June 17, 1940

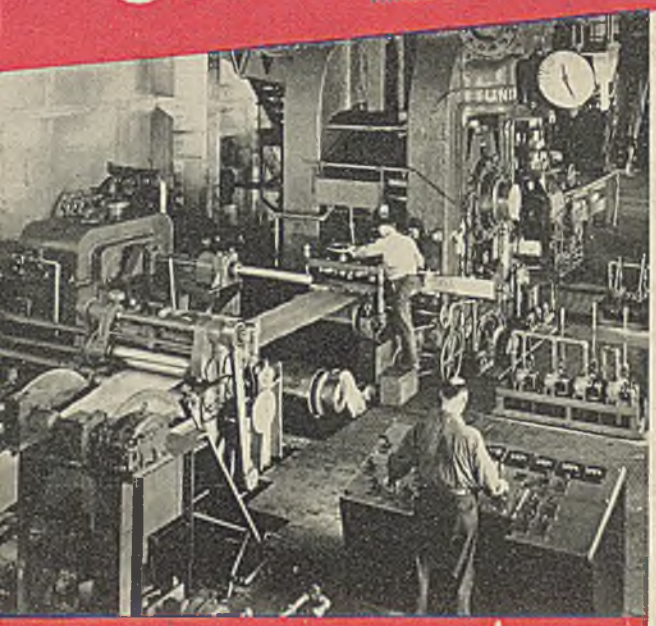
STEEL

PRODUCTION • PROCESSING • DISTRIBUTION • USE

ESTABLISHED 1882

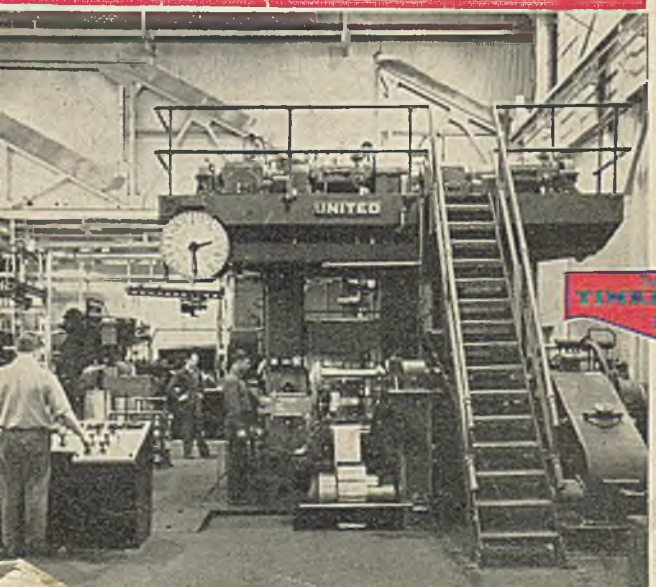
ROLLING STAINLESS STEEL ON TIMKEN BEARINGS

TRADE-MARK REG. U. S. PAT. OFF.



34" United 4-high Reversing Cold Mill equipped with TIMKEN Bearings.

20" United 4-high Reversing Cold Mill equipped with TIMKEN Bearings.



An overwhelming majority of the bearings used in the cold finishing equipment forming part of the recently completed stainless steel expansion program of a large steel manufacturer are TIMKEN Tapered Roller Bearings.

TIMKEN Bearings are used on back-up and work roll necks of the 34" 4-high reversing cold mill, the 28" 4-high reversing cold mill and the 20" 4-high reversing cold mill. They are also used in the following auxiliary equipment: combination drive and pinion stand of the 34" mill; drive and pinion stand of the 28" mill; pinion stand of the 20" mill; screwdowns; tension reel drives; pay-off reels; and gear drives. Miles of Smiles for the mill operator.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN TAPERED ROLLER BEARING EQUIPPED

TIMKEN

TAPERED ROLLER BEARINGS

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

Whitey Sez:

"No one can accuse us of taking our advertising that serious that nobody else does . . . even our product melts down to produce a smile on the operator's face."

MAURATH, INC., CLEVELAND

BUILDER OF BETTER WELDING ELECTRODES IN ALL ANALYSES

STEEL

1940 YEARBOOK OF INDUSTRY ISSUE

Contents

Price $1 Per Copy

Volume 106—No. 1 **January 1, 1940**

Index

CARBOLOY cemented carbide is not just a tool material—it is a metal with an amazing range of applications throughout industry.

As a wear-resistant material, Carboloy is employed in the form of inserts in machines and products subject to excessive localized wear. Hydraulic equipment, fish rods, food machinery, oil well pumps, textile machines, etc., are a few of the diversified machines and products doing a better job because Carboloy "inserts" guard against destructive wear.

As a die material, Carboloy draws wire, bar, tubing and sheet metal; sizes bars, bolts, nuts, etc.; extrudes such things as carbon resistors and other abrasive products; coats welding rods, automobile tire bead wires, etc.

As a wheel dresser material, Carboloy cemented carbide, impregnated with diamonds, dresses all types of commercial grinding wheels, eliminates diamond resetting, stops diamond waste.

As a gage material, Carboloy is employed on most commonly used types of precision gages to insure dependable accuracy over longer periods of use than has been ever before possible.

Even for maintenance purposes there is a use for Carboloy—Carboloy Masonry Drills—for drilling concrete, tile, etc., 50%—75% faster.

In 1940 let Carboloy help to step up production and step down costs on every possible process in your plant. Carboloy Company, Inc., 11141 E. 8 Mile Road, Detroit, Michigan.

The Mark of CARBOLOY

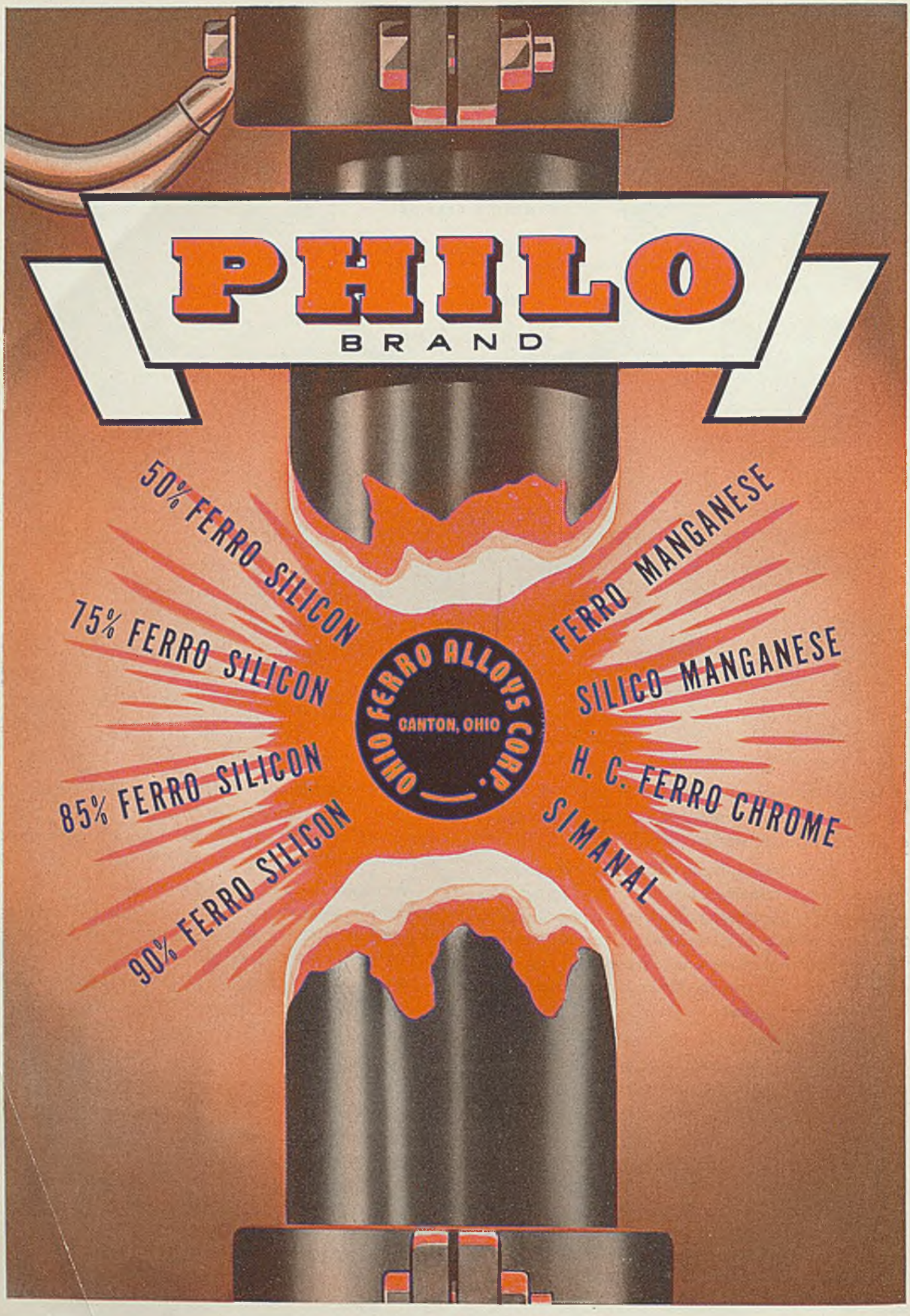
CARBOLOY

The Mark of CARBOLOY

TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS

★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★


PHILO
BRAND
50% FERRO SILICON
75% FERRO SILICON
85% FERRO SILICON
90% FERRO SILICON
OHIO FERRO ALLOYS CORP.
CANTON, OHIO
FERRO MANGANESE
SILICO MANGANESE
H. C. FERRO CHROME
SIMANAL

STEEL
PRODUCTION • PROCESSING • DISTRIBUTION • USE

As the Editor Views *This Issue*

■ INDUSTRY is entering a new year flushed with the successes of 1939's second half but cognizant of the uncertainties attached to the various factors that will regulate the fortunes of 1940. Restrained optimism and a disposition to avoid the pitfalls that accompanied previous periods of rising activity mark the attitude of business. Unprecedented expansion in industrial production last fall carried it to approximately the best level in history, although the 1939 average was well below that of 1929. Iron and steel and metalworking industries appear assured of a favorable first quarter. Although some moderation from the recent pace seems inevitable as the new year progresses, average improvement of 5 to 10 per cent in industrial production for 1940 is regarded as a conservative expectation.

* * *

War and Politics

Europe's war and domestic politics (p. 152) are the principal factors tending to obscure 1940 prospects. Continuance of the war should account, at least indirectly, for considerable business in steel and manufactured metal products. Demand from belligerents is unlikely to match the volume received in certain periods of the World war, since conditions generally are not comparable with those of 1914-1918, but the trend should be upward for the duration of hostilities. Continued harrassing of business by the national administration and possibility of a third term for the New Deal may prove a retarding influence on domestic business. . . . Recent labor developments (p. 158) have not been without some encouragement to industry and the public, and although some changes in federal taxes still are deemed necessary; modifications last year (p. 156) proved heartening. . . . Industry has reason to hope for better treatment (p. 178) at the hands of government, but the war and national election make the course of the administration's policies more unpredictable than ever.

* * *

Building Better

Improved activity in the construction industry (p. 163) as the year progresses, following a rather slow start in the opening months, is indicated for 1940. Commercial building will be heavier than last year; larger construction budgets have been set up by utilities for 1940; public housing should increase at least 50 per cent and private residential building about 5 per cent over 1939. Decline in public works of a civilian improvement type will be offset partly by heavy construction for the army and navy. Only highway construction, including bridges and grade crossings, promises to show an increase in the strictly public works group.

* * *

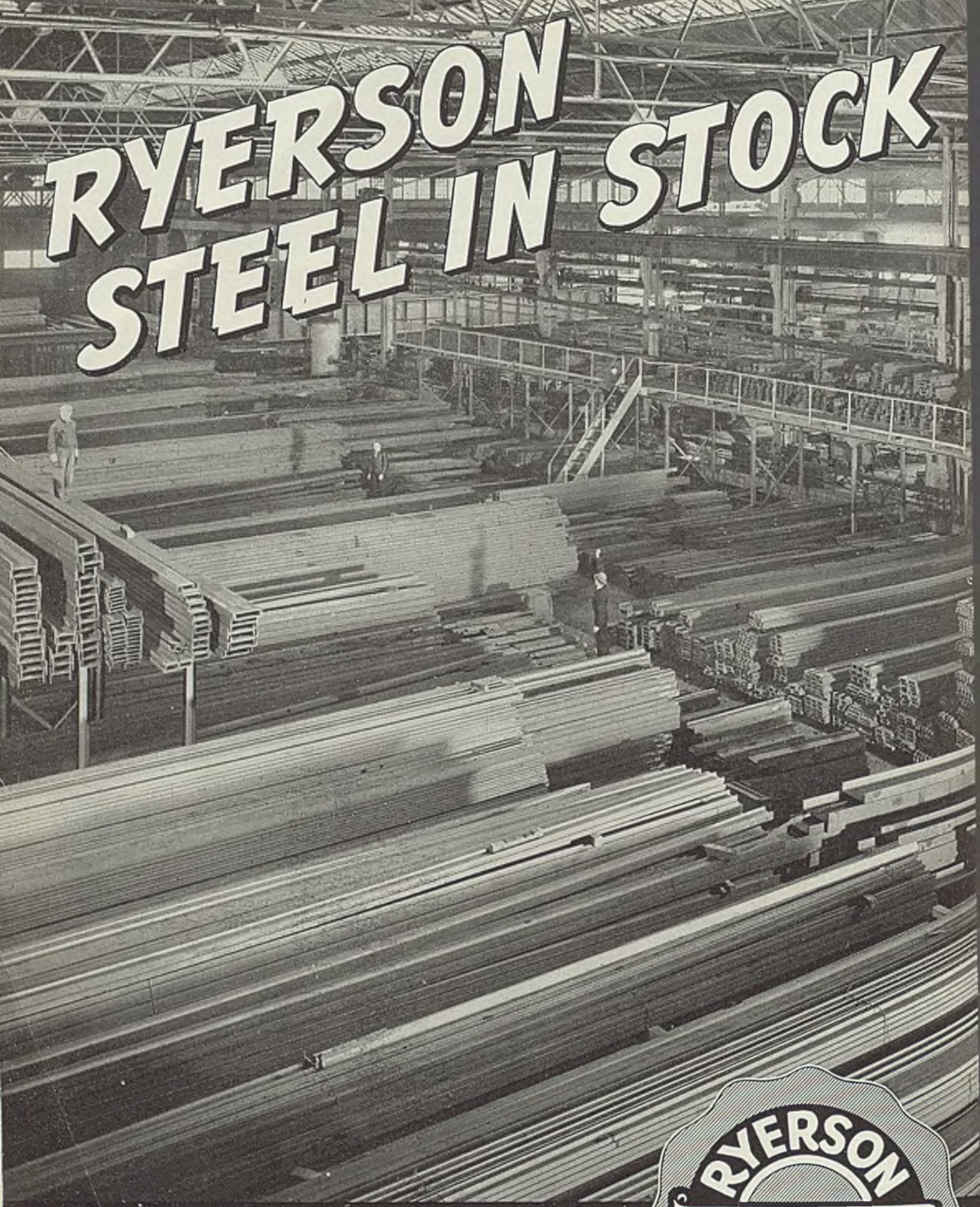
Automobile Gain Seen

Automobile builders (p. 177) probably will do better this year than the 3,650,000-unit output experienced in 1939. A 15 per cent gain to about 4,250,000 cars and trucks is seen as a reasonable forecast. Assemblies last year were up 37 per cent, almost even with the average of the preceding 16 years. Total motor vehicle registration reached a new high. Labor developments were costly to both workers and management. . . . Manufacturers of farm equipment (p. 166) look for a 10 to 30 per cent increase in sales this year. Business will be regulated largely by farmers' cash income which last year was moderately ahead of 1939, thanks partly to heavier government payments.

* * *

Shipbuilding More Active

Shipbuilders turned the year (p. 171) with the heaviest backlogs in peace-time history. Even greater activity is assured the next two or three years. Both cargo and naval vessels are prominent in current and prospective brisk operations of shipyards. . . . Railroads experienced the best fall traffic and earnings (p. 160) since 1930, and heavy purchases of equipment and track material contributed to the sharp expansion in steel demand. Prospects for continued active buying of cars and locomotives this year hinge on the trend of carloadings and profits. . . . Aircraft manufacturers'



TODAY, you can be sure of the same dependable steel deliveries that have characterized Ryerson's service to industry for nearly 100 years. Ryerson stocks of certified uniform high quality steel are ample, deliveries are prompt. A special quality control plan on Alloy Steels includes selection of special heats, identification, testing, and heat treatment information on every bar shipped. 10 large Ryerson plants carrying more than 10,000 sizes, kinds, and shapes of steel stand ready to meet both your regular and emergency requirements. Write for Stock List. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON
CERTIFIED
STEELS

$600,000,000 backlog (p. 169) points to a prosperous year for that industry.

* * *

Steel exports (p. 177) rose steadily last year, probably will gain further in 1940 through contraction, because of war, in former sources of supply to neutral countries, particularly in Latin America. . . . The container industry faces 1940 (p. 173) with the brightest prospects in many years, if not in history. Tin plate output in 1939 probably ranked second only to that of 1937. . . . Household appliance sales last year (p. 175) increased 20 to 25 per cent, and manufacturers are optimistic over the outlook. Machine tool builders, still buried under last fall's heavy orders (p. 176), have near-capacity schedules in prospect for at least the next four to six months and may have the most active year in history.

Exports To Expand

* * *

Notable advances in technology are available to industry at the beginning of 1940. Many of them present important potentialities (p. 219) for the steel industry. Under universal observation is the southern blast furnace equipped with an air conditioning system for reducing moisture in the furnace blast. Recently a 100-ton top-fired open hearth has been placed in operation. New emphasis is being placed on beneficiation of raw materials, as reflected in the iron ore crushing, sizing and blending plant now under construction in the South. The bessemer process, through recent developments, has new possibilities. Important research work has to do with refractories, mold design, preparation and steel pouring practices, continued application of automatic controls. Continuous casting of steel ingots (p. 342) now is being done commercially.

Technical Advances

* * *

Forging manufacturers are able to offer (p. 216) better and more accurate product. Forgings now are produced in a greater diversity of shapes and designs and are available in the newer alloys. The trend is toward integral construction through joining two or more forgings by welding. Numerous improvements have been made in forging equipment. . . . Potentialities of the welding process have been elevated considerably (p. 210) through improved welding machines, new welding electrodes and greater versatility in designing for welded fabrication; more also is known about reducing the cost of welded fabrication. Another notable advance in the field of joining is the further development of ingenious, low-cost fastening devices.

Forgings Improved

Recent progress in the field of heat treating makes it easier (p. 196) to meet exacting requirements. This includes: Improvements in atmospheres and furnaces for their utilization; application of radiant tube heating elements and elimination of alloy muffles; extension of induction heating for hardening; commercial acceptance for austempering; expansion of the flame process for hardening, softening and strengthening. . . . Significant to the stamping industry (p. 214) is the development of sheets that do not fail as a result of age hardening. They can be deep-drawn without roller leveling. The trend continues toward larger, more intricate stampings, with much deeper draws. . . . The foundry industry (p. 245) is in a better position by reason of improved molding and melting practices, wider range of analysis for iron, steel and nonferrous castings and greater ability to meet design requirements. . . . Die castings (p. 242) continue to find new uses and production processes have been placed under closer control; die castings now are being formed cold after casting.

New Uses for Die Castings

* * *

Says an important user with respect to progress in machine tools (p. 234): "Most outstanding developments are those based on recognition that the highest precision of product can be combined with utmost rapidity of production in a machine that retains its accuracy throughout its life with an absolute minimum of lost time from any cause.". . . In metal finishing (p. 238), new processes increase the effectiveness of corrosion-resistant coatings and make new finishes available on surfaces hitherto difficult to coat. For the first time, by plating with nickel, aluminum can be soldered. New arrival in the plating field (p. 240) is manganese. . . . Much new materials handling equipment is available (p. 203). For example, a center-control truck now can be operated in restricted clearances, making it possible to do much work mechanically that formerly was done manually.

Precision In Tools

* * *

Manufacturers and businessmen say insistently that the United States must stay out of war. Recalling the aftermath of the World war, they fear the economic dislocations that would grow out of complete industrial mobilization for war at the present time. In the same spirit, manufacturers are proceeding cautiously with plant expansion programs. As exemplified by the thinking of the machine tool industry (p. 229), they are eager to modernize, become more efficient, but are averse to adding production capacity that later might prove embarrassing.

E C Kreutzberg

By B. K. PRICE
Associate Editor, STEEL

To Shape 1940 Business Pattern; Year for Industrial Statesmanship

ALTHOUGH last quarter's production was heaviest in history, the American steel industry entered the new year with backlogs sufficient to assure profitable operations for some weeks to come. Only early cessation of hostilities in Europe could greatly alter this outlook.

Prospects for the whole year are more obscure. Europe's war and domestic politics are chief complicating factors. Continuance of the war should account, at least indirectly, for considerable business for the steel and metalworking industries. Continued harassing of business by the administration and the possibility of third term for the New Deal may prove a retarding influence on domestic business.

Some see in the war's continuation strong political ammunition for the New Deal's battle to succeed itself. But the war abroad is not this country's war, as has been pointed out repeatedly — by business. Moreover, for a period of months there have been recurring evidences of a turn in the political tide, a trend which augurs well for the November showdown.

On the whole, concensus is that if the war continues in Europe, steel's 1940 business will not only be good but will rank among the industry's best years.

Well aware are all industrial leaders that conditions today are not comparable with those in the early stages of the World war. Belligerent countries are much better equipped and organized for war. They have large stocks of war materials on hand. And so far there has been no succession of major military operations to consume huge quantities of steel.

Yet with the arms embargo repealed, it appears certain the United States will be called upon to supply the belligerents with equipment and munitions on an increasing scale, and to supply larger quantities of steel to neutrals now cut off from normal supply sources.

No such demand from belligerents as featured certain periods of the World war is expected this year, perhaps not even later, but export buying of steel and steel equipment should increase. This combined with fairly good domestic demand, which appears probable, with commodity prices generally buoyant as expected under the influences of a major European conflagration, should mean considerable business. Add defense requirements, and, as one trade leader says: "It would require a lot of politics to offset it."

Eventually, of course, such stimulating war influences will bring a severe aftermath, and, for this reason alone, if for no other, there is no doubting the sincerity of steel leaders in their strongly stated preferences for the long-range processes of peace, through which wealth is developed rather than destroyed. Still these stimulating war influences are now prevalent and probably will continue as long as the war lasts.

Assuming, on the other hand, that the war does come to an early and abrupt end, outlook for the year becomes less favorable from a strict and immediate business viewpoint. Of course, long pull prospects would be greatly enhanced, and the sooner peace does come, the less severe the readjustments, especially in view of the success that business and government have had so far in combating war-time inflation.

In fact, it might be added that the policy of the government, with its controls extending into finance, credit and virtually all lines of production, has become so pronounced as to have already suggested the danger, should the war continue, of government influences being extended to a point where it will interfere with the normal and necessary readjustments.

But withdrawal of the buying expected to arise from European hostilities, and the accompanying repercussions, would leave a major scar. Particularly would this be so in an election year, with its political party conventions and selection of candidates, the third term issue and the eventual political showdown.

Certainly, politics this year as a factor for business uncertainty cannot be ignored—war or no war.

Consider, for instance, the possibility of the President being renominated at his party convention in early summer, and then, soon thereafter, the possibility of some representative poll — say, the Gallup poll — revealing much support for the candidate with the rank and file of voters. Effect would be decidedly depressing on business, even before the November elections.

However, this and other political aspects represent bridges yet to be crossed, and in approaching them, the steel industry and business in general find encouragement in the apparent turn of the political tide —a turn which set in at the elections a year ago last November, found reflection in the seventy-sixth congress and again at state and local elections this past fall, when voters shied at pension panaceas and evinced greater interest in government economy.

With this turn, business confidence began to climb. There were setbacks, of course, when congress early in its first session last year managed to appropriate more than 11 billion dollars for a new peace-time record, with two billions being added later; when the President's so-called business appeasement program again fell flat; and when the Chief Executive's monetary powers were extended.

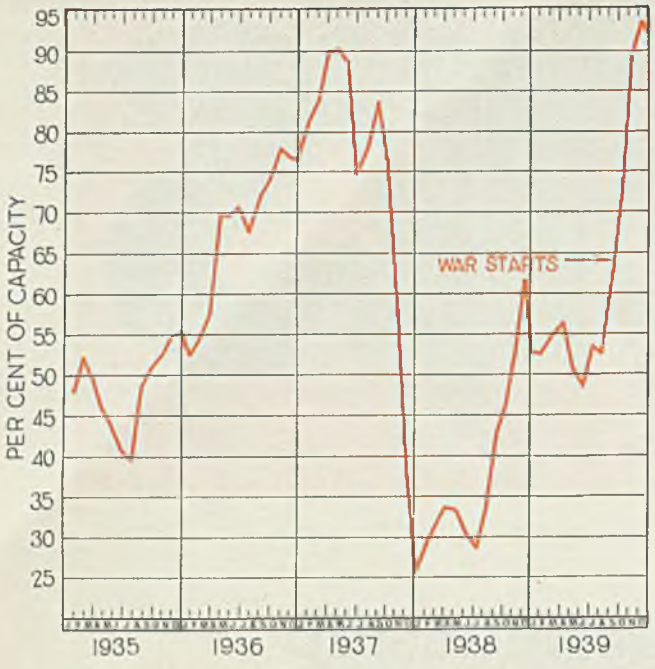
But congress, in the main, continued increasingly independent in its actions, and that was what business wanted to see. Congress showed less disposition to delegate any more of its essential powers and greater determination to retrieve some given over under excuse of economic emergency.

And when congress finally adjourned last August on the high note of squelching the administration's spend-lend program of two billion eight hundred million dollars (with significance attached not alone to the fact that it was done, but also to the thorough manner in which it was done), steel business was expanding daily.

In fact, under the added stimulus of the political calm then prevailing in Europe (the well-known calm that preceded the storm), and of the stronger price trend which followed the sharp break in the market on light flat products in May, steel business had been expanding contra-seasonally since late spring. Before that the undertone had been fairly strong, but business had been held in partial check by uncertainty as to what was going to happen in Europe, an influence that was particularly noticeable in March and April, which in normal years are two good months for steel production.

Subsequently, business became somewhat immune to repeated war threats abroad and when even these quieted during the summer and the political situation on this side appeared to offer reasonable encouragement, steel activity expanded. When the war in Europe finally broke, there was no faltering, as some expected, but rather, almost immediately, the beginning of one of the heaviest buying movements in history.

Consumers bought because of the large demands they thought would descend upon the steel industry,



■ **Steel production underwent one of the sharpest rises in history in the late summer and fall of 1939. From 48.32 per cent operations in May, production increased to 93.26 per cent of capacity in November, and an all-time tonnage record was established in the fourth quarter. Trend line from late summer shows clearly the upsurge was underway before the war started**

either directly or indirectly, as a result of a major European war. They bought on the probability of a sharp price increase and shortly they were buying to get on mill schedules, in a primary effort to insure deliveries against orders which were beginning to descend upon them from all directions—except from the belligerents.

Paradoxical as it may seem, this rush of buying ensued, even though the outbreak of war abroad did not come entirely unexpectedly, and undoubtedly in this set of conditions lies much of the answer, for had the war caught everyone flat-footed it could very well have created such confusion as to have made positive buying action impossible.

Moreover, when war came, domestic steel business was definitely on the upgrade. Consumers had begun to replenish abnormally low stocks, in the realization that prices were low and that fall business prospects were generally encouraging. They were in the frame of mind to go ahead. War provided the added spark.

During the ensuing period of fast expanding steel production, the question of "bottlenecks" naturally arose, particularly with respect to blooming mill capacity, which was a bottleneck in 1937, and coke. Answer to this question came a little later when steel output soared to practical capacity, and held over the remainder of the year.

The situation, it may be added, was not assisted by any large accumulation of semifinished prior to the outbreak of the war. In fact, except in possibly a few instances, there were apparently no excess stocks.

In the first two months following the outbreak of the European war the number of steel employes increased 87,000, from 458,000 in August, which in itself was the highest total in 18 months, to 502,000 in September and 545,000 in October. Total payrolls, including both wages and salaries, increased $15,527,000 in the two-month period, from $67,894,000 in August to $69,735,000 in September and $83,421,000 in October. According to the American Iron and Steel institute, on whose figures these calculations are based, average sumber of working hours per week fluctuated from 36.2 in August to 35 in September to 38 in the following month.

Employment low mark for the year was reached in May, when the total averaged 448,000. Payroll low was reached in February, a short month, with the total amounting to $57,044,000. Interestingly, the October figures last fall compared with 603,100 employes in August, 1937, and $90,863,016 in March of that year, the highest reported figures in recent years.

Buying of war steel for direct shipment abroad developed slowly. Soon after the outbreak, possibly 200,000 tons of semifinished and a round tonnage of pig iron were purchased. Following the repeal of the arms embargo late in October at a special session of congress, came important quickening of orders for airplanes, tractors, trucks, machine tools and other equipment, and in November more than 500,000 tons of scrap were added to the 200,000 tons or so placed last summer. But there was and has been to date no consistently large finished steel buying by belligerents.

Indirect Influences More Important

Nor is any especially large amount to be expected for some time to come, for the reason the warring countries long have been stocking munitions and supplies. Rather it will be indirect influences which will likely prove the more important, and, in fact, already have — through the requirements for equipment ordered to be built in this country and through steel bought by neutral countries which are having to turn more and more to this country.

Eventually, credit limitations may have effect. World war purchases were financed largely on long-term credit, which now, under the law, cannot be extended to belligerent governments. But this should have little bearing for some time, except through the more conservative pace of a long-range program by warring nations with this credit limitation in mind.

Precise effect of war influences on current activity in the steel and metalworking industries remains an open question. Undoubtedly it has been considerable. Yet the fact that the upturn began before the war and that pressure for steel continued heavy even after the initial spurt and in the absence of much

war business which could be immediately reflected on the books, lends strength to the contention war influences have in no sense been the sole motivating factor. This is further supported by the fact industries which have had little to expect from the war have participated in the recovery of the past few months. Admittedly prospects of a sharply advancing commodity market in general stimulated these lines to a certain extent.

To date there have been no indications of extensive overbuying. STEEL's survey of stocks of more than 300 consumers indicated a gain in the first two months after the outbreak of European hostilities of little more than 12 per cent, with three-fourths of the companies reporting on hand 90-day or less supplies, based on anticipated operations, with one-fourth reporting an actual reduction in their inventories within the period. Since then it is believed there has been a further, but moderate average increase.

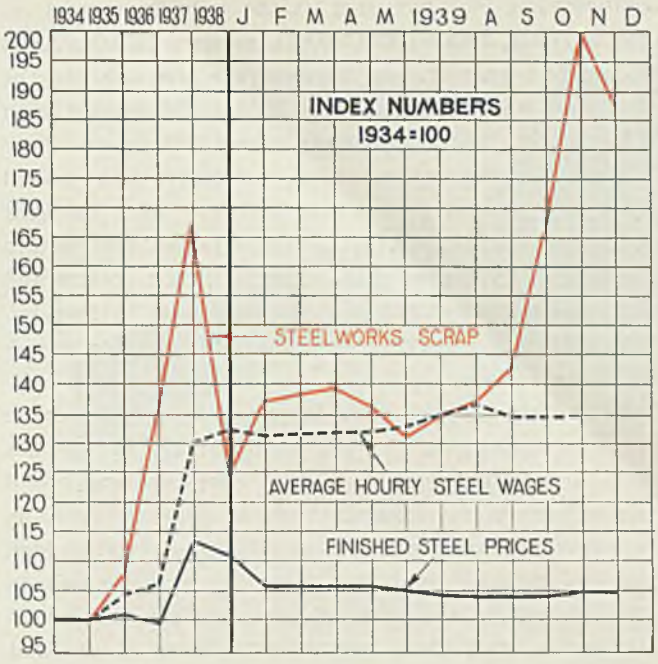
Industrial Expansion Limited

More questionable is how fast distributors will be able to move manufactured consumer products into actual consumption. Have they over-anticipated these final consumptive requirements to any important degree? As for durable goods, for which there has been an increasing demand over recent months—notably rolling stock, rails, ships and various lines of machinery and electrical equipment—this question is not so paramount.

Usually in durable goods there is a well defined need at the time of the placing of the order; certainly little directly depends upon public whim, or ability to purchase, a few weeks or a few months later. Sudden peace would cause cancellation of some machine tool orders, for intsance, but it would take something like that to do it.

Industrial building has expanded, although there has been nothing suggestive of a war boom, and this, of course, is as it should be. Certainly nothing, it is pointed out, could prove more disrupting later than a rapidly expanded industrial capacity built up on war orders, unless special provision is made for amortization. Manufacturers are apparently heeding the stern lesson taught by the World war. Industrial construction increased about 40 per cent last year, without being active, and probably will undergo a similar gain this year.

Reflecting increased activity in business, short-term commercial and industrial loans, expanded almost without interruption throughout the summer and fall, although the market for new security issues continued extremely inactive. For the first ten months corporate issues totaled $1,840,499,622, up from $1,691,234,441 in the corresponding period in the preceding year, but down from $2,329,023,600 in the first ten months of 1937. Amount of new capital represented was the lowest for any corresponding period since



■ While finished steel prices have fluctuated only moderately in the past six years, two important costs, labor and steelworks scrap, have risen sharply. Rise in scrap prices was especially sharp after outbreak of Europe's war. In the face of rising costs, steel producers reaffirmed finished steel prices for first quarter, 1940

1935, amounting to $322,870,605, against $768,933,802 in the same period of 1938, $1,142,315,923 in 1937, $887,667,283 in 1936, and $303,543,535 in 1935. In October, amount of this new capital was only $18,000,000, against $16,000,000 in September and $64,000,000 in October of the year preceding.

Obviously, there is still much uncertainty as to the long-range outlook, when it comes to financing large expansion programs and new business ventures. Disturbed world conditions are undoubtedly an important factor, but others, nearer home, lie in the magnitude of the public debt, burdensome taxes, the multiplicity of costly government controls and the disturbed labor situation, all of which have combined to make it extremely difficult to do business and make a profit.

So far prices on finished steel have been held relatively steady, largely as a matter of deliberate policy. Raw materials have advanced sharply in some cases —scrap, fuel, zinc, ferroalloys of the manganese and tungsten groups, and foreign ores, particularly manganese and to a lesser degree tungsten. Only the savings inherent in large-scale operations and the fact that a number of the major producers have had fairly good reserves of low-priced raw materials have made this stability possible so far.

Under stimulus of improved operations, net earnings of the steel industry increased in the third quarter, and sharp gains are indicated for the record-breaking production quarter just ended. In the third quarter net earnings of 18 leading steel companies

representing 89.3 per cent of the industry's total ingot capacity, totaled $29,289,843, against $12,074,750 in the second quarter, and brought the showing for the first nine months up to $51,416,398, as compared with a loss of $21,769,600 in corresponding 1938 period.

Since the depression began, no factor has proved more detrimental to business recovery than the fast mounting tax burden. With the national debt within the past six years up more than 20 billion dollars and with the federal deficit now running close to four billion dollars annually, the situation is growing steadily more serious.

Yet within the past year there has been some cause for encouragement. Certain modifications in the tax structure have been effected by congress and broad tax reform study started. Also, at present, there is considerable sentiment favoring offsetting certain added national defense needs by curtailing expenditures in other directions and then relying upon this and swelling tax receipts from improved business to at least hold, if not narrow, the gap between income and outgo. So far, this is only sentiment.

Meanwhile, it is estimated in some quarters the steel industry's tax bill for the year just ended will run around $145,000,000 against $98,000,000 for 1938, and, interestingly, $165,000,000 in 1937, which on an average was a more active year than 1939. For 1938, the industry paid out taxes which exceeded available net earnings by almost 18 per cent.

Asked Business' Views on Taxes

At invitation of John W. Hanes, ex-under secretary of the treasury, who more closely understood the business viewpoint on taxes than most officials in Washington, business leaders and public tax experts have made numerous suggestions over recent weeks, with the need for repeal of the capital gains tax and loss provisions of the income tax law coming in for considerable emphasis. Modification of this law in 1938 was not sufficient to materially encourage capital to take the business risks essential to private enterprise.

Also strongly urged is provision for carrying operating losses forward as deductions against income for a longer period than the two years provided by the 1939 revenue act. This would prove particularly helpful to the heavy industries, where there are sharp cyclical fluctuations and where the present law sometimes serves as capital levy.

Repeal of the capital stock tax and excess profits tax and elimination of double taxation on dividends are proposed; also permission for corporations to file consolidated returns as a means of combating multiple taxation and to permit losses of a pioneering subsidiary—one engaged in the development of new enterprise—to be offset by earnings of well-established units.

Substantial reduction in inheritance tax rates is urged, on the basis that present schedules often divert capital from highly productive enterprise, to apply it to government expenses; also reduction of individual surtax rates to encourage investment, removal of tax exemptions on public salaries and at least a mild beginning in broadening the base of government revenue by lowering the personal exemption level. Simplification of tax laws and their administration is generally urged.

Despite changes still deemed necessary, tax modifications last year proved heartening to business. Changes included the elimination of the remnants of the undistributed profits tax; provision of a 2-year net loss carry-over, which began Dec. 31, 1939, and for which a longer period is now being requested; imposition of a flat corporation tax on corporate incomes above $25,000; and allowance of an upward adjustment of capital stock values for the fiscal years ending June 30, 1939, and June 30, 1940.

Elimination of the undistributed profits tax was regarded as significant inasmuch as it represented the

Industry Employing 150 Men Means

■ Minnesotans recently became concerned over the state's decline in industry and employment, decided it was due largely to the state's taxing policy and restrictions on industry. Now a change of heart and policy is becoming evident. Above chart is part of a study by the Inter-Organization Committee for Economic Development of Minnesota, a group trying to attract new industries

administration's forced retreat from the theory of punitive taxation. However, it is pointed out that as a practical concession it did not mean so much, for the treasury department was able to strengthen section 102 of the 1938 revenue act under which taxes may be levied on undistributed corporation earnings if in the internal revenue commissioner's opinion these are being "unreasonably" accumulated to avoid payment of personal surtaxes.

Broad changes in the four-year-old social security act by congress last summer proved generally gratifying. In all, nearly 200 amendments were made, with some important sections being virtually rewritten Changes provided for the liberalization of benefits for the aged and for the freezing of the payroll tax for old-age annuity at 1 per cent up to and including 1942, instead of permitting it to go to 1½ per cent the first of this year. This is expected to result in a saving to employers and employes of $275,000,000 annually for the 3-year period.

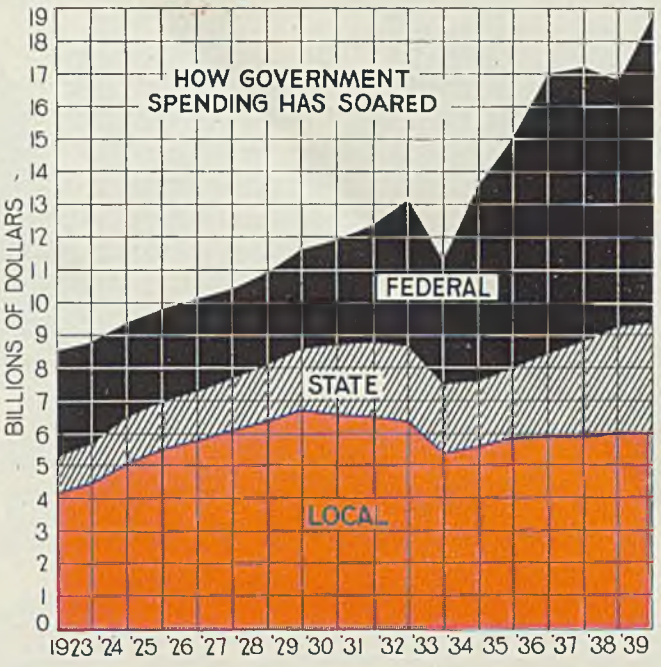
Further estimated saving to employers of about $80,000,000 annually will result from the elimination of unemployment insurance tax on that part of an employe's income above $3000. Particularly gratifying to business, in addition to these more immediate savings, was the abandonment of the contemplated huge reserve accumulation, which under the original program would have amounted by 1980 to the staggering sum of 47 billion dollars.

Company Plans Retained

Meanwhile, most company pension plans are being retained as supplementary to the social security act, according to the National Industrial Conference board. Only 10 per cent of the company plans have been discontinued because of this law, and the adoption of new supplementary plans by other companies has more than offset the discontinued plans. Private plans supplement social security benefits for the higher salaried employes, especially those receiving more than $250 a month.

While business and industry in general last year were encouraged by the actions of congress, particularly its stiffer resistance to administration domination, Supreme Court opinion was fixing more firmly than ever that body's authority to regulate and control business. Distinctions between interstate and intrastate commerce were drawn finer, as they affect employe relations and marketing of products, and hence the authority of congress over these two primary matters in the operation of any business became fairly unlimited.

Sketching briefly highlights in this trend: Upholding the national labor relations act two years ago; later the ruling, in the Jones & Laughlin Steel Corp. case, that the company's operations affected interstate commerce so closely and intimately that regulation of its labor relations was desirable in order to maintain the even flow of commerce.



■ **Why taxes soar: Government costs in the United States now are at the highest peace-time level, both absolutely and in proportion to national income. Aggregate expenditures for fiscal year 1939 are estimated at between 18.5 and 19 billion dollars. Expenditures over a period of years is the principal factor in determining the level of taxation. Chart drawn from data compiled by National Industrial Conference board from state and federal reports**

Within the past year the scope of the labor relations act was further extended in the Consolidated Edison case, where the law was found applicable to a company furnishing electricity entirely within a state, because some of the customers were engaged in interstate commerce.

Likewise the law was found to apply to a small garment processor having no title or interest in the raw materials or finished products which moved in interstate commerce to and from his establishment.

Supreme Court decisions in 1939, involving sales of tobacco and milk, appeared also to firmly establish the control of congress in the regulation of marketing. Significant also, was the upholding of the constitutionality of federal price-fixing of farm products which are "in the current" of interstate commerce.

While not a Supreme Court ruling, a far reaching court decision last year, in its direct bearing on steel, was that of the District of Columbia court of appeals, sustaining a complaint of several of the smaller eastern steel companies that the secretary of labor had exceeded her authority in determining minimum steel wages under the Walsh-Healey act. Case since has been appealed to the Supreme Court, but the District of Columbia court's 2-to-1 decision has had the effect to date, and will have at least until the end of the litigation, of staying an order for the establishment of 62½-cent per hour wage minimum in a "locality," covering

an entire area of 13 states and a part of another, from Maine to Kentucky and Ohio.

Court majority held the order to be "not only unwarranted, but incongruous," and stated: "Congress obviously had in mind a local center of manufacturing when using 'locality'"; also that "the secretary is not authorized to impose the predominant wage practice of an industry . . . viewed as a whole over broad regional areas."

This law, which first was made effective Sept. 28, 1936, applies to government purchases, and, by virtue of its wage and hour controls, has been regarded as having a potential influence on steel employe relations second only to the Wagner act. Subsequently, however, there was the passage of the wage-hour law, and, producers have long wondered what justification there is in the government continuing to seek the right to impose on steel a minimum rate where government work is concerned which is more than 100 per cent higher than the rate now fixed by federal law on nongovernment work and more than 50 per cent higher than the rate ultimately proposed under the wage-hour act.

Enforcement Problems Difficult

A similar, although less important point arises in connection with hours. The current weekly schedule under the wage-hour law is 42 hours; eventually, if the present program holds, it will be 40 hours. The Walsh-Healey maximum rate is 40 hours, and has been from the first.

To Col. Philip Fleming falls the unenviable task of placing the wage-hour law in such working order that it will withstand the sharp barbs of criticism which will be directed at it in the new session of congress. It barely escaped drastic revisions at the first session last year.

Rather vague and highly controversial at best, act's enforcement problems have been exceedingly difficult and its interpretation by the administrative body has carried its influence far beyond the scope originally contemplated. Designed to help submarginal labor, the law has been extended, principally through its hours provisions, to apply to the wage rates of more than 12,000,000 workers. This has tended to create a wage inflexibility which jeopardizes the interests of sound recovery, many critics declare.

The long arm of federal regulation of business has, in the attempted enforcement of this act, been brought home to many, with administrators of the law maintaining that even concerns selling entirely within their own respective states are subject to the statute if they buy from sources from outside their states. By doing this they become a party to interstate activities.

No accurate estimates are available as to how many employes in the iron and steel and metalworking industries are affected, although the National Industrial Conference board estimates that throughout the country some 12,300,000 workers, or 27 per cent of the 45,000,000 employed, are affected.

When the law first went into effect, Oct. 24, 1938, about 300,000 were receiving less than the 25 cents per hour minimum then stipulated; last Oct. 24, between 600,000 and 700,000 were estimated to be receiving less than the 30 cents per hour minimum now effective.

Those whose work week was automatically shortened or who were given time and a half for overtime, represented a much larger number. At the time the law first became effective it was necessary to extend the 44-hour week to approximately 1,380,000 additional workers; last fall the new 42-hour week was extended to about 1,700,000.

Next scheduled step in the gradual approach to the objectives of this law, which are a 40-hour week and a 40-cent hourly minimum, calls for a 40-hour week, effective Oct. 24, this year. The 30-cent hourly rate, which went into effect last fall, will stand for six years, whereupon, under the present schedule at least, it will be advanced finally to 40 cents.

In any broad discussion of the business and industrial outlook the question of employe relations, particularly as it refers to the Wagner act, looms as importantly as ever. The disturbed relations of recent years have done as much, in the opinion of industrialists, as any one factor in retarding the badly needed flow of capital into industry and in maintaining unemployment at a high level.

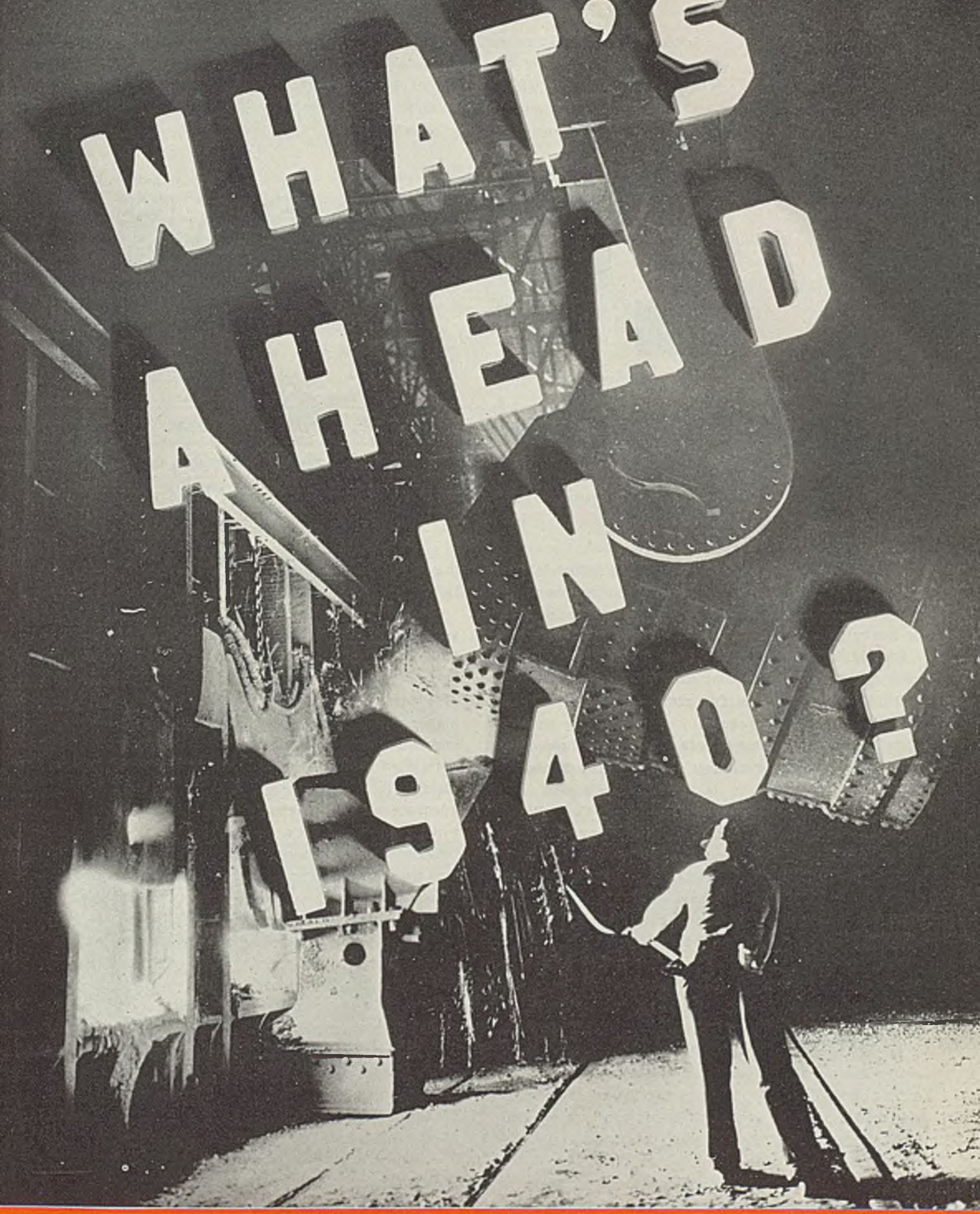
Reins on Radical Labor Tightened

However, while another year has passed without any legislative changes in the Wagner act, developments in recent months along the labor front have not been without some encouragement to business and industry and the public. Congressional investigations into the Wagner act and its administration are under way; the department of justice has outlined major objectives in its attempt to enforce antitrust laws against certain labor practices; and certain court decisions have tended to check the trend of radical labor activities.

Among these court decisions was that in the Fansteel case, in which the Supreme Court outlawed the "sitdown" as a weapon in industrial strife (although the weapon more recently has been superseded by the "slowdown," as witnessed in the Chrysler strike this past fall). One leading legal authority recently, in referring particularly to the Fansteel decision, expressed the opinion that chapter involving the principles in this case has not necessarily been brought to a close, and recommended a careful reading of some of the national labor relations board's late decisions on the reinstatement of strikers convicted of violence and other infractions of the law and also opinions in the circuit court of appeals in the Republic Steel Corp. and Stackpole Carbon Co. cases.

Recent moves to prosecute labor unions for antitrust

(*Please turn to Page 331*)



RAILROADS

Fall recovery boosts traffic, earnings to best levels since 1930. September, October freight car orders exceed total of preceding 28 months. Track material buying increases

RAILROADS not only shared in the industrial revival of late 1939 through improved revenues and earnings, but they also contributed to the upturn by heavy purchases of equipment and material.

Freight traffic the first half of 1939 was relatively light despite moderate gains over the depressed levels of 1938. Carloadings the first six months were 7.5 per cent larger than the year before but 24 per cent less than in 1937. Net railway operating income showed an increase of 132 per cent over 1938 but a decrease of 81 per cent from 1937.

Third quarter saw steady improvement. Carloadings gained 14.7 per cent over 1938, when business also was expanding more than seasonally, and cut the reduction compared with 1937 to 11.5 per cent. At the same time, net railway operating income was 53 per cent larger than the year before and 11 per cent ahead of the 1937 quarter.

October recorded more than seasonal betterment, traffic and earnings soaring to the best levels since 1930. However, income for the entire year was little more than one-half as large as in 1929.

As has been demonstrated in the past, railroads generally are required to regulate their spending by the extent of their income. The ups and downs of business and traffic the past ten years have been accompanied by a corresponding trend in expenditures for equipment and material.

When carloadings started their three-year slide in 1930, the carriers had ample supplies of freight cars and locomotives. There was little necessity to replace equipment as it wore out and was abandoned, because the decline in need for rolling stock was even sharper. As a consequence, railroad ownership has shrunk more than 600,000 freight cars and 14,000 locomotives since 1929.

Carloadings dropped almost 50 per cent between 1929 and 1932. Peak in traffic since the latter year was in 1937, but loadings in that period represented recovery of less than 40 per cent of the post-1929 shrinkage. This circumstance of light traffic, when coupled with higher freight train speeds, heavier load per car and improved co-operation between the railroads and their customers through the shippers' advisory boards, explains why the carriers have been able to maintain adequate service in the face of a steady decline in available rolling stock.

The railroads have come a long way since the World war from an efficiency standpoint. Freight trains move more than 60 per cent faster since then, and the average locomotive has 43 per cent more power to pull cars having 8 tons more carrying capacity than in 1918. The congestion of traffic and shortages of cars that were not uncommon 20 years ago have become infrequent. Last fall, when carloadings originally were not expected to reach a peak of more than 800,000 cars weekly but, instead, exceeded 860,000 cars in October, the bulge was handled without undue delays.

Sharp revival in fourth quarter freight traffic did not catch the railroads unprepared. When the outbreak of war in Europe, Sept. 1, was followed promptly by an acceleration in the industrial recovery of the preceding three months, the carriers met to lay plans for accommodating the indicated upturn in business. Outgrowth of this meeting was the decision to place additional facilities in shape for service through repair of damaged equipment and purchase of new cars.

This program gave powerful stimulus to iron and

steel demand. In September and October more than 42,000 new cars were ordered, exceeding total purchases of the preceding 28 months. Awards for all of 1939 were close to the best level in ten years. About 60,000 cars and 100 locomotives were repaired the 60 days after mid-September.

As steel backlogs swelled sharply and deliveries lengthened, accompanied by threats of higher prices this year if not sooner, the railroads considered it advisable to quicken track material buying programs. This resulted in a large portion of 1940 rail and accessory needs being ordered in September and October, or somewhat earlier than usual. Average requirements showed a 20 to 25 per cent increase compared with the year before, although the bulk of 1939 rails was not ordered until the first quarter last year.

Rail mill operations the first nine months of 1939 increased 77 per cent over the 1937 period. Fourth quarter output was restricted in some instances by the necessity of diverting ingot supplies to other mills, but production increased sufficiently to give the year's total a favorable comparison with the 1936-37 level. Output, however, still was far below pre-depression figures.

Congress took under consideration last year the question of railroad assistance, but little legislation of marked importance to the carriers was forthcoming. The President's spend-lend bill, among other contemplated expenditures, proposed a $500,000,000 appropriation to be allotted for leasing of railroad equipment, but the measure failed to pass.

The spurt in material and equipment buying last fall effectively substantiated the railroads' contention that improved business, rather than additional loans, is the best medium for stimulating purchases of rails, cars and locomotives. Since many roads already are heavily loaded with fixed charges, the disposition to avoid capital expenditures that cannot be at least partially offset by increased revenue is natural.

Trend in Railroad Earnings, Spending

	Net railway operating income	Freight cars ordered	Car-loadings of revenue freight	Freight car ownership	New rails laid (tons)
1929 ..	$1,252,000,000	111,216	52,828,000	2,277,000	2,037,000
1932 ..	326,000,000	1,968	28,180,000	2,145,000	407,000
1936 ..	667,000,000	64,523	36,109,000	1,758,000	931,000
1937 ..	590,000,000	51,611	37,670,000	1,744,000	1,038,000
1938 ..	373,000,000	16,303	30,469,000	1,700,000	606,000
1939* ..	625,000,000	60,000	34,000,000	1,650,000	900,000

* Estimated.

A survey made by the interstate commerce commission last year indicated that at the close of 1938 deferred maintenance of the railroads amounted to $283,000,000. The 1939 upturn in expenditures came too late to offset all of the postponed spending accumulated previously, consequently a maintenance of railroad revenues under the stimulus of good industrial activity may see a continuation of the more liberal appropriations.

It is not to be expected that the equipment buying rate of late 1939 will be extended indefinitely, even though earnings should be relatively well maintained.

■ Freight movement last fall was the heaviest since 1930. Suggestive of the increased traffic are these five fast freight trains of Illinois Central railroad which leave Chicago daily at sundown. Train in the center, known as the MS-1, is claimed to be the world's fastest long-distance freight train. It covers the 527 miles between Chicago and Memphis, Tenn., in a scheduled running time of 12 hours and 50 minutes

Heavy orders placed after Sept. 1 cleared most of the larger contemplated purchases from the market, and with delivery of this equipment taking care of the carriers' most pressing needs, a reappraisal of the general business outlook within another month or two probably will decide whether or not additional major expenditures are warranted.

Government officials have pointed out that an efficient transportation system is an important factor in national defense. This has led to the inference that rehabilitation of railroad facilities would be part of a general program looking to the country's preparations for wartime eventualities. The carriers, however, contend they will be prepared to furnish adequate transportation service regardless of traffic demands.

"The tendency on the part of most people is to greatly exaggerate or magnify the 'war load,' " it was stated by M. J. Gormley, executive assistant, Association of American Railroads. He pointed out that the increase in freight traffic between 1916 and 1918 was approximately 5,000,000 carloads. "Assuming that that increase was all made up of traffic that had some relation to the war load, it may now be assumed that in the event of involvement of this country in war, the additional traffic load would not be greater than 12 per cent of the ordinary commercial traffic load. Such a war load increase does not offer a serious problem to the railroads unless cars are utilized for storage." Mr. Gormley maintained that the association's embargo system will prevent any such accumulation outside of strictly government business.

Technological developments in the railroad field last year were directed toward further economies in operation. Of note in locomotive building was a new diesel-electric engine for through freight service. This locomotive, consisting of two units of 2700-horsepower each, was built by Electro-Motive Corp. and marked a departure in application of this type of power from passenger train and switching service.

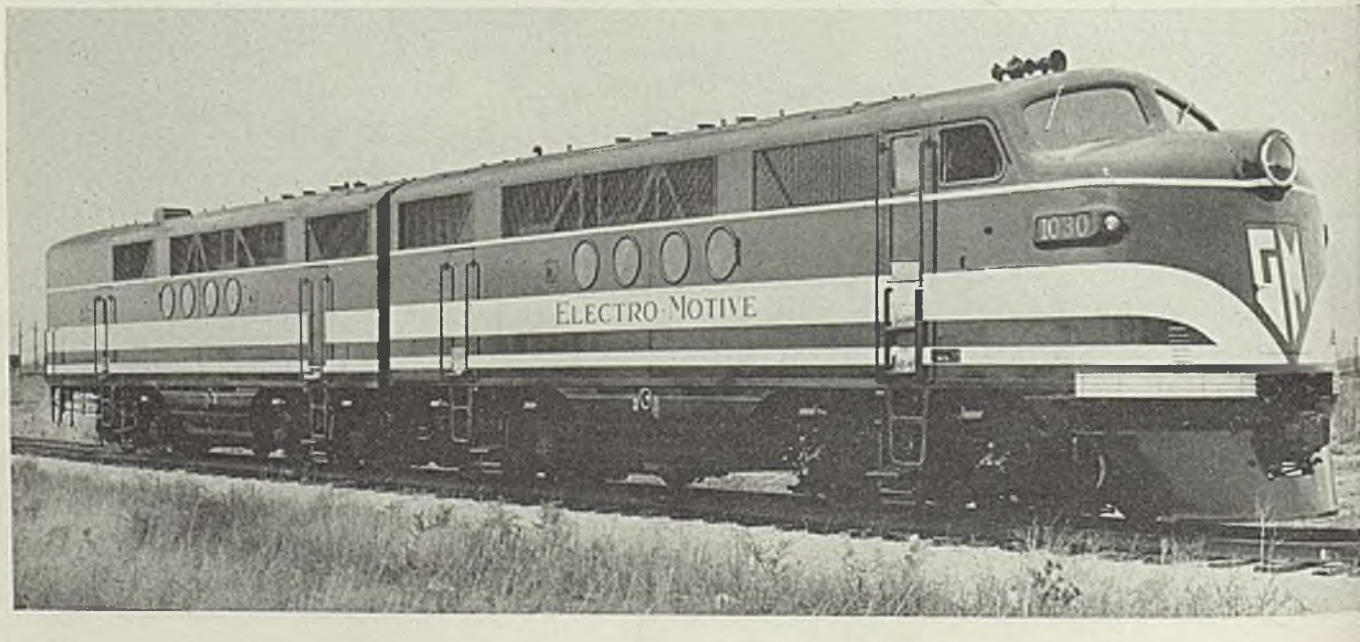
Another recent mechanical development is a new design of hydraulic transmission adapted to diesel switching locomotives. This transmission, a product of Hydro Transmission Corp., Hamilton, O., eliminates the electric drive commonly employed with diesel power. Used in connection with a two-speed, hydraulically-operated gear box, it provides an infinitely variable torque and speed ratio. Improved efficiency and reduced maintenance are claimed for this design.

Adoption of line production methods in building diesel-electric switching locomotives, was announced late last year by Baldwin Locomotive Works, Eddystone, Pa., and means a new step in manufacturing and selling practice. This company proposes to make it possible for the buyer to pick his locomotive from stock, as automobiles are selected in a showroom. Initial schedule called for production of 28 engines of 1000 and 660 horsepower for switching and transfer service.

Locomotive demand as a whole last year lagged behind that for freight cars. In the first nine months the railroads put in service 45 new steam locomotives and 157 new electric and diesel units and as of Oct. 1 had 68 steam and 40 electric and diesel locomotives on order. For the entire year installations or orders totaled about 300 locomotives of all types, compared with 252 in 1938.

Light-weight, high-tensile steel continued a widely-used material for freight car building and repairing. Under the auspices of the Association of American Railroads, the carriers are extending a study of weight reduction in freight cars through use of lighter-weight metals and through increased use of welding.

■ **High-speed diesel-electric locomotive designed for through freight service. Each unit is rated at 2700 horsepower and is being tested by several railroads but is not yet in commercial production. Use of diesel-electric power for passenger service and for freight switching has become widespread, but this is its first application to high-speed freight trains. The locomotive was built by Electro-Motive Corp., La Grange, Ill., General Motors Corp. subsidiary**



CONSTRUCTION

Higher activity expected this year. Industrial expansion to be held to conservative requirements. High labor costs and taxes threat to building. Fabricators' profits small

HIGHER rate of construction activity as the year progresses, following a rather slow start in the opening months, is indicated for 1940. War influence abroad on private construction is likely to be indirect so long as America remains neutral. Increases, however, in manufacturing, commercial and private residential building probably will be most in evidence, especially in industrial districts receiving large war orders from abroad and for the United States national defense program.

Whether or not structural steel bookings this year will reach the 1,300,000 tons of 1939 is a matter of conjecture, depending largely on world conditions affecting American economies. Bookings last year topped those for 1938 by approximately 50,000 tons. Tonnage available for fabrication, booked but not shipped, Jan. 1 was estimated at around 475,000 tons. Shipments in 1939 are estimated to have been at least 100,000 tons heavier and probably some thousands more.

Although still at a fairly satisfactory rate, private construction and engineering work was slowing down at the approach of the new year. This trend is expected to continue during the first quarter. Public construction is slackening.

Outbreak of war in Europe and revision of American neutrality act added stimulus to improvement in general business and industrial activity which started in mid-1939. This will naturally be slowly reflected in building, although likely to seep through to the structural steel industry in greater volume after the first quarter, providing America keeps out of war. It appears safe to assume the United States will not go to war in 1940. On the other hand, this is a presidential election year with usual political controversies likely to have some effect on business confidence in general.

Public building and engineering projects are likely to be affected by war by diverting public spending from civilian improvements to work related to national defense. Private building may be stimulated if large war purchases develop to sustain a rising volume of industrial production, employment, retail trade and national income. There is nothing to indicate, however, industrial producers intend over-expansion of productive capacity. Expansion is being held down to conservative needs, even by the airplane industry, among the first to benefit materially.

Large carry-over funds are available for two federal programs, one for federal-aid highways and the other for subsidized multiple public housing by the United States housing authority. Except in these two fields, both taking comparatively large quantities of reinforcing rather than structural steel, public construction is likely to be the smallest in recent years. This is assuming congress does not authorize more pump-priming. This is not expected, and the PWA program probably will be more conservative, covering hospitals, airports, strategic bridges, and possibly some power plants.

Decline in public works of a civilian improvement type will be offset partly by heavy construction by army and navy departments, 56 per cent of which will be in the Canal Zone and colonial possessions, 32 per cent in 37 states east of the Rockies and 12 per cent on the Pacific coast.

Railroad expenditures for equipment have been heavy but thus far have lagged for bridges and grade crossings. A continuance of the improved outlook for carriers will result in more bridge buying, replacements

and repairs. Subways at Chicago and New York still include a large potential tonnage of structural steel. The program for Chicago is underway, with more steel to be placed in 1940. New York work, except for a few sections for extensions in Brooklyn and Bronx, is not thought to be a large factor. The 150,000 to 200,000-ton years for New York underground transportation which prevailed in the early 30s are not likely to be repeated in the near future.

Outlook for public utility construction has improved. Peak load margin with numerous producers of electric power has been declining in recent years until they are now operating at a close ratio. To estimate with any fair degree of accuracy the volume of new construction for expansion is impossible, although opinion prevails more private steam power plant work will be carried on. This is providing federal government regulation and competition are not too great. Private projects would be discouraged by a large public ownership program.

New construction budget for utilities involves an expenditure approximating $700,000,000 compared to less than $500,000,000 last year. For several months following the TVA deal not a single public attack on utilities emanated from Washington, but recently the barrage was started again by several senators. Commonwealth & Southern was the target, attack resulting from a proposed financing program with a subsidiary, Consumers Power Co., in Michigan.

Number of Contracts Greater

Until recently, number of structural contracts placed for manufacturing plants was increasing. Except for airplane building, bulk of these contracts have been for moderate expansions, involving relatively small tonnages. Number of contracts, however, has been greater than expected, especially during the last half of 1939.

Higher industrial activity in many lines, notably the metalworking field has served to stimulate considerable work held back for several years. At the same time there is a definite stand by industrial management against over-expansion of production facilities. Considerable capacity can be provided by installation of new equipment only. Evidence of this realization is reflected by high operations and heavy backlogs of heavy equipment builders and machine tool shops.

Steel industry has completed or is nearing completion of large construction programs. Further expansion during the period just ahead probably will be conservative. Unless demand for manufactured goods booms even more during the year, industrial construction volume of 1937, $314,000,000, is not likely to be reached.

Commercial building will be heavier than last year, but somewhat below $297,000,000 of 1937, the largest in the past eight years. With higher industrial and business activity, however, commercial building appears bound for a good year. With federal financial aid curtailed or stopped, civilian improvements including hospitals, educational buildings, social and recreational units, institutions and public structures will be substantially fewer. Exceptions will include structures directly related to defense program. Although there is no indication of a marked increase in religious building construction during the year, these usually show a sharp increase after an extended period of rising prosperity.

Earlier in the year United States housing authority had but 38 per cent of its original $800,000,000 loan authorization under contract. A considerable increase in volume of such construction will take place during the next few months even without additional authorization by congress.

Public housing should increase at least 50 per cent and private residential building about 5 per cent over 1939. Apartment house building by private investors has been on the decline in recent years and will be slightly lower. Stimulus to investment housing projects has slackened because of the prevailing wage amendment to the national housing act, curtailing projects with government insured mortgages. But most public housing projects will be multiple dwellings, thus increasing net number of apartments.

Only highway construction, including bridges and grade crossings promise to show an increase in strictly public works group. Large potential projects include a Chicago super-highway with elevated and depressed sections and a suggested elevated highway at Pittsburgh. These are in the planning stage and how much actual tonnage reaches fabricators this year is questionable. Slight increase in number of dwelling units, one and two-family houses, is indicated. Bulk of them in low-cost group. Provisions of national housing act may stimulate development projects of single houses to cost around $2500.

Skyscraper construction, on the down trend in recent years, is expected to lag. From an average volume of

Value of Construction Contracts

37 States; in dollars; 000 omitted

(F. W. Dodge Corp. Reports)

	Total	Residential	Commercial	Industrial	Public works and utilities
1925	6,006,426	2,747,729	872,443	326,613	1,065,947
1926	6,380,914	2,671,120	920,890	471,249	1,340,351
1927	6,303,055	2,573,316	932,911	375,910	1,371,973
1928	6,628,286	2,788,317	884,609	508,840	1,464,480
1929	5,750,790	1,915,727	929,188	545,861	1,458,992
5-year av.	6,213,894	2,539,242	908,008	445,695	1,342,349
1930	4,523,114	1,101,312	628,809	256,632	1,651,238
1931	3,092,849	811,388	311,105	116,157	1,171,115
1932	1,351,158	280,067	122,718	43,490	590,301
1933	1,255,708	249,262	99,371	127,517	602,722
1934	1,543,101	248,840	150,595	116,078	751,236
5-year av.	2,391,698	538,174	260,023	131,975	953,322
1935	1,844,544	478,843	164,479	108,858	690,213
1936	2,675,295	801,624	249,136	198,019	920,412
1937	2,913,060	905,293	297,043	313,689	831,606
1938	3,196,928	985,587	215,807	121,084	1,139,004
1939†	3,355,000	1,340 000	250,000	170,000	1,057,000

† Estimated, based on ten months' data.

$1,000,000,000 per year the average dropped 66 per cent in the 30s to $300,000,000 annually.

High construction costs and taxes are factors tending to curtail building. Even building trade unionists are beginning to recognize danger of mounting costs. Government pressure may help in obtaining reasonable wage rates, while self-control by industry appears to have some effect in checking these costs. Not much increase is expected during 1940.

Prospects for new paper mill construction are not too encouraging. New plant for production of newsprint from Southern pine is nearing completion in the South, but pending definite success of the venture no additional work is on the boards for 1940. A producer in North Carolina has temporarily abandoned a building program. A small new mill at Pensacola, Fla., for the manufacture of high grade paper will go ahead. Construction at Maine and Western Massachusetts mills will be limited mostly to routine upkeep and replacement.

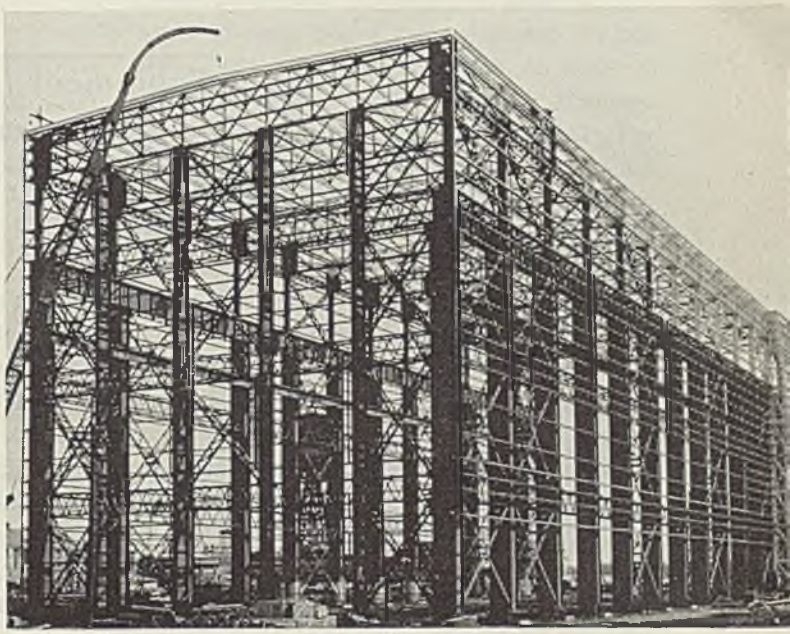
Considerable oil refinery expansion is under consideration involving catalytic methods of refining and also additional capacity for older processes.

Fabricated structural steel industry continues to show meager, if any, profits. Although somewhat better distributed, because of more medium-sized tonnages over a greater breadth of the country, few averaged better than 45 per cent of capacity in past 12 months. At the going fabricated and erection prices, little progress is being made in lifting profits to a point commensurate with investment. Influence of tonnage alone has not raised profits per ton. In fact, some of the larger tonnage years have made the worst showing as to profit per ton.

A relatively high capacity developed in the 20s, and estimated at 4,800,000 tons annually in 1929, has been accompanied by a falling sales volume for ten years until annual tonnage has leveled off at what may be called the depression average—around 1,300,000 tons annually compared with an average of 3,157,705 tons for 1925-29. While capacity probably has been reduced since 1929 by some liquidation of fabricating shops, widespread mergers and obsolete equipment, present capacity is still far above sales volume of recent years.

Less structural steel is being fabricated annually today than during the 1910-19 period when the average was 1,694,772 tons, even in face of an increase in population to 130,000,000 from 92,267,000 in 1910. This reveals clearly a sharp decrease in per capita consumption of structural steel since opening of the 1930 decade.

This decrease in sales with a relatively high capacity has brought about well-nigh ruinous competition, forcing out of business a considerable number of small shops. An example is the current liquidation of one of the old established shops in New England where competition has been keen. The fabricated structural steel industry during nine years, 1930-38, shipped steel valued at approximately one billion dollars with a profit of but three million dollars, or three-tenths of 1 per cent of sales. There is nothing to indicate this ratio was materially improved on the close to 1,500,000 tons shipped during 1939. Taxes and depreciation were not even deducted from earnings in some years.



■ **Superstructure and exterior crane runway for turret shop, United States navy yard, Philadelphia, fabricated in 1939 by American Bridge Co. It is a mill type building, 102 feet, 4 inches wide, 300 feet long, and 102 feet to bottom chord of flat slope trusses**

To qualify as successful bidder on available work, under current system of merchandising, fabricators often take part in what amounts to a reverse auction, bidding against each other until one, underbidding all others, gets the contract. This applies to work with alternates or when multiple bids are made, the contractor-buyer playing one shop against another.

While research continues, there have been few definite innovations in fabrication methods and erection of structural steel in the last year. Extended boom derricks and cranes are being used more often in the setting of steel for higher buildings than formerly.

(*Please turn to Page* 292)

Structural Bookings and Shipments

(Reported by American Institute of Steel Construction)

	Bookings		Shipments	
	1939	1938	1939	1938
January	101,712	80,320	84,281	87,763
February	82,719	57,144	84,412	103,300
March	95,065	84,257	125,259	103,300
April	118,309	91,158	120,943	100,038
May	156,848	77,322	125,818	96,439
June	111,594	99,899	130,114	98,554
July	114,056	96,013	110,473	87,992
August	100,849	106,772	139,680	98,602
September	121,357	92,469	140,828	93,553
October	112,097	154,756	129,321	105,032
November	†100,000	153,084	†115,000	99,872
December	†100,000	163,445	†120,000	106,457
Total	†1,314,606	1,256,639	†1,426,129	1,158,763

†Estimated.

AGRICULTURE

Equipment interests estimate 10 to 30 per cent increase in sales for 1940. Cost of materials and labor to be factors. Europe's war complicates forecasts, confuses price trends

IMPORTANT to steel is the fortune of America's agriculture, for among the industry's best customers are farm equipment manufacturers. As fares the farmer so do the builders of agricultural implements, tractors and trucks.

Equipment makers a year ago anticipated sales for 1939 about 10 per cent below those of 1938. This estimate, it develops, was accurate, although naturally there were individual exceptions. Statistics, however, fail to show the turnabout in sentiment and outlook effected during the past year.

Early 1939 was inauspicious, for although the farm equipment trade was confident the year would not be poor, there was little to indicate it would be unusually good. Despite the optimistic outlook for other industries, implement makers generally indicated 1939 would meet expectations if their business fell off only 10 per cent.

By spring it seemed evident the industry would be fortunate indeed if 1939 sales declined but so little. Ratio of prices received by farmers to that paid by farmers dropped from an index of 80 in December, 1938, to 74 in April, 1939.

Nevertheless, crops were good, and as early as June some companies noted improvement in sales. Others showed marked gains by July. Business increased more substantially in August, although still behind 1938.

September's historic events gave promise of more interesting times ahead. The outbreak of war in Europe touched off accelerated industrial activity at home, although without direct cause-and-effect relationship. Demand for farm products rose and their prices advanced sharply. Sales of farm equipment and machinery have moved up every month since.

Although the 1939 fiscal year, ending for most of the industry Oct. 31, fell far below 1938 during the first half, the second half showed decided improvement. The strong showing of September and October, however, brought a turn in sentiment. Whereas a year ago the trade predicted a 10 per cent drop in farm equipment sales for the coming year, today it estimates 1940 will show a 10 to 30 per cent improvement. Some experts see as much as a 50 per cent gain.

View taken by the department of agriculture, however, is somewhat more conservative. Purchases of machinery by farmers in 1940 may surpass those of 1939 if increases in agricultural income now anticipated are realized and if sharp upturns in the cost of materials and labor to manufacturers do not occur, asserts the department. It opines: "Should any increase in prices of steel and other materials or in wage rates occur after Jan. 1, 1940, an upward adjustment of machinery prices is probable."

Notwithstanding their optimism, farm equipment interests point out 1940 is an unpredictable year. The war complicates forecasts, confuses price trends.

Although part of the sharp gain in commodity prices following the outbreak of hostilities in September was lost when speculative buying eased, consistent demand is expected to maintain present levels.

Current level of prices has put Mr. American farmer in a better position to buy, which augurs well for the equipment industry. Prices of most commodities show improvement over this time last year, and in some cases over two years ago. Nov. 20, for example, wheat closed at $.95 per bushel, compared with $.64 the year before and $.93 two years before; corn closed at $.515, compared with $.47 and $.56; oats $.385, compared with $.28 and $.33; rye $.59, compared with $.46 and $.745;

cotton $.0998, compared with $.0908 and $.079; hogs $5.85 per hundredweight, against $7.65 and $7.90; steers $9.80 against $11.25 and $15.40; and sheep $3.90 compared with $3.88 and $3.50.

"The downward trend of commodity prices has been reversed," the agriculture department comments, "and more liberal buying policies are now in evidence. This will no doubt result in some accumulation of inventories. After the initial spurt in production incident to this inventory accumulation, induced by anticipation of further price advances, there may be a period of readjustment until consumer buying is brought into line with the new conditions created by war, and until expected increases in export trade actually appear."

Supplies of principal foods, feeds and fibers are sufficient to meet domestic and foreign demand and allow adequate carryover stocks in 1940, according to the department's surveys. They indicate no expansion in output of principal products will be required during the year.

Declares the department: "Economists emphasize that even in time of war, production may be excessive to the disadvantage of producers. In caution they point to aftermaths of the World war, to the collapse of prices and values following war inflation. Many of agriculture's present-day troubles are traceable to over-expansion a quarter of a century ago."

Some find it difficult to conceive how farm equipment sales can increase when agricultural production is being held down. Modern farm machinery and tractors swell production, it is pointed out, when at the same time the government is stressing controlled output and warning against over-expansion. The answer lies in the fact modern farm equipment does not necessarily work to increase production, as in bushels per acre, but rather to produce more efficiently, saving the farmer time and money.

The implement industry has gone to great lengths to keep farmers supplied with increasingly efficient and attractive means of production. Particularly significant has been the introduction of small tractors, placing powered agriculture at the disposal of smaller acreage farmers. Several new makes of small tractors were made available in the past year and met with an encouraging reception. A number of builders stress the part the demand for small tractors is playing in current accelerated production of farm equipment.

Manufacturers to some extent have emulated the automotive industry with greater emphasis on ease of operation, comfort and attractiveness of tractors. Brilliant colors and streamlining lend sales appeal. Engineering refinements have been accompanied by such niceties as radios and air-conditioned cabs on some machinery models.

Wider use of rubber tires has followed the trend from crawler to wheeled tractors. Tire manufacturers have been particularly encouraged by farm equipment demand recently.

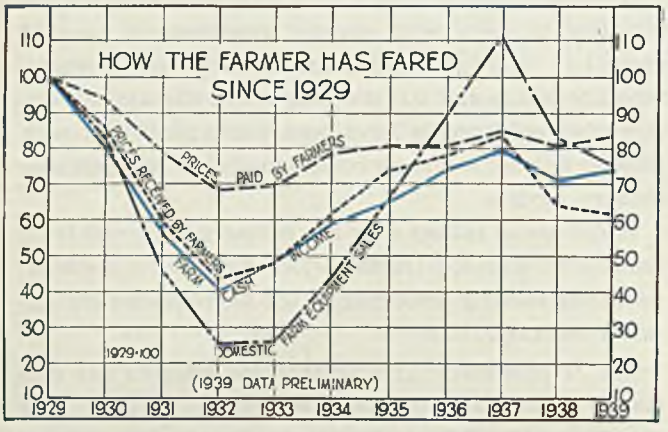
Use of pneumatic tires on wheeled tractors has continued to increase, but their general employment for other farm machinery apparently awaits introduction of interchangeable wheels to prevent undue loss through deterioration of tires on stored seasonal implements. In 1938, 68 per cent of wheeled tractors sold for domestic use had rubber tires, an increase of 6 per cent over 1937. It is estimated in 1940 some 75 per cent

■ Small combine at work with the tractor in harvesting wheat. Threshed grain is seen flowing from the grain tank into the box of the motor truck

of these tractors will be equipped with rubber tires.

Prospects for increased sales of farm equipment in 1940, and consequently for heavier buying of steel to be used in its production, are favorably influenced by several factors. One is the obsolescence of a large part of farm machinery now in use. Surveys show a surprisingly large portion of equipment in use is ten years or older, presaging early replacement. Decline of available animal power on farms indicates the steady trend toward power farming, from which equipment makers obviously benefit.

Prices during the coming year will determine the equipment industry's welfare, for on prices hinge the farmer's buying power. While crop prospects are not too promising at present because of adverse moisture



■ **Although the index for prices received by farmers apparently dropped from 65 in 1938 to an estimated 62 for the year 1939, they increased beginning last September, and were higher in that month than in September, 1929**

conditions, this does not necessarily imply impairment of farmers' cash income, for lowered production tends to increase commodity prices.

The farmer's buying power will be fixed by his cash income in relation to the prices he must pay for what he purchases. While farm prices have improved, prices the farmer must pay also are moving up. The latter are expected a trifle higher in 1940 than in 1939. Most increases are likely to be small, although it is believed war requirements may result in sharp advances for certain items. Slight rise in fertilizer materials and potash salts are anticipated. Seed prices may be higher, with considerable gains thought likely in red clover seed. Department of agriculture indicates prices of trucks, building materials, motor fuel and oil, binder twine, tires, spray materials and harness will probably also be higher.

Farm employment is likely to decline further in 1940, but increased use of machinery will maintain production levels.

Farmers' cash income for 1939 is estimated at $8,300,000,000, compared with $8,020,000,000 in 1938. This includes income from marketed products and government payments. Income from products sold was practically the same as in 1938. Government payments increased more than $250,000,000 to the highest figure in seven years.

Larger government allotments were due mainly to increased price adjustment payments and to earlier distribution of soil conservation payments on the 1939 program. Substantial domestic and world supplies of certain products contributed to lower price levels, despite the smaller volume of marketings. On the other hand, the larger volume of marketing in some cases brought down prices.

Since the government started distribution of cash in 1933 for control of production and prices, farmers have received a total of more than three billion dollars. In addition to income from marketings and government payments, farm operators also receive income from work off the farm. This additional return is estimated at nearly $750,000,000 annually.

Figures of the department of agriculture indicate the farmer in recent years has carried over a larger portion of his gross income as net income than was true in 1929 or 1930. Aiding in this respect are smaller expenditures for taxes and interest payments, both as regards total amounts paid and percentage of gross income paid for these purposes.

How price changes for farm commodities as well as for products the farmer buys, will affect his buying power, and consequently his purchases, is today's question mark. That the farmer already is in a better buying mood is reflected by the equipment industry and producers of wire products, steel sheet and other items for farm use, who closed 1939 with sales rising and prospects for the new year decidedly enhanced.

Exports of American farm machinery manifest no significant trend. Demand from some countries has picked up substantially since war began. But cut off by the war were several channels through which farm machinery had been moving to foreign markets. According to leading interests the result has been no noteworthy improvement in exports, and in some cases actual declines. Possibility for the coming year, however, is an increase in exports, with stronger demand from some countries more than offsetting loss of business in others.

Farmers' Cash Income

	From Farm Marketings		From Government Payments
1924	$10,272,000,000	1932 $4,606,000,000	.....
1925	10,881,000,000	1933 5,248,000,000	$131,000,000
1926	10,580,000,000	1934 6,138,000,000	447,000,000
1927	10,700,000,000	1935 6,805,000,000	573,000,000
1928	11,089,000,000	1936 8,012,000,000	287,000,000
1929	11,221,000,000	1937 8,621,000,000	367,000,000
1930	8,941,000,000	1938 7,538,000,000	482,000,000
1931	6,254,000,000	1939* 7,550,000,000	750,000,000

*Preliminary estimate.

AVIATION

Aircraft industry scores striking gains in production. Research, building facilities expanded to meet demands for transport, domestic and export military airplanes

CONFIDENT of the greatest year in its history is America's aircraft industry as it wings into 1940.

With every sign pointing to continuation if not acceleration of last year's phenomenal progress, few will venture to predict where tomorrow may find this precocious industrial youngster.

Striking gains were scored in all directions during 1939. Production of planes, engines, propellers and parts attained a new peak at over $200,000,000, compared with but $140,000,000 in 1938. In most cases doubling those of the previous year, profits were the highest ever recorded.

Such was 1939's stream of bookings that backlogs have swelled to an aggregate $600,000,000, against $150,000,000 at start of the year. What this volume of unfilled orders means is seen in the fact the industry's entire output since 1926 has totaled less than $800,000,000.

Most of the step-up in aircraft production admittedly can be attributed to military requirements. Last year saw events in a war-minded world which drove home to every nation the necessity for aerial power, resulted in huge domestic and foreign awards to American planemakers.

Our own expanded air defense program provides more than $220,000,000 for equipment purchases in fiscal year 1940. While the present goal is an army and navy air force of 9000 units by the end of 1941, it is believed congress will augment this during the coming session.

Exports—fighting and bombing planes and engines to the allies, civil and military craft to neutrals—last year reached a record high at about $130,000,000. Previous peak was 1938's $68,200,000.

Heavy during early months of the year was buying by Britain and France as they girded for apparently inevitable conflict. When our arms embargo was declared Sept. 6, however, upon the opening of hostilities, shipments were suspended. Two months later neutrality act revision lifted the ban and producers immediately dispatched large consignments they had been completing according to contract stipulation.

Within a single week after the embargo's demise, Britain and France signed with American builders cash-and-carry contracts for warplanes costing in all $160,000,000, intimated they stood ready to take on the same basis whatever additional output might become available.

Despite great emphasis on the military during 1939, civil aeronautics made substantial strides. Output of commercial and private craft for domestic use increased 90 per cent in the first half. As domestic and international passenger, mail and express traffic soared to record levels, and civil aeronautics authority liberalized mail payments, airlines turned to black ink for their financial statements, began searching the market for larger and more efficient transport equipment.

Lightplane producers have been reporting notable gains. These builders see unprecedented demand for their little craft arising from CAA's program to train 95,000 private flyers, launched last year and already well underway.

Wary of unsound "mushroom expansion," aircraft builders are studying their production problems carefully, are adding working shifts and new equipment

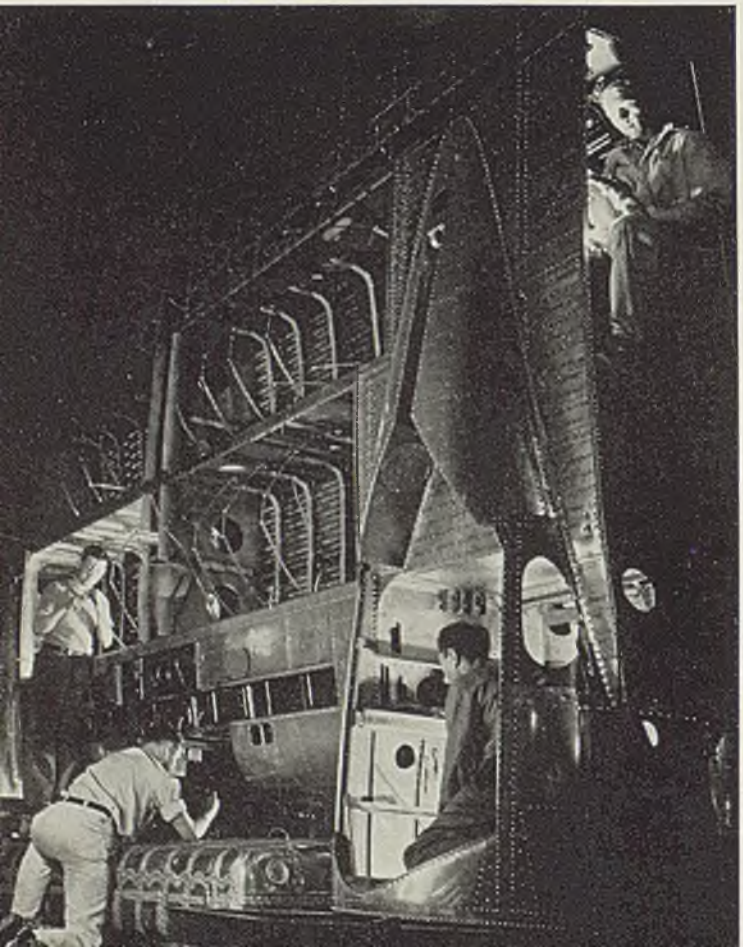
wherever possible, extending plant area only as a last resort. Nevertheless, during the past year some 45 aeronautical firms expended $25,000,000 in factory extension. Annual rated production capacity for the industry now is estimated at approximately $600,000,000, compared with $319,000,000 at the beginning of 1939.

Considerably facilitating expansion has been the treasury department's liberalization of profits on federal aeronautical contracts. The Vinson-Trammell act limits profits to 12 per cent, with five-year carryover. Under its new formula, however, the treasury may allow a contractor to charge against such profits a fixed portion of the cost of certain special facilities required for the government work. At the same time, informally encouraged by the war department, builders have boosted export prices enough to cover plant extensions necessitated by their foreign orders.

Among largest of the year's expansion projects were those of General Motors' Allison Engineering division, recently completing a $6,000,000 airplane engine plant at Indianapolis; Glenn L. Martin Co., Baltimore, spending nearly $3,000,000 for new factory units; and North American Aviation Inc., Inglewood, Calif., $1,000,000.

With payrolls growing steadily, shortage of skilled labor has become a serious threat to aeronautical companies. Amounting to only 24,000 in 1935, factory employment today aggregates 60,000. Seeking large numbers of craftsmen, particularly those trained in metalworking, aircraft builders have been interviewing long lines of applicants at plant doors, report few are acceptable. Scarcely more successful has been their nationwide search through all large industrial cities, combing employment agencies and running ads. Solution to this problem has been found to some extent in inauguration of apprentice schools and other factory training systems as well as special shop courses at technical colleges.

■ **Despite today's emphasis on the military, commercial aviation is making phenomenal strides, with orders for larger and more efficient passenger equipment swelling the industry's backlog. Below, a study in men and metals as workers at Douglas Aircraft Co.'s Santa Monica, Calif., plant assemble aluminum alloy wing panels for a giant transport**



Notwithstanding those peculiarities of aircraft manufacture which have forced the industry to cling to job-lot techniques, last year's large-scale orders enabled considerable progress toward the mass production goal through greater standardization. Boeing Aircraft Co., for instance, due to sizable air corps awards for "flying fortress" bombers was able to completely revamp operations in one of its Seattle plants, setting up virtual straightline production.

Equipment Buying Doubled

Equipment buying during 1939 assumed huge proportions under the pressure of rapidly increasing output. At midsummer National Machine Tool Builders' association, Cleveland, estimated the aircraft industry was accounting for nearly 20 per cent of domestic machine tool sales, compared with but 10 per cent in 1938, and 2 per cent in 1937.

During last year's buying surge equipment and toolmakers became more adept in meeting this industry's difficult production problems. Revising designs frequently in quest of greater safety, speed and efficiency, plane and engine builders require their machinery be versatile and yet miraculously accurate.

With manufacturers, army and navy, federally-sponsored organizations and commercial carriers accelerating their research and development, improvement marked every aeronautical product. Builders of airplanes, engines and propellers alone are estimated to have expended in 1939 approximately $15,000,000 on the most ambitious engineering programs in their history. Nearly every leading firm increased its development facilities.

Technical advance was highlighted by greater use of metals in aircraft, particularly stainless steel and aluminum alloys. Considered largely responsible for this trend is the recent remarkable progress in welding and flush riveting.

To aeronautical demand also is attributed larger production of various metals such as radium and magnesium. The steady gain in number of luminous indicator dials employed in present-day airplanes has increased need for radium, while aeronautical requirements for magnesium have reached a point where the industry is said to consume 60 per cent of all fabricated magnesium alloys.

Safety ever the watchword, aircraft last year be-

(*Please turn to Page* 281)

SHIPBUILDING

Merchant marine and naval building programs assure several active years for United States yards. Congress may authorize $1,300,000,000 more for fighting ships

AMERICAN shipbuilding, as result of the government's large naval and merchant marine programs, in 1939 rose to the highest levels since the war of 1914-1918. Most shipyards, especially during the last six months, have been operating at capacity and turned the year with the heaviest backlogs in peace-time history.

Even greater activity is assured for the next two or three years at least. Nearly a hundred vessels were placed during 1939 by the maritime commission, more than half after the war's outbreak. Estimated building time for this type cargo boats is 18 months. Building time may be shortened by standardization and mass production, but may be prolonged by congestion in the yards and delay in obtaining materials.

Heavy naval contracts also were awarded during the past year and some of these ships will require three to four years to complete. Twenty-four vessels, aggregating 159,000 tons and requiring 40,000 tons of steel, were allocated to private and government yards in a single day last June.

Now to be considered by congress, probably favorably, is an additional $1,300,000,000 naval program, providing for 127 ships of which 95 would be combatant craft. New ships would be outside the regular naval appropriation bill for fiscal year 1939-1940, which is expected to carry appropriations of $900,000,000 to $950,000,000, making, with the new measure, about $2,200,000,000 to be authorized or provided for the navy during the coming congressional session.

Representative Carl Vinson, Georgia, chairman of the house naval affairs committee, has announced hearings on the authorization bill will begin Jan. 8. He has indicated a special effort will be exerted to complete bulk of the construction within the next three or four years.

Proposed construction would increase United States naval tonnage 25 per cent, or 5 per cent more than provided in the "billion dollar act" of 1937. Ships included: 3 aircraft carriers, 8 cruisers, 52 destroyers, 32 submarines, and a complement of auxiliary craft.

Program, if approved, added to construction already authorized, assures a shipbuilding boom for several years, with the peak probably being reached in 1942. Demand for ship steel again will figure prominently with the mills. Shipyard capacity will be taxed. Organizations in remote industries are studying the program's possibilities and there is talk that war-time yards, rusting peacefully since 1919, again may see bustling activity.

An active period of shipbuilding, of course, should have been experienced without benefit of this latest naval bill soon to be considered by congress.

In the 12 months ended Nov. 1, the navy department placed contracts with private and government yards for 32 vessels, aggregating 316,690 tons, and for numerous miscellaneous small craft. Naval vessels now building total 96.

United States maritime commission's program for building 50 cargo vessels a year for the next ten years was proceeding on schedule until war broke out in Europe. Commission accelerated plans sharply, placed 49 contracts for cargo ships in September alone.

During the first 11 months last year the commission placed 97 vessels requiring more than 380,000 tons of steel. During the 12 months ended Nov. 1, the commission and private owners placed contracts for 118 commercial sea-going ships, aggregating 911,455 gross tons.

Immediate future of the cargo vessel building pro-

gram appears doubtful. While the navy department is frankly anxious to have a strong merchant marine which can be converted into auxiliary ships for the navy in event this country becomes involved in war, the revised neutrality act severely restricts the activities of private ship operators. Pending some "out" for ship operators from the neutrality act's ban on American cargo vessels in the war zone, it is unlikely the operators will be willing to commit themselves for more vessels, even with the maritime commission's cooperation.

Shipping companies, excluded by the act from their most active trading lanes, have been left to solve their own problems. Some American-owned vessels were transferred to foreign (neutral) registry before the neutrality act was passed. After the act's enactment, a request by the United States Lines to transfer ships to Panama registry brought a flurry of public protest. Many shipping authorities privately believe transfer of registry still will be the ultimate solution.

Some American ships will find cargoes for unrestricted routes. Some may be sold to foreign interests, with perhaps a contract provision the former owners act as operators. Some ship operators may lease foreign-flag ships for operation in the restricted area and thus hold their present customers.

The delicate situation created by the neutrality act and the desire for a strong merchant marine, government sponsored, is causing head-scratching in government as well as shipping circles. It is privately admitted there is little rhyme or reason in promoting the building a merchant marine on an argument it will assure America a means of maintaining normal foreign trade during any foreign crisis, and then enacting a bill which will cause many ships to be tied up at docks and discourage further private building.

Pending solution of the problem, however, shipyard management and government officials are wrestling with the problem of speeding up construction. Standardization and simplification of ship specifications are being considered as a means to cut down the period required for building.

Navy department has consolidated approving authorities and shortened the delay in approving plans.

Skilled labor and technical management is a possible bottleneck but is being trained as rapidly as possible. Virtual moratorium on shipbuilding during the 20s and early 30s placed this country on a less favorable basis when the present upsurge started than countries which have maintained active construction programs. Private shipyards now are estimated to have increased employment to well over 50,000 while navy yards are giving work to 75,000. When the peak is reached, shipyard employment is expected to exceed 200,000.

Inland waterway vessel construction also is likely to increase during 1940. Few major lake vessels have been constructed in recent years, and practically all the fleet was active when the shipping season closed.

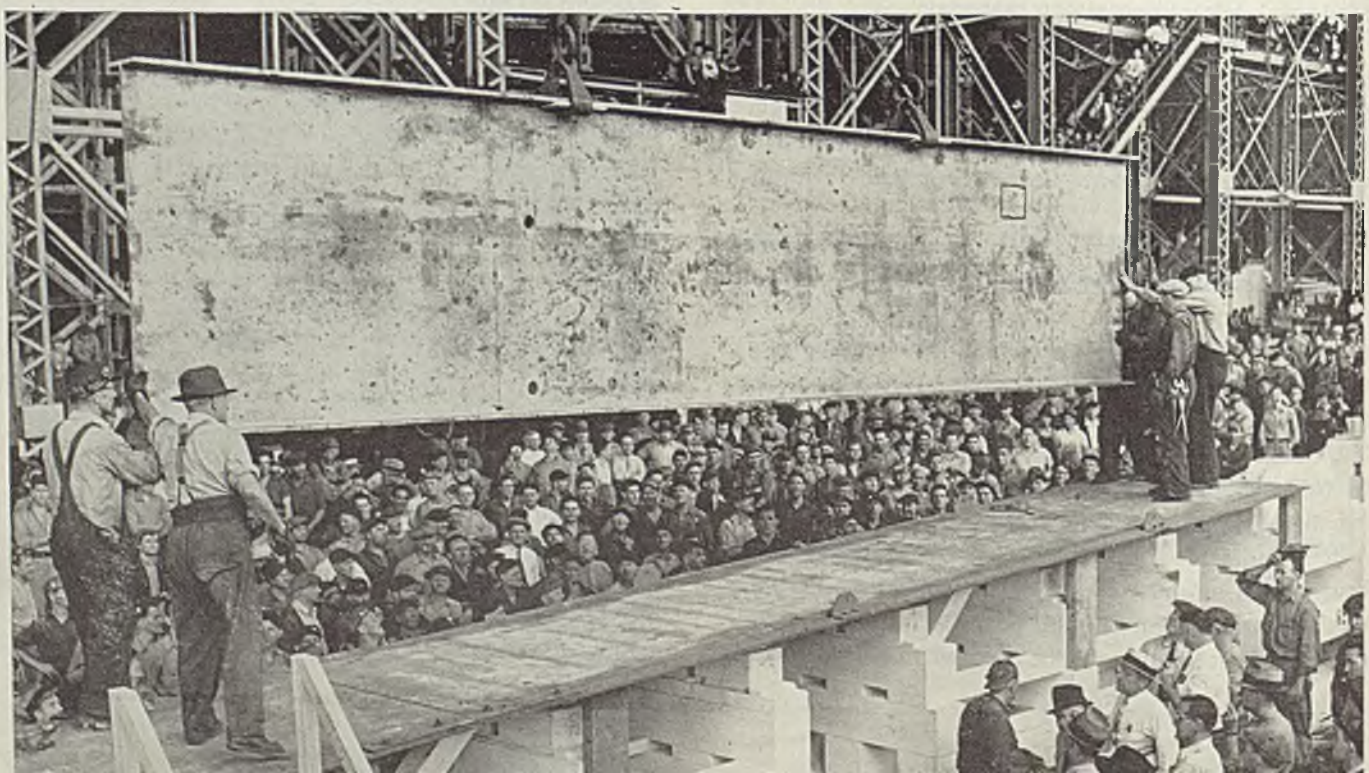
Barge construction, although not reaching the heights attained by naval and ocean-going cargo shipwork, was active and 1939 ranks among the best years for this type work.

Survey of the nation's leading builders shows approximately 400 units were built last year. About two-thirds were the common hopper type, the balance being covered cargo units, oil, acid and other liquid carriers, and miscellaneous units, such as dump scows.

Approximately 70,000 tons of shapes and plates were

(*Please turn to Page* 292)

■ **National defense accounts in part for the quickened interest in shipbuilding by steelmakers. Here the keel of the new battleship South Dakota is being lowered into place on plates of the hull bottom at the Camden, N. J., yard of New York Shipbuilding Corp. Acme photo**



CONTAINERS

Tin can manufacturers' 1940 prospects appear bright. Increased applications for metal containers indicated through improvement in production methods, facilities

THE container industry faces 1940 with the brightest prospects in many years, if not in history. Heavy stocks of canned food products carried over into 1939 were largely dissipated through a combination of strong demand last fall and smaller packs of such leading items as peas, corn and tomatoes. Acreage of some crops was materially reduced.

Last year as a whole, however, was not below average as reduced packs of surplus items were largely offset by increases in others, such as pineapple. In addition, production of general line cans was considerably ahead of 1938. In fact, from the standpoint of tonnage, the tin plate trade in 1939 probably enjoyed the best year in its history with the exception of 1937. It is estimated that approximately 50,000,000 base boxes or 2,265,000 tons of plate were produced, compared with actual production of 32,000,000 base boxes or 1,430,071 tons in 1938. The 1937 output was 54,000,000 base boxes or 2,418,190 tons, about one third larger than 1929 production of 40,000,000 base boxes or 1,816,223 tons.

With present supplies of canned foods in a decidedly healthy position, can company officials feel the industry may establish new peak levels this year.

One of the most significant developments in 1939 was the announcement of a more flexible contract on cans. Henceforth, can makers will announce prices at the beginning of each year as the maximum for that period. If cost of tin plate is reduced, the saving will be passed along to customers. This will apply on all savings over 10 cents per base box. Instituting the new system, a refund of two per cent was made for 1939. The plan, as announced, applies only to packers' can customers.

Outbreak of war abroad resulted in fear that tin plate production might be interrupted through shortages of tin. Plate makers rushed into the market for large tonnages of the metal and prices soared sharply. However, immediate steps were taken by tin producers to augment the supply, large shipments were directed here

Strong British control over metal prices has led to belief that no extremely high prices for tin, such as were experienced in the great war, are in prospect. Spot straits tin averaged 48.786 cents per pound in August last year, but in early September was bringing 75 cents, and more. By October, the metal was selling as low as 55 cents; more recently the price has been nearer 50 cents. According to some opinion, the market will be stabilized at around the 50-cent level.

Many significant changes are noted in uses for

Tin Plate Capacity, Production and Exports in 1939

(Gross tons)

	Cold Reduced				Hot Rolled			
	Annual Capacity	Production	Per Cent Capacity	Exports	Annual Capacity	Production	Per Cent Capacity	Exports
First quarter	1,878,200	299,704	63.8	21,581	1,585,360	122,195	30.8	22,038
Second quarter	1,923,200	433,364	90.1	40,053	1,540,360	122,544	31.8	21,905
Third quarter	1,936,200	458,173	94.7	55,961	1,527,360	129,054	33.8	17,590
Nine months		1,191,241	82.0	121,997	.....	373,793	32.6	57,131

"Annual capacity"—as it existed in each quarter.

packers' cans. More than a score of food products now are marketed in tin plate containers which were not included ten years ago. Foods high in acid content are satisfactorily canned through use of lacquer linings and adoption of cold reduced low metaloid plate.

One of the outstanding developments of the ten-year period has been the rapidly growing market for fruit juices. Condensed milk, however, still leads the list with tomatoes, peas, corn and fish continuing of major importance. Canned dog food, surprisingly enough, also has become a major product.

General line cans have continued to make steady progress. Beer, coffee and sealed quart and 5-quart oil containers, the latter largely made from terne plate, undoubtedly established new high records in 1939. In fact, it is reliably estimated that these oil cans alone accounted for the consumption of probably 100,000 tons of steel last year. Beer in cans has found a wider market, especially where freight and storage are factors.

Cold reduced tin plate now practically dominates the domestic market. Its capacity of 1,936,200 gross tons annually was occupied at 94.7 per cent in third quarter last year, while hot rolled tin plate capacity of 1,527,360 tons was occupied at only 33.8 per cent.

Cold reduced plate is also finding wider acceptance in the export market and opinion is expressed that after the war, important producers like Great Britain and Germany will find it necessary to almost completely revolutionize their production methods if they hope to compete abroad. In England especially, hot rolled plate predominates and is produced by a large number of smaller interests. Germany already has made considerable progress, including hot-dip tinning of cold-reduced strip on a commercial basis.

Manufacturing methods and coatings have come in for increased attention. Present can-making equipment has been speeded up so that as many as 375 packers' cans may be turned out per minute. By far the bulk of tin plate used is in sheet form, but some can companies are using some plate in coils, electrolytically coated, mostly for can ends, to reduce loss.

Similar scrap savings are not so apparent in production of can bodies, but some thought is being given to use of coils. Tin plate in coils now is available in lengths up to 7000 feet.

In some quarters opinion is expressed that tin plate with the coating applied by electrodeposition has a definite place in the can-making picture and that this process is destined to become a development of increasing importance. The electrolytic process permits extremely uniform application of as little as 0.2-pound of tin per base box. Coatings of 0.5 pound are sufficiently thick for many purposes, especially dry pack products. Hot-dip plate for packers cans carries 1.2 to 1.5 pounds per base box.

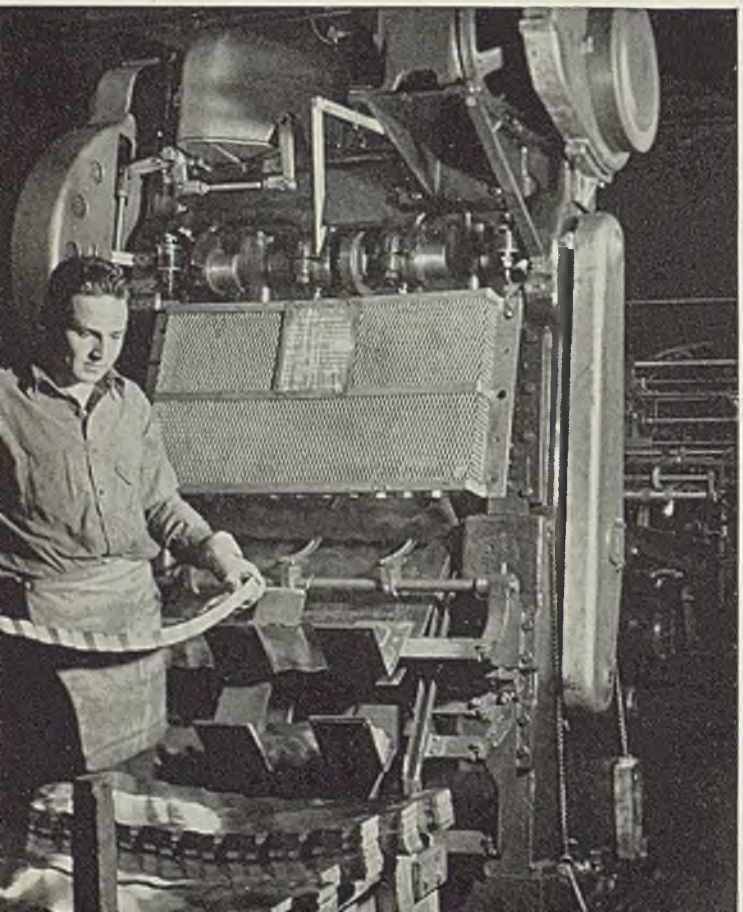
With United States entirely dependent upon foreign sources for tin, development work on substitute coatings has been accelerated by the war. These include nickel, silver, aluminum and lacquer. While all present possibilities, none has attained importance.

Cans have been fabricated on an experimental basis, from plate with an electro-deposited layer of nickel which is closely adherent and non-porous. This development is being watched with considerable interest. Excellent results also have been obtained with new coatings which display unusual corrosion resistance and fabricating properties when as little as 0.0004-inch is applied. The base coating is nickel with a light flash of chromium or tin.

A number of packers' cans plated with 0.001-inch copper followed by 0.0001-inch silver are under test. However, these coatings are too thin to permit major forming operations and therefore are applied to formed parts before assembly.

Some work has been done on rolling molten aluminum on plate but aluminum-base lacquers have attained more significance. The lacquer produces a bright metallic sheen ideal for outside coatings but not used extensively for linings.

■ **Reducing scrap loss with scroll shear. This shear cuts tin plate in various shapes from which can tops are punched with minimum waste. Photo, courtesy American Can Co.**

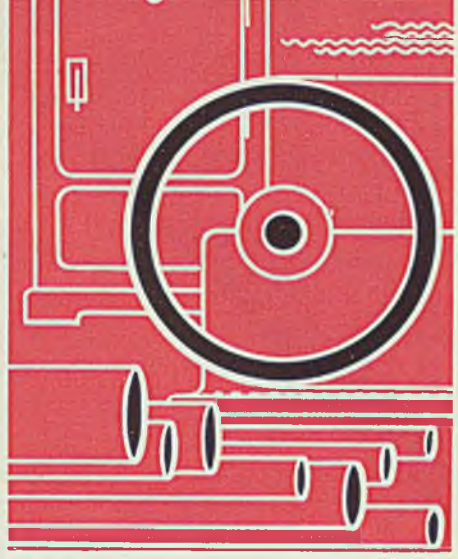


Three Major Vegetable Packs

(In millions of cases)

	1939	1938	1937	1936	1935	1934	1933	1932	1931
Tomatoes ..	18.5	23.0	20.5	24.0	15.7	13.1	12.0	16.0	9.6
Peas	16.3	24.5	23.3	16.0	24.6	15.7	12.9	10.4	13.3
Corn	15.3	20.8	24.3	14.0	21.0	11.3	10.2	9.4	19.4

APPLIANCES
PIPELINES
AIR CONDITIONING
MACHINERY



Machine tool builders enter busiest year. Household appliance sales up 20 to 50 per cent in 1939, with outlook bright for 1940. Pipe line construction active

MOTHER'S lot was eased last year. Household labor-saving appliance sales were 20 to 50 per cent higher than in 1938 and for some items approached the record year 1937.

Sharp industrial improvement during the last four months, with resulting fatter pay envelopes, was quickly reflected in appliance shipments and Christmas sales were at near-record levels.

But even during the early part of the year, appliance manufacturers were not doing badly. Electric refrigerator sales for the first three quarters totaled 1,841,000, compared with 1,285,000 for the same period in 1938. Year's output is estimated at 2,500,000. An average of 190 pounds of steel is required for each, indicating a market for about 240,000 net tons, not allowing for scrap.

Household washer shipments for nine months were 1,110,166, an increase of 27 per cent over 1938.

Vacuum cleaner sales showed a slight increase from 940,409 in the first three quarters of 1938 to 1,000,251 in the comparable 1939 period. Ironers failed to show improvement, holding around 115,000 for both years.

Miscellaneous small appliances, roasters, toasters, coffeemakers, waffle irons, were in good demand throughout the year, with brisk holiday sales.

Appliance manufacturers are optimistic over the 1940 outlook. Demand for such units, they point out, follows closely the trend of general business conditions and any improvement in employment is quickly registered in the tills of appliance dealers.

All-electric kitchens are becoming the mode in new homes and apartment buildings.

Rural electrification projects, both by the government and by private utility companies, are making electricity available to an estimated 300,000 homes yearly and open a virgin market for electrical appliances.

To exploit 1940 possibilities, appliance manufacturers have upped advertising appropriations to near-record proportions for the next 12 months.

Oil burner shipments increased 50 per cent during the first ten months over the same 1938 period. Shipments totaled 184,456 against 119,476 units in first ten months of 1938.

Factory sales of mechanical coal stokers registered an 8 per cent gain over 1938 and were practically at the 1937 level, according to a survey of 101 manufacturers. Ten months' sales were 89,883, compared with 83,545 in ten months of 1938, and 90,699 in the comparable period of 1937.

Nearly 90 per cent of sales were class 1 stokers, under 61 pounds of coal an hour and intended for residential use. This size requires between 100 and 150 pounds of iron and steel.

Automatic firing, stoker and oil burner manufacturers agree, has not even approached a saturation point. A recent survey indicated 10,000,000 buildings valued at more than $5000; only 25 per cent had automatic firing.

Air conditioning sales, which rose from $8,000,000 in 1932 to $81,500,000 in 1937, resumed an upward trend in 1939 after a breathing spell in 1938. Although dollar volume fell below the 1937 record, the industry made important gains in design and distribution—two of its major problems. Trend continues toward the self-contained or "packaged" unit. These are now available with capacities up to 15 tons of refrigeration, enough for the average restaurant, office suite, or all rooms of

a home. Air conditioning's saturation point: Less than ½ of 1 per cent.

Pipe line construction was active and 1939 will rank among the best pipe line years in a decade. More than 4000 miles were completed or are under construction, in addition to numerous short lines and replacements.

Expenditures for lines and terminal facilities are estimated at well in excess of $100,000,000. Expansion includes crude oil, gasoline and natural gas system extensions, while several new lines, not connected with any system, were laid.

Rapid expansion in Illinois crude production and laying of a new system in the Rocky Mountain area account for a large part of 1939 activity. Utah Oil Refining Co. built a 410-mile, 8-inch line from Lance Creek, Wyo., to Salt Lake City, Utah. Socony Vacuum Oil Co. Inc. completed 360 miles of 10-inch line from Wood River, Ill., to Lima, O. Two major lines were constructed in South America, 100 miles of 16-inch line from Oficina to Guanta in eastern Venezuela, and 240 miles of 10-inch from the Barco concession to Covenas in Colombia.

Approximately 1200 miles of gasoline lines were built. Major projects: Magnolia Pipe Line Co.'s 225 miles of 4 and 6-inch from Kilgore to Beaumont, Tex.; Cimarron Valley Pipe Line Co.'s 280 miles of 6-inch from Superior, Nebr., to Sioux City, Iowa; Illana Pipe Line Co.'s 320 miles from Wood River, Ill., to East Chicago, Ind.; and Standard Oil Co. of Ind., 180 miles of 8-inch from Sugar Creek, Mo., to Council Bluffs, Iowa.

Industrial consumption of natural gas has been expanding steadily with improvement in business conditions. Domestic consumption also has been increasing. At least two major lines will be built this year and present systems will be enlarged. Northern Natural Gas Co.'s 240-mile, 16-inch line from Sioux City, Iowa, to near Minneapolis, ranks first among 1939 projects.

Current national defense program is expected to at least slightly alleviate the oil industry's over-production problem. Modern war machines, motivated by the internal combustion engines, require tremendous quantities of oil products. United States aircraft building and pilot training program will raise requirements for high octane gasoline. Mobile army units and a vastly increased navy, not to mention exports to warring nations, should absorb a large share of the surplus.

Prospects for higher demand for aviation gasoline has caused plans for new refining plants with annual capacity of 125,000,000 gallons to be revealed. Present aviation gasoline capacity is 37,000,000 gallons; present requirements, 20,000,000 gallons.

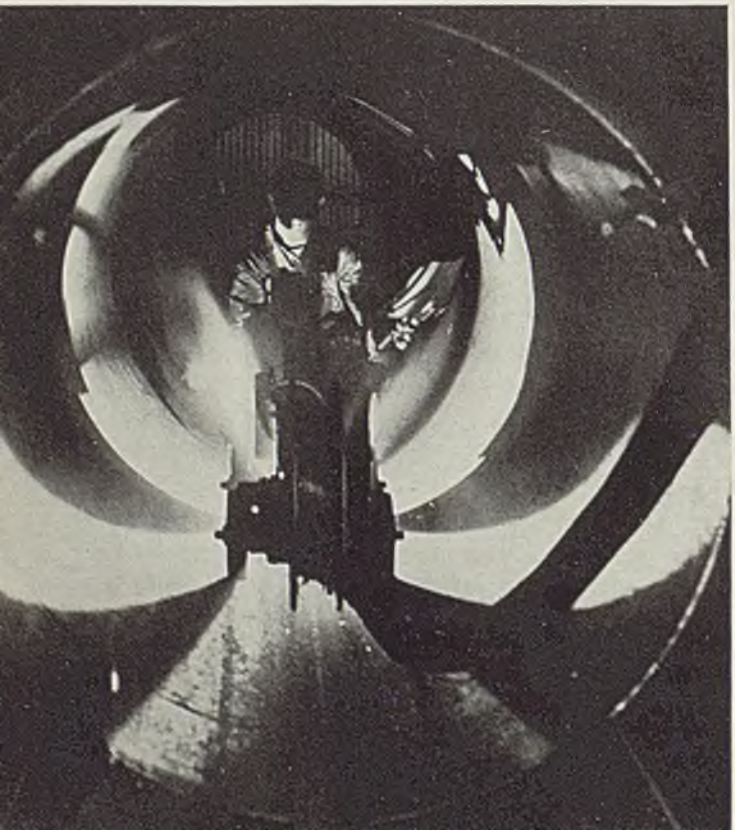
New refining processes, notably catalytic processes, now emerging from the experimental stage, may revolutionize petroleum refining and necessitate extensive replacements within the next few years.

Fabricated steel plate orders for refinery use were approximately 40 per cent greater in the first three quarters of 1939 than in the comparable 1938 period.

Machine tool manufacturers are entering what promises to be the most active year in history.

The year past was entirely satisfactory. From May through August new orders index of the National Machine Tool Builders' association, Cleveland, held above 200 (1926 shipments = 100).

■ **Two half cylinders of ⅜-inch steel plate are fused together by a tractor-type, automatic arc welder to form a 51-inch diameter pipe for the Colorado river aqueduct. The pipe, 13½ miles of it, is being fabricated by Emsco Derrick & Equipment Co., Los Angeles. Photo courtesy Lincoln Electric Co., Cleveland**



Toolmakers Deluged with Orders

When war broke in Europe at the beginning of September, builders were deluged with orders from both foreign and domestic buyers. Coming on the eve of the machine tool builders' national exposition, the frantic buying caused the show to be postponed. Key men and machines could not be spared from the shops and in several cases tools intended for exhibition at the show were demanded by anxious buyers.

Orders for the first 15 days of September were more than double those for the entire month of August. Machine tool builders' operations were stepped up from 52.5 per cent of estimated capacity in January to 91.2 per cent in November.

Other industrial machinery manufacturers experienced a slightly less dramatic upsurge, but most experienced a steady gain through the first eight months and a sharper gain after Sept. 1.

Gear sales gained steadily and for October were the highest since March, 1937. Construction and conveying machinery, power-generating equipment and textile and shoe machinery shared in the general industrial advance and as the year closed were still heading up.

EXPORTS

Steady increase through year doubles early rate. Small war effect shown but signs indicate shift in buyers. Machinery shipments may make new record this year

TEN months' exports in 1939 ran almost even with those of the same period in 1938, both years being above normal, although about 35 per cent under the record of 1937. This applies to items other than scrap. Exports of the latter were larger by almost 25 per cent.

Not until October, the latest month for which statistics are available, did the effect of the European war begin to show in the export pattern of the United States. In that month shipments to the United Kingdom raised the European total from 51,879 tons to 74,632 tons, while exports to the Far East declined from 69,743 tons to 49,607 tons. Tonnage exported to North and Central America and the West Indies rose slightly but South America increased its imports from this country from 34,846 tons in September to 39,936 tons in October and Africa from 10,310 tons to 12,278 tons.

These shifts appear to indicate effects of the new world situation brought about by embargoes on commerce and blockades incident to the war. As the effectiveness of these restrictions develops it seems that 1940 will bring to the United States a larger share of world trade if the industry is not too busy filling domestic requirements. Officials of the department of commerce estimate that South America requires 2,000,000 to 2,500,000 tons of steel and iron products annually in excess of its own production and under conditions now applying a large share of this must be bought from this country.

Under normal conditions Latin American countries have bought much of their requirements from the United Kingdom, Germany, France, Belgium and Sweden. The first three of these are practically out of the picture and it seems probable the other two will find markets nearer home. This leaves the United States as the source from which to draw for South and Central America.

During the first ten months of 1939 steel and iron exports, excluding scrap, aggregated 1,772,069 gross tons valued at $116,555,474, the figures being by the metals and minerals division, department of commerce. In the corresponding period of 1938 the total was 1,786,660 tons valued at $128,104,620. During the first five months shipments showed an increase, from 134,788 tons in January to 147,760 tons in May, but each month was below the figure for the corresponding month in 1938. In June the total increased to 189,968 tons, compared with 150,037 in June, 1938. For the remainder of the period, including October, each month exceeded the 1938 figure, reaching 255,081 tons in October, compared with 201,473 in October, 1938. The jump from 185,182 tons in August to 244,933 tons in September seemed a direct result of European hostilities.

Shipments of pig iron, which was the largest item in 1938, at 373,846 tons for ten months, dropped sharply to 121,494 tons, steel ingots from 153,847 tons to 110,478 tons and steel rails from 45,299 tons to 34,218 tons.

Increased shipments in the same period were shown in steel plates, 169,204 tons to 196,523 tons, tin plate from 135,584 tons to 201,263 tons, galvanized sheets from 59,192 tons to 82,410 tons, hot-rolled strip from 28,896 tons to 46,301 tons and wire from 66,450 tons to 83,663 tons.

Canada took 273,648 tons in ten months, excluding scrap, Japan 129,199 tons, the United Kingdom 109,923 tons, the Philippine Islands 107,794 tons and Sweden 103,672 tons.

Scrap exports for ten months this year totaled 3,098,369 tons valued at $46,572,685, compared with 2,401,793

(*Please turn to Page* 281)

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

ONLY a seer can foretell what lies in store for industry at the hands of government in 1940. Always difficult to predict, the course of this administration's policies today more than ever is devious and dim, shaped by a war abroad, clouded by an election at home. But one thing is clear: Industry may hope for better treatment.

Jan. 3 the 76th congress opens its third session. All bills dropped into the legislative mill since Jan. 3, 1939, still are "alive", with the same status as when congress adjourned.

First session of the 76th congress began a year ago, was followed Sept. 21 by a second or special session called by the President to consider neutrality act revision. During that entire session, lasting until Nov. 3, neutrality was the only matter taken up.

At this time last year the steel industry looked forward to tax revision. While taxes were revised and business given some relief, it was only some. Taxes will be up again in 1940. It is no secret that treasury officials including Secretary Morgenthau and industry's friend, Undersecretary John W. Hanes, want tax revision. On the other hand, members of both house and senate are shying. Well do they realize this is an election year, presidential and congressional. Dynamite in election year is the current suggestion in some quarters that personal income taxes be boosted, even in lower scales.

In June the trade agreement law expires, and there is every indication the program will have to fight for its life. Original reciprocal agreement law went into effect June, 1934, expired in June, 1938. When reenacted for a two-year period until June, 1940, there was great opposition and it remained on the statute books by a slight margin.

Opposition to trade agreements is growing, even among New Dealers. This was evinced recently at hearings on the Venezuela trade pact, when congressmen appearing before the committee openly expressed opposition to the entire trade agreement program. This opposition stems not only from industry but agriculture as well. Moreover, European hostilities have practically nullified many agreements through various controls and special orders.

During the past year, steel's top-flight executives appeared before temporary national economic committee in connection with presentation of the industry's case by department of justice. Further hearings are to be held this month. By far the most important steel hearing held at the nation's capital in many years, it was marked by TNEC's effort to "get something" on the steel industry. This was to little avail. What the eventual outcome will be, however, no one knows.

At any rate, Senator O'Mahoney, TNEC chairman, will attempt to keep his committee alive, asking congress for additional funds. More than a million dollars has already been spent. While it is believed the committee will make recommendations for legislation by April, the body probably will carry on since the President has requested it keep in close touch with the price situation and report from time to time.

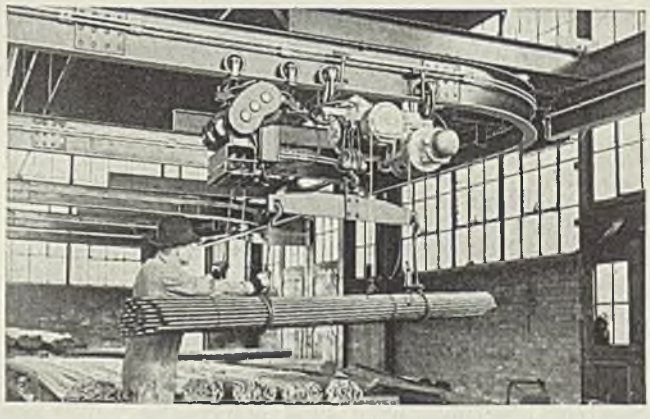
Within a short time the house ways and means committee, which originates all revenue legislation, will begin looking into the tax situation. Whether there will be revision depends on a variety of circumstances, including national defense expenditures.

Representative Doughton of North Carolina, ways and means committee chairman, expresses hope that tax increases can be avoided in 1940. But both Doughton and Representative Cooper of Tennessee, chairman of the tax subcommittee of ways and means committee, are leaving this matter open.

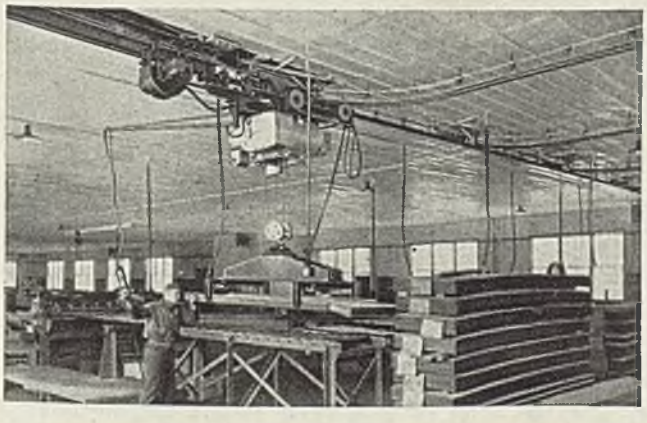
Some weeks ago Treasury Undersecretary Hanes appeared before the ways and means committee to analyze the views of nearly 1500 leaders in business and agriculture. Treasury experts subsequently have been studying their recommendations on taxes. At the same time officials of the joint congressional committee on internal revenue have worked with treasury men on some 40 points in the present tax structure.

Revenue bill of 1939 was designed to remove business

Co-ordinate Handling with Production



MonoTractor and Hoist on 3-ton RailMaster System.



All movement of 3-ton load controlled by push-buttons.

Handling adds no value to a product unless it is co-ordinated with production as part of a process or by tying operations closely together.

A system, so designed, eliminates waste, speeds up the pace of production and invariably establishes lower cost records.

American Mono-Rail engineers apply these principles wherever possible. Extreme flexibility of standard equipment enables them to meet special requirements without extra cost. Engineering service is available at no obligation.

A 254 page book used as a technical reference for all data covering MonoRail Equipment will be sent on letterhead request.

The American MonoRail Co

13102 Athens Ave., Cleveland, Ohio

deterrents and stimulate recovery. Businessmen and federal officials agree that the tax law of last year was good as far as it went, but did not go far enough.

Only large source for new revenue now open to congress is the income tax. This unavoidably would hit the "little fellow" which politicians seek to avoid at this stage of the game. At the last session Mr. Roosevelt asserted he favored scaling down the high surtax brackets and broadening the base. This was not done, and now many legislators doubt the political sagacity of adjusting income taxes during an election year. While congress at its last session approved the President's plan for reciprocal taxation of federal and state salaries, it failed to take action on taxation of income from future federal and state security issues.

Defense Cost To Rise

Prior to last year's revenue law corporation profits and losses were treated without regard to operating results in preceding or succeeding years. Business was taxed in years it showed profits, but ignored was the fact there may have been losses for several preceding years. Thus, firms with alternating years of profit and loss paid higher taxes over a long period than those with stable earnings. New enterprises and the capital goods industries, ordinarily subject to wide fluctuations in earnings, were penalized.

To correct this, corporations have been permitted to deduct their net operating losses incurred in one year from their profits during the two succeeding years. Another important 1939 amendment was removal of the undistributed profits tax, adopted in 1936. Relaxed, also, was the former provision regarding the taxation of gains from sale of capital assets.

Of special interest to steel, and intimately tied to the tax question, is national defense. As this is written the budget figures for fiscal year 1941, beginning July 1, are unavailable. It has been freely predicted, however, the navy will ask for about a billion dollars and the war department, not to be outdone, for the same amount. In addition, the navy intends to request authorization, although not appropriation, of some $1,300,000,000 for future construction. Talk has it that within a few days legislation will be introduced in the house to authorize such a naval expansion program.

According to reports, this program will involve a 25 per cent increase in naval tonnage, 5 per cent more than that of 1937's "billion dollar program." Effort is to be made to repeal the provision in existing law requiring that 50 per cent of all naval construction be done in navy yards. It is also planned to amend the law so the secretary of the navy can advance up to 30 per cent of cost of any ship to the contractor.

No new social security legislation as yet is in sight. Official circles feel the law is not perfect by any means, but the amendments enacted by congress last year were a material improvement.

Keynote of last year's social security changes was liberalization and expansion of the program so as to include not only the worker but his family. Tax-saving changes were made in federal provisions relating to unemployment compensation. While these amendments do not alter the original co-operative protection for wage earners, they make available to states more federal money for public assistance.

By amendments adopted last year the federal insurance system is to become effective Jan. 1, 1940, instead of in 1942. Provided are more liberal benefits to those retiring in early years, and monthly benefits to the dependents of annuitants and survivors of insured wage earners.

Forecasters see this year an amendment to the national labor relations act. Supporters of the labor board made a mighty effort the last session to stall off an investigation, but to no avail. A congressional committee has started a probe of the board's administration of the act. This committee includes men not sympathetic with NLRB, and it is certain to report out legislation to amend the act.

Even J. Warren Madden, the board's militant chairman, grew panicky during the past session. Taking the bull by the horns, he made changes in procedure which eased things up a bit for industrialists. Although of little importance, this was a step in the right direction and showed how the wind was blowing.

Whether congress will actually get down to business as regards the labor board, and if so how far it will go, may only be conjectured. Congressmen are wrought up over the board's conduct and from every indication the "stalling" days are past.

Minimum Steel Wages Unsettled

What will happen to steel wages under the Walsh-Healey act is anyone's guess. It depends largely, of course, on what the United States Supreme Court does with the appeal of the labor department on lower court rulings in the case. It will be recalled that during 1939 extended hearings were held before the public contracts board, which administers the Walsh-Healey act. The tentative decision rendered was not satisfactory to the steel industry. Upon appeal an oral argument was held before labor department officials. Secretary of Labor Perkins over-ruled the industry and ordered the minimum wages suggested by the board be put into effect.

With challenge of the rates by small eastern producers began the legal duel which still drags along in the courts. Meanwhile, however, the courts enjoined the secretary from putting her order into effect. Before this case is over it may well dig into the constitutionality of the Walsh-Healey act itself. It is to be remembered an effort was made during the last session to amend the act. Among other things the amendment would lower from $10,000 to $2500 the minimum for government contracts coming under the act. Sponsored by Senator Walsh of Massachusetts, one of the original law's authors, this amendment still pends on calendars of both houses, and may be enacted during the new session.

Various government agencies will keep close watch

Speed Nut System

A million a Day

TOOK THE STOVES AWAY

AFTER 7 DECADES IN BUSINESS

For over 70 years the Tinnerman Stove & Range Company has been known in the manufacturing field. While our name has not been identified with *mass* production in the years that have passed, it has always been identified with *quality* production.

We originally developed SPEED NUTS to increase the efficiency and prolong the life of our stove assemblies. Our SPEED NUT Division, which was in its swaddling clothes less than ten years ago, has expanded and grown so rapidly that we have concentrated our entire production on the manufacture of SPEED NUTS and Speed Clips—now used on the assembly lines of all leading products at the rate of over a million a day.

In order to provide ample space, facilities and man power to keep pace with the increased demand for SPEED NUTS, it was necessary that we discontinue the manufacture of stoves and ranges, as well as construct new additions to our plants.

So we announce, as of January 1, 1940, the formation of

TINNERMAN PRODUCTS, INC.

New readers of our advertising may be interested in knowing that the SPEED NUT System of Assembly is the most modern method on the horizon. SPEED NUTS not only reduce average net assembly costs 50%, but also *improve* assemblies. One SPEED NUT replaces two parts, namely the threaded nut and lock washer. It is applied faster and gives a firm spring tension grip that prevents loosening from vibration for the life of the product.

Over 900,000,000 SPEED NUTS have already been manufactured in over 500 different shapes and sizes. SPEED NUTS may be used on any type of bolt, screw, rivet or stud. Special Speed Clips are also made to serve as the *sole connecting means* in many assemblies.

Regardless of the nature of your assembly, this organization of

FASTENING ENGINEERS

stands ready to serve you. Samples and details are awaiting your request.

TINNERMAN PRODUCTS, INC.

2039 FULTON ROAD, CLEVELAND, OHIO

MANUFACTURERS OF PATENTED SPEED NUTS

In Canada: Wallace Barnes Co. Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London

900 MILLION SPEED NUTS ALREADY USED

on prices throughout duration of Europe's war. Industry as a whole is supporting the administration's effort to prevent price inflation. Witness the steel industry's stepping into the vanguard by reaffirming prices through first quarter in the face of rising raw material and other costs.

While it would be unwise to expect too much from the government's efforts for price stability, there are many who believe it is the watched pot that does not boil over.

To this end, it is expected the temporary national economic committee will ask congress for funds to continue its activities through most of 1940. Such action probably will be taken despite earlier plans to submit a final report on the committee's findings, along with legislative recommendations March 1.

Committee already has started studies which cannot be completed until late summer. Various departments represented on the committee will strongly urge additional funds that these studies may be finished.

Many administration officials favor maintaining TNEC as a permanent body, and impartial observers, noting any government agency's distaste for disbanding, believe heavy administrative pressure for the committee's continuance will be brought to bear on congress.

At TNEC hearings on prices early in December, Thurman Arnold, head of the justice department's antitrust division, declared flatly against "drastic and far-reaching price legislation," pointed out the public is not in favor of such action.

Would Expand Staff

He suggested expansion of his antitrust division operations by adding 150 men to his staff, at cost of not over $2,000,000, to watch over prices, maintenance of TNEC as an investigative body and establishment of a business information service for the benefit of antitrust enforcement agencies.

A start in the latter direction has been made by the commerce department which last month started combing a score of basic industries for information on sales and inventories. First questionnaires have been sent out to several hundred small, medium and large companies. Response was gratifying and the department expects to conduct a monthly survey.

The economic committee found little to cavil at in the domestic situation. In fact, Dr. Theodore Kreps, committee's economic advisor, paid high tribute to industry. "In the last four months, business statesmanship has arisen to a new high."

Soundness of domestic pricing policies since the war started, as revealed by TNEC hearings, is believed to have knocked the props from under those members of the administration and congress who have been advocating high taxes on war profits to prevent profiteering.

Congress may be forced to embargo exports of scrap and other materials to Japan. Considerable pressure has been exerted here during recent months by West coast interests for a scrap embargo. This question has been raised before and it is known the President is well disposed to such action. Nevertheless he cannot slap an embargo on scrap without treating other commodities likewise.

Late this month our 1911 commercial pact with Japan will be abrogated and it is questionable what will follow. Undoubtedly Nipponese officials are concerned, because well-informed circles feel Japan cannot long continue her Chinese adventure without raw materials from the United States.

War Resources Board Disbanded

Although many bills directly affecting steel were introduced at the last session of congress, few were enacted. One that passed dealt with educational orders for the war department, another law with the purchase of strategic materials. The treasury department's procurement division now is engaged in these purchases. The educational order bill called for expenditure of $32,000,000 and the strategic minerals bill $100,000,000. Of the latter sum $10,000,000 is available this year.

Bills still pending call for embargoes on scrap to Japan and other countries. Little favor has been shown these measures as yet, no hearings being held. A number of patent bills were introduced, five becoming law, others awaiting action.

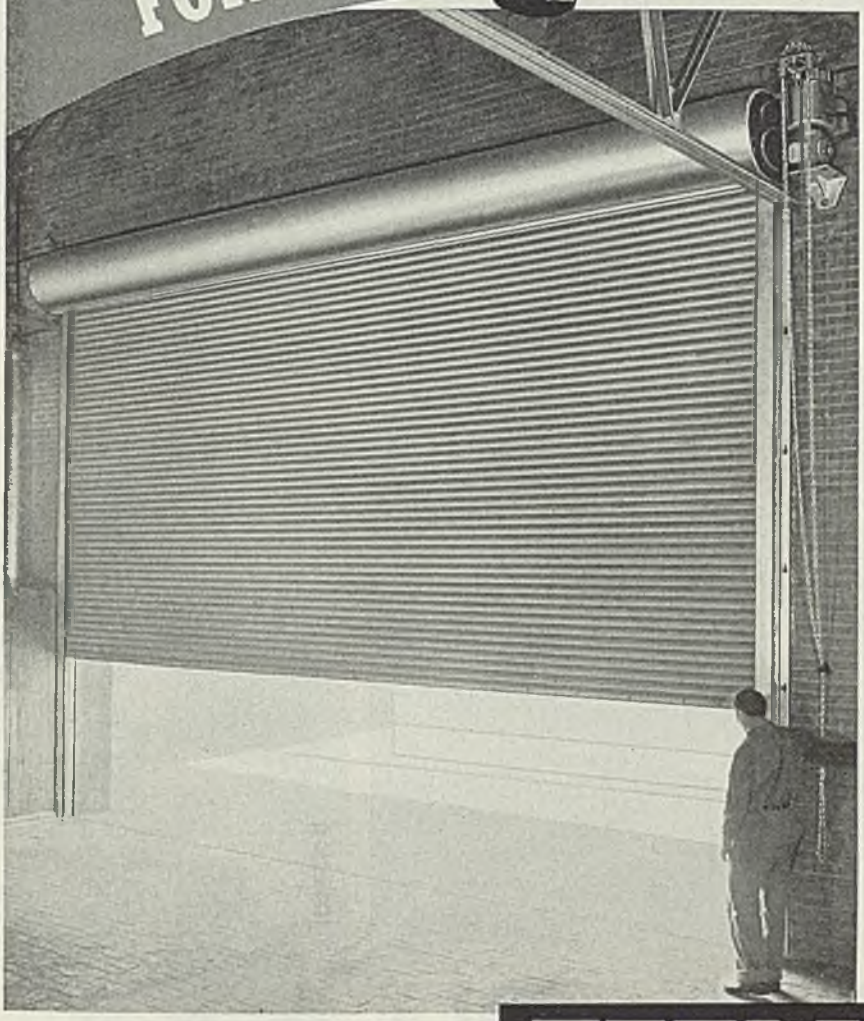
From all indications the administration will be a little more sympathetic to business and industry than it has been in the past. Mr. Roosevelt himself seems to have "softened" somewhat. At press conferences he no longer takes random potshots at industry. On the other hand, some of his closest advisers feel the way they always have—deadset against business. This was evidenced recently when the war resources board, headed by Edward R. Stettinius Jr., board chairman of United States Steel Corp., was suddenly "liquidated".

Those in the know whisper that in organization of the war resources board something was slipped over on the President's advisers. The body had too many industrialists on it to suit them and they worked diligently until they had killed it.

In the absence of Secretary of War Woodring, Assistant Secretary Johnson planned the board and persuaded Mr. Roosevelt it would be a good thing. The President then appointed the board's personnel after consultation with Johnson. Taken by surprise, the "insiders" started at once to break it. Apparently they saw to it complaints reached the President that the board made it appear the United States was preparing for war. The crackup came when Senator Borah let it be known at the White House that unless the board were abolished he would rise on the floor of the senate and denounce it as composed of "Morgan men".

Announcement that the board was to be disbanded was made at a press conference by the President, who said he had never intended continuing the group after it made its report.

A FOOL-PROOF FORMULA FOR DOOR ECONOMY



KINNEAR DESIGN *plus* THE STRENGTH AND DURABILITY OF STEEL

The vertical, coiling operation of Kinnear Rolling Doors is the key to door economy because it **eliminates** the disadvantages of other types of doors. Kinnear Doors open completely out of the way of all door traffic—and that cuts maintenance and repair costs. They coil compactly overhead, giving you maximum economy of floor and wall space. And they save time and effort by clearing the entire doorway in one quick, smooth, easy operation.

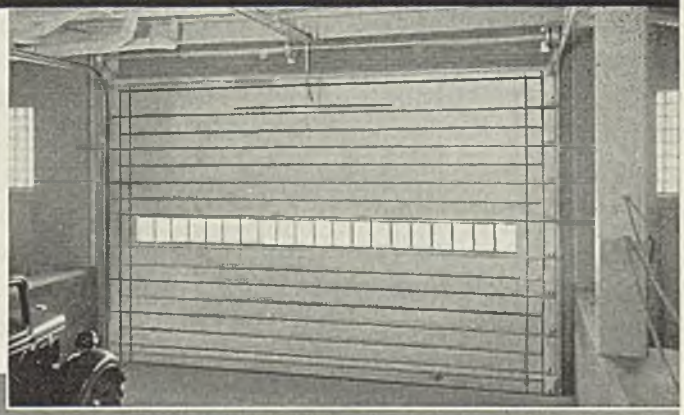
When you add the advantages of rugged, all-steel construction . . . its resistance to fire, weather, burglary and wear—you have service doors that will set new records for durability and economy in your plant. (They've been doing it in other plants for more than forty years!)

Kinnear Doors are built in any size, for manual or electrical operation, and for easy installation in old or new buildings. Get the complete story of Kinnear Door economy in the new 1940 catalog.

. . . AND AN ALL STEEL Rōl-TOP DOOR

Another Kinnear Door that is setting a new standard for efficiency and economy in industrial plants of today . . . the All-Steel Rol-TOP Door. Here are all the conveniences of upward-acting doors built into an all-steel assembly, with provision for any number of light sections. It features Kinnear's famous, weathertight Keystone Seal; rigid tracks mounted with continuous angle irons; effective, pre-tested counterbalance spring, and easy ball-bearing operation. The All-Steel Rol-TOP is ideal for any service opening. It will pay you to check its many advantages.

KINNEAR ROLLING DOORS

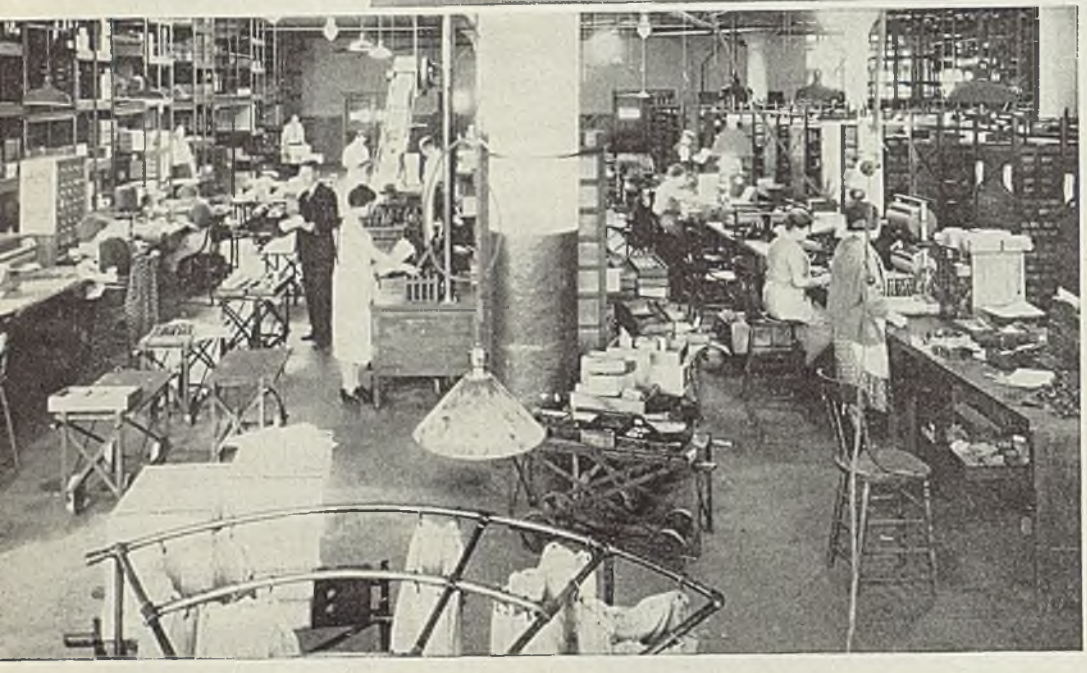


THE KINNEAR MANUFACTURING COMPANY

1780-1800 FIELDS AVE., COLUMBUS, OHIO FACTORIES: SAN FRANCISCO, CAL.; COLUMBUS, OHIO

OFFICES AND AGENTS IN ALL PRINCIPAL CITIES

As tools come from the factory they are wrapped in protective oiled paper, boxed and labeled for protection against dirt and moisture, and to facilitate prompt shipment.



Left: Central shipping floor, fireproof tool storage bins and racks on either side.

TO GIVE YOU G. T. D. TOOLS *Quickly . . Safely*

These pictures suggest the facilities maintained by G.T.D. Greenfield to insure adequate stocks, careful packing and prompt shipping, so that tool users all over the world can get any standard G.T.D. Greenfield tools in minimum time. In addition branch warehouses and distributors' stocks are carried in every industrial city in the world.

Lack of a single tap can hold up a vital assembly job, literally cost some manufacturer hundreds of dollars, perhaps as much as he would spend for taps in a year. *That must not happen to Greenfield customers.* Hence these facilities — maintained for *your use*.

Greenfield Tap & Die Corporation · Greenfield, Mass.

Detroit Plant: 2102 West Fort St. Warehouses in New York, Chicago, Los Angeles and San Francisco
In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GTD GREENFIELD

PARCEL POST IS BIG BUSINESS

From this bench parcel post shipments go daily to nearly every city and state. This service, rendered for distributors, speeds up delivery of the many semi-special sizes and types of tools which constitute a large part of the business. Plenty of light and air make for fast, accurate work.

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

DISTINCTLY a twentieth century phenomenon, the automobile industry is entering upon the fifth decade of its existence, in the comparatively short space of 40 years having achieved top-flight ranking in size and industrial importance, as well as exerting a profound effect upon all phases of the life of civilized society.

Quoting from the searching analysis of the motor vehicle industry completed last June by the federal trade commission, in which a study of the business of the vast General Motors Corp. convinced the commission that "its business is not only big, it is colossal," the industry, including vehicles, bodies and parts, expanded from a puny enterprise in 1899 employing 2241, paying wages of $1,320,658, producing 3723 units in which $2,943,724 was added by manufacture, to the gigantic structure which in 1937 employed 479,158, paying wages of $755,887,379, producing 4,808,974 units in which $1,506,444,418 was added in manufacture.

In the peak year of 1937 the industry ranked first in value of products, cost of materials and value added by manufacture, second to steel in wage earners and wages.

A student of automotive history, while impressed by these astronomical figures of production, must be struck at the same time by the prominent parts played by a few great figures in this rapid emergence of the American automobile industry to the highest point the world has ever known.

Henry Ford has been and still is the guiding genius behind the Ford Motor Co., transforming an original investment of $100,000 into a corporate surplus of over $600,000,000 and a plant investment of an equal sum. W. C. Durant probably had more to do with the building of General Motors than any other single individual, although he has not been active there for many years. The story of Walter P. Chrysler and his phenomenal organization and development of Chrysler Corp. has been told many times.

These three companies now account for about 90 per cent of all automotive business and have extended their interests to many other fields including aviation, air conditioning, farm implement manufacture, refrigeration and household equipment manufacture.

The next ten years are likely to see further advances by these three interests and while there has been much undercover activity in behalf of organizing a fourth great combine among the so-called independents, conflicting personalities will have to compose their differences before anything concrete can come of this.

Studebaker, Packard, Nash and Hudson lead the independents, while Willys and American Bantam struggle to keep a foothold in the small-car field. Graham and Hupp are making efforts to repair financial fences so they may continue in business, but their future status is doubtful.

■ IN RETROSPECT, the year 1939 fulfilled expectations cited here last year this time, total production for the calendar year coming to an estimated 3,650,000 cars and trucks, an increase of 37 per cent over 1938. This total practically coincides with the 16-year average from 1923-38 of 3,704,833, and on the basis of three-year cycles of increasing or declining production which have been the experience of the industry, augurs for a further increase in 1940 production.

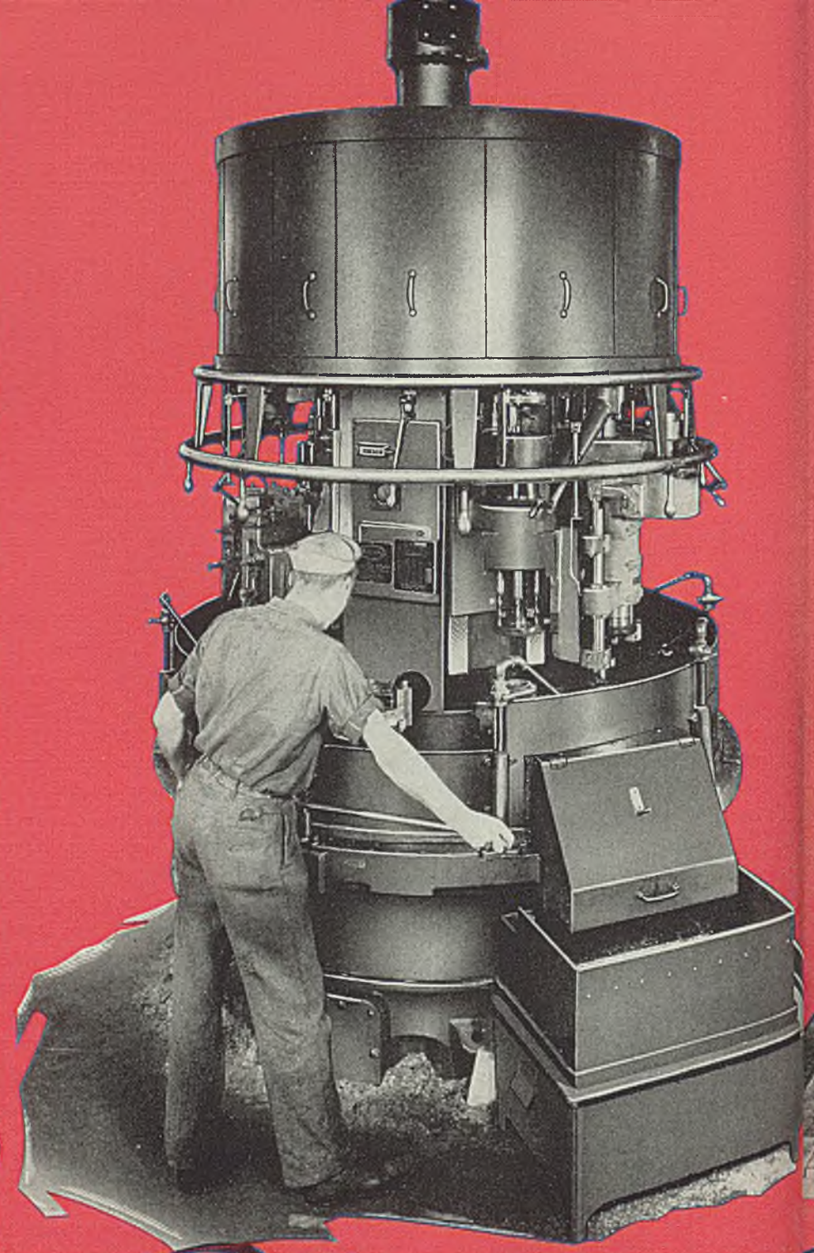
Observers are inclined to temper forecasts for this year with a note of caution, so perhaps a 15 per cent advance over 1939 is reasonable, bringing output for the calendar year to around 4,250,000. On the basis of year-end demand for cars, such an estimate seems to be on the conservative side, but it is believed a considerable volume of buying has been dictated by fear of price advances which last fall were being whispered for January.

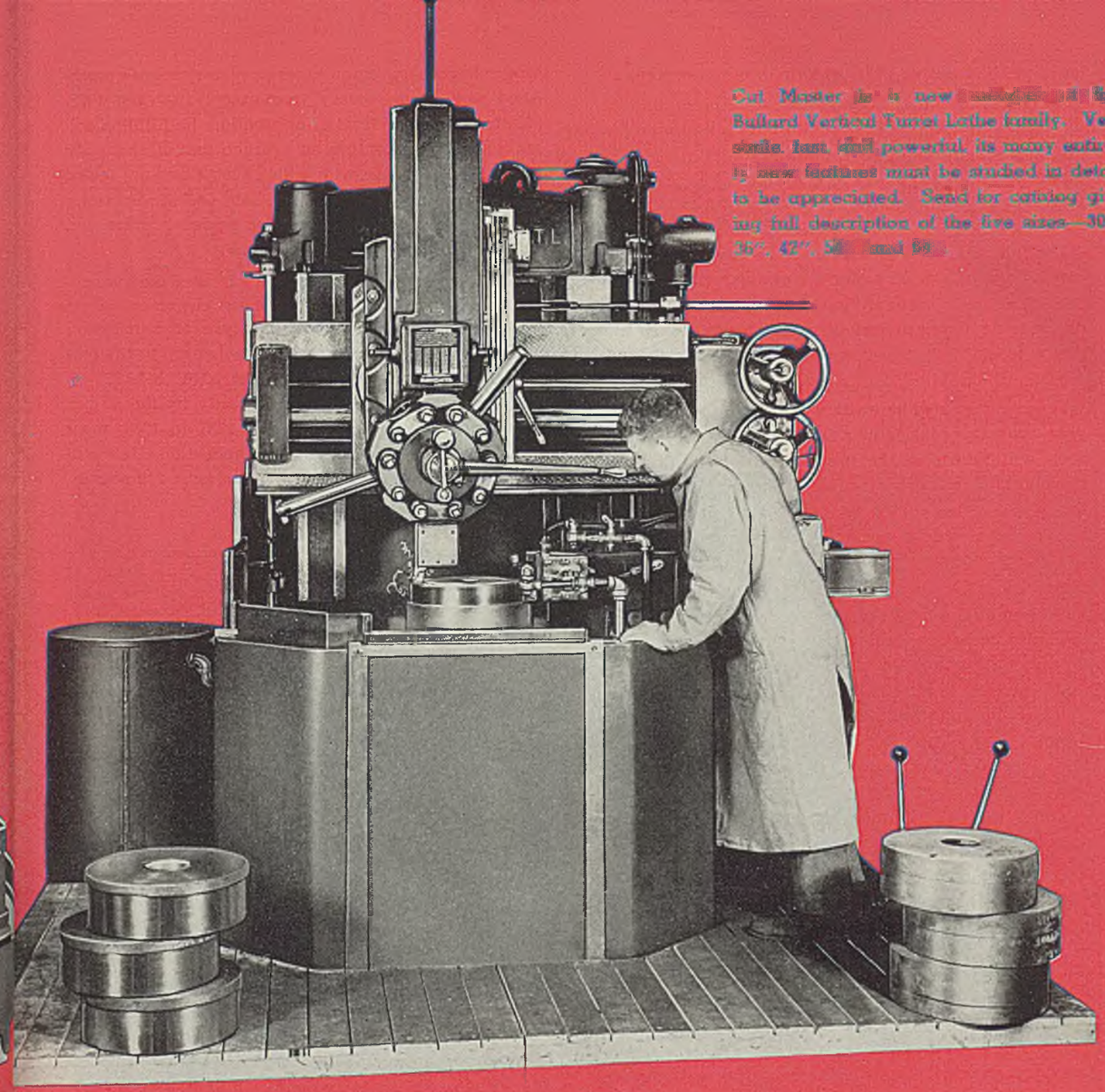
Month by month, the year stacks up somewhat as fol-

The Mult-Au-Matic Method is five or seven stations operating simultaneously to machine a finished piece in the time of the longest operation, plus a few seconds for indexing.

As one of the functions of this Method, individual speeds and feeds at each station permit the selection of cutting speeds for any operation.

There are Mult-Au-Matic models in large or small 6 and 8 spindle machines for handling large, heavy work, such as fly wheels, pump cylinders, shells, shell cases, etc. There are models for machining small castings and forgings, such as gear blanks, rings, motor covers, etc. Mult-Au-Matics can be tooled to handle over 20 different machining operations without rechucking and are profitable on runs as short as 250 pieces.





Cut Master is a new [illegible] of the Bullard Vertical Turret Lathe family. Versatile, fast, and powerful, its many entirely new features must be studied in detail to be appreciated. Send for catalog giving full description of the five sizes—30", 36", 42", 52" and 66".

BULLARD

ARE YOU *Ready* FOR *More Business?*

● Is your machinery fast, accurate, versatile, equal to the unpredictable demands which 1940 may impose upon it? Or have you, too, many old and slow machines or too heavy an investment in single purpose equipment not easily adaptable to changing needs? » » » The machines illustrated here are familiar to every production man in the United States and in most countries overseas. Their design, their versatility, their sustained accuracy, their amazing productive capacity, all have become traditional in the metal working world. » » » But it is not the "metal working world" to which this message is addressed. It is addressed to *you*, and has to do with specific problems of *your own*. To *you* we say, "Ask Bullard for production estimates on any production job you have"—quantities to 10,000 or higher. If the part can be checked, it is very likely that some one of the Bullard machines will handle it better, faster, less expensively.

BRIDGEPORT **THE BULLARD COMPANY** CONNECTICUT

MULT-AU-MATIC **CUT-MASTER** VERTICAL TURRET LATHES

lows, on the basis of past performance and current retail activity:

ESTIMATED PRODUCTION

January	370,000	August	250,000
February	330,000	September	300,000
March	390,000	October	350,000
April	400,000	November	370,000
May	390,000	December	400,000
June	390,000		
July	310,000	Total	4,250,000

The fact new models continue to be introduced in the fall necessitates a continuation of dual statistics for "calendar" years and for "model" years, and the calendar year figures must include about 75 per cent of one year's model and 25 per cent of the following year's model.

Figures presented herewith will all be on the calendar year basis. It is considered a fair possibility the industry soon will return to the practice of introducing new models in January because of pressure from dealers and also because the early introductions have not accomplished nearly as much as had been anticipated in the leveling of employment throughout the year.

For several years now, production totals for the last quarter of the year have been accurate indicators of the sales trend for the ensuing year. Thus, the sharp drop in 1938 production was forecast by comparatively poor production records in the last quarter of 1937; much as the improved picture for 1939 was forecast by November and December of 1938 when production was well over the 300,000-mark. A strong last quarter in 1939, on this basis, may be taken as the token of a healthy run on 1940 models through the first three quarters of this year.

■ ALTHOUGH final figures have not been assembled, it is believed motor vehicle registrations for 1939 broke through the 30,000,000 level for the first time. After a drop of 220,000 from the 1937 peak to 29,485,680, registrations climbed last year to a new all-time high level.

No population estimate was available from the department of census, in view of 1940 being an official census year, but it is safe to assume a normal increase of about 1,000,000, which means one automobile for about every four persons. This does not take into consideration tax-exempt official cars of which in 1939 there were an estimated 400,000. Registration figures since 1925 are as follows:

Year	Population United States	Registration All Motor Vehicles	Ratio of Population per Vehicle
1925	115,378,000	19,937,274	5.78
1926	117,136,000	22,001,393	5.32
1927	118,628,000	23,133,243	5.12
1928	120,013,000	24,493,124	4.90
1929	121,500,000	26,501,443	4.58
1930	122,775,000	26,545,281	4.62
1931	124,070,000	25,832,884	4.80
1932	124,822,000	24,115,129	5.17
1933	125,693,000	23,874,232	5.27
1934	126,425,000	24,951,662	5.07
1935	127,172,000	26,227,276	4.86
1936	128,429,000	28,165,550	4.55
1937	129,257,000	29,705,220	4.35
1938	130,215,000	29,485,680	4.42
1939*	131,100,000	30,000,000	4.37

* Estimated as of September, 1939.

Summary of the enormous tax bill carried annually by motor vehicle owners shown in an accompanying table indicates aggregate taxes on motorists have established new records every year except 1921 and 1938, and are now at the level of one and one-half billion dollars a year, representing an average cost of about $50 per vehicle. The ease with which such taxes are levied and collected suggests no immediate ceiling, especially in view of mounting deficiencies in local, state and federal government administrations.

Second only to the steel industry in size, the automobile industry is the former's best customer, albeit at times a plaguy one. STEEL's analysis of distribution figures for 1938 showed an appreciable drop in the percentage of the auto industry—from 20.04 to 16.88—although this may be explained logically by the 50 per cent decline in auto output from 1937 to 1938, more severe than the relapse in steel production. Unit consumption of steel likewise dropped almost 240 pounds, as shown in the following tabulation:

Year	Car and Truck Production in United States	Automobile % of Output	Consumption of Finished Steel Gross Tons	Apparent Lbs. Finished Steel Per Car†
1923	4,033,248	10.59	3,524,042	1914
1924	3,605,206	11.37	3,193,427	1943
1925	4,265,830	14.60	4,874,496	2517
1926	4,300,934	15.09	5,356,330	2736
1927	3,401,326	13.34	4,386,062	2829
1928	4,359,087	17.76	6,688,934	3375
1929	5,358,420	17.57	7,251,896	2976
1930	3,355,986	14.10	4,161,334	2726
1931	2,389,738	14.78	2,834,197	2618
1932	1,370,678	18.15	1,896,856	3050
1933	1,920,057	20.95	3,505,982	4052
1934	2,753,111	20.87	3,984,830	3195
1935	3,946,934	24.04	5,005,784	2792
1936	4,454,115	20.87	6,068,187	3011
1937	4,808,974	20.04	6,553,506	3004
1938	2,489,085	16.88	3,155,906	2765
1939 (Est.)	3,450,000	18.00	4,500,000	2900

† These figures take into consideration the fact about one-half gross ton of steel produced in the United States goes into manufacture of each car produced in Canada. Fluctuations in unit consumption are not explained by sudden shifts in amount of steel used in automobiles; rather they reflect changing tonnages going into replacement parts and other related auto equipment included by steelmakers in their estimates of output of "automotive steel." Since 1934, unit consumption has been in the range 2700-3000 pounds per car. Further deducting scrap losses from forging, stamping and machining operations, the weight of actual steel in a finished car continues to be nearer 2000 pounds.

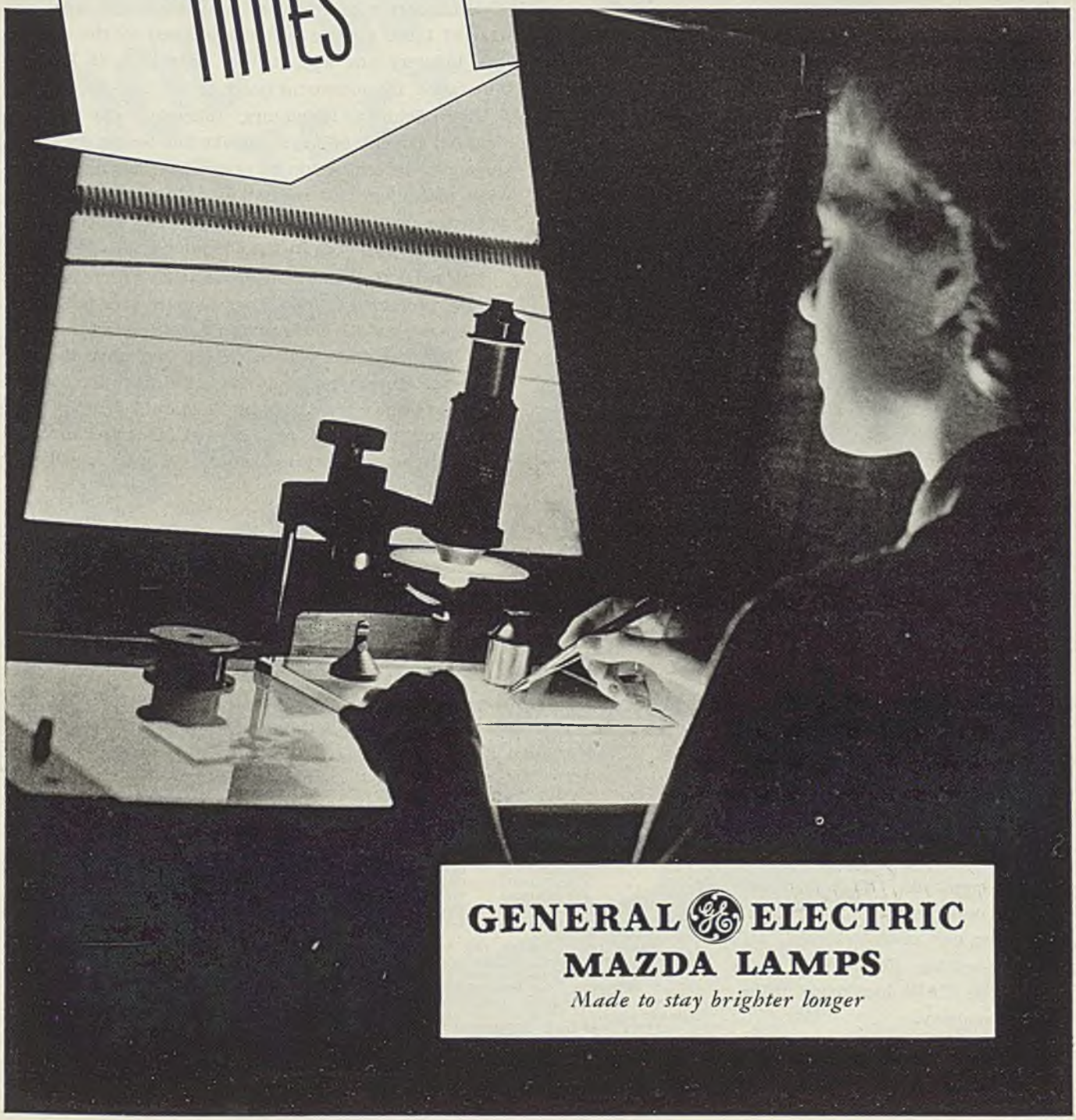
Estimated figures for 1939 naturally will be subject to minor revisions, but preliminary study indicates the industry consumed close to 4,500,000 gross tons of steel and perhaps slightly increased its share of all steel produced. The deferring of distribution figures until spring by steelmakers makes any final determination at this point difficult if not impossible.

Inroads on the use of steel in automobiles were of no major importance during 1939. Much talk was heard of the possibilities of plastics in body panels, but this development still is far from the practicable stage. Ford has been supplying a few cars with trunk compartment lids or covers of soybean plastic impregnated in canvas and molded to shape, but these are regarded as purely "feelers." Briggs Mfg. Co. engineers have done some experimental work with "steelplast" in the molding of body panels, but it is definitely not in the production picture as yet.

■ WAR and labor troubles held the stage in motordom, especially during the last three months of the year. One

MAGNIFIED 60 TIMES

ONE OF THE REASONS why G-E MAZDA lamps give more light in 1940 is the improved tungsten filament that burns brightly inside the lamp. Finer than a human hair, it is coiled into a tiny spiral, then magnified 60 times for final inspection. Below (top to bottom) a coiled filament, a human hair, an uncoiled filament. When you buy G-E MAZDA lamps you are sure of getting the benefit of the latest improvements in lamp bulb manufacture. General Electric Company, Nela Park, Cleveland, Ohio.



GENERAL ELECTRIC
MAZDA LAMPS
Made to stay brighter longer

immediate effect of European hostilities was to improve greatly the position of American truck manufacturers, but they still have much ground to regain before attaining the lush foreign markets of ten years ago. The following table summarizes export statistics over the past eleven years:

EXPORTS OF PASSENGER CARS AND TRUCKS

	Cars	Trucks	Total
1929	451,095	282,667	733,762
1930	247,764	157,951	405,715
1931	134,304	107,619	241,923
1932	73,115	47,350	120,465
1933	98,155	78,428	176,583
1934	184,156	126,366	310,522
1935	210,367	124,474	334,841
1936	211,477	134,590	346,067
1937	272,503	203,411	475,914
1938	190,156	135,786	325,942
1939†	175,957	167,314	343,271

Includes exports from plants in U. S. plus number of vehicles assembled abroad from parts produced in U. S. plants; Canadian production excepted.
† November and December estimated.

It is likely 1940 will see foreign purchases, especially of trucks and commercial cars, on a bountiful plane, although unsettled conditions abroad have seriously disturbed exports and foreign assemblies of American passenger cars. Commandeering of foreign plants of American builders probably already has further crippled this situation.

Scarcely a motor plant in the country, accessory, parts or otherwise, has escaped the continued sniping of union labor organizations, and at the year-end conditions were once more near the critical stage of early 1937, particularly for the Chrysler Corp. which experienced a disastrous strike beginning Oct. 6. Continuing for eight weeks, during which time an estimated 58,000 Chrysler workmen were idle, the tieup was costing the corporation over $10,000,000 weekly in sales and employes about $2,500,000 weekly in wages.

Original contract which Chrysler signed with the UAW on April 6, 1937, and finally extended to Sept. 30, 1939, expressly forbade any stoppage of work in the company's plants. However, in the 2½ years under the contract the record shows 84 strikes and stoppages of production; 65 slowdowns; 64 evictions from plants, involving 91 employes; 18 instances of plant picketing, principally to collect dues; and 100 cases of intimidation involving 136 employes. This experience was not importantly different from the other car manufacturers', always excepting Ford of course, where the UAW has made little or no headway.

Labor troubles in 1939 dated from the latter part of January when the UAW split into two groups, one maintaining alliance with the CIO, the other floundering around for several months and finally affiliating with the AFL, under direction of the deposed Homer Martin. After sporadic labor disputes at Briggs, Chrysler, Hudson, Packard and Fisher Body, 12 major strikes were called in tool and die divisions of General Motors which lasted for about a month and threatened delay in 1940 model production plans.

It soon became evident the UAW-CIO held the upper hand in the union split, despite the fact court litigation still pends between the warring groups. NLRB-sponsored elections in Packard, Chrysler and a number of other plants in the Detroit district gave a clear majority in all cases to the CIO faction.

Closing of all plants of the Chrysler Corp. in the fourth quarter of the year resulted in the most protracted labor dispute ever experienced by the automobile industry and was another body blow to Detroit's reputation for industrial peace.

The Michigan legislature, following the untimely death of Governor Fitzgerald who had been a vociferous supporter of legislation to prevent strikes and to provide machinery for mediation of industrial disputes, passed a devitalized labor relations act which quickly proved its impotence in the Chrysler strike.

The aged Governor Dickinson, who succeeded Fitzgerald, preferred to turn labor disputes over to God for settlement, but His intervention in Michigan apparently was deferred. Talk was heard in December that Ex-Governor Murphy might decide to return to the political arena to avenge his defeat by Fitzgerald. Murphy probably would receive the solid vote of labor and he would be almost a certainty to defeat Dickinson, should the latter run again.

■ AUTOMOTIVE milestones in 1939 were numerous;

Taxes on Motor Vehicle Owners

	State Registration Fees	State Gasoline Tax	Federal Excise Taxes*	Personal Property City and County Taxes**	Total***
1924	$225,492,252	$ 80,442,295	$139,201,755	$60,000,000	$ 507,150,141
1925	260,619,621	148,358,087	143,430,709	62,000,000	616,273,492
1926	288,282,352	187,603,231	96,255,639	66,000,000	638,272,350
1927	301,061,132	258,838,813	60,473,708	68,000,000	688,373,653
1928	322,630,025	304,871,766	20,386,176	69,000,000	716,887,967
1929	347,843,543	431,311,519	.....	70,000,000	849,155,062
1930	355,704,860	493,865,117	.....	70,000,000	919,569,997
1931	344,337,654	536,397,458	.....	68,000,000	948,735,112
1932	330,005,109‡	513,047,239	81,290,193	68,382,000	992,724,541
1933	310,100,884‡	518,195,712	247,744,425	70,000,000	1,146,041,021
1934	316,662,000‡	565,027,000	252,151,729	70,998,000	1,204,838,729
1935	335,375,000‡	616,851,671	273,324,821	73,079,000	1,298,650,492
1936	374,920,000‡	686,631,000	314,352,976	72,363,000	1,448,266,976
1937	415,829,000‡	756,930,000	343,781,275	72,000,000	1,588,540,275
1938	405,246,000‡	766,853,000	285,213,125	72,000,000	1,529,312,125
1939†	410,000,000‡	770,000,000	300,000,000	72,000,000	1,552,000,000

These are taxes on the motor vehicle owners. Income and property taxes on motor vehicle, body, parts and tire factories, garages, dealers, repair shops, terminals and truck, taxicab and bus operating companies are not included.
* Figures from bureau of internal revenue; war tax remaved May 29, 1928.
** Estimated by Automobile Manufacturers association, including bridge and tunnel tolls.
*** Totals include Federal tax on vehicles for hire (fiscal year): 1924—$2,013,839; 1925—$1,865,075; 1926—$131,128.
‡ Includes state motor carrier taxes: 1932—$5,731,599; 1933—$7,385,000; 1934—$9,402,000; 1935—$12,421,000; 1936—$15,137,000; 1937—$16,216,000; 1938—$16,421,000; 1939—$16,500,000.
† Estimated.

GOOD OIL SEAL PROTECTION is a break for both machine and operator

"Perfect" Oil Seal PATENTED

● The conscientious machine operator is always glad to get a machine with adequate oil seal bearing protection. With such a machine he does not have any unsightly oil leaks with which to contend. As a result he does more and better work.

The machine operator also knows just how often bearings have to be lubricated. With good oil seal protection he can be sure that these bearings retain an adequate supply between the times when they are lubricated.

If the product being turned out is one that would be spoiled by lubricant leakage, oil seals give him further protection.

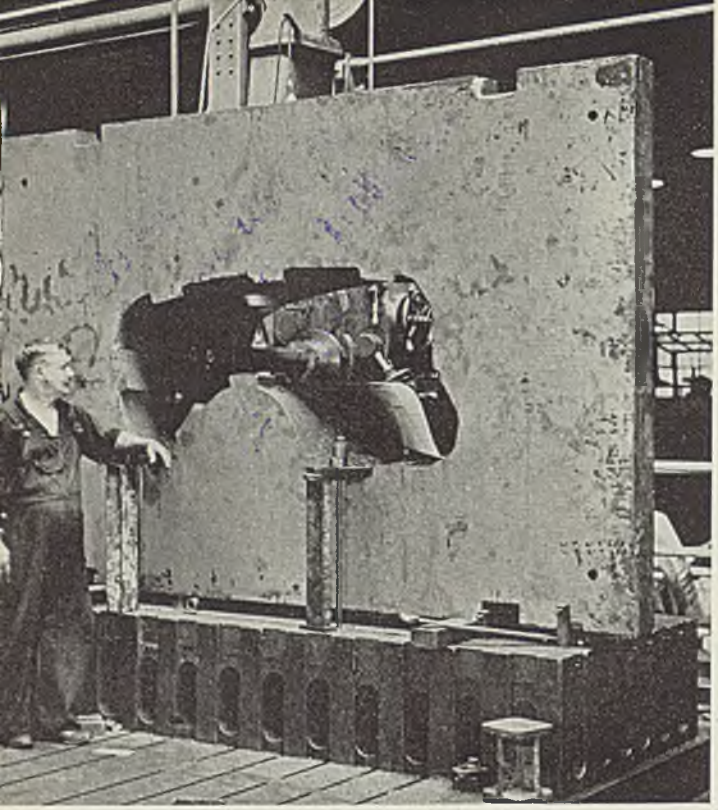
Give the men who will operate the machines you manufacture a break by equipping them with "Perfect" Oil Seals—the best protection available. Write for technical information.

CHICAGO RAWHIDE MANUFACTURING CO.

1308 ELSTON AVENUE, CHICAGO, ILLINOIS

61 Years Manufacturing Quality Mechanical Leather Goods Exclusively

PHILADELPHIA • CLEVELAND
NEW YORK • DETROIT
BOSTON • PITTSBURGH
CINCINNATI



■ In the Hayes Body Corp.'s plant, Grand Rapids, Mich., this boring machine is shown reaming out a trial autobody die blank from gray iron 20 inches thick

a brief listing should include: Studebaker's highly successful introduction of the low-price Champion model in the mass volume market.

Introduction of small tractors by International Harvester Co., J. I. Case Co., Cleveland Tractor Co. and Ford Motor Co., the latter's aimed to revolutionize agriculture by making low-cost power available to millions of farms. The Ford tractor, based on English designs, pioneered a number of innovations in construction, including hydraulic control of implements.

Almost universal adoption of the sealed-beam headlight on passenger cars. An outgrowth of carefully planned research by car builders and lamp manufacturers, this type of headlight marks the first major improvement in lights since the introduction of electric lights on cars. Not only does the sealed unit provide 50 per cent better illumination, but also it is designed to maintain efficiency over long periods of usage, and can be replaced at low cost in event of breakage.

Introduction of the first completely automatic transmission by Oldsmobile. Known as the "hydramatic" drive, the equipment combines the fluid flywheel principle with a hydraulically controlled planetary-gear transmission. General Motors has equipped a separate plant in Detroit to build the units, and it seems likely not many years will elapse before all the corporation's cars will be equipped with this type of transmission as standard equipment, dispensing altogether with the conventional clutch pedal and gearshift lever.

After completing much of the preliminary design work on a new version of a small car, and taking figures on a large volume of machinery and tools required in its production, Packard suddenly abandoned the project, but did proceed with virtually a complete rearrangement and integration of equipment in its present plant buildings. Packard also began engineering work leading to manufacture of a sleeve-valve, liquid-cooled aircraft engine.

Announcement of manufacture of still another low-price diminutive automobile by Crosley Corp., Cincinnati. Selling for around $350 and powered by a 2-cylinder motor, this project at the end of the year appeared to be languishing.

Publication of the previously mentioned report on the motor vehicle industry by the federal trade commission, as thorough and far-reaching a document as many students of the industry had ever inspected. One immediate result of this investigation was a realignment of pricing policies by most of the large car builders.

Important plant expansions were completed during the year, including a new Fisher Body plant at Grand Rapids; new press and body plant for Ford Motor Co.; 200,000 square foot addition to Allison aviation engine plant at Indianapolis by General Motors; remodeling of Chrysler plant at Los Angeles; additional space for Chevrolet-Fisher Body at Buffalo; new driveaway buildings for Lincoln Zephyr and Ford; new plant for consolidating operations of Carboloy Co. in Detroit; melt shop for Rotary Electric Steel Co.

Plant Expansions Successful

With regard to plant expansions, both past and future, it may be interesting to note the underlying philosophy of executives of a large corporation—such as General Motors. Expansion is regarded as a policy termed "broadening the profit base." It proceeds in three directions—foreign markets; integration or absorbing manufacture of parts and accessories previously purchased; and thirdly, expansion into new ventures not closely related to motor vehicles, such as diesel engines, refrigerators, washing machines, electric appliances, etc.

Success of such a policy cannot be disputed, and it undoubtedly suggests the path of future expansions, not only by General Motors, but by other large motor companies as well. An amusing sidelight is the statement of principal purposes of incorporation embodied in the original articles of incorporation of General Motors in 1916, to wit: "To manufacture, buy, sell and deal in automobiles, trucks, cars, boats, flying machines and other articles, their parts, accessories and kindred articles, and generally to conduct an automobile business in all of its branches and further to engage in any other manufacturing or mercantile business of any kind or character whatsoever and to that end to acquire, hold, own and dispose of any and all property, assets, stocks, bonds and rights of any and every kind."

How accurately this legal masterpiece foretold the corporation's future, and how well these fond hopes were realized are matters of record now.

Speed with Safety

Thousands of Everlock lockwashers are used on the Rock Island Rocket trains as an additional margin of safety to prevent loosened nuts, bolts and screws.

Leading manufacturers . . . world wide . . . recognize this same need for safety in their assemblies, and use hundreds of millions of Everlock washers yearly.

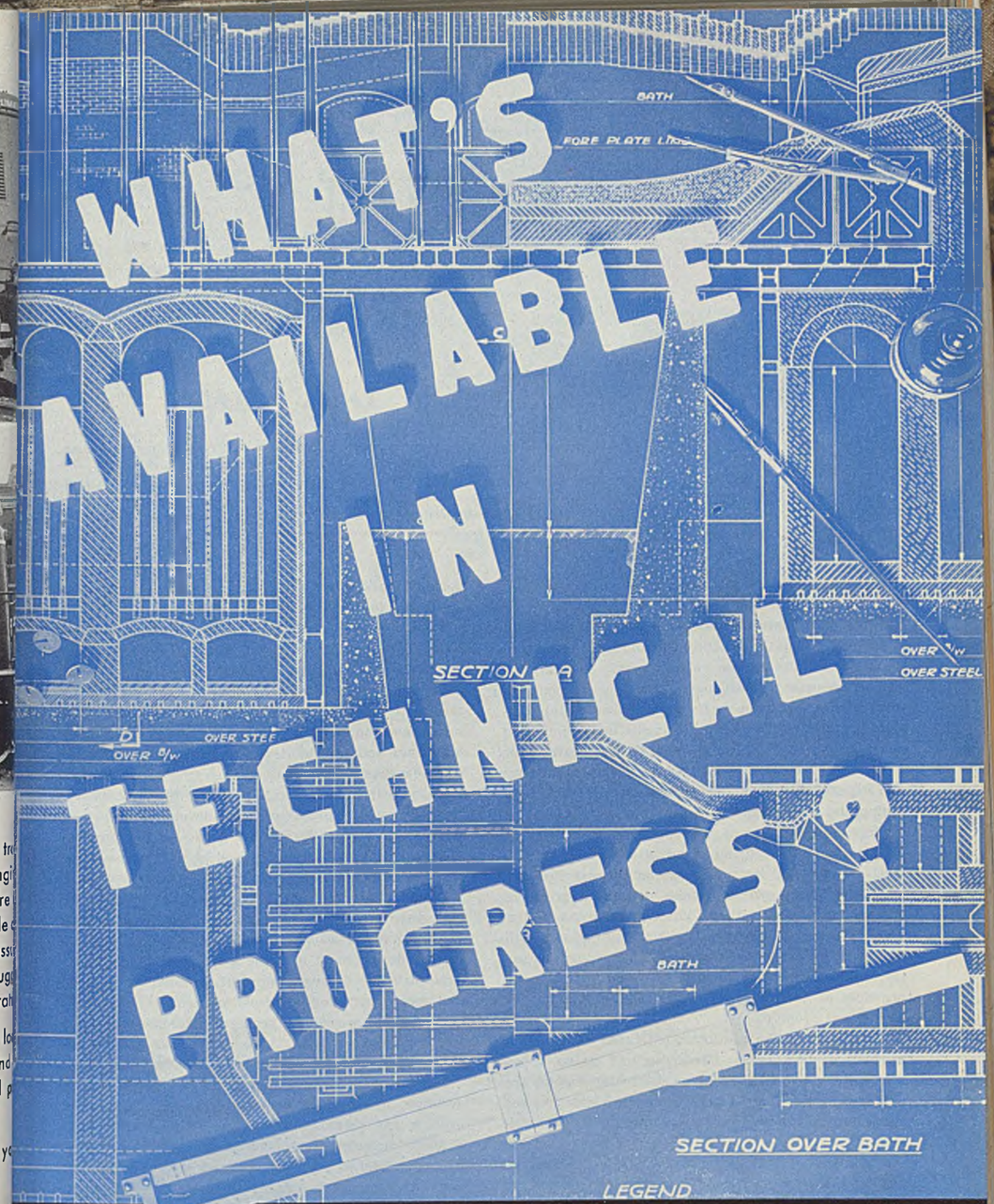
Your products need this same protection . . . start using Everlocks on your assemblies now.

Everlock
WASHERS

THOMPSON-BREMER & CO.

1640 WEST HUBBARD STREET · CHICAGO, ILLINOIS

WHERE OTHER WASHERS HAVE BEEN TRIED *NOW* EVERLOCKS ARE SPECIFIED



WHAT'S AVAILABLE IN TECHNICAL PROGRESS?

HEAT TREATING

Equipment and processes reach a high degree of perfection giving assurance of improved quality in treated product. Controlled atmospheres are filling wide variety of needs

MARKED advances were made in all phases of heat treating practice and equipment during 1939, thereby providing industry with efficient tools for meeting the exacting demands of heavier production schedules in the coming year. Heading the list of important developments are improvements in atmospheres and furnaces for their utilization; application of radiant tube heating elements and elimination of alloy muffles; extension of induction heating for hardening; commercial acceptance of austempering; and expansion of the flame process for hardening, softening and strengthening.

Clear understanding of the fundamentals contributed by carbon and other important alloying elements in steel, as disclosed by researches on the so-called "S" curve, represents an important step in progress, in the opinion of G. C. Riegel, chief metallurgist, Caterpillar Tractor Co., Peoria, Ill. This information will be useful in improving practice in annealing by isothermal decomposition of austenite, and in improving practices of hardening to obtain best combination of mechanical properties.

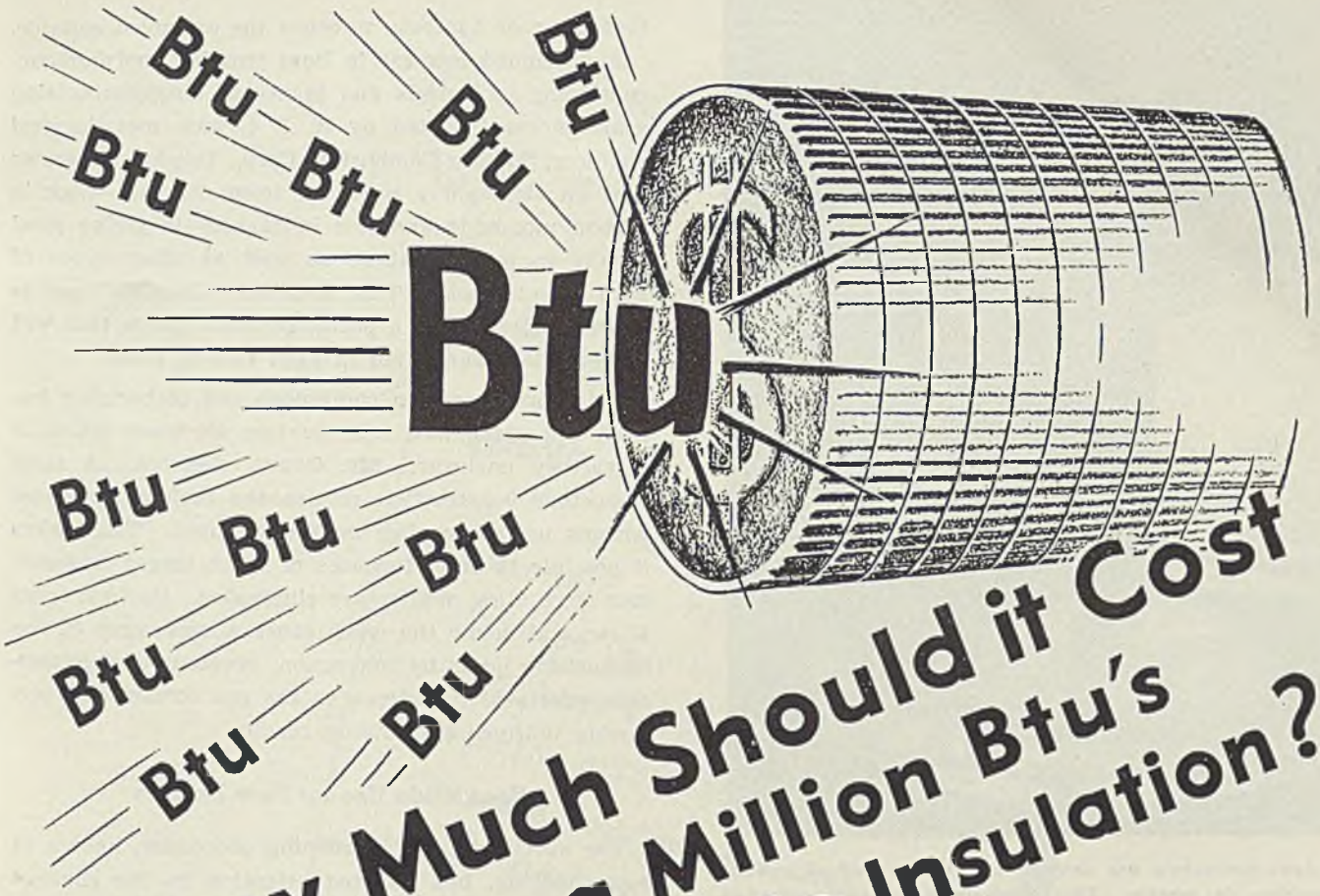
Without doubt, he continues, extension of induction methods of heating for hardening will go on at an accelerated pace. Some of the microstructures which are obtained by these rapid heating and hardening cycles are strangers to our present conception of steel metallography.

Application of various methods for selective hardening again has occupied a large share of our attention, observes A. E. Focke, research metallurgist, Diamond Chain & Mfg. Co., Indianapolis. While flame hardening has won general acceptance, it still is difficult to be sure of obtaining satisfactory metallurgical uniformity when only a few of any one size or type of parts are to be treated.

The partial automatic temperature control obtained with high-frequency induction heating should tend to overcome much of the difficulty, he states. Several interesting applications have been worked out in addition to the original development on crankshafts. But again these applications are for specific items in large quantities and possibilities for general application on miscellaneous articles can be determined only when basic principles and peculiarities of the process are more thoroughly understood and developed. Much of the preliminary work on this phase of the problem has been done in 1939 and by end of 1940 the probable general value of the process should be more apparent.

Outstanding progress in heat treating practice the past year is cited by T. A. Frischman, chief metallurgist, Axle division, Eaton Mfg. Co., Cleveland, as further development in flame hardening, wider use of nondestructive testing equipment, installation of more and more controlled atmosphere furnaces and excellent results in wearing-in properties obtained from rust inhibiting compounds. These developments have advanced knowledge and progress considerably, he adds.

Developments have proceeded rapidly toward more accurate control of artificial atmospheres and rates of heating and methods of cooling, comments A. M. Steever, superintendent, Columbia Tool Steel Co., Chicago Heights, Ill. Atmospheres used for heating and treating metals run to the two extremes from scaling to carburizing. Clean annealing and hardening is not a new development as applied to large continuous furnaces, but ability of the small producer to obtain bright parts economically and with comparatively in-



How Much Should it Cost to Stop a Million Btu's with Backing-up Insulation?

An analysis of the cost of backing-up insulation for equal heat-flow through walls of various materials, shows as much as 40 per cent difference in the prices paid for accomplishing the same result.

A B&W refractory representative will, on request, show you how to avoid paying such unnecessary premiums—he will give you insulation-economy facts and other money-saving information as well. He can demonstrate, for example, how to get maximum insulating value per dollar cost, with B&W K-16 Insulating Firebrick. K-16's have:

(1) The unsurpassed stability of a fired-clay refractory product
(2) Low thermal conductivity
(3) Light weight (19 lb. per cu. ft.)
(4) High strength at all temperatures up to the recommended limits of 2000 F. for backing-up and 1600 F. when directly exposed.

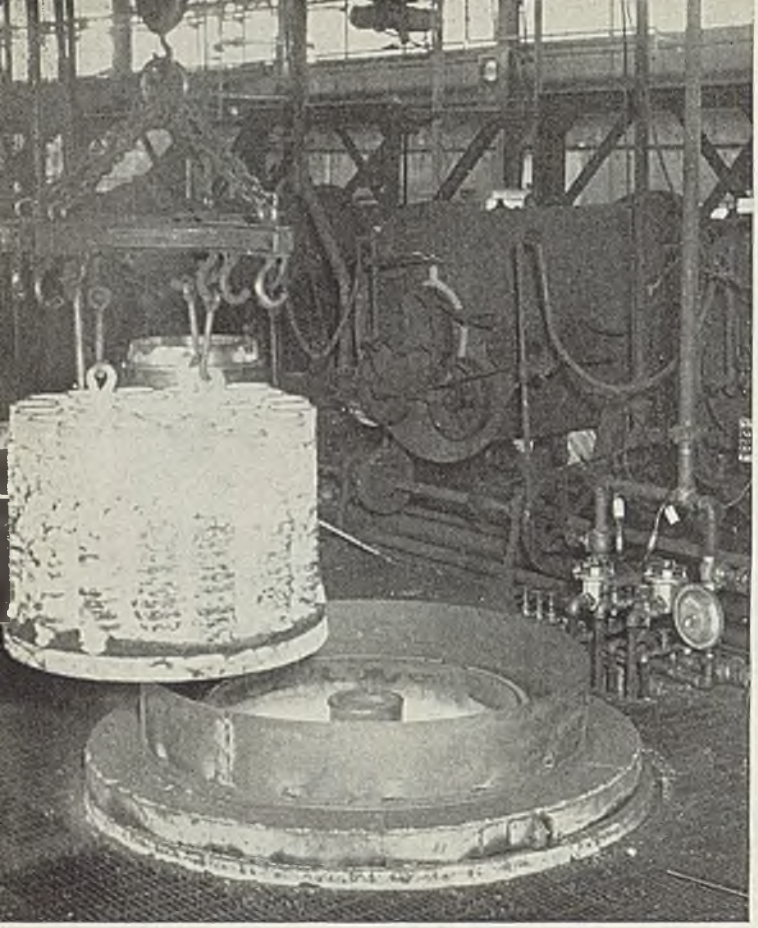
Whether you want such information immediately or at some future date, a request for it now will bring it to you *when* you want it—without obligation.

Just off the press—this leaflet gives engineering data on B&W K-16 Insulating Firebrick. Write for Bulletin R-18.

R-97

THE BABCOCK & WILCOX COMPANY
REFRACTORIES DIVISION: 19 RECTOR STREET, NEW YORK, N. Y.

BABCOCK & WILCOX



■ Heat treatments are devised to produce desired specific properties in metals. This specially-designed, controlled-atmosphere, vertical furnace carburizes outer races for heavy-duty roller bearings. Photo courtesy Timken Roller Bearing Co.

expensive batch-type furnaces is an advancement of first importance.

The most revolutionary development of 1939, he continues, is bright hardening of steel without decarburization from small standard batch-type furnaces, this being accomplished by use of certain atmospheres and furnace equipment designed with tilting alloy hearths, which discharge through a chute to quench without contact with outside atmosphere. It is interesting to note that the atmosphere used in the process follows almost exactly the ideas of theorists and compilers of atmospheric equilibrium curves which have been available many years.

Improvements in muffle furnaces for tool hardening have come from adoption of the foregoing and other methods. Gas-fired muffles with controlled atmospheres have been developed as economical tool hardening furnaces producing high-quality work, Mr. Steever points out. These furnaces operate with high CO atmosphere, this being obtained by built-in reaction tube or generator. Raw material for this atmosphere is charcoal.

Considerable progress has been made in heat treating by the electric induction process with or without prepared atmospheres and results of considerable magnitude can be anticipated. Many additional applications for the new nitrogen generator and the charcoal gas apparatus undoubtedly lie ahead. So complete is the range of atmosphere offered, Mr. Steever declares, that the user has only to select the one most suitable.

A continued interest in heat treating molybdenum-containing tool steels and in use of nondecarburizing atmospheres is noted by R. J. Cowan, metallurgical engineer, Surface Combustion Corp., Toledo, who states that an atmosphere produced from charcoal—high in carbon monoxide and low in carbon—is giving good results in treating these as well as other types of high speed steels. This so-called "Char-Mo" gas is finding wider use as a protective atmosphere that will prevent decarburization in high carbon steels.

An improvement in continuous gas carburizing has been use of radiant tube heating elements within a refractory enclosure, Mr. Cowan declares. A tight refractory construction retains the carburizing gases without use of an alloy muffle container. This makes it possible to build furnaces of much larger cross-section since alloy muffles are eliminated. Radiant tubes above and below the work cause a movement of the carburizing gases by convection, overcoming objectionable effects of turbulence in the gas stream and producing uniform carburizing results.

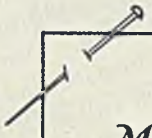
Sees Wide Use for New Process

The special type of hardening procedure, known as austempering, has directed attention to the changes that occur at temperatures below the critical points of steel. Fundamentals of this process are far-reaching and when utilized in the heat treating art, Mr. Cowan believes, will make possible a range of structures and physical properties that will be of considerable importance. Quite likely, another year will see a number of improvements along this line.

A process for bright strand annealing of wire perfected during the year, he continues, is unusual in that neither furnace nor atmosphere tube is required. Instead a gas burner of special construction is used and the wire passed through the flame which protects it from discoloration and at the same time supplies heat for annealing. These burners are used in sizes up to 27 feet long and are capable of annealing No. 6 to No. 36 wire at speeds from 190 to 1500 feet per minute.

Some ten years, reflects S. K. Oliver, process engineer, Douglas Aircraft Co. Inc., Santa Monica, Calif., a number of questions were discussed widely in connection with heat treating furnaces. Among these were: Soot control in gas carburizing equipment; universal atmosphere for scale-free heat treatment of ferrous metals; longer alloy pot and retort life; universal and low-cost type equipment for the induction hardening process; and scale-free tempering in elevated temperature ranges.

Many of these problems have been solved today by use of specially-designed furnaces for particular jobs. In those cases where production warrants, cost of special equipment is negligible to advantages gained. But in the case of low production industries where



MEMO . . .

Regarding that furnace problem --- write The Electric Furnace Co., Salem, Ohio --- they have a reputation for solving difficult production furnace problems --- they build both electric and fuel fired equipment, and will recommend the best type for the job. Better write or 'phone them today.

E. F. C.

one piece of equipment must serve a number of heat treating operations, it seems to Mr. Oliver that little progress has been made in solving earlier problems. It is difficult to convince industries demanding the stock item of equipment of the advantages of new, highly-specialized, high-production type, atmosphere-controlled furnace equipment.

Perhaps this is due, he explains, to exaggerated accounts of difficulties encountered with atmosphere controlled furnaces, and the fact that standard stock item type furnaces have not been brought up to the state of perfection of high-production, special-purpose types. He suggests more engineering thought be given to stock-type furnaces incorporating solutions of the aforementioned problems.

Important developments in protective atmospheres and furnaces for their use, also are impressive to C. L. Harvey, chief of staff, Lamson & Sessions Co., Cleveland. He points out that one of the most outstanding of these has been introduction of a tool hardening furnace for air-hardening die steels, which uses dissociated ammonia gas as a protective atmosphere during the heating and cooling cycles. Work can be treated in this furnace without a trace of carburization, decarburization or scale.

In production heat treating, he finds great strides have been made in gas-fired equipment of the forced connection and radiant-tube type. Gas-fired, recirculating atmosphere furnaces are now available for tempering which have uniform temperatures, rapid heating and low cost characteristics. Hardening furnaces of the radiant tube type also are coming to the front. Low-cost of operation and their ability to be used with a great variety of protective atmospheres make them especially desirable for many applications.

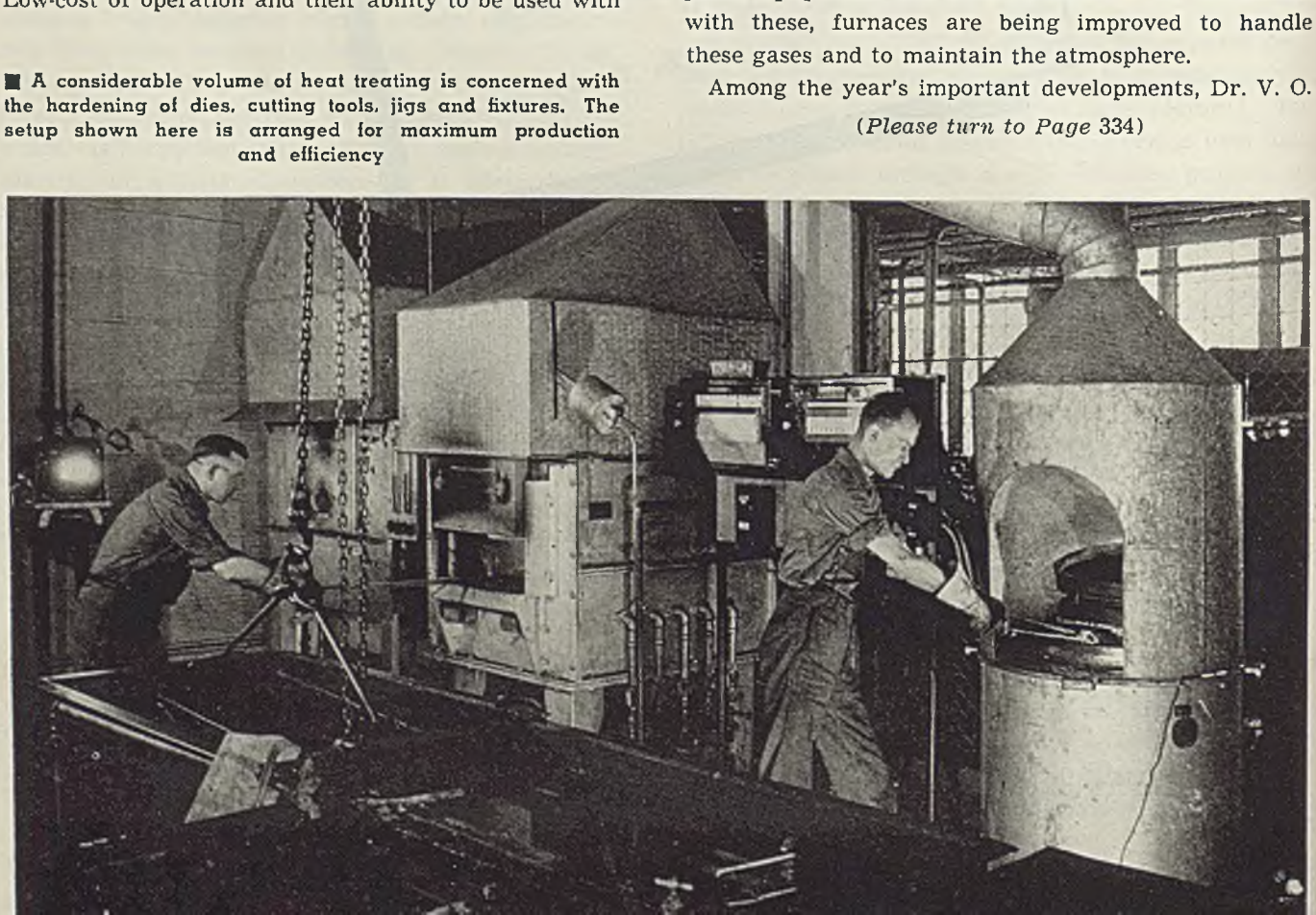
Further developments in gas atmosphere producing equipments and in application of refined gas atmosphere have resulted, in general, in use of more accurate control and finer quality in heat treatment of steel, particularly those in the high carbon and alloy tool steel group, declares C. E. Peck, heating section engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. One development deals particularly with the furnace and separate gas generating equipment which will satisfactorily harden the slow-cooling type of tool steels without decarburization or oxidation. It allows heat treating of finished dies without surface defects, with uniformity of hardness and control of dimensions.

For short cycle hardening of a wide range of alloy carbon and high carbon steels using a temperature of from 1400 to 1750 degrees Fahr. there is now available a commercial gas generating equipment which will allow hardening without decarburization or oxidation. For the longer cycle annealing of various high carbon and alloy carbon steel, complete gas generating equipment is available in which a hydrocarbon-type fuel gas is burned under controlled conditions and the carbon dioxide and water vapor are thoroughly removed. Also available is equipment which will combust dissociated ammonia and produce a pure high-nitrogen bearing gas, which is particularly suitable for the long cycle annealing of high grade silicon steels.

In general, Mr. Peck asserts, developments are tending toward wider use of separately-controlled atmosphere equipments and their auxiliaries. In connection with these, furnaces are being improved to handle these gases and to maintain the atmosphere.

Among the year's important developments, Dr. V. O.

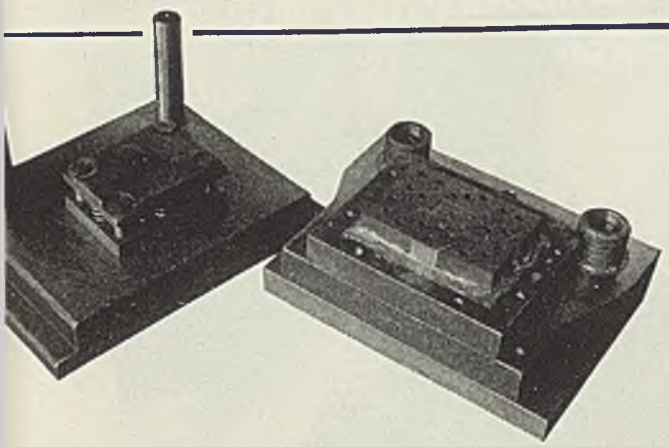
(*Please turn to Page* 334)

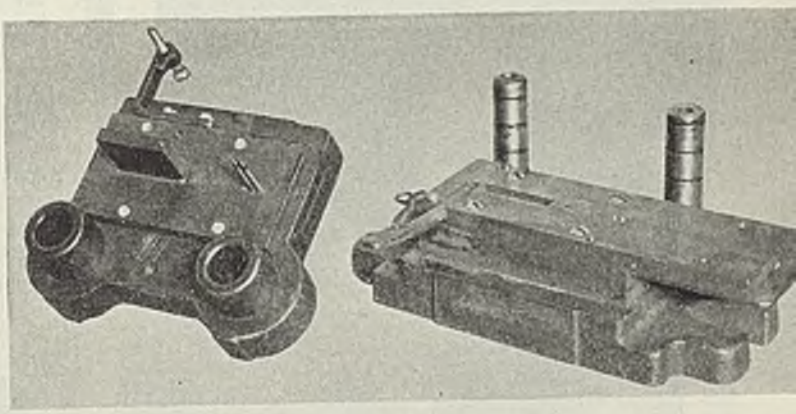


■ **A considerable volume of heat treating is concerned with the hardening of dies, cutting tools, jigs and fixtures. The setup shown here is arranged for maximum production and efficiency**

NEW WESTINGHOUSE FURNACE BRIGHT HARDENS DIE BLOCKS

Without Oxidation, Decarburization, Distortion or Cracking





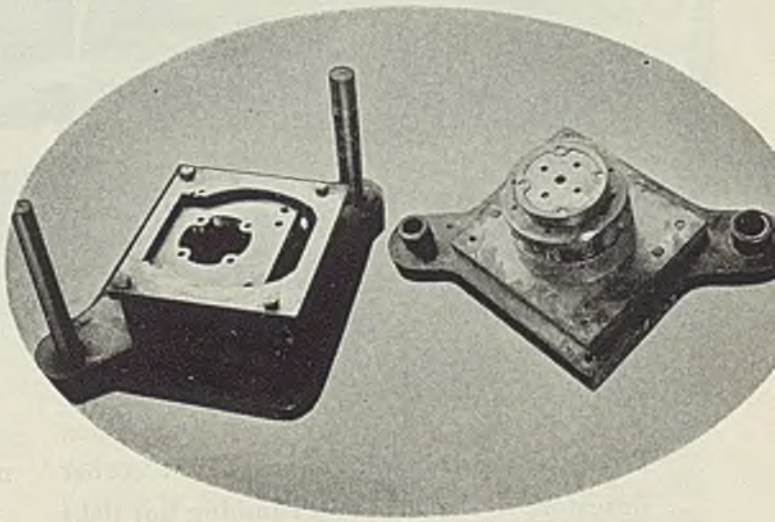
pensive Grinding and
ishing Operations Eliminated

s always been an accepted fact that damage to die
:s during hardening can not be avoided. This is
an old idea. Damage *can* be avoided. Die blocks can
ight hardened without oxidation, decarburization,
rtion or cracking. Dies can be produced without
nsive grinding or finishing operations. Production
can be reduced without any loss in precision
uality.

estinghouse research has revealed the causes of
age to die blocks during hardening. Westinghouse
neers have designed a furnace that eliminates these
es.

ne new electric furnace is of entirely different con-
:tion and design to permit the use of a newly
loped atmosphere, "Ammogas." Heated by this new
ric furnace in Westinghouse Ammogas, die blocks
en with bright, clean, smooth surfaces.

herever dies are hardened, this new furnace can cut
uction costs. For full information see your Westing-
e representative, or write direct. Westinghouse
tric & Mfg. Co., East Pittsburgh, Pa.



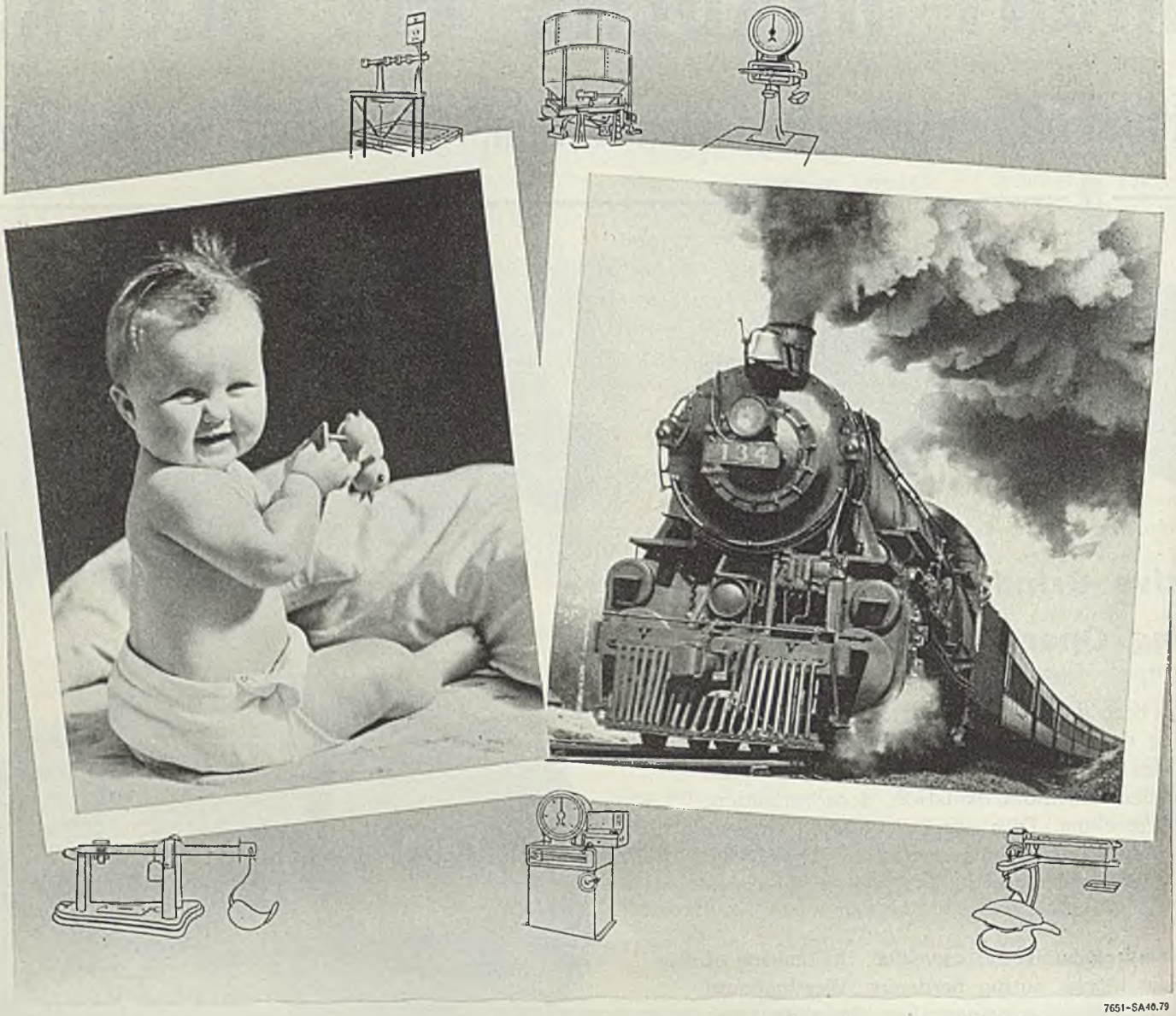
An outstanding advantage of Ammogas hardening is the complete assurance that a die set will come from the hardening room in a serviceable condition. The die sets illustrated here are typical of more than 300 punches, dies and other tools hardened for production departments during the past 28 months

J-10154-A

Westinghouse

Complete Heat Treating Equipment

From BABIES *to* LOCOMOTIVES!



7651-SA40.79

From the prescription counter of the corner drugstore to the steel mill handling hot slabs of metal . . . from the nursery to the roundhouse —there is hardly a type or size of weighing job for which Fairbanks Scales aren't built. Each scale can be depended upon for the *sustained* accuracy that has made Fairbanks the greatest name in weighing throughout the world.

The facilities of the organization that has made this name great are available to you on call. Fairbanks, Morse & Co., Dept. 96, 600 South Michigan Avenue, Chicago, Illinois. Branches and service stations throughout the United States and Canada.

FAIRBANKS-MORSE

The Greatest Name in Weighing

SCALES

MATERIALS HANDLING

Efficient movement of material greatly facilitated by the introduction of new units which expand range of loads that can be handled. Many machines feature built-in handling

ADVENT of larger ram trucks to handle bigger coils of strip, increased flexibility of power and hand trucks, wider adoption of unit packaging methods, faster cranes and hoists—all are important advances in materials handling equipment and methods during the past year. A method of handling ore underground by use of scrapers appears an important development.

For the first time in several years, the need for increased storage space for raw materials as well as for finished products has cropped out. This combined with the immediate problem of getting increased production would have brought forth additional warehouse space not so long ago, but not so under present conditions, points out L. M. Sears, president, Towmotor Co., Cleveland. He adds that solution of this problem of storage space involves simply stacking of units, thus using overhead space, much of which is usually available around any plant. Gas-powered fork-type lift trucks more than double available storage space in many such instances.

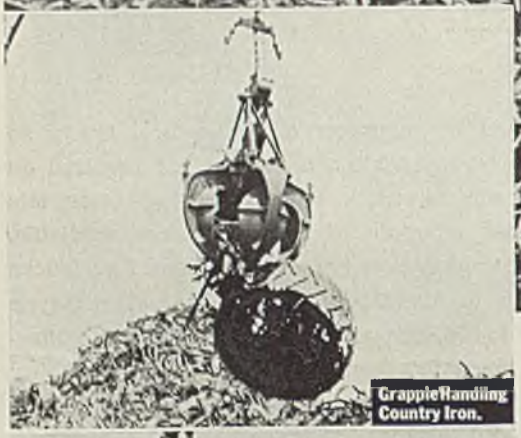
Increased dependability of power industrial trucks is emphasized by their greater use in processing lines, states C. B. Cook, Elwell-Parker Electric Co., Cleveland. Removing coils of strip from horizontal rotating 4-arm "star stands" requires trucks to cover a delivery cycle and return to match the turning of the wheel. Another unit is the coil upender that takes from vertical, rotates in transit if necessary and delivers to horizontal, or vice versa.

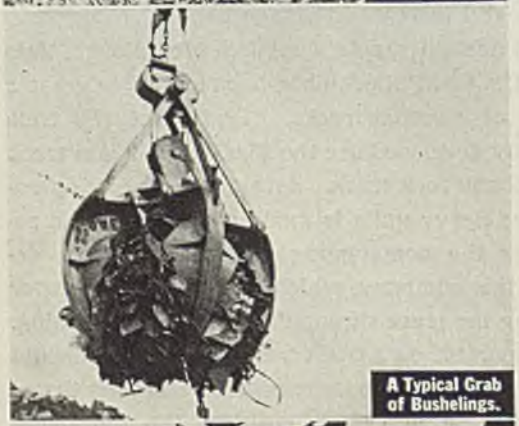
Another comparatively new application of heavy-duty crane trucks is placement and removal of mold tops, freeing overhead cranes for other duties. Several years ago the first so-called "pedal guards" began to appear behind the operator on end-control trucks to protect him when backing, a feature not required on new center-control trucks where the operator sits amidship. As example of increased sizes available, Mr. Cook's company now has center-control fork trucks available up to 10,000-pound capacity and ram-type trucks up to 35,000-pound capacity. Added refinements for operator's comfort include sponge rubber pedals, cushion backrests and seats, resulting in faster, safer work and increased tonnage handled.

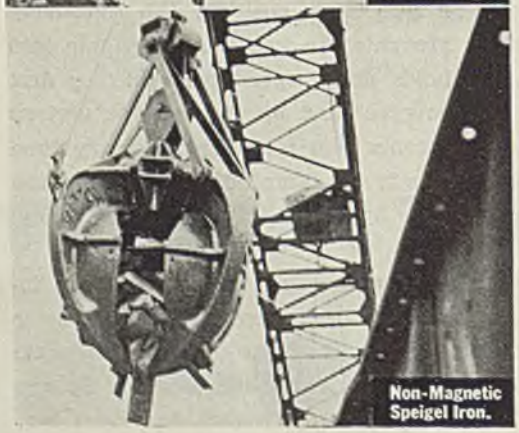
Increased flexibility, points out J. S. McCullough, Yale & Towne Mfg. Co., Philadelphia, has resulted in greater acceptance of electric trucks. Typical of the Yale units recently developed are the 25,000-pound ram truck and 12,000-pound fork truck. Safe, fast, low-cost operation of these heavy units is made possible by such refinements as the nonplugging time-delay control, developed by this company, which prevents the operator from abusing the truck through inconsiderate handling. Thus if an operator on a truck traveling forward should throw the directional handle to reverse and then throw the speed handle into high position, the time-delay control actually prevents the truck from leaping into high speed. It holds down operations, shifting first to "stop," then "reverse" and up through the various speed steps in sequence and allowing necessary time on each step. This is as essential as the improved braking systems now available in preventing damage to truck.

An important development in the metalworking industries during 1939 has been increased use of power trucks in restricted clearances on work previously done manually, particularly box car loading, states George E. Stringfellow, vice president, Thomas A. Edison Inc.,

YOU WHO HANDLE SCRAP-IRON


Grapple Handling Country Iron.


A Typical Grab of Bushelings.


Non-Magnetic Speigel Iron.

INCREASE • DECREASE

★ Weight Per Lift up to 683%
Hourly Tonnage up to 540%

★ Operating Costs..Handling Time..Demurrage Charges

with

Owen Grapples

DAILY—increasing numbers of Scrap Handlers everywhere are profitably utilizing the new Owen Method of Handling Scrap Iron.

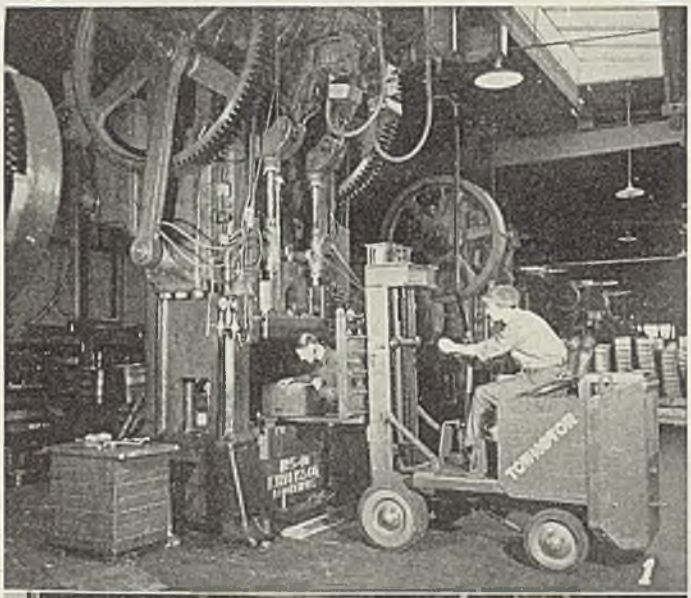
Revolutionary, independent tine action of these remarkable grapples speeds handling and lowers operating costs amazingly. They are available in sizes from the small crane unit to the large size with a 9 foot 4 inch spread.

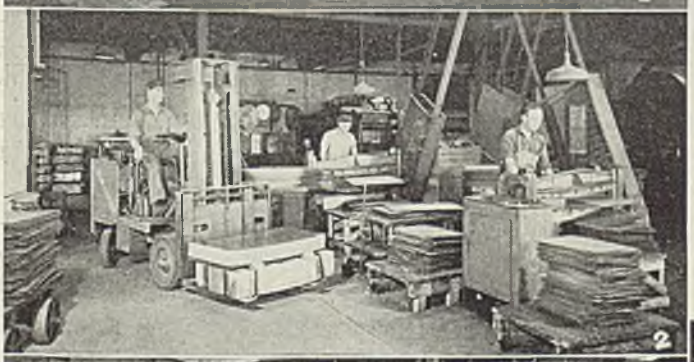
Whether you are a large or small operator, now is the time to write for details on this profit earning Scrap Handling System.

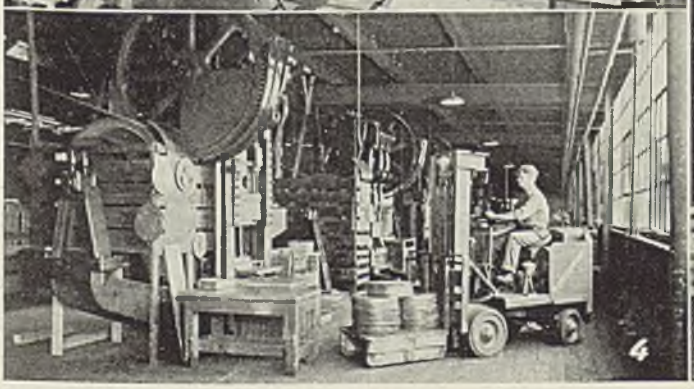
★ *Figures based on actual comparative tests.*

THE OWEN BUCKET CO.
7762 BREAKWATER AVE. • CLEVELAND, O.
BRANCHES: New York, Philadelphia, Chicago, Berkeley, Cal.

TOWMOTOR CLEVELAND MOVES IT THROUGH 6 FACTORY Operations







CUTS HANDLING COSTS IN A TYPICAL STAMPING AND ENAMELING PLANT

1 — Moving dies in and out of presses.

2 — Handling sheet steel from storage to shearing.

3 — From shearing machines to notching presses on skids.

4 — From notching presses to draw presses on skids.

5 — From storage to pickling room in crates designed for the job.

6 — Stacking to ceiling to conserve space in storage rooms.

All photos showing these six Lift Truck operations taken in the plant of the Strong Manufacturing Company, Sebring, Ohio. These are all performed with the same TOWMOTOR, showing the versatility and maneuverability of the lift truck with a reputation for greater economy. Let us show you how TOWMOTOR economies can be applied to your own plant.

TOWMOTOR CO.

1247 East 152nd St. Cleveland, Ohio

SALES OFFICES IN PRINCIPAL CITIES

■ For moving heavy loads, an overhead crane gives access to every spot on the shop floor. With suitable slings, loads of about any type or shape can be handled. Photo courtesy Westinghouse Electric & Mfg. Co.

West Orange, N. J., who adds that this has been made possible largely by development of the center-control truck. Other developments include a midget center-control fork truck in capacities down to 1000 pounds, an exceptionally compact unit. Its small size and weight permit use on elevators and floors not suitable for conventional trucks. Looking into 1940, Mr. Stringfellow says the question of whether or not ram trucks will grow larger depends on the steel industry itself. Larger trucks will be produced as soon as there is need for them.

Along this line, K. D. Tracy, Baker Industrial Truck division, Baker-Raulang Co., Cleveland, says some mills are talking about rolling coils weighing up to 50,000 pounds. He points out a truck of sufficient capacity to handle such coils would be entirely too large to maneuver in the space provided in many cases. A trend noted by Mr. Tracy is that architects and designers of industrial plants are placing more emphasis on sufficient space for proper material handling and flow of material.

A paradox in the metalworking industries is that with the exception of tin plate, carloading is still done largely by hand. Ezra W. Clark, Clark Tructractor division, Clark Equipment Co., Battle Creek, Mich., emphasizes that correcting poor packaging, poor routing, unnecessary rehandling and inadequate mechanical aids in loading cars offers a great field for improvement and profit for everybody concerned, including shippers, carriers and consignees. Adoption at plant of origin of a standard size, weight and shape of package to be picked up by power lift trucks and placed in storage or taken directly to freight car, ship or motor truck, offers many advantages. Upon arrival at delivery point, load is removed from car by a power truck of same type. In any case, package remains intact throughout the complete series of handlings and shipping.

Typical example, says Mr. Clark, is a Michigan manufacturer of automotive axle housings who assembles his product at the conveyor on wood skids, transports the unit packages to freight car with a Clark carloader and gets 60 per cent more housings into a car. Cost of handling has been reduced from $0.1345 to $0.082 per housing. A similar installation has already shown a 45 per cent return on the investment in containers and trucks at an automobile body plant.

Handling By Pallet Increasing

Increased use of pallets and pallet trucks is becoming more popular due to the extreme flexibility of this method of packaging and shipping, points out E. J. Heimer, vice president, Barrett-Cravens Co., Chicago. In the portable elevator field, he adds, there seems to be a rather remarkable trend toward units capable of picking up a drum or round container and raising it to the desired height to empty the contents into a hopper or mixer.

Packaging methods and unit handling have seen increased use of steel strapping not only in forming the various packages of units, but also in loading and bracing the material in the cars during shipment. In this connection, V. C. Hogren, Acme Steel Co., Chicago, states that a comparatively new development in the steel industry is handling of heavy timbers steel-strapped into large units. Large numbers of such timbers are used for skids in shipping sheet. Strapping them into bundles at the saw mill greatly facilitates loading and unloading as well as provides a safer handling method.

Hand trucks are finding increased application due to the many refinements. Some of these include greater truck capacity without increased truck weight, better wheel equipment, easy-rolling rubber tires, antifriction bearings and modern lubricating systems, states G. C. Munoz, vice president, American Pulley Co., Philadelphia.

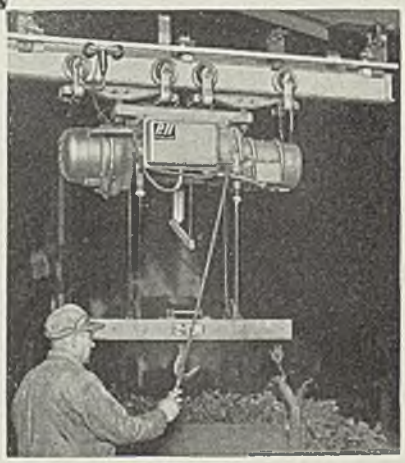
Handling equipment which is sufficiently flexible to permit use even in event of a radical product change and which fits equally well into production lines, storing, shifting and shipping routine is most essential today, according to J. C. Struthers, vice president, Colson Corp., Elyria, O. One such system, he adds, is the lift jack system where two separate units are employed, one a 2-wheel live skid platform and the other a 2-

HANDLE IT "THRU THE AIR"

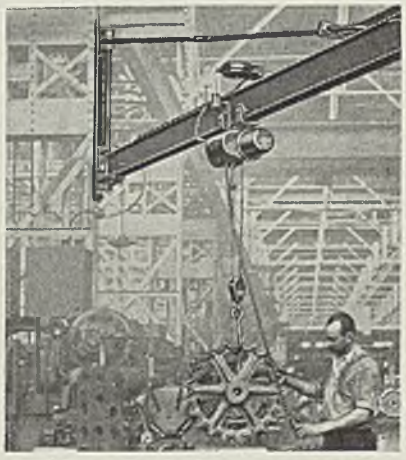
FASTER . . . AT LOWER COST

with P&H EQUIPMENT

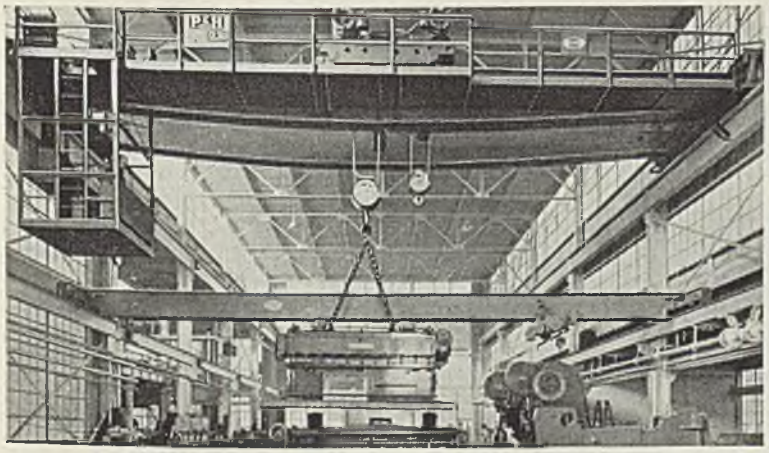
● Whatever product you make, the materials that go into it . . . the movement from one stage to another . . . the assembly of parts . . . even the product in its final form — all require handling. Many of these moves can best be done "thru the air" — the only method by which loads can be lifted, transported and lowered exactly where you want them without re-handling. P&H Engineers have cut costs in hundreds of plants with faster, simpler handling methods. They can help you. Write for full details.



P&H HEVI-LIFT HOISTS — all sizes and types up to 15 tons capacity; with all types of controls, including variable speed push-button. Their many uses are described in Bulletin H-5.



P&H ZIP-LIFT HOISTS — so low in price as to make hand-operated hoists obsolete. For loads up to 1000 lbs., easily installed on hook, jib or trolley. Ask for Bulletin H-1 and H-2.



P&H ELECTRIC CRANES — offered in all capacities up to 350 tons. P&H is America's oldest and only crane builder producing complete electrical crane equipment. Described in Bulletin C-3.

P&H TRAV-LIFT CRANES — for lower cost and simpler operation in intermittent crane service, handling loads up to 15 tons. With all types of controls including variable speed push-button. Ask for Bulletin H-13.

4411 W. National Avenue, Milwaukee, Wis.

HARNISCHFEGER

CORPORATION

ELECTRIC CRANES • EXCAVATORS • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

wheel lift jack. Platform is standard for storing, yet is readily moved about by use of the jack when necessary. Empty skids can be wheeled about like ordinary wheelbarrows.

A trend noted by F. J. Shepard Jr., Lewis-Shepard Sales Corp., Watertown, Mass., is the increasing use of roller-bearing floor-protective wheels due to their easy movement and saving in floor wear. In some instances, soft rubber treads appear best, while in others a canvas bakelite type of wheel having the same load-carrying capacity as semisteel wheels works better.

G. S. Allen, Nutting Truck Co., Faribault, Minn., notes increased variety of fork truck equipment now available. Not so far back a buyer selected from standard stock equipment the truck he felt would best serve his purpose. Now he can easily obtain custom-built equipment exactly suited to his particular needs.

W. B. Lackey Jr., secretary, Service Caster & Truck Co., Albion, Mich., also notes increased trend toward wider use of specials or custom-built fork trucks. Operating conditions differ widely in any plant, so this is a natural trend. Increased use of truck and industrial casters also is evident even in highly conveyorized factories where such equipment is being employed to make production and handling units, formerly stationary, readily portable.

The same shift toward use of tailor-made equipment is commented upon by H. S. Germond III, Revolvator Co., North Bergen, N. J. Portable elevators made by this company are practically all designed exactly for the application. Use of standardized parts and the welding of actual frameworks on variable jigs helps keep costs down.

An unusual new conveyor installation is mentioned by N. W. Elmer, Stephens-Adamson Mfg. Co., Aurora, Ill. He says that in Minnesota conveyors have rehabilitated a worked-out iron mine which had reached its economic limit as an open pit. A tunnel was sloped in from the lake front following the parting line of rock and ore down under and beyond the center of the pit. Three vertical shafts were brought up through the ore body to the surface. Shovels, scrapers and trucks feed ore to these open shafts from bottom of which it is delivered to ships at the lake side on nearly a mile of conveyor belt at rate of 700 tons per hour.

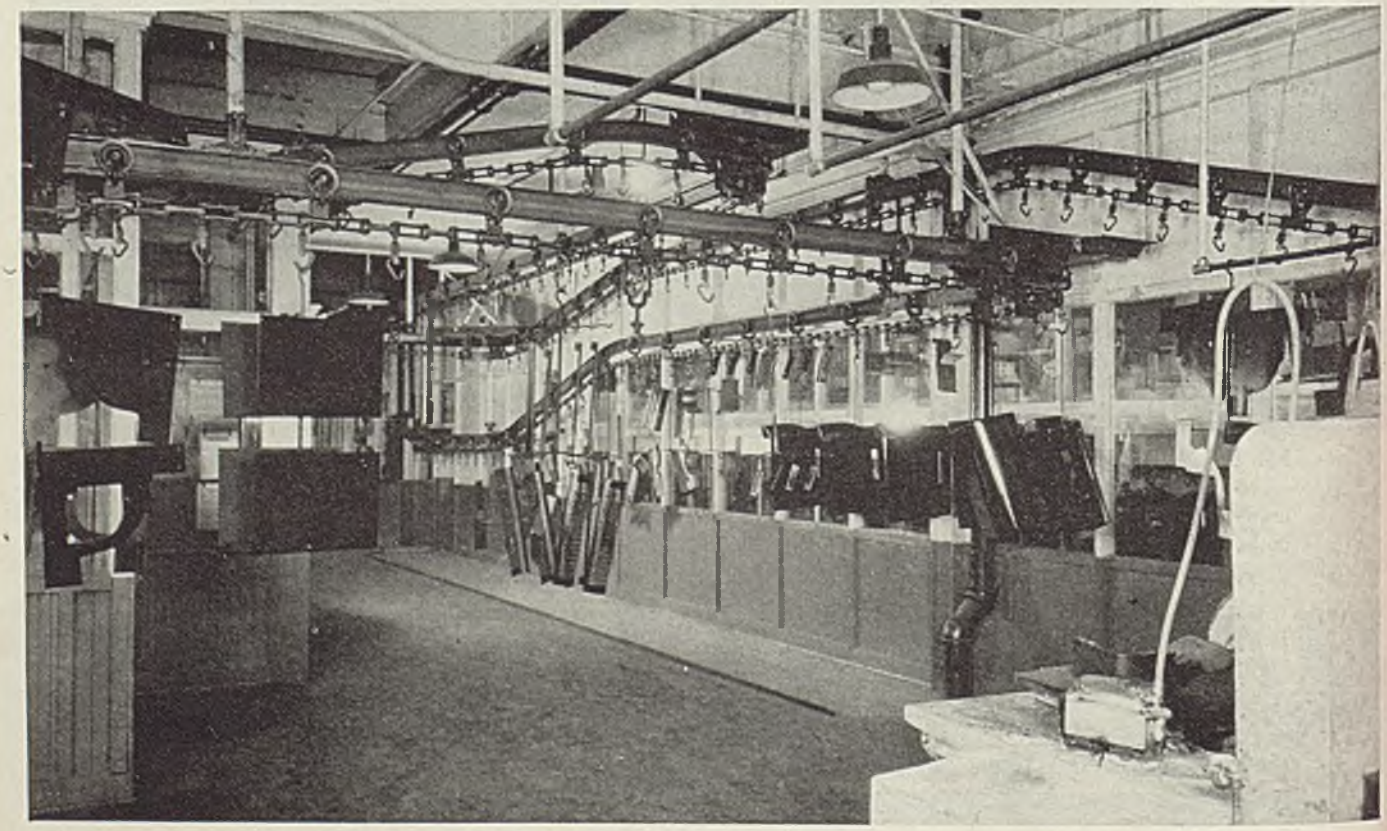
An ore supply for 15 more years is thus available, and cost per ton is lower than ever.

C. W. Staacke, B. F. Goodrich Co., Akron, O., also notes the shift to conveyors in mining and states a conveyor belt system will be installed at the Canisteo mine of Cleveland Cliffs Iron Co., Colerain, Minn.

Heavier conveyor equipment has been introduced to handle the larger diameter coils now being processed in many mills, points out H. R. Gotthardt, Logan Co., Louisville, Ky. Means for upending and downtilting coils and also for sidetilting delivery have been worked out satisfactorily in the past year. Handling narrow coils of large diameter on their sides on conveyors is

(*Please turn to Page* 336)

■ **Where processing and handling are combined in such operations as spraying and electroplating, the chain conveyor holds an important position. Here three lines of conveyor are serving the finishing department of National Cash Register Co., Dayton, O.**



"Seeing is Believing"

SEE THE FLEXOMOTIVE* IN ACTION —TAKE A LOOK AT THE RECORD!

There is a FLEXOMOTIVE Working Near You Ask us about it!

● Get an entirely new conception of the SERVICE you can expect from your locomotive. See the FLEXOMOTIVE in action. Notice its perfect visibility, its flexibility, its operating and maintenance economy. Take a look at the record—a background of 15,000 hours on the toughest jobs that could be found, out-pulling and out-performing a much larger steamer. Write for the FLEXOMOTIVE bulletin.

PLYMOUTH LOCOMOTIVE WORKS
Division, The Fate-Root-Heath Company
PLYMOUTH, Ohio

DE MARK REG.

PLYMOUTH FLEXOMOTIVE

DOLLAR FOR DOLLAR—THE GREATEST DIESEL LOCOMOTIVE EVER BUILT

JOINING AND WELDING

Better understanding of design factors, refinements in mode of application, new and improved equipment—all help broaden range of application of joining methods

ADVANCES in joining during the past year include effective cost reductions resulting from improved welding machines, new welding electrodes and better understanding of design factors entering into welding for minimum finished cost. Better metallurgical and manufacturing control has improved a wide variety of fastening devices. Considerable progress also was made in codes and specifications, notably in resistance welding field where the Resistance Welder Manufacturers association has done much standardization.

Of outstanding significance is work accomplished by fundamental research committees of American Welding society and Engineering Foundation, says Gilbert E. Doan, head of metallurgical department, Lehigh university, Bethlehem, Pa. These committees, by stimulating fundamental research and encouraging investigation of basic welding problems, are doing much to expand the industry.

A. F. Davis, vice president, Lincoln Electric Co., Cleveland, calls attention to the manner in which welding has permitted speedy production of a wide variety of equipment to meet emergency needs in the last few months. The urgent use of welding in many fields, including many types of military and naval equipment, indicates vital importance of this process in industry today. Advances outlined by Mr. Davis include reduction in grinding and finishing costs of welded products by use of a new electrode specially developed for finish welding of flat surfaces; development of other special electrodes such as a new type having better arc characteristics and specially made for small alternating-current transformer-type welders; new welding machines include an engine-driven welder of 200-ampere capacity which weighs only 900 pounds and costs only $450.

A most important development in welding during the past year has been in the phase of cost reduction, points out A. E. Gibson, president, Wellman Engineering Co., Cleveland. Chief problem today has crystallized into how to produce better equipment at lower cost. Outstanding progress has resulted from bending steel to eliminate excessive number of welded joints, and from premachining parts of an assembly before welding. Where production permits, these two procedures offer great possibilities in cost reduction. With suitable welding fixtures, alignment of the premachined part may be held to satisfactory working tolerances.

The trend in new arc-welding machines seems to be in the direction of small, direct-current motor-generator sets to compete with the transformer type, notes Robert E. Kinkead, consulting engineer, Cleveland. A new rectifier-type welder was well received. Built-up cabinet-type arc-welding equipment seems to have filled a need. A new development is flash welding of brass on a commercially successful basis.

J. W. Meadowcroft, assistant works manager, Edward G. Budd Mfg. Co., Philadelphia, believes application of welding in manufacture of automobiles, buses, trucks, trailers, trains, airplane, marine and bridge structures, etc., will increase in greater proportion during the next few years than during any comparative period in the past. Comfort A. Adams, consulting engineer of the same company, points to need of co-operative attack on problem of weldability, the ability of steel to experience the heat cycle of the conventional welding process without cracking either during or after cooling. He points out that much additional know-

Why it Pays

TO STANDARDIZE ON

Linde Products

THE Linde organization can supply *all* your oxy-acetylene needs. For this reason, it usually pays dollars-and-cents returns to standardize on Linde products.

By buying from Linde, you can centralize your source of supply — can look to just one responsible organization to fill your requirements. Your bookkeeping and ordering often can be simplified, your cylinder and materials handling made easier, your investment in parts and equipment reduced.

Even more important, Linde can furnish process help which will contribute to the technical skill and knowledge of your operators — can show you how and where to apply new Linde processes — and can help you control your process costs.

The Linde man who calls on you will gladly explain in detail exactly how and why Linde customers are getting the most for their money. The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, New York and Principal Cities.

PLUS VALUES

IN SERVICE—Linde makes available to its customers real, tangible, process service that helps bring highest returns from Linde products.

IN MEN—The Linde men who call on you are highly trained. They are coordinating factors between you and Linde's extensive engineering facilities.

IN PROCESSES—Linde laboratory men are continually developing new ways to help customers do a better job—in less time—at lower cost.

LINDE OXYGEN · NITROGEN · HYDROGEN · RARE GASES · PREST-O-LITE ACETYLENE
UNION CARBIDE · OXWELD APPARATUS AND SUPPLIES · UNIONMELT WELDING

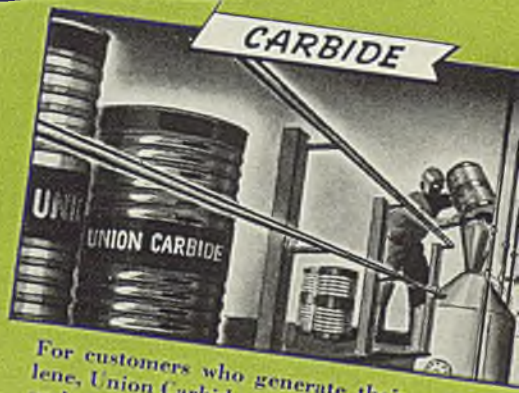
IT PAYS ON OXYGEN

Linde oxygen is of uniform high purity. It available in any quantity when and where yo want it—at a price that is always fair.

IT PAYS ON ACETYLENE

Prest-O-Lite dissolved acetylene is the conv nient, all-purpose, fuel gas for welding, cutting or any related process. It can be delivered b the same truck that brings your Linde oxygen

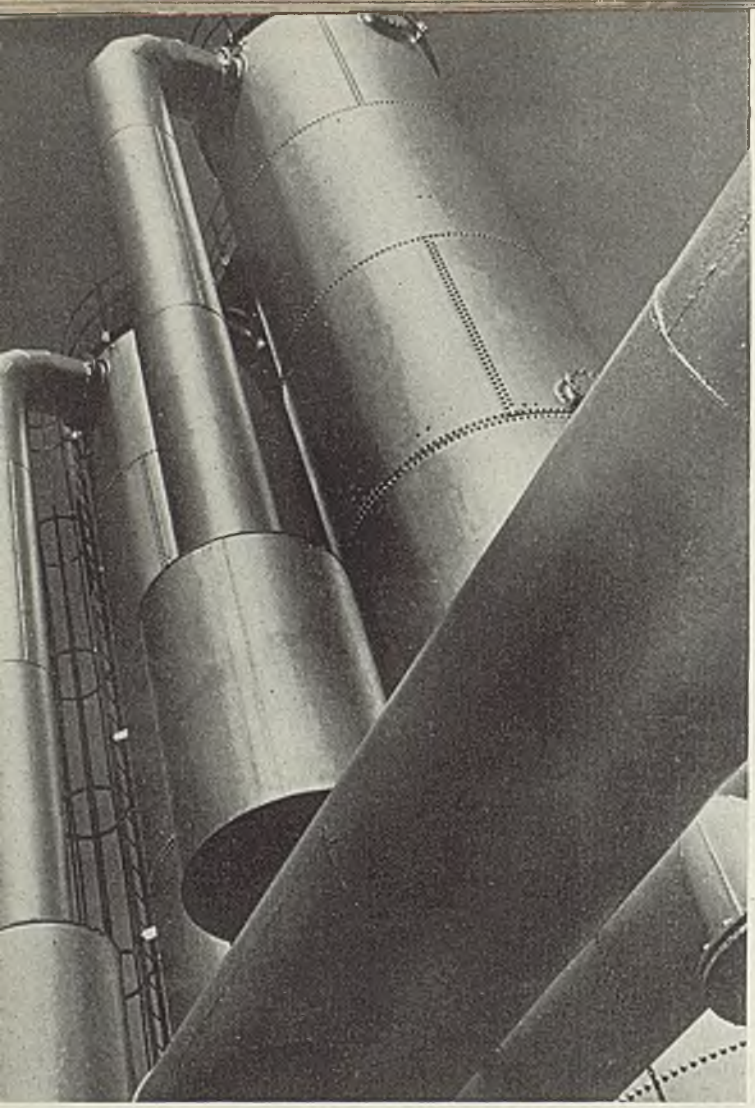
IT PAYS ON CARBIDE



For customers who generate their own acety lene, Union Carbide—sold in the familiar blue and-gray drums—assures uniformity, accurate sizing, purity, highest gas yield.

IT PAYS ON APPARATUS

Linde has a complete line of precision-bui apparatus and supplies for every oxy-acetylen application. Blowpipes — regulators — mani folds — generators — cutting machines.



■ Judicious combination of joining methods produces lowest total cost. Refining equipment here, for instance, employs fusion-welded pipes with riveted towers; bolted connections for manholes and pipes at top. NEA photo

ledge is needed as to relationship of residual stresses and ductility of the material, both being affected by rate of cooling.

American Welding society and American Society of Mechanical Engineers boiler code committees have worked during the past year to standardize and simplify the rules, including qualification tests of welding operators, reports D. S. Jacobus, advisory engineer, Babcock & Wilcox Co., New York. Revision of the ASME unfired pressure vessel code to embody provisions in the API-ASME code is under way and shortly will be published in tentative form.

Application of arc welding to manufacturing of machinery is passing into a new phase, according to H. C. Hettelsater, chief engineer, small excavator division, Harnischfeger Corp., Milwaukee. It has become apparent, he says, that important advantages can be obtained by making radical changes in the manner in which parts are designed for welded structures and also in designing so one part can take the place of several formerly separate parts.

Progress in arc welding, notably in the carbuilding, shipbuilding and heavy machinery construction fields, has been outstanding, asserts W. W. Reddie, welding division, Westinghouse Electric & Mfg Co., East Pittsburgh, Pa. This is due not so much to new development in welding machinery, electrodes and techniques, as to expansion in this industry. Increase in use of alternating current as a source of welding power, using transformer-type welders, has been striking. This has taken two directions—first, use of unusually large amounts of power for automatic systems of welding; and second, use of unusually low welding currents.

A. P. Young, associate professor, mechanical engineering, Michigan College of Mining and Technology, Houghton, Mich., believes that perhaps the most impetus has been given to welding during the past year by publication of the "Welding Handbook" by the American Welding society. The wealth of information assembled there on how to weld all kinds of metals and alloys places at the disposal of managers and designers a most convenient tool. Mr. Young adds that welding in combination with casting, forging and use of nonmetallic materials with proper design and fabricating methods will place on the market many new products that manufacturers previously had hesitated to produce.

More Ships Are Welded

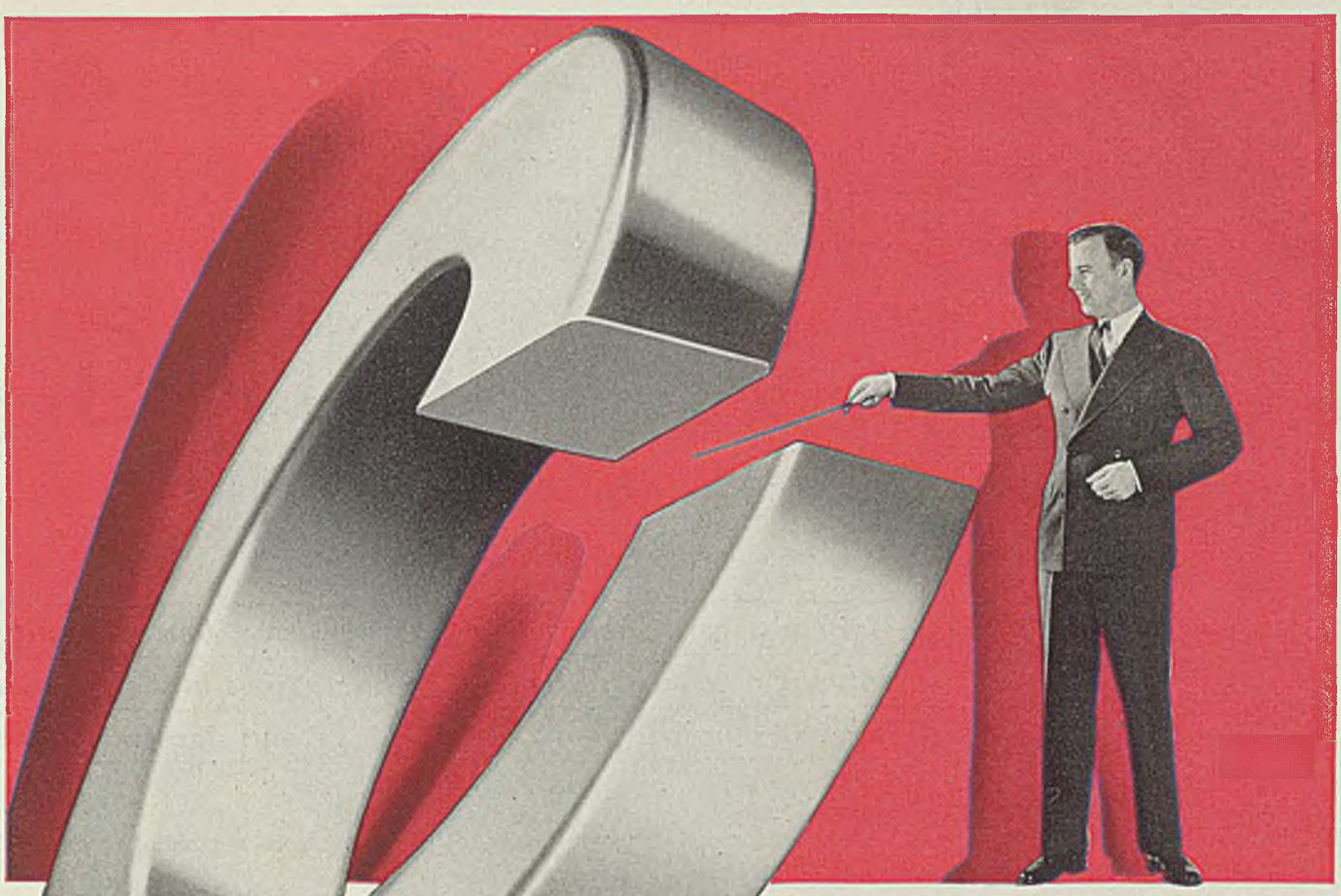
Extended use of welding in the shipbuilding industry is a notable development of the past year, writes F. Eder, Robert W. Hunt Co., New York. Ingalls Shipbuilding Corp. is building four all-welded steel freighters and four cargo vessels at Pascagoula, Miss., using a novel subassembly method.

J. A. Weiger, vice president, P. R. Mallory & Co. Inc., Indianapolis, Ind., reports electrode standardization by the Resistance Welder Manufacturers' association has made much progress recently and that plans already formulated should complete this program during 1940. A number of alloys were developed during the past year for use as resistance welding electrodes, and they now make available a complete series with hardness and conductivity characteristics suitable for all classes of metals and types of resistance welding.

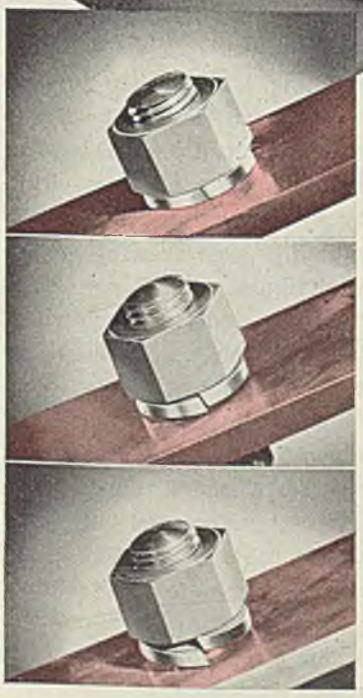
Structural welding has made great strides, points out W. G. Paton, assistant to general manager, Austin Co., Cleveland. He says there is yet a tremendous need for steel sections better adapted to welded structures. Elimination of tapered flanges would permit easier connections. Tees of uniform thickness and stiffness in both directions are needed badly. Heavier sections also should be made available.

An outstanding contribution to expansion of both arc and resistance welding has been the recognition in the past year of the necessity of fundamental research in both these fields, according to J. D. Gordon, general manager, Taylor-Winfield Corp., Warren, O. J. H. Cooper, of this same company, notes methods of fabri-

(*Please turn to Page* 348)



A Mere Temporary "Biting" Hold Is No Substitute for Bolt Tension Maintained by Long Range Live Action . . .



Initial looseness is never caused by backward turning of the nut. It is caused by bolt stretch, wear of contacting surfaces, breakdown of rust, scale or paint. Unless the device has long range of action to maintain adequate pressure on the threads, *it cannot compensate for these causes of initial looseness.*

Any device depending upon teeth biting into the bearing surfaces reduces pressure on the threads—the only means of keeping bolted parts tight. The *more* "bite" *due to vibration*—the *less* pressure on the threads.

Thread pressures can be maintained only by the long range live action of helical spring washers.

SPRING WASHER INDUSTRY
Wrigley Building • Chicago, Ill.

Only a Helical Spring Washer has this Long Range Live Action!

STAMPING

More intricate shapes, deeper draws and better quality drawing steel are in demand. Presses have higher speeds. Dies accomplish more. Stampings run larger in size

INCREASING usefulness of stamping and forming was reflected in 1939 by the more intricate shapes and deeper draws in demand. Higher quality drawing steels were developed and dies were elaborated for progessive and multiple operations. Streamlined for action as well as appearance, presses now are compact, more efficient and faster—one particular press averaging 1000 blanks an hour using oscillating dies. Progress also has been reported in the stamping and forming of alloys such as those of magnesium.

A forward-looking plant is providing certain of its hydraulic presses with more positive control of speed and working pressures, having in mind possibility of a changeover to plastics should future economics make this possible; conveyor speeds influence press design in one shop; use of tapped extruded holes replacing nuts tack-welded to stamping is finding increased application; unit punch setups have been developed for automotive work which punch up to 52 holes at once from various angles and which have practically 100 per cent salvage value in model changes; overload control has been perfected to the point where a press turning out 100 pieces per minute can be stopped before the third piece can pile on the second.

An idea of the depths of draws now attempted is given by a streamlined auto headlamp made from a steel blank 17⅝ inches square in seven stepped cylindrical drawings to a torpedo shape 12⅝ inches deep with an 8-inch opening.

Widening manufacturing possibilities in stamping and forming are indicated by hardware specialties made with multiple dies which progressively blank, punch, draw and form and which turn out three pieces at one time. Product is nested on stock to reduce waste and all operations from beginning to end are handled by the presses.

Heavy steel culvert sections have been corrugated and punched on one machine utilizing an automatic feed, with curvature formed on a second machine.

Importance of in-line setup of presses was stressed in shops built during the year to allow logical progressive flow of work through plant with no back-tracking. Special die-handling trucks have in some instances taken over all transportation of dies from store room to position in press.

A three-in-one automotive stamping incorporating fender, headlamp shell and portion of hood in one integral unit is being made for a 1940 automobile. The steel sheet blank weighing 75 pounds is given the first draw by dies weighing 44 tons. Most severe working of steel in this piece is at nose of headlamp shell where elongation reaches 50 per cent. This gives an indication of the severe demands made on drawing quality of the steel by automotive requirements.

It is obvious that without improved drawing quality of steel, such deep draw stampings could not be attained. In commenting on the general development in 1939 of a superior drawing steel in the nonaging grade, F. B. Poto, mill representative, Inland Steel Co., Chicago, states that other factors besides drawing ability also have been responsible for the development—demands of fabricators for a sheet requiring no roller leveling preliminary to stamping and one which would "stay put" for a considerable time in the user's stockroom; and the desire to eliminate the "season" or spontaneous cracking of deeply drawing stampings made from rimmed steel, due to age hardening of the

(*Please turn to Page* 337)

PALM AND LEE SPRINGS ...PURVEYORS OF PEP

Palm Springs, California—where society and tired executives relax in the desert sun; where outdoor sports, the year round, revitalizes frayed nerves and puts the "springs" into winters.

Just as famed El Mirador turns an arid waste into a stimulating oasis—so do Lee-Built Springs convert many a run down mechanization into a responsive and salable unit . . . for Lee-Built Springs are fashioned into countless designs and from innumerable metals and their alloy combinations.

Solving your spring problems is our established profession and a modern series of bulletins our printed proof. We'll either tackle your individual problem or mail you the literature—both without obligation.

LEE SPRING COMPANY, INC.
30 MAIN STREET BROOKLYN, N. Y.

FORGING

Emphasis is on larger machinery and closer tolerances. Difficult shapes are on production basis. Heating phase, heat treatment and selection of steel get more attention

A GREATLY stimulated forging industry now is enjoying all the prospects of a good year in 1940. Old equipment that served peak requirements of World War I is wearing out under demands of the second production peak since the war and is creating inquiries for new equipment. Trend is clearly toward heavier presses, with larger and larger machines being built for special work and closer tolerances. To satisfy demands for greater overload capacities on forging presses there has been an augmented use of alloy, structural and engineering steels in construction of high-production equipment.

More care is being exercised in selection of steel and in heat treatment of forgings. Corrosion-resisting metals, both ferrous and nonferrous, have been specified for an increasing variety of applications, and metals such as stainless steel are passing out of the experimental stage. Forging plants also are recognizing the need for standards and the necessity for greater use of metallurgical and engineering facilities in the industry.

One of the most significant 1939 developments in the drop forging industry was organization of a technical committee by the Drop Forging association, Cleveland. This committee now is conducting metallurgical research to establish comparative physical properties and merits of forgings and competitive products.

Values to be secured are: Tensile strength; yield point or elastic limit; reduction of area; elongation; hardness; charpy and impact tests; Izod; relative soundness and homogeneity of material; percentages and costs of rejects; and also relative tool machining costs.

Eventually the committee will broaden its activity to include collecting scientific data already existing pertaining to forgings, originating and conduction research for bettering forging processes and providing means for working on a strictly technical basis with other scientific groups. The committee also will help formulate standards pertaining to production, heat treatment, chemical analysis and mechanical testing of forgings and will issue technical material for use of engineers and metallurgists.

According to Waldemar Naujoks, chief engineer, Steel Improvement & Forge Co., Cleveland, importance of the heating phase in forging practice is receiving greater recognition, and many of the difficulties that occurred in various processing operations are being reduced since the effect of proper heating for various alloys has become better understood. Use of forging equipment and other processing machinery continues steadily over a greater diversity of shapes and designs and for the many newer alloys. Narrow tolerances, specification of materials to close metallurgical standards and production of shapes considered difficult a short time ago now are accepted as normal practice.

Mr. Naujoks further states that use of arc and flash welding in producing parts from two or more forgings has been given considerable thought. While use of such parts has a limited field at the present time, the practice of welding two or more forgings together for designs that cannot be fabricated economically as a solid forging appears to be a certainty.

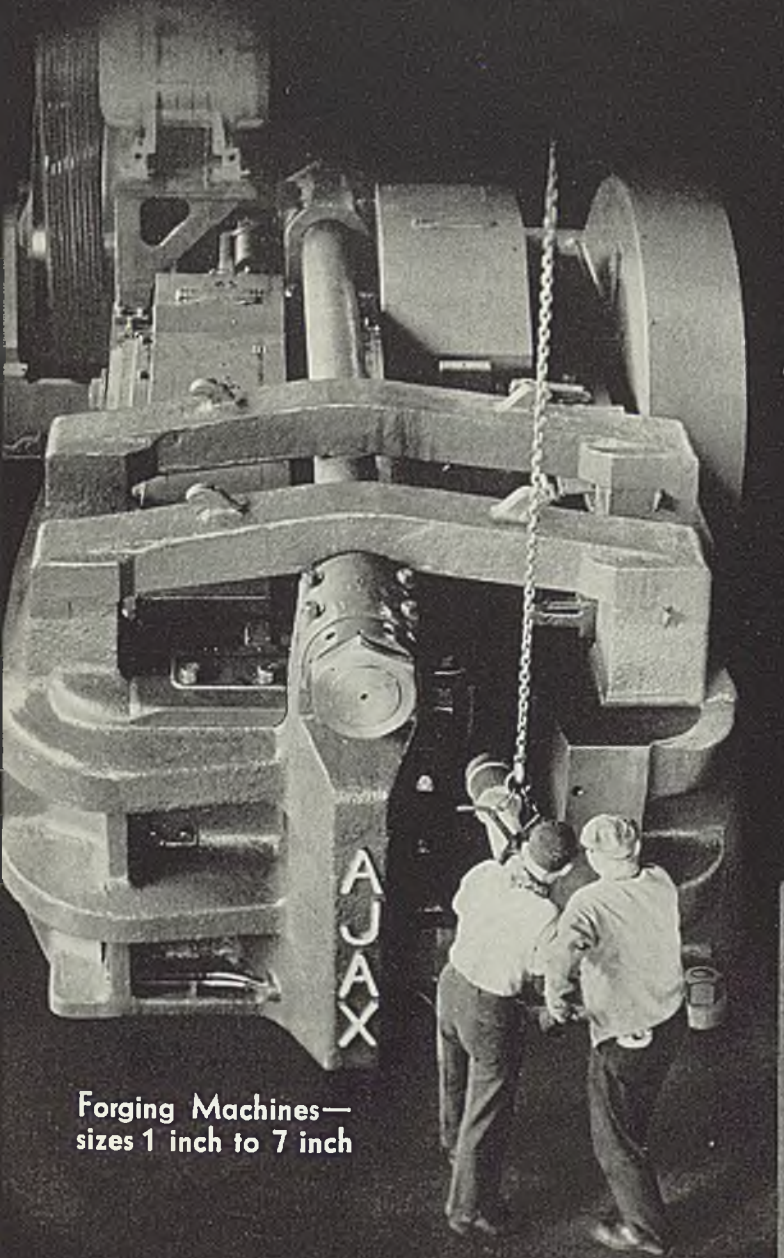
The opinion that parts heretofore considered as specialty jobs now are handled in a routine production manner also is voiced by R. W. Thompson, sales

(*Please turn to Page* 339)

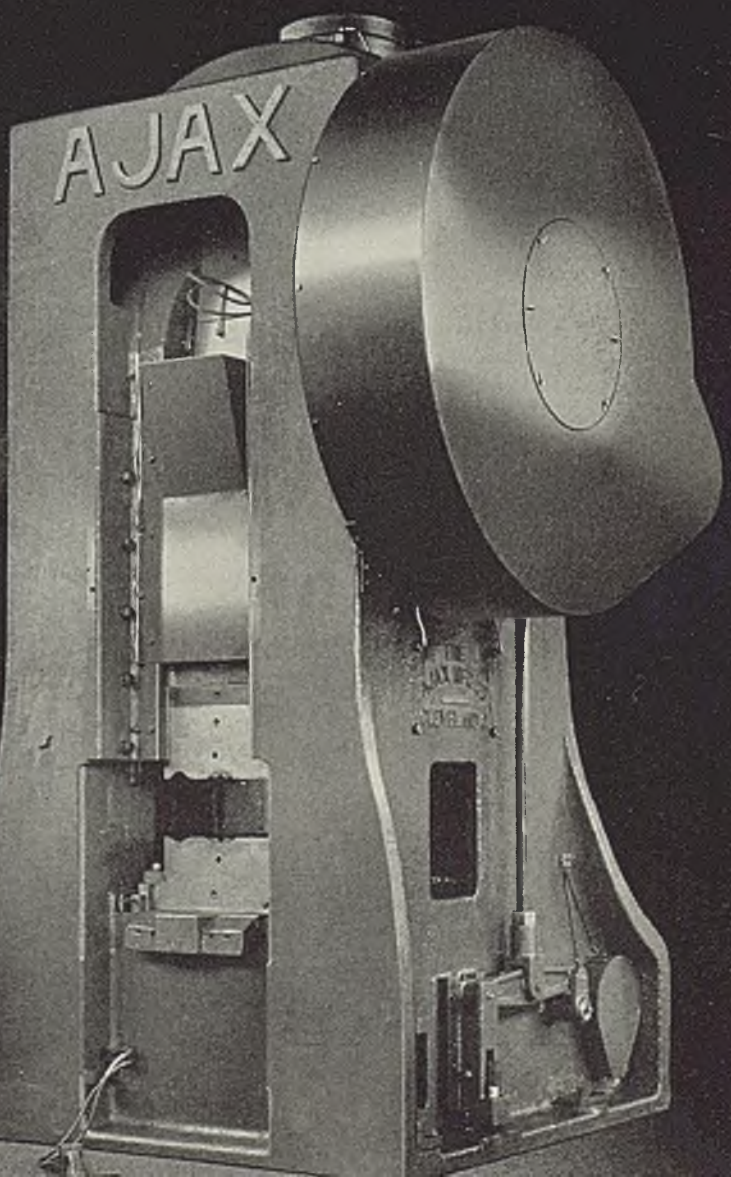
AJAX

FORGING MACHINERY

Built on advanced engineering principles, with simple and thoroughly sound design and the liberal use of highest quality materials—all of which result in high production, accurate product and long, dependable machine service for the user.



Forging Machines—
sizes 1 inch to 7 inch



Forging Presses—
sizes
500 to 2000 ton

Forging Rolls
and other forging
equipment

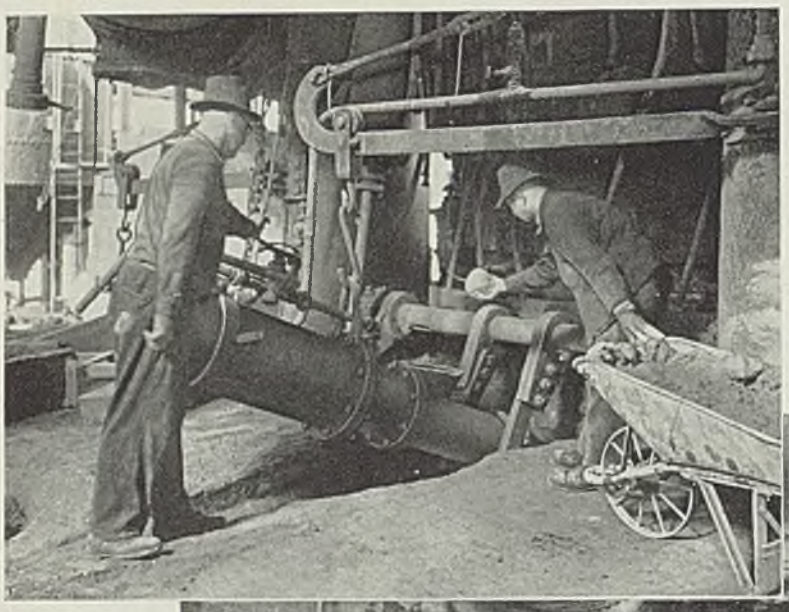
THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O.
CLEVELAND, OHIO

21 Marquette Bldg.
Chicago, Ill.

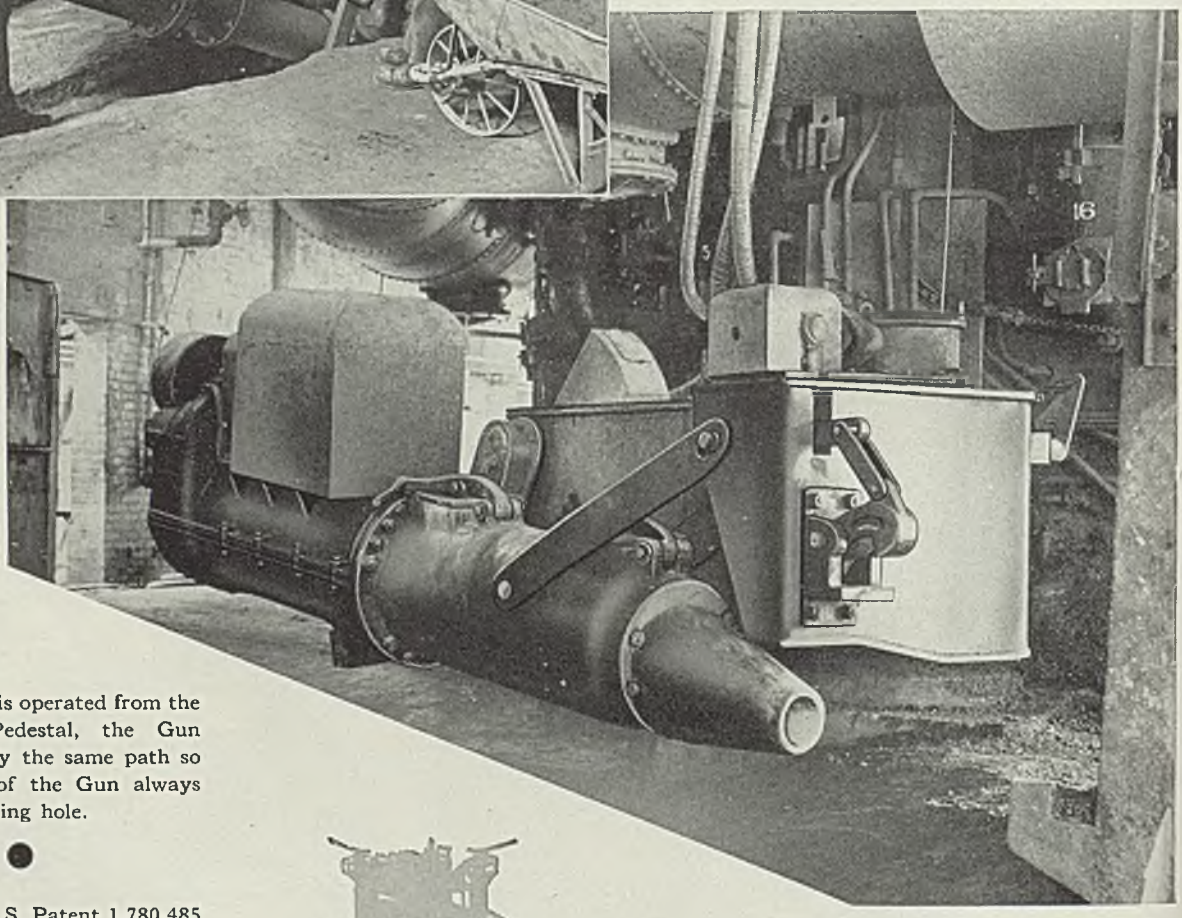
201 Dewart Bldg.
New London, Conn.

PROGRESS *in Clay Gun Design*



The upper picture shows a twenty year old Mud Gun. Two men operate the Gun. One man drops a single ball of clay into the cylinder; the other man operates the steam cylinder piston which, by reciprocating action, forces each clay ball into the tapping hole.

Compare this obsolete Gun with our Automatic Electric Plunger Gun—with its remote push button control and 9½ cu. ft. clay capacity. This clay capacity—together with its 600 lb. pressure per square inch available—assures a long plug of denser clay which guarantees sureness and safety in completely plugging the hole continuously without reducing the wind pressure on the furnace.



When the Gun is operated from the Independent Pedestal, the Gun moves in exactly the same path so that the nose of the Gun always enters the tapping hole.

Built Under U. S. Patent 1,780,485 and Mechanical Patents Granted and Pending

WEIGHT:
24,000 lbs.
CLAY CAPACITY:
9.6 cu. ft.

WILLIAM M. BAILEY COMPANY

PITTSBURGH · *ENGINEERS* · PENNA., U. S. A.

European Representative: Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees, England

PROGRESS IN STEELMAKING

Near-capacity operations transfer emphasis from cost reductions to tonnage. Facilities long idle are modernized and placed in service. More interest in bessemer process

STEELMAKERS are well prepared to meet whatever production demands may be made of them in 1940. Technical developments of the past year have improved the art of steelmaking through the full sweep of operations. Highlights of 1939 include further beneficiation of raw materials; better control of blast furnaces and steelmaking units through metallurgical advances and instrumentation; more extensive use of insulation and controlled atmospheres; modernization of furnace equipment; and rounding out of finishing facilities.

Pressure of production, balancing up operations to use maximum tonnage of ingots, departmental cost reductions, and changes in routings to increase the narrow margin between low selling prices, and rapidly mounting raw material prices have been the chief concern of steel managers in recent months, asserts L. F. Reinartz, manager, Middletown division, American Rolling Mill Co., Middletown, O. Open hearth, annealing, normalizing and other furnaces—dormant for years—have been rebuilt and put into service.

Where six months ago stress was on cost reduction, the cry now is for more tonnage, he states. Blast furnace superintendents are watching with interest the experiment in the South to reduce moisture in the furnace blast. Many operators believe, if cost is not excessive, more uniform analyses and greater regularity of iron production will result. Large quantities of cast scrap are being used in blast furnaces to meet increasing needs of open hearths.

Recently, a top-fired 100-ton open hearth has been put into operation, Mr. Reinartz continues. Claim is made that tonnages will be increased, repair and fuel costs decreased, and slag in slag pockets almost eliminated. Many plants are trying out basic brick patches in roofs, particularly above the tap holes and some outstanding results are reported. Synthetic, rammed bottoms continue a subject of discussion. Insulation of furnaces below floor level is almost universal practice. Attempts are being made to tap slag from slag pockets.

Soaking pits, due to peak production, are receiving much consideration. New recuperative pits have been installed in many plants, and attempts are being made to modernize older pits, at times by changes in fuel and adoption of some form of control for air and gas.

A new 120-inch slabbing mill, powered by two 5000-horsepower motors, and having a large vertical edging mill 35-feet away from the mill proper, has recently been completed in a midwestern strip plant. The mill to date, Mr. Reinartz points out, has shown great flexibility as well as tonnage possibilities. All over the country hot and cold strip mills are breaking all-time records. Plans are being perfected to round out finishing capacity beyond the cold strip mills to take care of increasing production from these mills. Stainless steel tonnages, particularly in sheets, is increasing at a more rapid rate than ordinary sheet steel production.

Regarding pig iron manufacture, C. D. King, United States Steel Corp., Pittsburgh, notes continued installations of larger furnaces—1000 tons and over; continued emphasis on beneficiation of raw materials as characterized by crushing, sizing and blending facilities for ore now being installed at a Southern unit; continued studies of beneficiation of air blast and actual installation of equipment for moisture removal from air at a Southern furnace plant; and develop-

■ As steel is poured into ingot molds, a workman takes a laboratory sample to be used in checking the correctness of analysis. Photo courtesy Carnegie-Illinois Steel Corp.

ment of improved-type primary gas washing facilities.

Continued study of metallurgical process control by controlled oxidation, and including control of bath, tapping and pouring temperatures; continued increased use of liquid blown metal charges in steel production, including use of tilting and stationary open hearths; improved control of bessemer steel ingot manufacture, resulting in improved quality, and continued research of the bessemer process; and continued trend of open-hearth rehabilitation to provide larger heats and continued installation of additional large-sized units, are among outstanding steelmaking developments as Mr. King sees them.

Others cover intensive research programs covering use of refractories for open-hearth furnaces, including bottom-making materials as well as refractory brick; intensive study of mold design, preparation and steel pouring practices; and continued application of automatic control equipment.

Due largely to increasing costs of moving iron ore from mines to blast furnaces, there is a definite movement toward ore mixtures that will yield larger percentages of iron, asserts R. H. Sweetser, consultant in blast furnace practice, New York. Not only is this true in the Adirondack region, where refinements in magnetic concentration and sintering are in progress, but even in the Red Mountain district of Alabama where it was once regarded not profitable to beneficiate. Beneficiation of Lake Superior ores is still on the increase, with new methods and improvements in old washing and jigging machines.

Use of these richer ore burdens is not altogether because of less freight and less coke per ton of pig iron, but also on account of the greater tonnage of hot metal per stack in periods when heavy production is demanded, Mr. Sweetser adds.

Regularity of quality of hot metal and cold pig, obtained largely by controlling regularity of raw materials, is another definite trend receiving attention. Beneficiation of ores, coking coals, and flux has become standard practice, and this past year the benficiation of the air blast (the largest "ingredient" in making pig iron) has been revived on a basis that appears economical and controllable. There is still need for more concerted research work in blast furnace work, Mr. Sweetser feels.

Charging Control Systems Are Improved

Blast furnace charging has been undergoing steady refinement, there being increased realization of the importance of positive co-ordination and enforced checking of the functioning of the several devices which contribute to this operation as afforded by a comprehensive charging control system, says Gordon Fox, vice president, Freyn Engineering Co., Chicago. Automatic charging of coke, optionally by weight or by volume has attained advanced perfection. Control for the revolving distributor has been substantially simplified through its incorporation as an integral part of the charging control system for the furnace as a whole.

The pneumatic bell hoist, enjoying renewed popularity, has been improved through refinements in control which enable speed of opening and of closure of the bells to be adjusted independently. The continuous stockline recorder, now accepted in the category of a blast furnace necessity, has been enhanced in value by expanding its function to serve also as a "stock movement visualizer," Mr. Fox asserts. This, in effect, enables the operator to look inside his furnace to observe rate of burden settlement. Irregularities can be more quickly detected and corrective measures more promptly applied. An improved insulated blowpipe has been developed in which the outer member, exposed to handling, is a single heavy casting, an inner alloy tube being provided to serve as a blast duct, with intermediate insulating space.

Little over a year ago, a large steel company rebuilt a blast furnace to get increased capacity. According to F. L. Lindemuth, chief engineer, William B. Pollock Co., Youngstown, O., not only was diameter of hearth and bosh increased, but furnace height raised 10 to 15 feet to 105 feet. This height kept the ratio of volume of furnace to areas of hearth and bosh to about the same ratios worked out 15 or 20 years ago as the most economical. Operating results from the rebuilt furnace were so successful that a second furnace was

How Electromet SERVES

THE IRON AND STEEL INDUSTRY

THE Electromet organization is geared to give the iron and steel industry continuous practical assistance in making and marketing better iron and steel. Important features of this program are metallurgical research and market development. The complete scope of this service to Electromet customers may be briefly summarized as follows:

- **Good ferro-alloys**—uniform in composition, closely graded, correctly sized—in a wide range of analyses as indicated by the partial list at the right.
- **Competent metallurgists** who give on-the-job assistance in the profitable use of "Electromet" products.
- **Extensive laboratory facilities** for developing new ferro-alloys and solving special problems of the iron and steel industry.
- **Market research** and promotion through an active program of literature, advertising, and engineering co-operation.

For more than 30 years we have produced ferro-alloys and alloying metals. We have thus accumulated a fund of data on iron and steel of all kinds. If you want help in the manufacture or use of iron or steel for a specific purpose, consult us.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, N. Y.

CHROMIUM
Low-Carbon Ferrochrome (in grades, maximum 0.06% to maximum 2.00% carbon)
High-Carbon Ferrochrome (maximum 6.00% carbon)
High-Nitrogen Ferrochrome
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

•

SILICON
Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 90%
Ferrosilicon 90 to 95%
Silicon Metal
"Silvaz" Alloy
Miscellaneous Silicon Alloys

•

CALCIUM
Calcium-Silicon
Calcium-Aluminum-Silicon
Calcium-Manganese-Silicon

•

VANADIUM
All grades

MANGANESE
Standard Ferromanganese 78 to 82%
Low-Carbon Ferromanganese
Medium-Carbon Ferromanganese
Spiegeleisen
Manganese Metal
Manganese-Copper
Miscellaneous Manganese Alloys

•

SILICO-MANGANESE
All grades, including Silico-Spiegel

•

ZIRCONIUM
Zirconium 12 to 15%
Zirconium 35 to 40%
Aluminum-Zirconium

•

COLUMBIUM

•

TUNGSTEN
Ferrotungsten
Tungsten Powder

•

BRIQUETS
(Patented)
Silicon Briquets
Manganese Briquets
Chromium Briquets

Electromet
Trade-Mark
Ferro-Alloys & Metals

Available through offices of Electro Metallurgical Sales Corporation in the following cities: Birmingham . . Chicago . . Cleveland Detroit . . New York . . Pittsburgh . . San Francisco. In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

The words "Electromet" and "Silvaz" are registered trade-marks of Electro Metallurgical Company.

rebuilt last fall, its height being increased in the same manner.

Several larger companies, Mr. Lindemuth continues, have been considering replacement of small blast furnace hot metal cars and ladles with larger and more economical equipment. Principal question is whether it is more economical to use comparatively small, 60-75 ton, heat-retaining-type ladles which can be taken from the car and handled in cranes, or larger heat-retaining type ladles, 125 tons or more capacity, which must be dumped in the car and cannot be crane handled. This matter was settled this year in one plant, which after considering both types of ladles and conditions in many plants bought the small demountable type.

A year ago mention was made of a proposal to operate blast furnaces under pressure. It can be stated at this time that progress is being made toward a commercial trial of the process.

Employment of photoelectric cells and associated equipment to record scientifically variations in the blow of the bessemer converter and from the graph obtained to control blowing precisely, is regarded by Dr. H. K. Work, manager of research and development, Jones & Laughlin Steel Corp., Pittsburgh, as an outstanding development of the year and perhaps the most significant in the process since its invention. A better understanding of the factors affecting oxidation and nitrogen absorption during course of the blow has contributed toward general advance of the process, and it seems safe to predict it will result in development of superior bessemer steels for applications now foreign to this product.

In the open-hearth process, several methods of measuring bath temperature have been investigated. Both the quick immersion thermocouple and optical pyrometer sighted through a tube introduced into the metal have given favorable results, but neither can yet be considered a finished development, Dr. Work reports. A new product to ease the lot of the melter is the carbanalyzer developed in the Jones & Laughlin organization, for magnetic determination of carbon content of the steel bath. With it a carbon determination may be made in a few minutes. Availability of electrolytic manganese is being followed with considerable interest because of the possibility that imported manganese may become difficult to obtain.

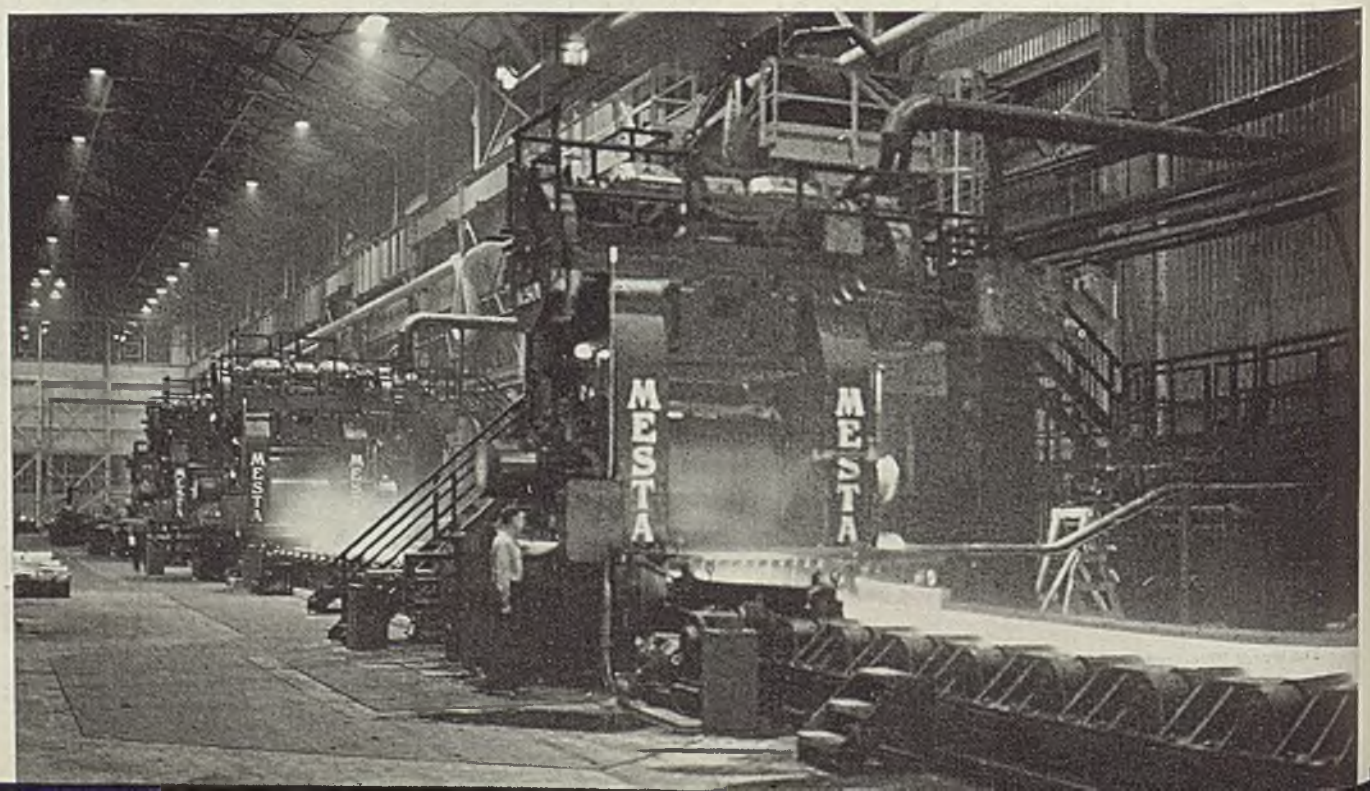
The industry has displayed considerable interest recently in complex deoxidizers, compounded with the purpose of obtaining the optimum combinations of oxide-forming, grain-refining and fluxing elements. Dr. Work says it is not unlikely that this activity will lead to improvement in deoxidizing practices, resulting in improved quality. With this same end in view, determination and control of gases in steel melting practice also has become a matter of importance. As long as it remains unsolved, application of scientific control to the open-hearth process is restricted.

Open hearth tonnage has been increased by using larger furnaces and ladles, new types of refractories, insulation and a better knowledge of steelmaking reactions, asserts W. J. Reagan, assistant superintendent of open hearth, Edgewater Steel Co., Pittsburgh. Some outstanding increases have been made by use of chrome refractories coupled with streamlined furnace interiors that produce high tonnages with low refractory costs. Use of basic bricks in the roof is still in the experimental stage, but holds promise.

Atmosphere control has had its effect in increasing furnace life, he continues. New insulation materials with better refractory values are appearing, but there is still a difference of opinion as to the best types

(*Please turn to Page* 342)

■ **The most recently completed strip mill is the 56-inch unit of the Youngstown Sheet & Tube Co., at Indiana Harbor, Ind. Shown below is the delivery side of the hot mill rough stands**

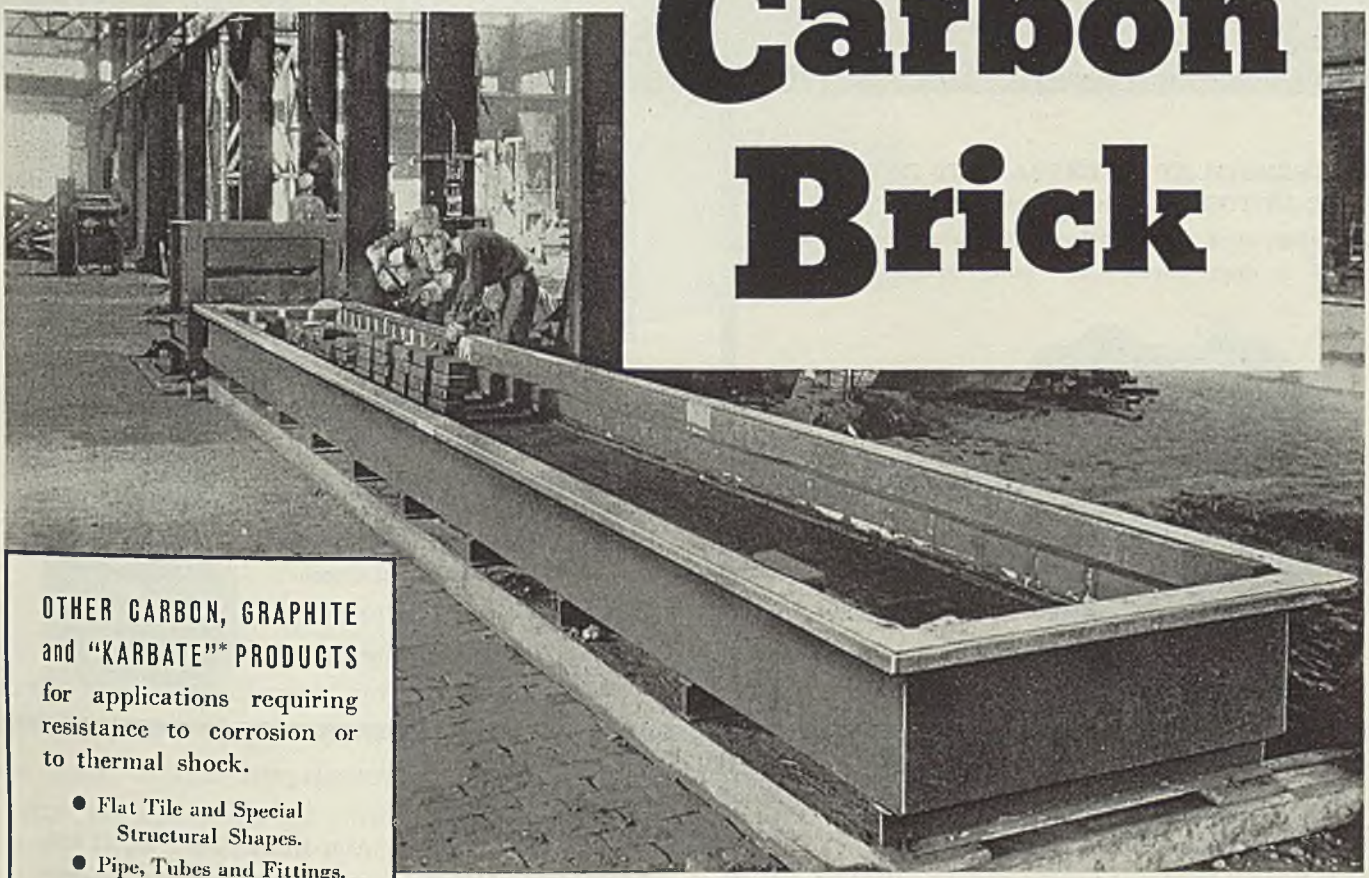


LINE YOUR PICKLING TANKS WITH

"National" Carbon Brick is being used successfully for lining pickling tanks. Even where the mixture contains nitric and hydrofluoric acids, carbon brick has proved immune to destructive corrosion.

NATIONAL
TRADE-MARK

Carbon Brick



"National" Carbon and Graphite Brick have been found highly satisfactory for many types of masonry construction requiring a material that is resistant to corrosion or to severe thermal shock. Carbon and graphite are exceptionally resistant to most of the liquids and gases encountered in chemical processes. They resist the corrosive action of all acids, alkalies and salt solutions except those of highly oxidizing character.

"National" Carbon Brick is mechanically strong, adheres firmly to bonding materials, is not subject to growth and is highly resistant to thermal shock. Graphite brick is recommended in preference to carbon when high thermal conductivity is required.

CUT DOWN LOSSES FROM CORROSION OR THERMAL SHOCK BY USING CARBON OR GRAPHITE BRICK ON CONSTRUCTION EXPOSED TO THESE DESTRUCTIVE FORCES

OTHER CARBON, GRAPHITE and "KARBATE"* PRODUCTS

for applications requiring resistance to corrosion or to thermal shock.

- Flat Tile and Special Structural Shapes.
- Pipe, Tubes and Fittings.
- Heat Exchangers.
- Raschig Rings.
- Flue Gas Scrubber Plates.

*A carbon or graphite base, corrosion resistant material, impervious to the seepage of fluids under pressure. Developed and sold by National Carbon Company, Inc. under its trade-mark "Karbate."

WRITE FOR A COPY OF THE NEW BULLETIN ON CARBON AND GRAPHITE BRICK

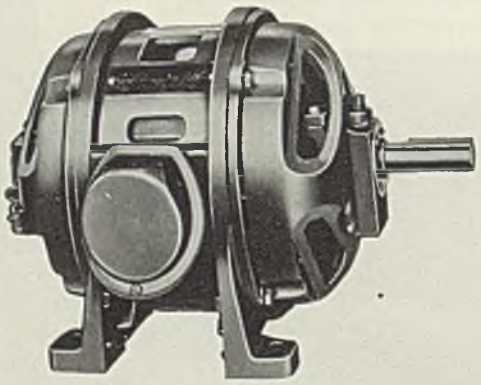
NATIONAL CARBON COMPANY, INC.

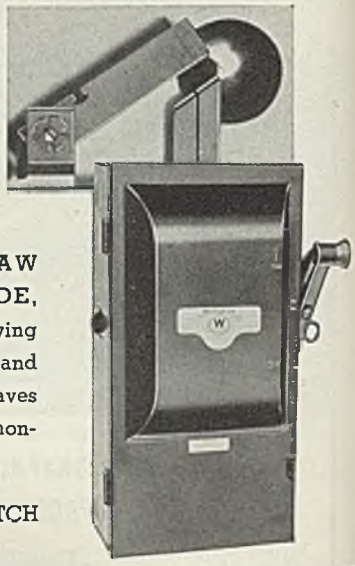
Unit of Union Carbide UCC and Carbon Corporation
Carbon Sales Division, Cleveland, Ohio
GENERAL OFFICES
30 East 42nd Street, New York, N. Y.
BRANCH SALES OFFICES
New York, Pittsburgh, Chicago, San Francisco

WESTINGHOUSE POINTS THE WAY

TO NEW SPEED IN PRODUCTION

EXTRA STRENGTH AT NO EXTRA COST IN WESTINGHOUSE MOTORS . . . Extra electric strength in Tuffernell Insulation, extra mechanical strength in rigid one piece frames. Ball or sleeve bearings free from lubrication grief.

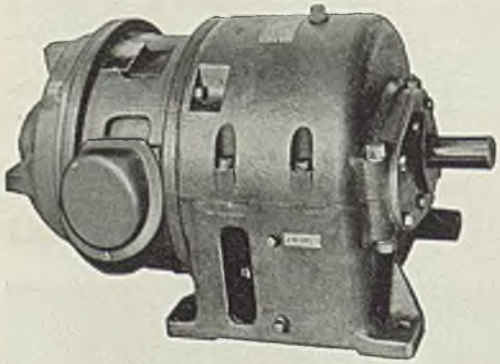


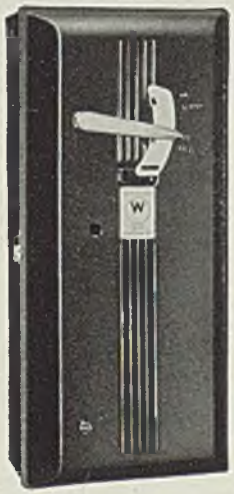


DIAMOND POINTED JAW WITH EXTENDED BLADE, confines arc to noncurrent carrying areas . . . eliminates burning and beading. Saves dressing down, saves maintenance. Ask to see it demonstrated.

WESTINGHOUSE SAFETY SWITCH

HIGH SPEED MOTOR EFFICIENCY FOR SLOW SPEED MACHINES . . . Now you can get the horsepower you want at the rpm. of the driven machine. Saves cost of separate mechanical units . . . simplifies installation, saves maintenance of belts, pulleys, sprockets or chain.





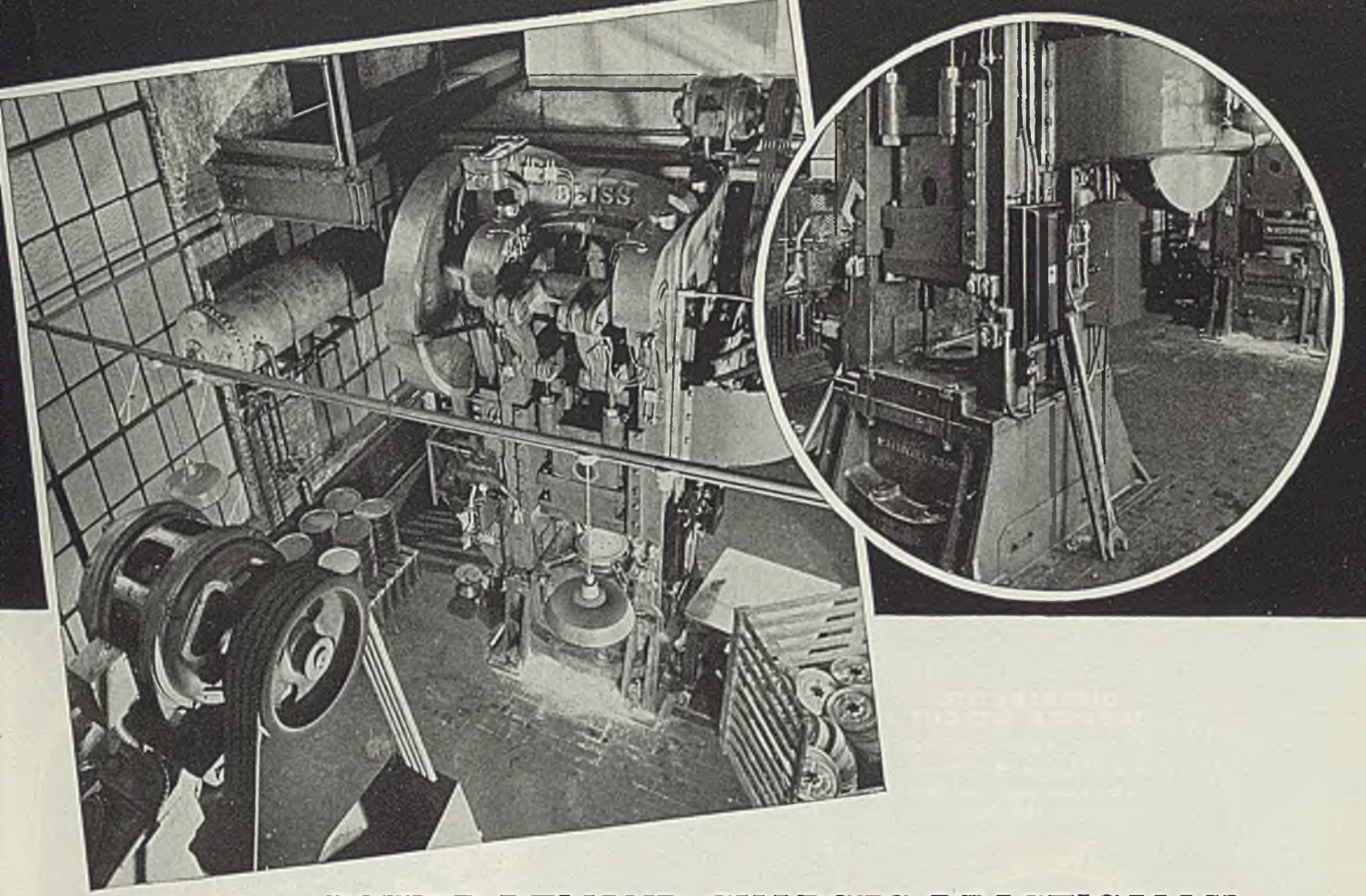
ALL NECESSARY CONTROL AND PROTECTION IN ONE EASILY INSTALLED PACKAGE. . . The Westinghouse Combination Linestarter . . . Costs less to install . . . saves wiring, conduit, labor . . . simplifies inspection.

★ ★ ★

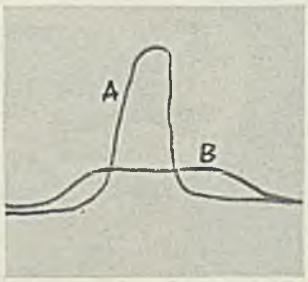
WESTINGHOUSE COMBINATION LINESTARTER

Westinghouse

W WESTINGHOUSE ELECTRIC



POWER DEMAND CHARGES DRASTICALLY CUT BY CORRECT MOTOR APPLICATION



A Westinghouse representative, making this little sketch on the scratch pad of a stove manufacturer's desk, showed him how to cut his demand charge for power in his punch press operations.

The "A" line in the sketch represents the peak load of a 25 hp. general purpose motor the buyer thought he required. The "B" line represents the power demand of a Westinghouse 15 hp. punch press motor, capable of operating the presses efficiently. Notice the saving.

Similarly, the Westinghouse representative showed how presses powered by 20 hp. motors could be better operated by 10 hp. punch press motors, and how 5 hp. presses could be operated by 3 hp. motors.

Change-overs are now partially made. When completed, savings in demand charges will be several hundred dollars a month—and these savings will accrue to the manufacturer for years to come.

In working out your own motor and control applications, consult Westinghouse. Be sure you have the advantage of modern developments in motors and control, and their efficient application. Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

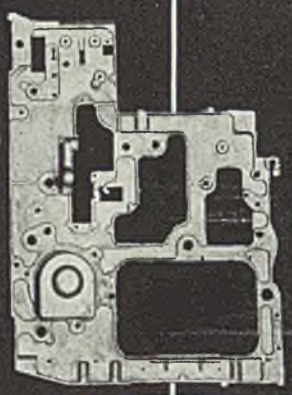
Apparatus wholesalers, industrial agents, and district offices in all principal cities.

J-90150

Motors and Control

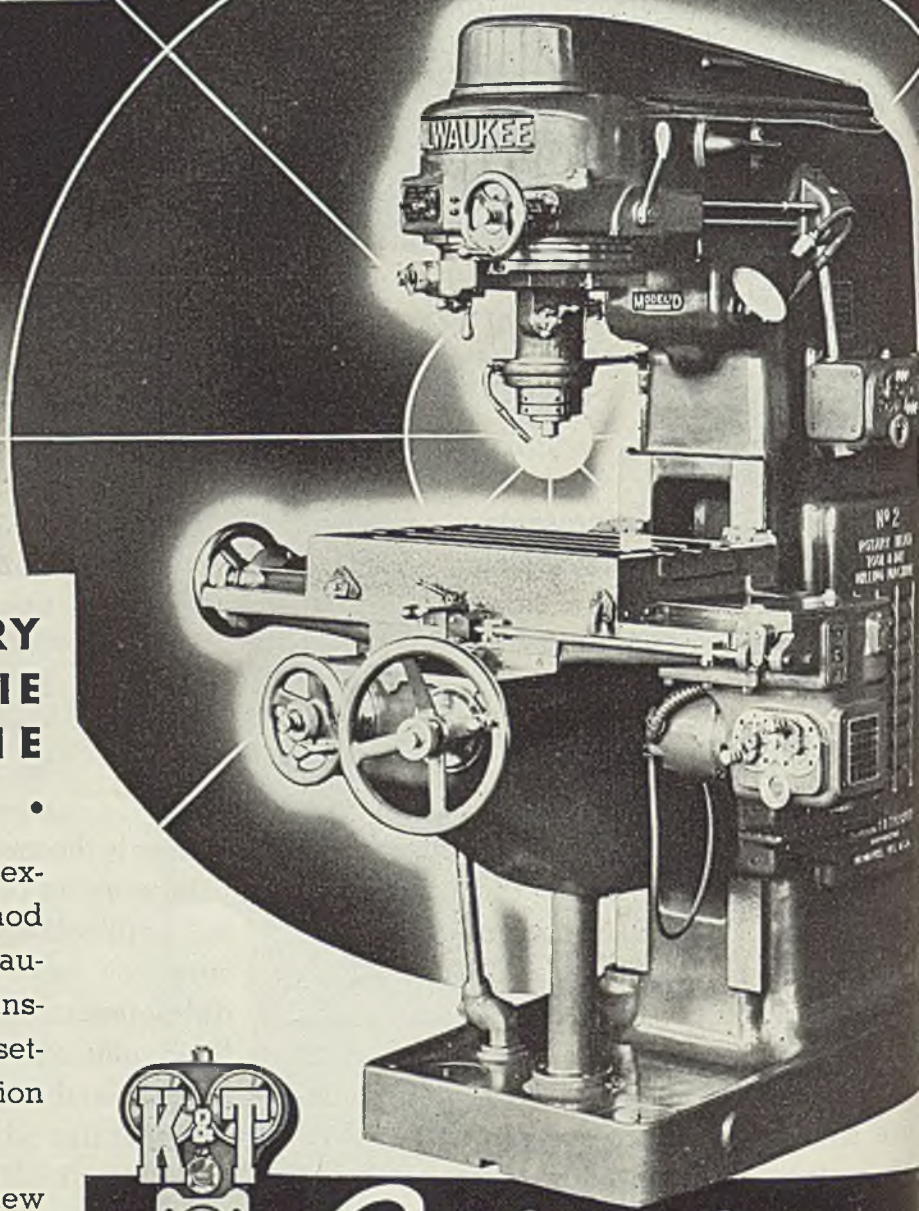
FROM *Blue-Print* INTO *Steel* IN A SINGLE SET-UP

FORMING DIE
Milled from solid to tolerances of .0005 in 4¼ hours. Can be group milled in lots of 6 at the rate of 2½ hours per piece.



DIE CAST TIME CLOCK FR
Note numerous radii great amount of detail —produced with spee accuracy on the Mod

DISTRIBUTOR COUNTER WEIGHT
All four cavities completed in a total time of 72 hours — previous time, ordinary equipment, 156 hours.



EXAMPLES OF ROTARY HEAD TOOL AND DIE MILLING MACHINE PERFORMANCE . . .

HERE are a few of hundreds of examples of the Rotary Head Method of tool and die making with a Milwaukee Model D — the machine that transmits blueprint into steel in a single set-up — layout, milling, drilling, precision boring and slotting operations!

Investigate this machine and the new technique it offers for the production of dies and tools—in far less time, with positive accuracy, and at costs much lower than ever thought possible.

K&T

Milwaukee

MODEL D-ROTARY HEA TOOL AND DIE

MACHINING

Production overshadowed machinery development in September. Equipment perfected earlier in 1939 will be big factor in meeting 1940 quantity and quality standards

SELDOM has the American machine tool industry experienced a stranger and more unpredictable year than 1939. At the beginning, business was none too good, except for those companies participating in foreign orders generated by the European and Asiatic armament race. Those concerned with recovery in the domestic market had high hopes focused upon the National Machine Tool show, scheduled to be held early in October.

While there was an encouraging pick-up in the business in May, it was not enough to divert attention from this show as the main hope of the year. Therefore, design developments were carried on apace and with many companies the big problem during the first three-quarters of 1939 was to complete new designs and get the machines built in time for the show. In the meantime a considerable amount of domestic business was being dammed back by potential customers who were waiting for the show before making final decisions as to exactly what they would buy.

Then came the outbreak of the war in Europe, followed immediately by cancellation of the show—this almost on the eve of its opening. The whole picture was changed literally overnight. Dammed up domestic demand was suddenly released and this, combined with still further accelerated European business, made the final quarter of 1939 comparable to the hectic days of 1918 and 1928 as far as the machine tool industry was concerned.

This industry enters 1940 with a backlog of orders, and at a level of operations, which seldom have been equaled. At the same time, however, the industry moves forward into the new year with far more caution and with a much more critical eye on the future than was the case at the beginning of any previous boom years. In other words, this sudden, long-awaited prosperity has not caused the machine tool builders of America to "lose their heads." Whatever they are doing to meet the situation is being done not alone for this purpose but, to an equally if not to an even greater degree, to prepare the industry to meet the conditions of a post-war future.

From the moment the decision was reached to have a show in 1939 (which incidentally was in the spring of 1938) until the cancellation early in September, 1939, design development—including a development of tools and accessories—was matched by an equal amount of effort toward plant improvement. While the latter did include some building and rebuilding programs (more in fact than at any time in the past 20 years), greater emphasis was on replacement and re-arrangement of equipment to give higher efficiency in existing plants. Thus the machine tool industry became during this development period one of its own best domestic customers, and for that matter it still is.

Except possibly at the beginning of 1936 following the memorable 1935 machine tool show, American machine tool builders have never been better prepared to cope with improved business conditions, as far as highly perfected products and improved facilities for turning out these products are concerned.

To give readers of STEEL a broad and unbiased picture of recent engineering and economic developments in the fields of machine tools and machining, together with some inspired glimpses into the immediate future, a number of authorities on the design, manufacture and use of machine tools have been consulted. At this point, therefore, we will let these valued con-

tributors pick up the thread of this 1939-40 story.

N. D. McLeod, president, Abrasive Machine Tool Co., East Providence, R. I., says: "From our own experience, customers are not so much concerned with new developments at this time, as they are with deliveries. For this reason we are doubling our efforts to turn out models we already have in production rather than trying to get new models into production. We are going slowly on the new models so as to have them ready when the present abnormal demand begins to weaken.

"As for future trends, I do believe that there will be a leaning towards more electrical equipment and devices. There will also be more attention paid to machined surfaces, especially ground surfaces. More accurate and simple methods must be found for determining degrees of finish."

William Watson, vice president in charge of manufacturing, Allis-Chalmers Mfg. Co., Milwaukee, pays generous tribute to the machine tool industry with these words: "In purchasing machine tools to take care of our widely diversified products ranging from heavy and large machinery lines, through agricultural equipment of varied character and on down to small manufacturing work, our company for many years has had dealings with a great many machine tool builders who have fulfilled our demands for a large variety of tools and equipment.

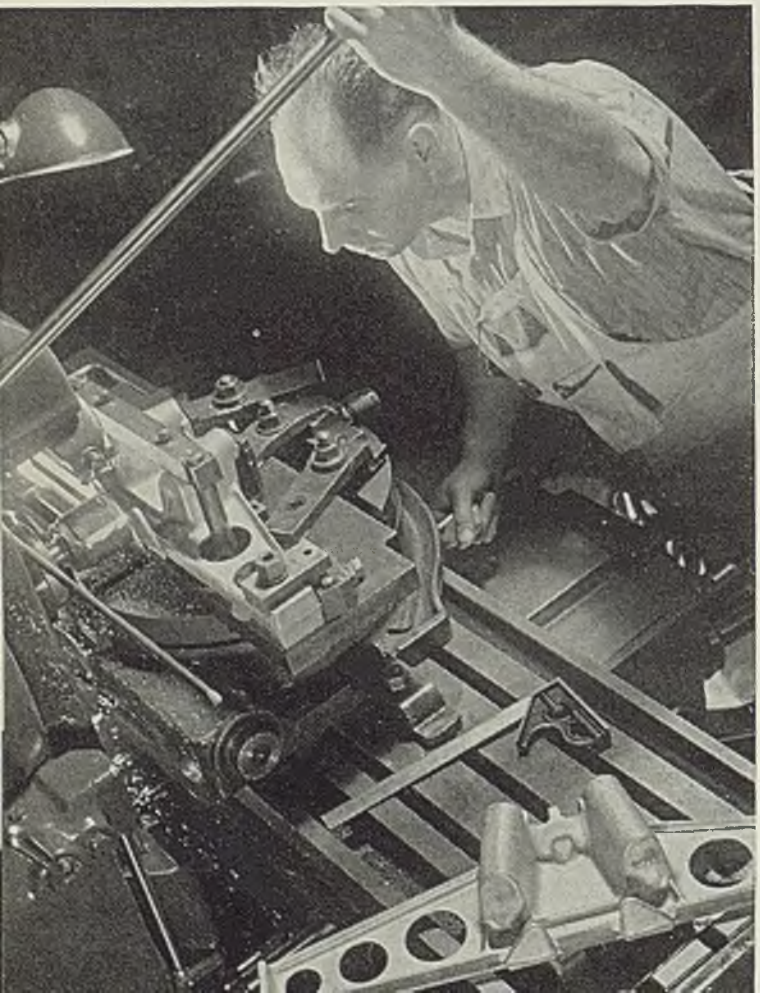
"On this occasion, therefore, we would like to go on record—not so much with suggestions as to what we know the machine tool industry will accomplish in the future—but rather to express our very highest regard for one of the most progressive industries in the United States.

"During the past several years, there have been marked advances in the design of the machines and devices supplied by the machine tool industry. Engineers of that industry have proved themselves capable of designing machines and tools to meet exacting requirements for economical production and the high quality of workmanship demanded in present day manufacturing processes. Our company has relied to a great extent on the cooperation of the machine tool builder, and has profited by being able to approach him and his engineers, asking them to recommend or design machine tools to meet our requirements.

"During these contacts, we have come to think highly of the designers, tool engineers, and manufacturers in the machine tool field. We have come to consider them a progressive body of men and believe that—as an industry—the machine tool builders are about as far advanced, in keeping up with the times, as any other industrial group."

C. H. Bromley, Bromley & Son, lubricating engineers, deals with his particular field thus: "To my knowledge the past year saw no new or exciting developments in machine tool lubricants—either for bearings or for cutting. It is extremely significant, however, that there has been a broadening realization on the part of machinery users as to the distinct operating and financial benefits growing out of correct lubrication.

■ **Typical of rapidly increasing use of modern machine tools in the aircraft industry is this setup for milling sides and ends of an airplane truss member. Photo courtesy Cincinnati Milling Machine Co.**

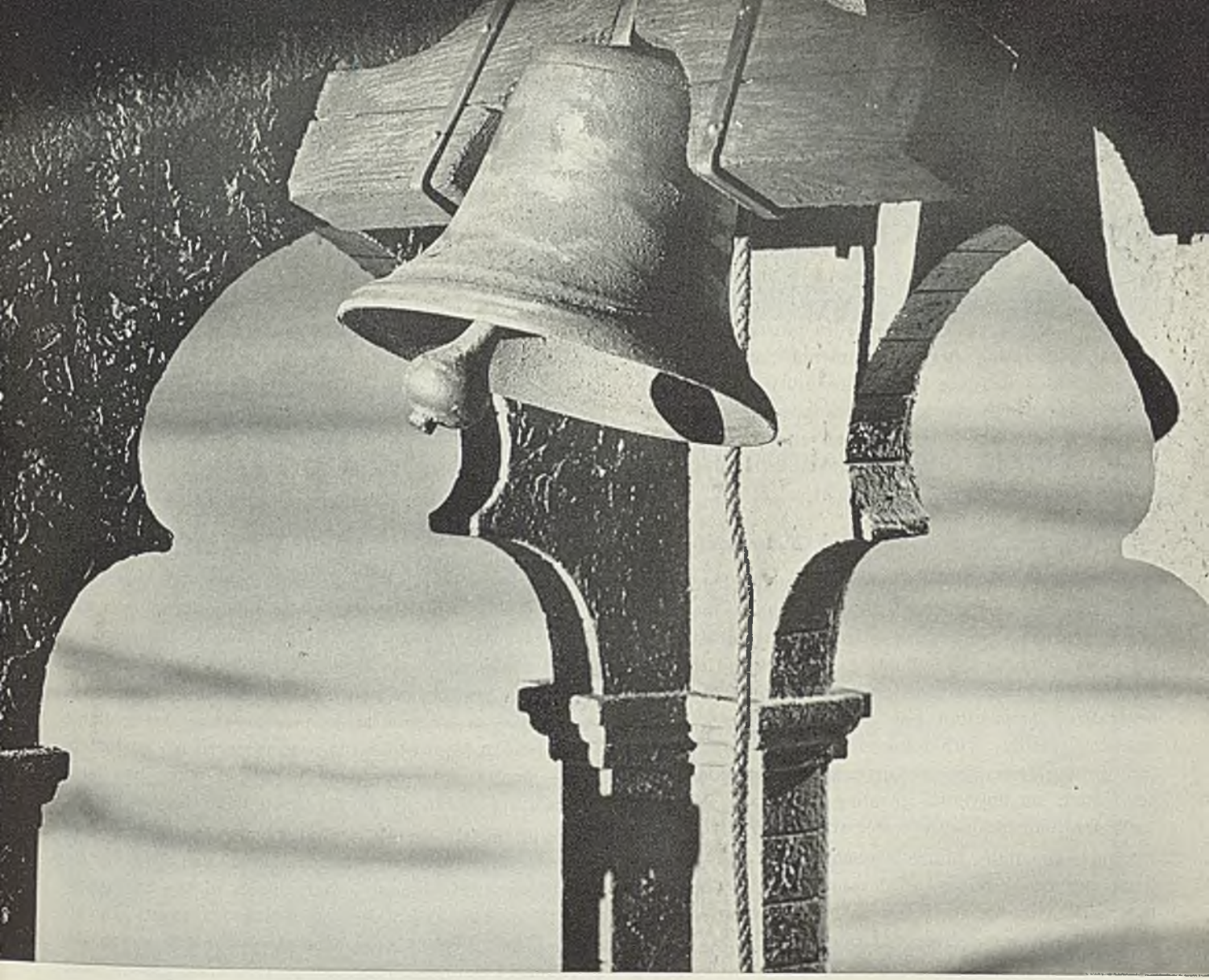


Lubrication Technology Needs Clarification

"For a number of years this phase of the 'lubrication cycle' was eclipsed by technical developments in lubricants themselves—extreme pressure lubricants, for example. Technical developments 'stole the lubrication show' to such an extent that it was not so good for the petroleum industry, the machinery builder and the machinery user. It is in no spirit of disparagement that I say that lubrication technology—as a business proposition—got too far ahead of the average customer.

"It is high time that the lubrication industry should begin to cash in on its huge investment in technology by translating it into the language of the user. Lubricants and coolants are still in too much of a state of confusion in the minds of shop men and purchasing agents. There is coming to be however more universal agreement as to the classes best suited to various kinds of work and to various cutting and tool conditions.

"Realization on the part of management that hand



When The Armistice Is Signed

. . . and the flame and crash of battle are replaced by the tolling of bells, the shrieking of whistles, the roar of happy crowds . . . the question "What of tomorrow?" will again occupy men's minds. Once more, men will plan to adopt machines engineered-for - greater - human benefits, whose use improves social and economic conditions by raising the standard of living. The Monarch Machine Tool Company, Sidney, Ohio, U. S. A.

Monarch
Lathes

oiling of important bearings and slides means excessive down-time, undue power consumption, costly maintenance and shortened machine life, is giving much needed impetus to the adoption of automatic lubrication."

Brown & Sharpe Mfg. Co., Providence, R. I., views the situation in this manner: "In the lines with which we are most closely connected there have been no revolutionary developments, but evolution has gone steadily forward. Appearance continues to receive attention; several interesting new attachments have been developed which increase the serviceability of screw machines; and silent stock supports are being used in increasing numbers—indicating an effort by users to make their screw machine departments pleasanter places in which to work.

Controls Now Built-in and Centralized

"Power rapid traverse in all directions is being supplied even on small, light knee-type milling machines in an increasing number of cases; continued attention has been given to the building in of electrical controls and to the protection and accessibility of such units; centralized lubrication has been extended; grinding machine spindles with reduced clearances are coming into general use; and better coolant provisions have been made on universal grinding machines. Machine tools are unquestionably better than even a year ago.

"The immediate future probably will see a somewhat reduced number of developments coming into the market, due to the pressure being put on machine tool builders for delivery of current models. There is little doubt however that developments will be going forward, although they may not reach the customer as quickly as in periods when there is less pressure.

"Probably one of the most interesting phases of the machine tool industry during the past few weeks has been the extent to which American manufacturers have endeavored to anticipate the needs of the domestic market in a period when foreign buyers were willing to take the entire output at long deliveries not acceptable to domestic buyers. The rationing of the foreign market does give definite although limited protection to the needs of domestic consumers."

W. E. Whipp, president, Monarch Machine Tool Co., Sidney, O., and treasurer, National Machine Tool Builders' association, of which organization he served as president during the 1938-1939 period, says: "Important trends in the turning field of the machine tool industry during 1939 include further 'clean-lining' of the appearance of machines, 'built-in' instrumentation and wider use of the flame hardening process in wear-protecting vital parts.

"Typical of advanced styling in turning machines is a 10-inch precision lathe which we put into production during the past year. Motor drives and controls are completely enclosed and no wiring except the 'lead-in' cable is exposed. Since appearance was an important consideration in the original designs, there are no gadgets or levers that look as though they were added as after-thoughts. Overall appearance is further enhanced by the use of chromium-plated handles and handwheels, chromium-plated strips to cover cored ventilating slots, and hollow head capscrews set flush with the surfacing.

"Typical of the instrumentation trend is application of tachometers on Monarch machines with hydraulic transmissions. The tachometer enables the operator quickly to select any desired spindle speed throughout the entire 'stepless' range and to know the exact operating speed at all times.

"Interest in the flame hardening of wearing parts, especially cast-iron surfaces, reached a new high during the past year, this being a leading topic of discussion at a number of national technical and engineering society meetings. At our plant, the wear test which has been going on continuously 24 hours a day for almost a year and a half, still fails to show up any measurable wear on the flame hardened way surfaces.

"In addition to bed ways, other cast iron parts, such as those in taper attachments are now being flame hardened. Meanwhile, the percentage of our customers specifically ordering flame hardened ways has been mounting month by month throughout the year."

William Hartman, vice president, engineering and production, National Cash Register Co., Dayton, O., calls attention among other things to the fact that: "The decided trend toward plastics in practically all lines of endeavor is one of the most interesting developments of the past year. This calls for the best in steel composition to insure the accuracy and permanence of molding equipment. These requirements in turn demand machines of highly specialized character to meet modern molding die making economy. The die engineer must guide his design practice definitely toward more uniform and balanced cross sectional areas and also must develop shapes that do not call for the impossible in die machining.

Trends as Seen Through Eyes of User

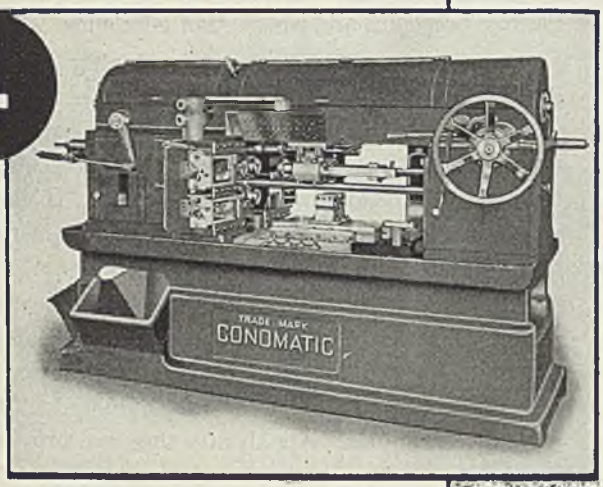
"Other trends which we will mention briefly are: Fabrication of machine frames and beds by electric welding steel plates, I-beams, channels and bars, replacing castings; flame hardening of wearing parts, such as ways on lathes, increasing life and requiring less repair to maintain accuracy; use of low viscosity lubricants to insure proper lubrication of intricate parts in machinery which must maintain close production limits; and considerable success in use of lead bronze bearings in connection with alloy steel spindles for machines operating at high speeds."

F. G. Hughes, general manager, New Departure division, General Motors Corp., Bristol, Conn., makes the following significant comments: "During the past

CONOMATIC
SCREW MACHINES

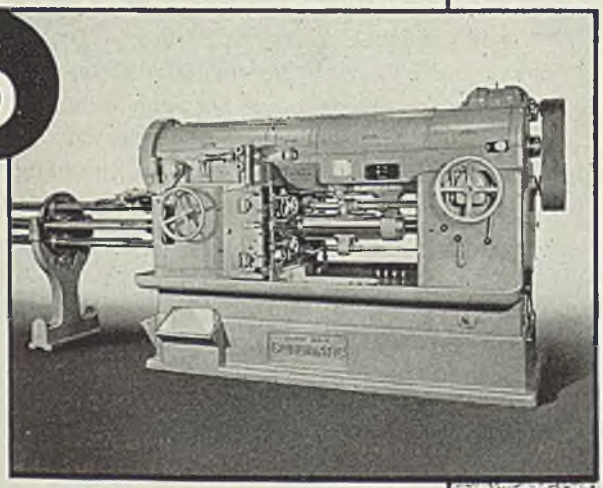
ECONOMY

4



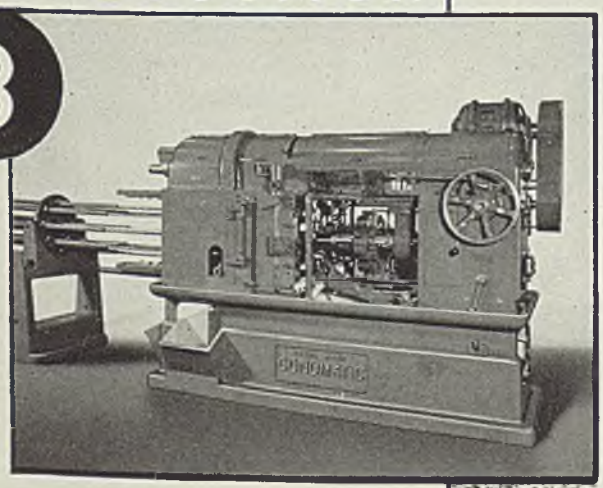
ACCURACY

6



PRODUCTION

8



PROFITS

CONOMATICS are built with 4, 6 and 8 spindles to cover the complete demands of those manufacturers who want to streamline their production to the point where profits are assured.

Parts may be produced from bars up to 6 inches in diameter with a milling length of 7 inches. The Cone policy of exceptionally rigid construction permits taking unusually heavy forming cuts at maximum speeds and feeds. This, together with rigid slides, accessible tooling, cams out of the way, individual forming slides, and individual positive forming stops, are but a few of many profitable CONOMATIC features. Your inquiries on machines and time studies will incur no obligation.

SEND FOR YOUR FREE COPIES
OF THE NEW CONOMATIC
CATALOGUES

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VERMONT

year there has been a notable increase in the trend toward the adapting of machine tools of every description to the greatly increased cutting speeds available with the use of carbide or similar cutting tools. This trend markedly has influenced design in that increased rigidity must of necessity be provided. This, with the increase in speed, has made the use of large spindles mounted on antifriction bearings a necessity.

"To increase rigidity as well as speed of operation and sensitivity to dimensional controls required by the demands for high precision products, tool slides and tables are now being designed with frictionless metal-to-metal contact involving the use of gibs and ways mounted on preloaded bearing balls.

"Increased attention is being given to the simplification of design so that setup time may be reduced and further, to prevent lost time and reduce maintenance, ball bearings are used on all shafts and intermediate gear boxes. Greatly increased volumes of coolant are being provided, care being taken at the same time to prevent contamination of machine lubricating systems. Increased chip space and provision for ready chip removal are features of prime importance.

"In short, the most outstanding developments have been those based on recognition that the highest precision of product can be combined with utmost rapidity of production in a machine that retains its accuracy throughout its life with an absolute minimum of lost time from any cause."

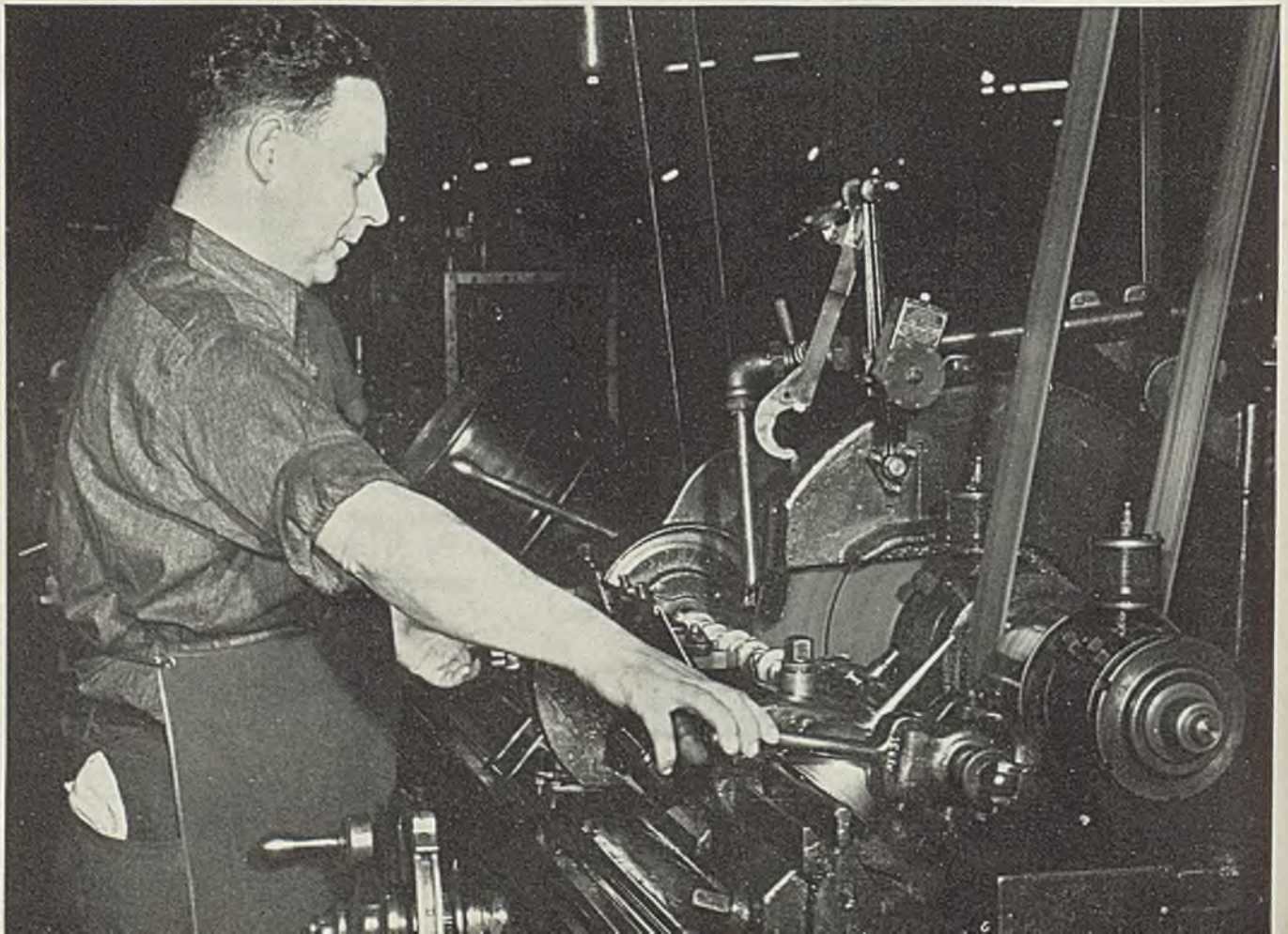
E. S. Ault, professor of mechanical engineering, Purdue university, Lafayette, Ind., says: "Among the many developments in machine tools I am particularly impressed by certain details and certain trends such as for example; wide adoption of hydraulic drives and controls to various types of machines, use of electrical controls, and the combination of these two systems resulting in a high degree of automatic operation promoting precision and production efficiency.

"Manufacturers have been developing unit attachments designed to permit extending the range of applicability of standard machines. Enclosed working parts, smooth exteriors and careful placing of controls are now the usual thing. While welding is now much used, cast iron and cast semisteel are still in extensive use in standard production lines.

"The safety feature of stopping the machine automatically when lubrication is inadequate, definitely is a 'trouble preventer.' I am much interested in use of cylindrical bearings of the 'fluid-wedge' type in grinding machines. Apparently they are proving satisfactory in performance, installation, and cost."

J. R. Weaver, director equipment, inspection and test, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and president, American Society of Tool Engineers, makes the following comments and suggestions: "A great deal of progress has been made during the past year in the development of machine tools and equipments. Attention has been given to the higher speeds

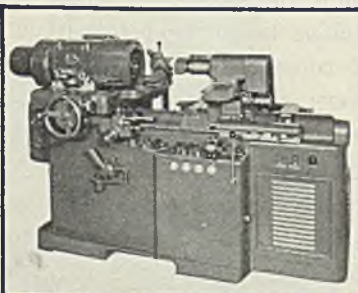
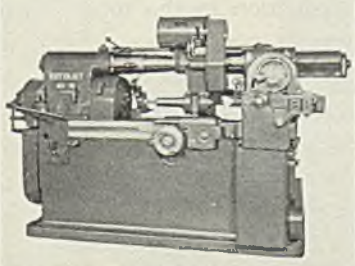
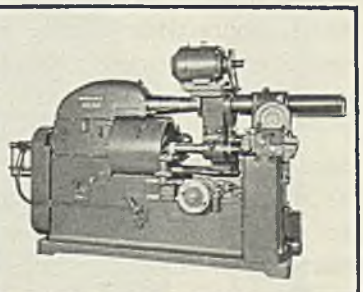
■ **Grinding grows in importance as a method for keeping pace with automotive production schedules on parts such as this camshaft, being semifinished in a Norton mahine. Photo courtesy Studebaker Corp.**



BRYANT GRINDERS

FOR EVERY INTERNAL AND FACE GRINDING NEED

THERE is a Bryant Grinder to meet every requirement of tool room work, small lot grinding, and high production work. The exclusive feature of BRYANT wheel head suspension is an outstanding asset when grinding straight, taper, a combination of straight and taper, or double taper holes in one operation, as well as curved, cam shaped, or blind holes. BRYANT Two-Spindle Grinders are a further asset in that the bore and face of the work may be ground concentric in one setting. BRYANT Grinders cover the complete range of internal and face grinding work — from tiny bearing races to large gears and cylinders. Send for catalogs.

Series 5	Series 112	Series 16	Series 24
			

BRYANT CHUCKING GRINDER CO., Springfield, Vt.

required for new cutting materials and machine tools have been designed and built with higher speeds and more ruggedness to stand these requirements.

"However, further developments must be made to eliminate idle time from machines. It requires too much time to load and unload, to change feeds and speeds, to start and stop cuts, etc. Machines should be designed to insure proper cutting speeds at all times. I believe that machine tool and equipment manufacturers realize this and are endeavoring to design and build their products to meet these conditions.

"Great strides have been made in establishing standards for surface qualities or finishes. Undoubtedly these standards will improve the efficiency in manufacturing operations in that there will be a definite understanding of the finish required and means provided to evaluate it.

"Manufacturing operations will have to be developed still further to insure getting a specified finish. For instance, changes will be made in the design of cutting tools, grinding wheels and other finishing means to produce with more certainty a prescribed finish. Savings undoubtedly will result because fewer operations will be needed to attain the final finish required.

"More thought should be given to the elimination of waste and defective work. During the year 1939 more than $2,000,000,000 was spent for defective work. This huge loss could have been reduced materially through better facilities and better understanding of requirements.

"Modern designs of apparatus require closer tolerances and better finishes. Many of the existing machine tools and other manufacturing equipment apparently are inadequate to meet the requirements of these new designs. Machine tool and equipment manufacturers should develop their machines to meet these increased demands of modern products and thus justify replacement of inadequate machine tools."

Machine Tools Insure Living Standards

As a fitting closure to this review we are pleased to present the following broad view of the machine tool situation as visualized by Charles J. Stilwell, president, Warner & Swasey Co., Cleveland. Mr. Stilwell says: "One thing which we have ahead of us in industry, whether we like it or not, is the certainty of shorter hours with little or no reduction in the total income of the worker. Regardless of whether or not hourly rates are maintained at their present high levels, it will—when all is said and done—be up to equipment manufacturers to insure for American workmen the highest possible standard of living. In other words, the American workman must be provided with equipment which will enable him to turn out the greatest possible amount of satisfactory work in the shortest possible space of time.

"That is exactly what machine tool builders have been striving for these many years—constantly increased productivity of their machines. There can be no question but that this consideration has had profound effect upon machine tool development. That during the next ten years it will be the greatest single factor toward influencing the trends in design, I have no question.

"Higher cutting speeds through increasing use of cemented carbide tools of one kind or another are now a foregone conclusion. Application of such high speed cutting media to small quantity production as well as to mass production already is apparent and it will increase. Incidentally, better adaptability of these high speed cutting media to various types of metal other than cast iron and a relatively restricted list of steels, is one line of development along which progress is an immediate necessity.

"Higher operating speeds and correspondingly increased output per operator demand constant refinements toward greater ease of operation, which means elimination of all possible physical and mental strain in connection with machine control. In this connection, remote control through mechanical, hydraulic or electric means is bound to receive an increasing degree of attention.

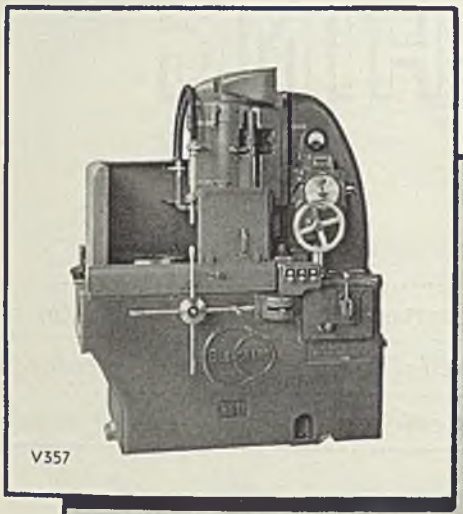
Chip Disposal Presents Problem

"Another problem which calls for immediate attention is that of chip removal. To cope with an ever-increasing flood of chips resulting from increasing cutting speeds, the idea of using built-in conveyors for discharging chips from machine tools undoubtedly will be further developed. By the same token, more attention must be given to protection of machine operators from growing hazards of flying chips and coolant.

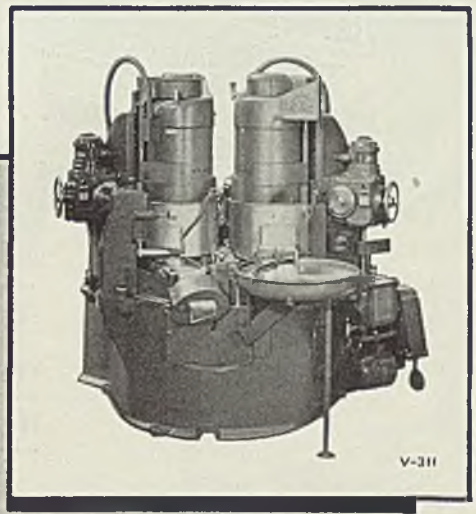
"During the past year the element of esthetics rapidly has grown in importance in connection with machine tools of all kinds. Ideas as to what constitute 'good looks' in machine tools may change as time goes on but there is bound to be growing appreciation of the appearance factor in general. While some efforts in this direction have been somewhat expensive, this extra cost is justified. Years of experience have proved beyond the shadow of a doubt that in the eyes of the customer good finish and graceful lines denotes good design and workmanship. Furthermore, the better a machine looks the better it will be treated in service and consequently its useful life will be lengthened to a very considerable degree.

"Color, smoothness and durability of fillers, paints and lacquers; and use of chrome plating wherever it may be practical and economical—these are typical of the many points which are receiving and will continue to receive their full share of attention. As we see it, in the development of the appearance factor there is no need to go to extremes in the direction of so-called modernistic treatments in design."

BLANCHARD
Surface Grinders
for 1940



NO. 11



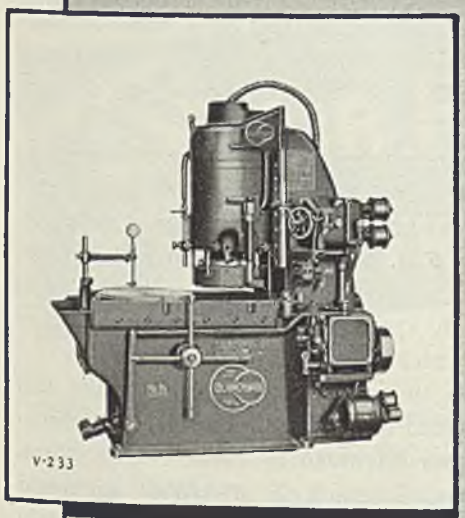
NO. 16-A2

THE Surface Grinders which Blanchard offers for 1940 are accurate, profitable machines which no modern shop should overlook. They grind rapidly the flat work usually done on a surface grinder, and with the proper selection of wheels an *exceptionally fine finish* is produced. The Blanchard will also rough and finish flat surfaces on castings and forgings in one operation.

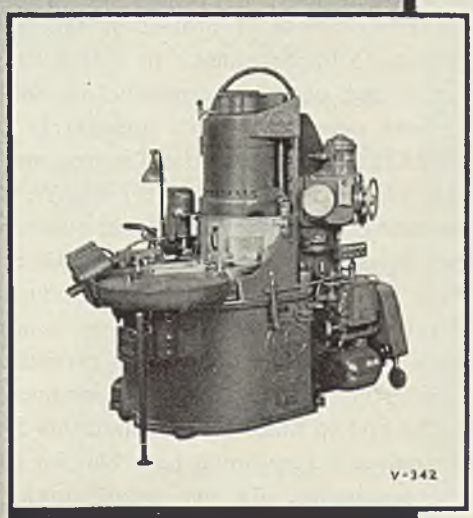
It pays to use genuine Blanchard wheels, to enable your Blanchard Grinders to operate to best advantage.

We will gladly send you further information on Blanchard Grinders and Wheels without obligation.

BLANCHARD

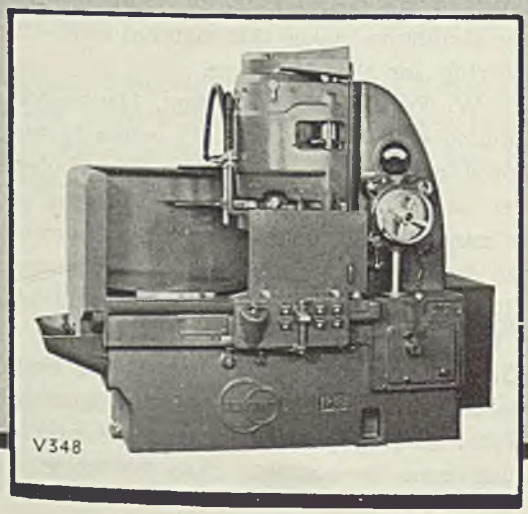


NO. 16

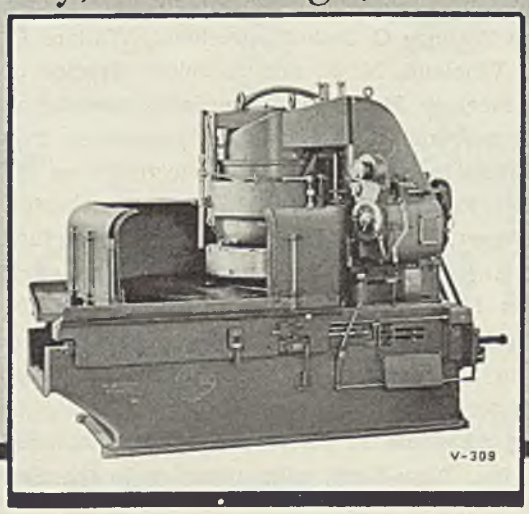


NO. 16-A

Blanchard Machine Company, Cambridge, Mass.



NO. 18



NO. 27

METAL FINISHING

New processes increase effectiveness of corrosion-resistant coatings, make new finishes available on surfaces heretofore difficult to coat. New synthetic resins are widely used

POSSIBLY greatest advances in metal finishing during 1939 were those contributing to increased effectiveness of protection against corrosion. In addition to improvements in galvanizing, tinning, synthetics and porcelain enamels, an entirely new coating was developed which appears to have important possibilities as a protection for iron and steel surfaces.

In the galvanizing field, reports W. H. Spowers Jr., consulting engineer, New York, outstanding work has been done on obtaining heavy, ductile coats on straight wire. Many firms now are producing on 18-gage wire a three-minute coat with an asbestos-wiped technique at speeds as high as 18 revolutions per minute on a 22-inch block. Improved methods of firing deep kettles and in fluxing are responsible for these results. In tinning, a new liquid bath blanket results in important economies. In one small tinning pot handling 18-gage steel wire, tin fed to the pot was reduced from 13.6 to 8.1 pounds per ton of finished wire by its use.

An important development in hot-dip galvanizing, according to Wallace G. Imhoff, president, Wallace G. Imhoff Co., Vineland, N. J., and technical director of research, American Hot Dip Galvanizers Association Inc., is the new method of welding galvanized iron and steel sheets by use of tin-coated electrodes as detailed by A. R. Eckberg, Eastman Kodak Co., Rochester, N. Y., in STEEL, Oct. 23, 1939, page 52. A method of spot welding galvanized iron without a blemish is described in STEEL, Sept. 11, 1939, page 54. Valuable new equipment includes a dross gage made from light pipe to afford accurate measurements of dross thickness at any point on pot surface.

Regarding advances in electroplating, International Nickel Co., Inc., New York, calls attention to the electroforming of solid articles entirely by electrodeposition with nickel on a continuous production basis. Nickel is deposited some 15 times as fast as in common practice. Building up heavy nickel layers for wear resistance and strength also has been done on a wider scale.

The Travers process for nickel plating on aluminum was adopted by several plants during the year. This process deposits a sound, adherent coating of good protective thickness. E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., introduced a new jet black finish, deposited at high speed from a solution containing molybdenum and nickel.

Progress made in color plating now permits this process to be applied to sheet aluminum and all aluminum alloys, reports Raymond F. Yates, vice president, Krome-Alume Inc., Lockport, N. Y. With aluminum alloys and pure aluminum sheet plated as cheaply and easily as other common metals, many new applications are possible. Gray, unbuffed nickel plated over aluminum makes this material available for plain soldering for the first time.

C. W. Yerger, vice president, Hanson-Van Winkle-Munning Co., Matawan, N. J., points to the extended applications of electrolytic cleaning and plating in the steel industry, continuous cleaning of strip at 1750 feet per minute for example. Much development also has been done in continuous electrolytic plating of tin on strip. It is expected tin plate will shortly be produced by this method.

G. R. Bennett, vice president, Toledo Scale Co., Toledo, O., reports the Bullard-Dunn process has been adopted in that plant for cleaning heat-treated parts which must be held to close tolerances and which

must be ground after treatment. Also, some experiments with this process for cleaning spun metal parts prior to plating have proven quite satisfactory.

An electrocleaner which not only removes all trace of oils and greases from the surface of highly finished steel sheet, but also solid abrasive particles from buffing and polishing compounds, carbon, smut and dirt is an important development, says E. C. Rinker, technical department, Oakite Products Inc., New York. This should materially reduce polishing and buffing operations.

J. S. Nachtman, manager, electrochemical processes division, Blaw-Knox Co., Pittsburgh, reports new processes for producing an inherent chemical blue for steel strip, sheet and wire; for electroplating thick alloy deposits on ferrous or nonferrous strip, sheet, wire or articles; an electrochemical cleaning line for strip and wire operating at higher speeds and with better cleaning; process for obtaining semibright electrotinplate; also a wet mechanical process for brightening electrotinplate. Experimental work scheduled for completion in 1940 includes processes for cladding strip, sheet and wire with nickel, stainless steel, monel, brass or bronze; electroplating a nonporous nickel deposit for rustproofing strip, sheet, wire, etc.; rapid pickling of sheet, strip and wire.

Increased industrial application of electroplated chromium to increase wear resistance and reduce coefficient of friction is noted by Colin G. Fink, head, division of electrochemistry, Columbia university, New York. He also mentions a new arrival in the plating field, manganese. Although the plate is not nearly a hard as chromium nor as stable in air, the ease of oxi dation of the manganese coating results in an easily obtained and attractive gunmetal finish.

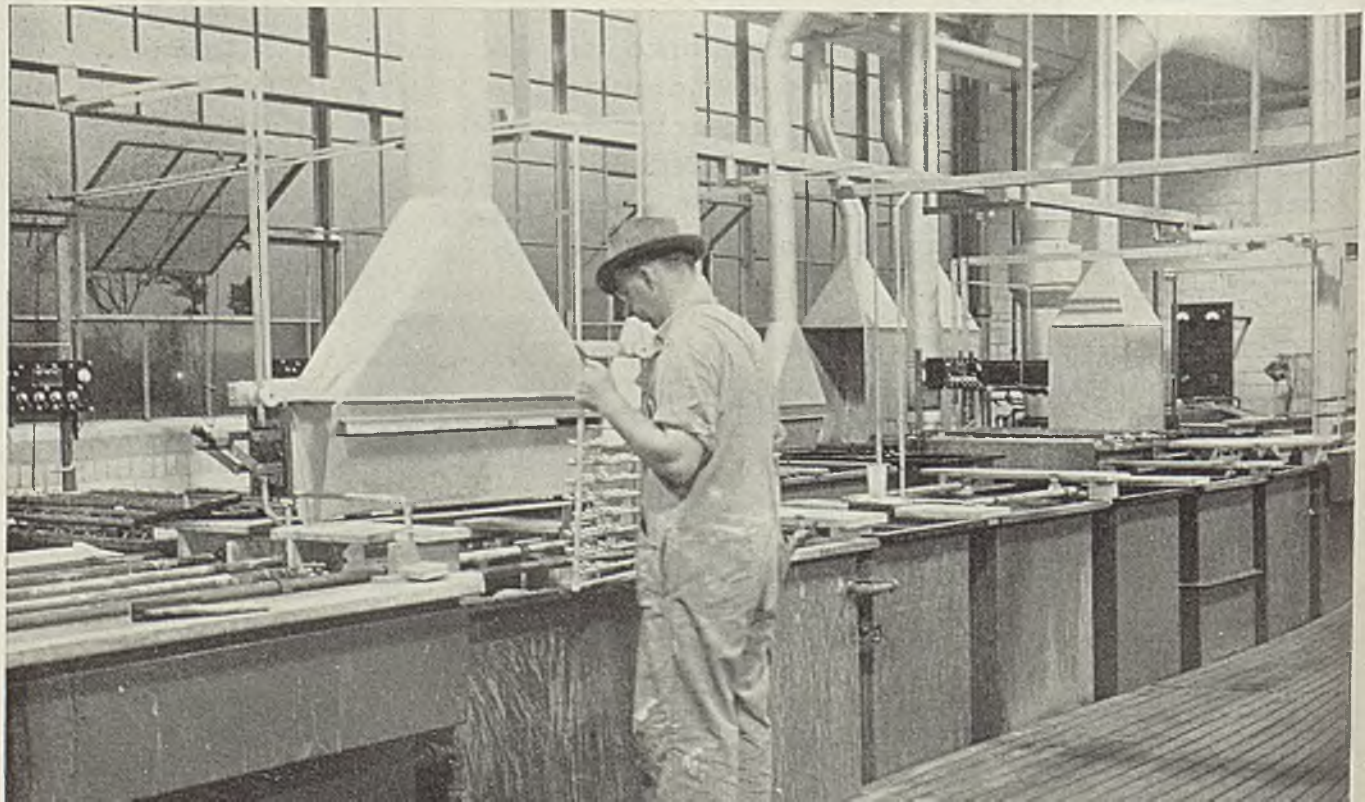
A new combination of urea and alkyd synthetic resin has found marked favor as a vehicle in formulating coatings for thin steel, particularly in the automotive industry, according to Paul L. Swisher, vice president Reichhold Chemicals Inc., Detroit. The protective finish produced is suitable for outside exposure and results in a tough, hard, mar-proof, porcelain-like surface without sacrifice of color or gloss and without brittleness. Of the polymerizing type which harden by heat, such a finish permits extremely fast baking schedules. A difficult shade to obtain, he points out has been a gray-blue aluminum pigmented coating which does not turn mottled green in forced oven drying. The urea alkyn combination does not experience this trouble. The urea apparently gels and quickly traps the aluminum pigment powder near the surface resulting in greater refraction of light and giving a metallic depth to the film impossible with alkyd resin alone.

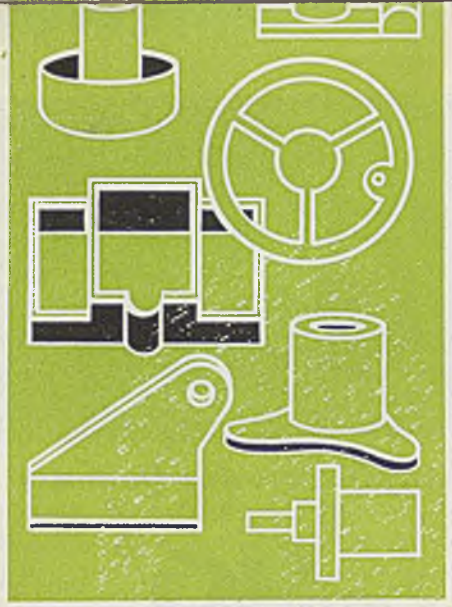
Typical of the extreme speed permissible by use of these new combination enamels is experience of one manufacturer who formerly operated a finishing department 24 hours a day to keep pace with one 8-hour shift in the fabricating department. With the new enamels plus a slightly higher baking temperature, the same volume of work is easily finished in 4 hours.

Outstanding application of new synthetic resin finishes, points out Harold E. Kennedy, organic chemical department, American Cynamid & Chemical Corp., New York, is on recent bridges, many of which have

(*Please turn to Page* 344)

■ **New plating methods are being employed in many plating departments. A black, wear-resistant aluminum coating is one being produced in the new parts plant of Spencer Lens Co., Buffalo. Efficient layout aids production**





DIE CASTING

Assumes proportions of a basic industry as product finds applications in new fields. Production processes are placed under closer control. Die steels are improved

MORE diversified applications for all types of die castings, better control of alloy specifications and purity, improvement in systems for handling, trimming and finishing completed castings, increasing popularity of the high-pressure cold-chamber type of casting machine, and better appreciation of the values of die steels heat treated in advance of machining sum up pretty well the direction and extent of a year's progress in the die casting industry. Technical experts in the industry appear in fairly general agreement that production of die castings has attained the stature of a basic industry and that as time goes on advances will be made in various details of casting technique rather than any broad changes in fundamental procedures.

Estimates show about 80 per cent of die casting tonnage to be of zinc alloy, the balance comprising mainly aluminum and zinc, with minor proportions of brass and certain other new nonferrous die casting alloys, such as aluminum-magnesium and copper-zinc-silicon-manganese-aluminum. Chief outlet for zinc die castings continues to be motor cars, an average for 1940 models being set at 60 pounds per car.

The rapidly expanding aircraft industry is seen as a growing field for die castings, particularly aluminum-base and magnesium-base alloys. F. C. Seeger, sales engineer, Aluminum Co. of America, Pittsburgh, points out that the present higher rate of production of aircraft and aircraft engines warrants more extensive use of aluminum die cast parts which become more economical as volume expands. Another large user of aluminum die castings is the outboard motor industry, some manufacturers building practically complete motors of these castings, even to cylinder blocks and crankcase units with bearing and cylinder wall inserts of other metals.

Mr. Seeger also mentions the development of aluminum-magnesium alloy No. 218 for die casting purposes. It provides excellent combination of strength, ductility, resistance to corrosion, machinability, finishing qualities and color, and may be solution heat treated to further enhance properties.

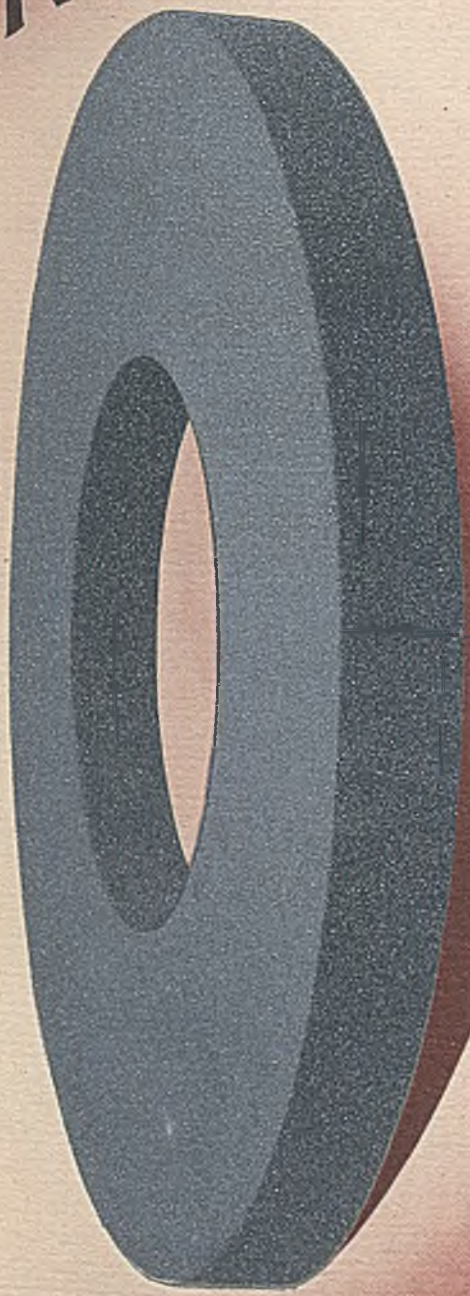
Daily use of about 6000 magnesium alloy die castings for starting motor and generator parts by a leading auto manufacturer is a significant step forward in extending use of this light metal, according to A. W. Winston, director, metallurgical department, Dow Chemical Co., Midland, Mich. Other applications of magnesium die castings include aircraft engine rocker box covers, shroud tube fittings and the like, vacuum cleaners, motion picture cameras, binocular frames, instrument cases, goggle frames, portable tools, musical instruments, business machines, textile machines, bakery equipment, rotors for induction motors and airplane instruments.

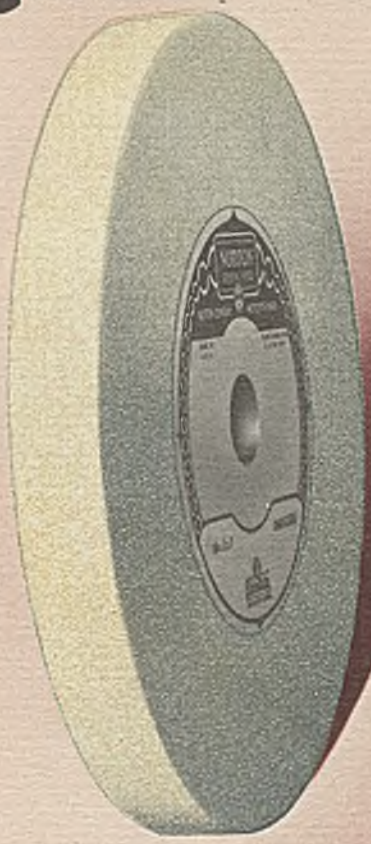
Sixty-two parts on a new Curtiss airplane are magnesium die cast, reports Charles Pack, president, Doehler Die Casting Co., Toledo, O., who points out interestingly that at present prices, magnesium is the lowest-priced die casting metal available, volume for volume.

Change to zinc die cast radiator grilles in the complete Ford line of automobiles for 1940 marks the first instance where one of the "big three" car manufacturers has adopted this type of grille, and will mean an appreciable increase in tonnage of zinc consumed in die castings this year. Herbert Chase, con-

(*Please turn to Page* 352)

NORTON SERVICE





Distribution

Factory stocks at Worcester—warehouse stocks in five industrial centers—distributor stocks in 150 cities.

Engineering

A Norton field staff and Norton factory specialists cooperating with 1800 distributors' representatives.

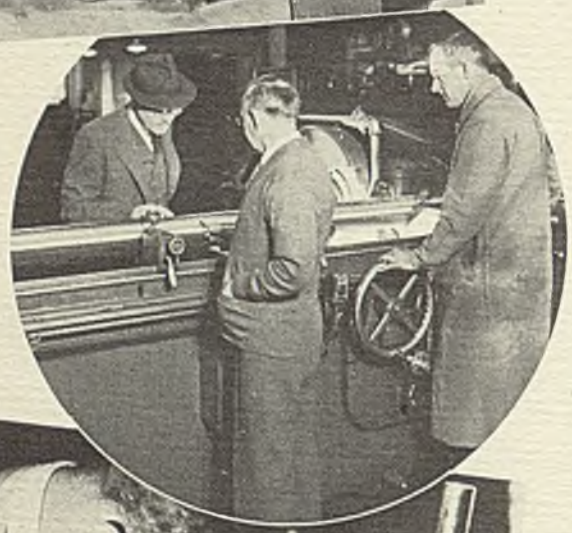
Research

A staff of over 50 trained scientists and technicians developing new abrasives, new bonds and improved manufacturing processes.

NORTON ABRASIVES

A Three Phase Distribution System

(1) In 150 cities Norton distributors carry grinding wheel and abrasive stocks for local needs. (2) Backing them are the Norton warehouses in five industrial centers with a half million stock wheels and facilities for emergency alterations of wheel sizes and shapes. (3) In the Worcester stock rooms are over 2,000,000 wheels in some 100,000 combinations of size, abrasive, bond, grain, grade and structure.

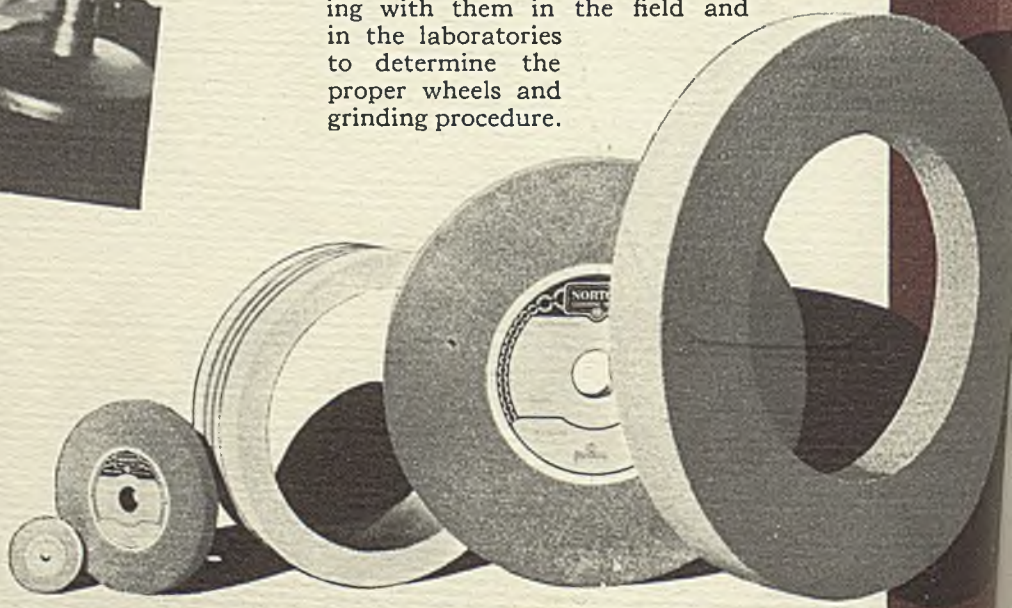


Consulting Engineering Service

Every hamlet is within reach of a representative of a Norton distributor—with experience and knowledge of the industries of the locality. Back of them is the experienced Norton field staff—operating from the Norton offices and warehouses and some twenty other industrial centers. Back of the field men are the special field engineers operating from Worcester—each a specialist in a particular type of grinding.

Extensive Research Laboratories

The work of the Norton staff of 50 trained scientists and technicians, with their nineteen well equipped laboratories—50,000 square feet of floor space—is divided into two important phases: (1) the constant improving of abrasives and bonds to provide better grinding wheels; (2) helping the engineering staff in the solving of customers' current problems—working with them in the field and in the laboratories to determine the proper wheels and grinding procedure.



NORTON COMPANY
WORCESTER, MASS.

New York Chicago Detroit
Philadelphia Pittsburgh Hartford
Cleveland Hamilton, Ont.
London Paris Corsico, Italy
Wesseling, Germany

Behr-Manning Division, Troy, N. Y.

NORTON SERVICE

CASTING

Superior castings result from application of metallurgical control, improved metal analyses and use of modern foundry equipment. Product designed for specific service needs

FLOW of foundry research findings from laboratories to casting floor proceeded at an uninterrupted pace during 1939 under impetus of technical conferences and symposia sponsored by organized groups of experts in the industry. Thus casting of steel, malleable iron, gray iron and nonferrous metals moves further from old rule-of-thumb methods which guided progress in another decade. Hand-in-hand with better appreciation of metallurgical control in castings production and of the value of detailed specifications of properties and analyses has come further perfection of mechanical equipment in all phases of foundry operation, plus more concerted attention to safety and health of working forces.

Over and above these practical considerations is the matter of the competitive position of castings versus stampings, plastics, welded steel and the like—competition of which foundrymen are well aware but perhaps not too aggressive in meeting. W. D. Hamerstadt, president, Rockwood Mfg. Co., Indianapolis, and president, National Founder's association, declares that too often foundry business is being lost by *default*.

The successful foundryman, in his opinion, should become a keen and skillful consultant in the *use* of castings, able intelligently to help customers improve their products and lower costs. Can a casting be made thinner and lighter and still be strong enough for purpose intended? Will more care in molding and cleaning improve appearance and save needless waste of time in finishing? What about finishing technique? Can the shape or design of a casting be changed with resulting saving in machine work or molding time? Can one casting be made to combine functions of two with resulting reduction of cost? These vital questions Mr. Hamerstadt urges foundrymen to examine closely.

Foundry managements are urged by Marshall Post, vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., to be watchful of their obligations for quality and service as well as quantity, especially these days when healthier business imposes more insistent demands for preferred deliveries and entails a rapid expansion of staff and personnel, placing greater strain on key men and equipment.

From the West coast, Charles Hoehn, president, Enterprise Foundry Co., San Francisco, notes that competitive manufacture of diesel engines, airplane parts, motors, valves, pumps and similar lines, has impelled foundries to adopt the most effective methods to produce castings of highest quality at lowest possible cost. High-test alloy castings of iron, steel, aluminum and bronze have become the rule of the day rather than exception. He cedes a large measure of credit to equipment suppliers and technical societies for technical progress on the Pacific coast.

Reluctance to take advantage of new materials because older materials were considered adequate for existing designs is giving way in the present era of redesign, says R. G. McElwee, foundry engineer, Vanadium Corp. of America, Detroit, adding that the challenge has been issued to the wideawake casting producer to take still another step both in composition and control methods.

C. W. Briggs, technical adviser, Steel Founders' Society of America, Cleveland, sums up progress for the year in the field of steel castings and notes primarily concentrated attention to such subjects as steel melting practice, slag control, sands, chills and chaplets, cleaning room practices, safety and hygiene. The industry

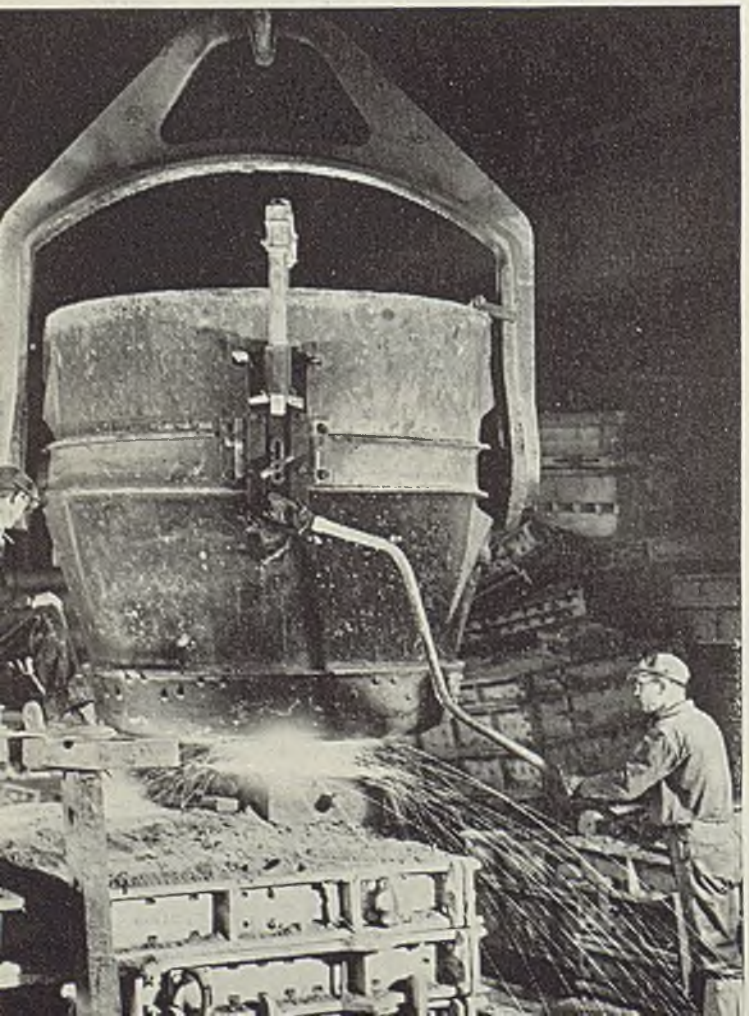
also has made important progress in the adoption of radiography as a method of nondestructive inspection.

On the subject of cast-welded construction, Mr. Briggs detects greater recognition by designers of the importance of welding castings to castings, or steel castings to wrought steel in the effort to reduce cost of all-welded fabrication. Furthermore, complicated castings which are most difficult to produce integrally are being considered from the standpoint of manufacturing them in readily castable parts and assembling the composite structure by welding.

Development of green sand practice for steel castings formerly produced by dry sand methods is considered a noteworthy step in the past year by John Howe Hall, consulting metallurgist, Philadelphia. Much work is being done, he observes, and with varying degrees of success, on the problem of obtaining more resistance to cutting and burning-on of the sand molds, especially near the gates. One suggestion has been to make the mold at these vital points of some refractory other than silica. Mr. Hall concludes significantly that the improvement in business of last year is likely soon to place a decided strain on organizations geared to the minimum tonnages of recent years.

Return to popularity of the bessemer converter as a melting medium for many steel castings is a prophecy "risked" by F. A. Melmoth, vice president, Detroit Steel Casting Co., Detroit, on assumption the price spread between scrap and pig iron is maintained as small as at present. He adds that desulphurization development, improved cupola practice, allied with probable economies in melting losses, and the fact that excellent physical properties can be obtained, may develop into a challenge to use of electric melting furnaces for small and medium steel castings.

■ Improved molding and melting practices and a wider range of analyses of iron, steel and nonferrous metals are enabling foundrymen to produce castings of superior quality



Mr. Melmoth likewise notes further progress in differential heat treatment of steel castings, including the established success of flame hardening castings of suitable composition. New avenues of application for steel castings have been opened thereby.

Attention is called by W. C. Hamilton, research director, American Steel Foundries, Chicago, to adoption of tentative specifications by the A.S.T.M. covering steel castings of three types, for fusion welding: Carbon steel castings for miscellaneous use; carbon steel castings for service at temperatures up to 850 degrees Fahr., and alloy steel castings for service at temperatures from 750 to 1100 degrees Fahr.

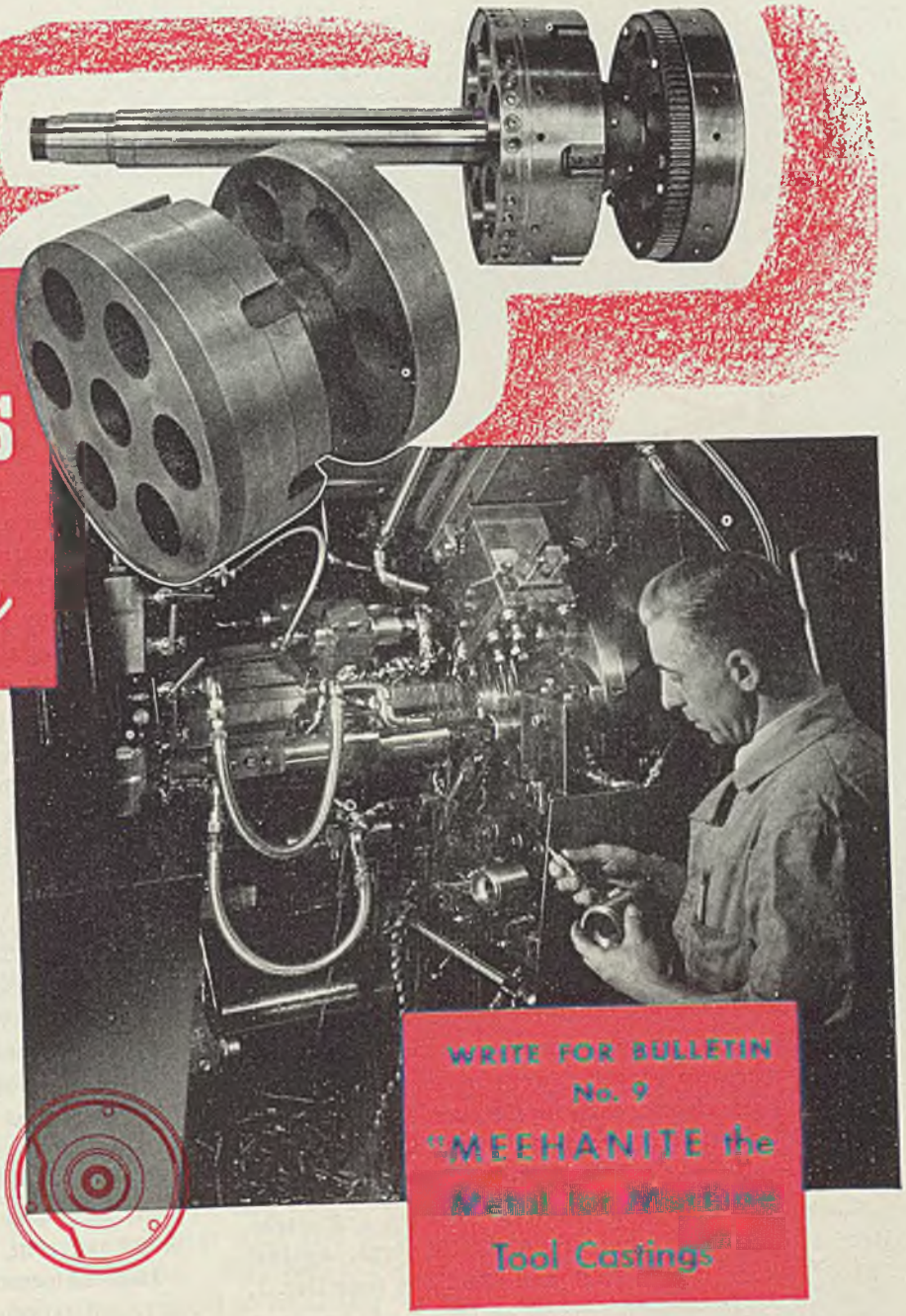
More Low-Alloy Steel Is Cast

Low-alloy steels are being used more extensively in the cast form, according to Mr. Hamilton, an example being high-tensile castings for railway equipment. Recognition of the importance of shape and location of inclusions on physical properties of castings, study of new deoxidizers, and the proper use of aluminum in acid electric steel are other milestones, as also must be the successful casting of gear blanks by the centrifugal process, now a commercial operation.

In the field of malleable irons, greatest interest continues to center around the so-called "pearlitic" malleables, a considerable number of which have been produced by varying methods and with different properties. Committee A-7 of the A.S.T.M. has submitted a tentative standard for pearlitic malleable, adopted by the society, intended only to identify properties and outline methods of acceptance testing. Difficulty of attempting to be at all specific in drawing up such a specification is emphasized by Dr. H. A. Schwartz, manager of research, National Malleable and Steel Castings Co., Cleveland, who, after reviewing the number of these new pearlitic malleables available, says "there is certainly as yet nobody of experience justifying the exclusion of these materials nor indeed have the possibilities been so far explored as to make it possible to predict precisely what combinations of properties can be had and which are most useful for various purposes. It would appear that this specification would have to stand as tentative for a considerable length of time until producing and consuming industries find what materials are desirable and what are not.

"The situation is rendered more difficult by the fact that certain particular operations are patented and

(*Please turn to Page* 355)



The RIGHT CASTINGS solve a modern problem

THE PROBLEM

To maintain exactness of tool alignment for consistent work accuracy at increased feeds and speeds,—to provide ability to withstand rapid and frequent torque shocks.

THE MACHINE

Acme-Gridley automatic bar and chucking machine manufactured by National Acme Company, Cleveland, Ohio (right).

THE PART

Spindle carrier.

Tool alignment in this machine depends upon permanency of spindle spacing. Carrier must therefore be free of internal strains.

THE SOLUTION

Meehanite castings, the *right* castings for the job.

With the application of *Meehanite* castings to the spindle carrier shown above, strength was doubled, as cast brinell was low enough to provide improved machinability, accompanied by freedom from internal distorting stresses after machining.

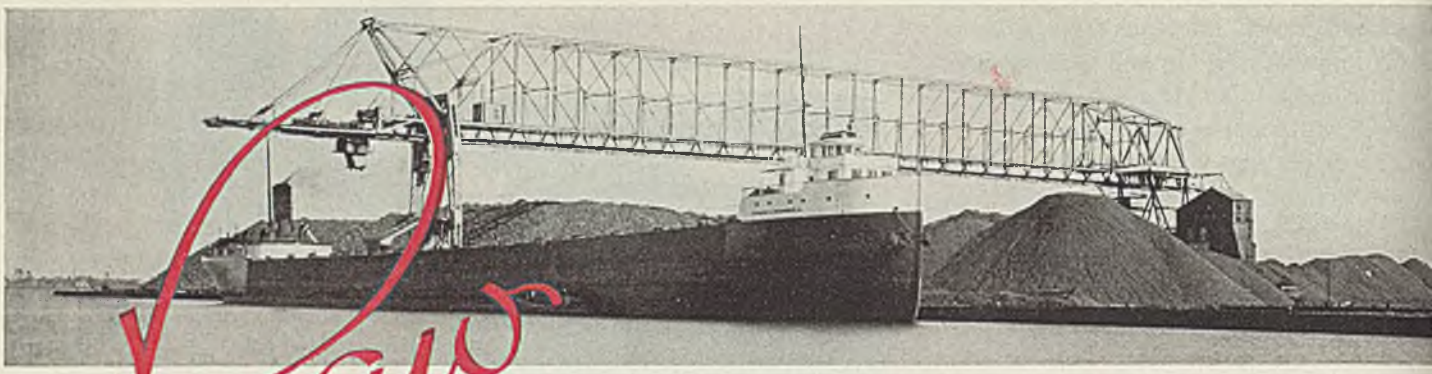
WRITE FOR BULLETIN No. 9 "MEEHANITE the Metal for Machine Tool Castings"

MEEHANITE RESEARCH INSTITUTE

311 ROSS STREET • • • PITTSBURGH, PA.

THERE IS A MEEHANITE FOUNDRY NEAR YOU

Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Bethayres, Pa.	H. W. Butterworth & Sons Co.
Bridgewater, Mass.	The Henry Perkins Co.
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Greenlee Foundry Company
Cincinnati, Ohio	Cincinnati Grinders Incorporated
Cincinnati, Ohio	The Cincinnati Milling Machine Co.
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Company
Hamilton, Ohio	Hamilton Foundry & Machine Co.
Irvington, N. J.	Barnett Foundry & Machine Co.
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Koehring Company
Mt. Vernon, Ohio	Cooper-Bessemer Corporation
New York, N. Y.	The American Brake Shoe & Foundry Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Canada	E. Long, Ltd.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co., (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Meehanite Metal Corporation
Pittsburgh, Pa.	Rosedale Foundry & Machine Co.
Rochester, N. Y.	American Laundry Machinery Co.
Springfield, Mass.	Fleming Foundry Co.
St. Louis, Mo.	Banner Iron Works
St. Paul, Minn.	Valley Iron Works
London, Eng.	The International Meehanite Metal Co., Ltd.
Waterloo, N. S. W.	Australian Meehanite Metal Co., Ltd.



Raw Materials

■ RESPONDING to sharply rising demand for raw materials late in the year, the Great Lakes fleet brought down 45,072,724 tons of iron ore in 1939, 134 per cent more than 19,263,011 tons in 1938.

Shipments to Aug. 1 were 15,541,187 tons, only slightly more than a third of the season's total. By Sept. 1 they amounted to 22,495,767 tons. In the last three months transportation was further speeded up, as much ore handled as during the prior four.

One hundred seventy ore carriers, with a total 1,584,600 tons per trip capacity, were in service last May. At the season's peak, early in October, 287 ships with 2,645,090 tons capacity, were in commission, aggregating 94.7 per cent of the lake bulk freighters.

Stocks on hand at lower lake furnaces and docks Dec. 1 were approximately 40,732,096 tons, against 37,456,325 tons Dec. 1, 1938, and 42,625,954 tons Dec. 1, 1937. The anticipated carryover on May 1 will be about 13,100,000 tons, far lower than 33,500,000 tons at opening of the 1939 shipping season and considerably less than is normal.

Consumption of iron ore in 1939 was approximately 44,000,000 tons, 71.1 per cent over 25,703,050 tons in 1938, but considerably less than 53,996,000 tons in 1937. In 1936 44,639,000 tons was used; 30,789,000 in 1935, and 22,113,000 in 1934. Highest tonnage on record, 63,645,000, was consumed in 1929.

Estimates of shipments from mines this year indicate 60,000,000 to 65,000,000 tons, compared with 62,598,000 in 1937. Significant was Ford Motor Co.'s formal inquiry early in December for 220,000 tons for 1940. Normally its inquiry is not issued until spring.

Domestic scrap consumption in 1939 increased to about 34,800,000 tons, up 62 per cent over 21,528,000 tons in 1938. This compares with the all-time record of 38,006,272 tons in 1937.

Scrap exports in the first ten months totaled 3,098,369 tons, compared to 2,401,793 tons in the corresponding 1938 period. For the full year 1939 they are estimated at 3,500,000, tons. Japan, for the fourth year, was heaviest buyer, taking 1,720,015 tons the first ten months last year, against 1,058,065 in the 1938 period, and 1,864,916 in 1937. United Kingdom, with 457,983 tons, was second largest importer of United States' scrap, Italy third. Total value of scrap exported in the first ten months was $46,572,685 in contrast with $37,034,379 in the same 1938 period.

In ten months last year scrap imports into the United States totaled 27,388 tons, valued at $281,223, compared to 12,183 tons valued at $153,802 in the corresponding 1938 period. To October, in 1937, 77,941 tons were imported. Practically all the scrap came from Canada.

Strong activity was noted in fourth quarter in Connellsville beehive coke. Of slightly more than 6500 beehive ovens available, nearly 5500 were producing in mid-December.

By-product ovens have been operating at capacity. Of total coke production in the first ten months last year, 33,745,953 tons was by-product, and 734,600 tons, or 2.1 per cent, beehive.

Lake shipments of limestone in 1940 are estimated at 12,000,000 tons, against 8,240,000 in 1938, 14,429,000 in 1937 and 12,080,000 in 1936. These figures include all limestone transported on the lakes, not solely that for steelmaking.

Ore, Scrap, Coke, Limestone Statistics

(Unit: 1000 tons)

	Lake Superior Ore Consumed	Lake Superior Ore Shipped by vessel	Domestic scrap consumption	Total coke production	Lake shipments limestone
1939	44,000*	45,072	34,800	34,480†	12,000*
1938	25,703	19,263	21,528	32,661	8,240
1937	53,996	62,598	38,006	52,375	14,429
1936	44,639	44,822	36,358	46,275	12,080
1935	30,789	28,362	26,415	35,141	9,082
1934	22,113	22,249	18,800	31,821	7,392
1933	18,115	21,623	17,460	27,589	6,664
1932	10,283	3,567	10,000	21,788	3,928
1931	24,114	23,467	18,300	33,728	7,208
1930	45,192	46,582	26,600	48,302	12,432
1929	63,645	65,204	37,600	59,883	16,269

Iron ore and scrap, gross tons; coke and limestone, net tons.
* Estimated. † Ten months.

America's Hospitality-

. . . IS CAPPED WITH STEEL

Millions of times every day someone flips the top off a cool, refreshing bottled drink. That top, which protects the purity of the drink, is made of tin plate.

From refreshment to furnaces, cans to clothing, matches to movies, our lives depend on steel. We sleep on steel springs, bathe in a steel tub, cook on a steel range, use food out of steel cans plated with tin, drive a steel car, work in a steel building at steel machines, and live securely because steel guards our nation's borders. To make all the modern steels for these many uses requires modern equipment, and Youngstown has spent $94,000,000 in the past ten years to keep its mills up-to-the-minute. However, men are more important than machinery in the making of steel, and Youngstown is more proud of its experienced men than of all the equipment in the world. We in the sales department know how these workmen operate .... we've watched them in the mills and we know they won't allow a pound of steel to carry their name that isn't the finest that can be made. You can't blame us for being proud to offer the output of a bunch like that.

★

QUALITY
TRADE MARK
YOUNGSTOWN
SERVICE

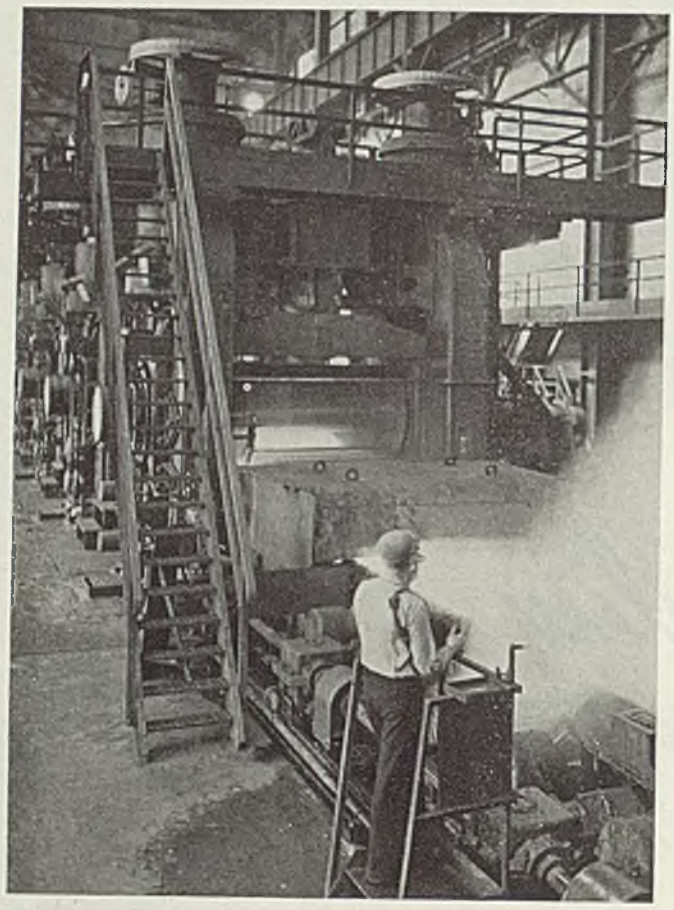
Cold Reduced Coke Tin Plate - Sheets - Plates - Pipe and Tubular Products - Conduit - Bars - Rods - Wire Nails - Tie Plates and Spikes

25-17B

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - YOUNGSTOWN, OHIO



A hiss of steam, a scattering of scale, a trip between shiny-faced rolls and what once was a slab becomes an autobody sheet

Steelworks Expansion

By JOHN D. KNOX
Associate Editor, STEEL

■ WHAT a cheery atmosphere that blankets the iron and steel industry at the opening of the new year. Factory whistles blow in hundreds of industrial towns. Workers troop toward steel mills where they man the furnaces and manipulate levers that start heated ingots bouncing along approach tables into the gap of the blooming mill rolls.

Electric lights high on plant transmission towers are burning throughout the night. Had you looked over the fence of any steel plant a year ago you would have seen only a few automobiles parked outside semidarkened buildings. Today parking lots inside the steelworks' gate are well filled with cars day and night for payrolls have become swollen into the top brackets. Today sweaty men are engaged in making and shaping steel on a basis that makes production figures stand out in bold relief.

If it were possible to stave off winter, ore boats still would be plying the Great Lakes with their precious cargoes well beneath the surface of the water. Slack wind at blast furnaces is forgotten at the moment for the reason that skip cars are carrying full burdens. Bessemer converters light the sky all through the night. Open hearths are making their brew on regular schedules. Finishing departments have every one of their inspectors engaged.

Everywhere the electric drill is whining as it burrows its way through the iron notch of blast furnaces to start molten metal running down the trough. Everywhere tapping bars are being inserted through the wicket of the open-hearth charging door to poke out heats of steel. Everywhere ingot buggies are rumbling through mill yards as they move red-hot "sentinels" to soaking pits. Everywhere the crunch of steel is heard as mill rolls knead ingots to the desired shape. Everywhere the forging hammer is pounding steel to ordered contour.

Steel is being made at a rate which was thought impossible but a few months ago!

In view of the upturn in the iron and steel industry this question is being asked more and more: "What is the outlook for new iron and steelworks expansion?" Mention of the word "expansion" causes those who are responsible for charting the course of their companies to turn their memory back to the days of the Great War when iron and steel plants went through an era of drastic enlargement only to be followed by an army of spiders which marched into darkened buildings and used rusty mill housings as an anchor for their shiny webs.

And now once again Europe is a busy beehive only the products do not have the sweetness of honey. By day and night the forges flame, the heating furnaces roar, and the riveting hammers and welding torches join steel to steel to form some new instrument of war. Gun after gun is bored and shaped and fashioned for a new fleet that soon is to sail the seas. Europe is in a tension that chills the whole world. A fog hangs over

Only one organization in this specialized field accepts

UNDIVIDED RESPONSIBILITY

ONLY Arthur G. McKee & Company is prepared to offer a *complete* engineering and construction service, within its own organization, to the Iron and Steel Industry.

With a third of a century of world-wide experience and a large and highly specialized staff, this company is in a position to render all services from preliminary surveys to complete construction ready for operation.

Requirement surveys, economic studies, cost estimates, plant design and construction, design, selection, purchase and erection of equipment are all under the direction of experienced technical experts.

The McKee method of Undivided Responsibility gives to all parties concerned accurate foreknowledge of every detail of the project.

The value of the McKee method of operating under one lump sum contract has been proven in the Iron and Steel Industry throughout the world.

ARTHUR G. McKEE & COMPANY

★ *Engineers and Contractors* ★

2422 EUCLID AVENUE · CLEVELAND, OHIO

30 ROCKEFELLER PLAZA, NEW YORK, N. Y. · BUSH HOUSE, ALDWYCH, LONDON, W. C. 2, ENGLAND

every capitol that masks the plans of governments. Too many loaded guns are cocked. The ocean is as restless and troubled as the land. Destroyers are riding the waves up and down like fishing bobs. Submarines are diving beneath the surface like giant crabs. Never has the word "security" commanded so little respect. In the light of all this there is little wonder that eyebrows turn downward when the term "expansion" is mentioned. Uncertainty across the water has had a dampening effect on planning for the future.

Then, too, revolving doors in many administration buildings are in motion a great deal of the day. Busy men pass in and out with quick step, their caps and work shirts sparkling with flakes of graphite from the steelworks. Production problems are occupying their attention to such an extent that little thought is being given to problems of expansion. In fact, there is a strong tendency to avoid expansion lest it result in over-expansion.

Moreover, management is faced with excessive taxation and this is tending to drive any thought of plant enlargement from the minds of those who occupy the "front offices." On the other hand many executives are cautious in their commitments for expanding steelmaking and finishing capacity preferring to be in a position to incorporate any late and drastic developments.

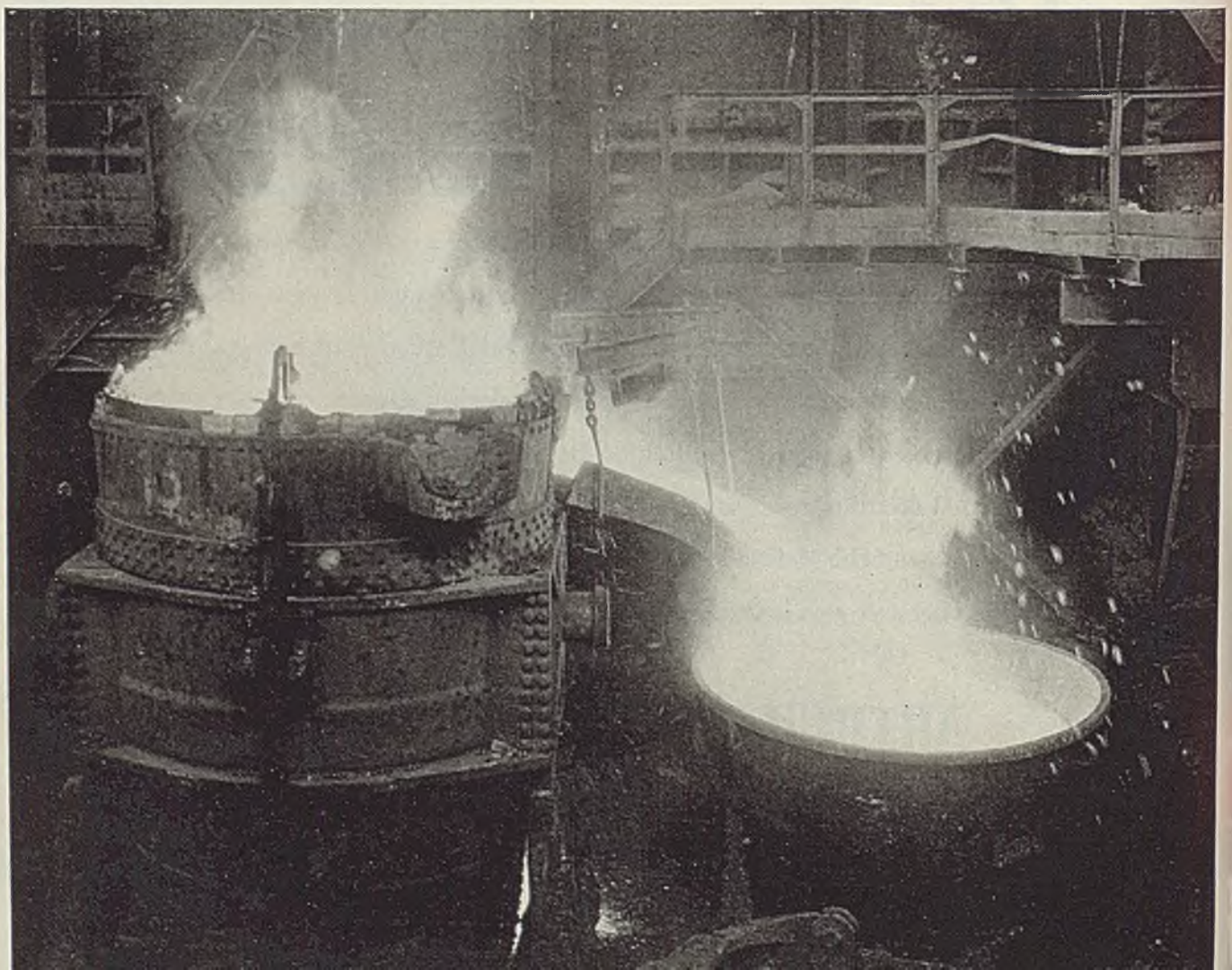
So that a busy industry, unsettled European conditions and burdensome taxation may be said to be the principal influences that are restraining expansion in the iron and steel industry when considered from various angles.

But an entirely different condition exists concerning modernization programs. Activity within mill enclosures, or no activity, modernization of producing units must be effected if the plant is to engage in business on a profitable basis. And that is just what is occurring now as an analysis of company reports shows.

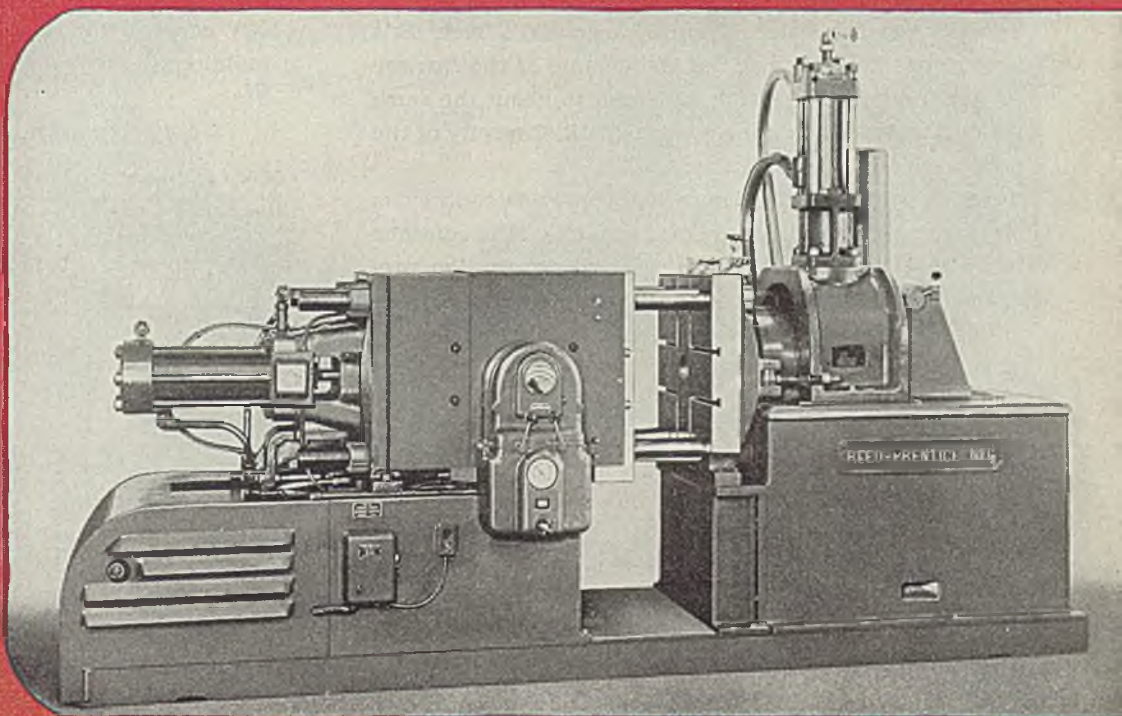
Blocks of by-product coke ovens are being rebuilt along modern lines. By-product refining equipment is being replaced. Blast furnaces are being rebuilt and enlarged to cast larger tonnages. Stacks are being equipped with revolving distributors or present distributors are being remodeled. Open-hearth furnaces are being altered to tap larger heats of steel. Soaking pits are being replaced with more efficient units. True, all this improvement is not being done on a wide scale but it is being accomplished at a rate which in the aggregate commands attention.

Three stacks were remodeled and enlarged during the year just closed. That of the Republic Steel Corp., Warren, O. invites attention in that it was rebuilt in

Magnify this open-hearth pouring scene many times and you have a typical picture of the American steel industry at present



MODERN REED-PRENTICE DIE-CASTING MACHINES



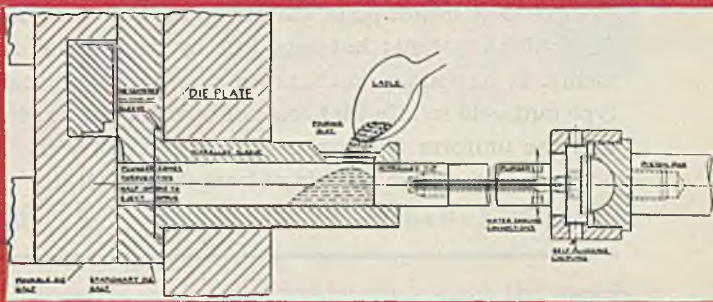
NO. 1-1/2 ALL HYDRAULIC DIE CASTING MACHINE FOR ZINC, TIN OR LEAD BASE ALLOYS WITH SEMI-AUTOMATIC ELECTRIC CONTROL

[illegible]

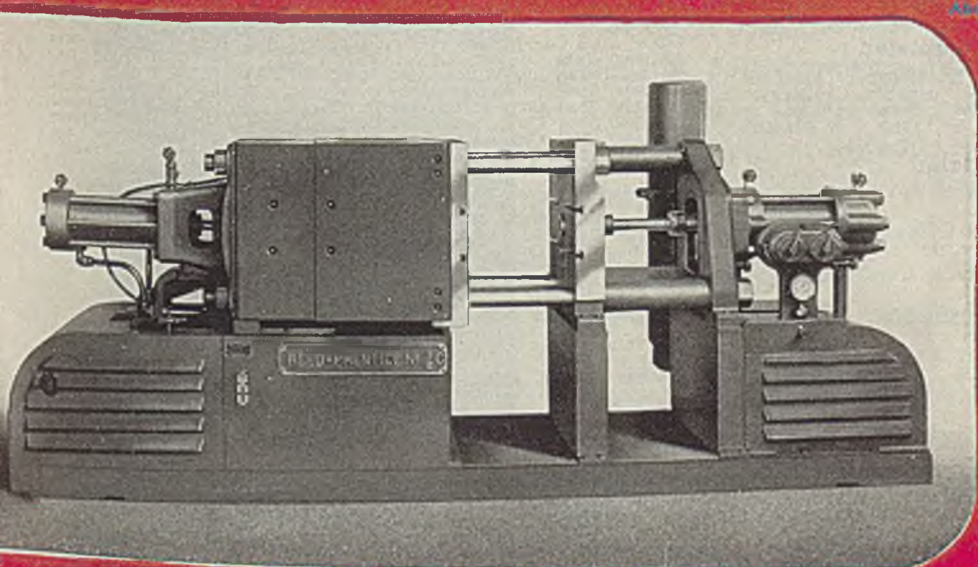
SPECIFICATIONS

	No. 1½	No. 2
Approximate size of die plates	23x29 in.	32x37 in.
Cap. of melting Pot (Zinc)	300 lbs.	900 lbs.
Space between bars	15x18 in.	18x21 in.
Die Opens	10 in.	12 in.
Maximum Die Space	18 in.	24 in.
Minimum Die Space	6 in.	8 in.
Locking pressure (Tons)	[illegible]	[illegible]
Weight	[illegible]	[illegible]

WRITE FOR COMPLETE DETAILS



Above line cut shows principle of operation, "G" type machine



NO. 1½G HYDRAULIC HIGH PRESSURE DIE CASTING MACHINE — FOR ALUMINUM, BRASS, MAGNESIUM OR ZINC

SPECIFICATIONS

	No. 1½G	No. 2
Approximate size of die plates	23x29 in.	32x37 in.
Space between bars	15x18 in.	18x21 in.
Die opens	10 in.	12 in.
Max. Die Space	18 in.	24 in.
Min. Die Space	6 in.	8 in.
Locking Pressure (Tons)	[illegible]	[illegible]
Weight	[illegible]	[illegible]

We solicit your die casting problems and offer a complete "Die Casting Service" including Machines, Dies, Design, for die cast parts in Zinc, Tin or Lead base alloys, Aluminum, Brass and Magnesium.

REED-PRENTICE CORP.

DIE CASTING MACHINES
PLASTIC INJECTION MOLDING MACHINES
LATHES, ENGINE, TOOL ROOM AND PRODUCTION
DIE SINKING MACHINES
VERTICAL MILLING MACHINES

record time, approximately 85 days lapsing from the time it was blown out until the torch was applied. Construction work was carried on day and night during this period. The diameter of the hearth and bosh was increased and the height from 91½ to 106½ feet. This new height kept the ratio of the volume of the furnace to the areas of the hearth and bosh to about the same ratios adopted when the stack was built. Capacity of the new stack is 1200 tons a day.

But in cold reducing departments of wide continuous stripsheet mills additional stands of cold rolls continue to be installed. Here in particular modernization programs are receiving attention. Inquiry for tandem cold mills and temper pass stands indicates that producers of tin plate are concerned over tight rolling schedules that have plagued cold mill departments on several occasions. Consequently, steps are being taken to bring producing facilities more in line with domestic and export tin plate requirements. Tandem mills are being altered to include additional stands of rolls. Single stands are being changed to roll wider stock. The speed of cold reducing and temper pass mills is being increased to conform to modern practice.

In the pipe industry the trend is toward the adoption of a recently developed buttweld mill of the continuous type for making pipe in a range of diameters from ¼-inch to 3 inches. The unit is being built under the Fretz-Moon patents but modified by several improvements. It has many advantages over the conventional type buttweld mill in that costs of operation are reduced and the uniform heating affords a uniform weld, less wastage and a high bursting strength. In fact, the heat control is the heart of the process as pointed out in a detailed description of the unit in STEEL, Aug. 1, 1939, page 40. This year seven of these new mills will swing into production.

New construction completed in 1939 or in the state of building at the opening of the new year, follows:

CARNEGIE-ILLINOIS STEEL CORP.

Completed

66,000 volt electric power transmission lines between S. Chicago and Gary, Ind., including transformer and switching facilities. Improvements to electric furnace plant and extending electrical distribution system. Mold conditioning building and equipment. New benzol refining plant and improvements to auxiliary equipment. Relining and improving four blast furnaces.

Underway

Relining and improving seven blast furnaces. Rebuilding two batteries of coke ovens. Improvements to electrical distribution system at Gary, Ind. Enlarging plate producing facilities and electric power station.

NATIONAL TUBE CO.

Completed

Changes and improvements to seamless mill for producing finished tubes in 50-foot lengths. Improvements in facilities for stocking and handling materials, new charging machines, cranes, ladles, etc. necessary for increased output at open-hearth department.

Underway

Sintering plant for blast furnace flue dust and sludge.

AMERICAN STEEL & WIRE CO.

Completed

Extension and improvements of facilities for making cold rolled strip. Additional facilities for making asbestos insulated wires and cables.

Underway

Additional heat treating equipment for rods and wire.

TENNESSEE COAL, IRON & R. R. CO.

Completed

Processing line for drum stock and coal cutting machines.

Underway

Central ore conditioning and sintering plant. Relining blast furnace. Annealing furnaces. Electric hoist and mechanical coal conveying units and coal cutting machines.

COLUMBIA STEEL CO.

Underway

Warehouse building. Mechanizing sheet mill. Open-hearth stockyard.

General

Purchase of Boyle Mfg. Co., manufacturer of drums and pails.

(*Please turn to Page* 359)

Equipment Completed or Building in 1939

Open-Hearth Furnaces Completed

Company	No. of furnaces	Rated capacity, tons	Annual capacity, tons
Laclede Steel Co., Alton, Ill.	1	150	342,800

Blast Furnaces Remodeled

Company	Name
American Rolling Mill Co., Ashland, Ky.	Norton
Inland Steel Co., Indiana Harbor, Ind.	No. 1
Republic Steel Corp., Warren, O.	Trumbull-Cliffs
Total	3

Blast Furnaces Dismantled

Company	Name
Chateaugay Ore & Iron Co., Standish, N. Y.	Standish
Jenifer Iron Co., Jenifer, Ala.	Jenifer
Witherbee Sherman Corp., Port Henry, N. Y.	Nos. 1 & 2
Total	4

By-Product Coke Ovens Completed

Company	Number of ovens	Type of ovens*	Est. annual coking cap., tons
Ford Motor Co., Dearborn, Mich.	61	K-B	385,000

*Type of ovens: K-B, Kopper-Becker.

Rolling Mills Completed

Company	No. mills		Type mills
Allegheny Ludlum Steel Corp., Leechburgh, Pa.	1	24"	cold strip
American Rolling Mill Co., Middletown, O.	*1		slabbing
American Rolling Mill Co., Middletown, O.	1		vertical edger
Ames Baldwin Wyoming Co., Marietta, O.	1	60"	breakdown
Athenia Steel Co., Clifton, N. J.	1	7½"	cold strip
Cold Metal Process Co., Youngstown, O.	1	8¼"	cold strip
Granite City Steel Co., Granite City, Ill.	1	48"	skin pass
Granite City Steel Co., Granite City, Ill.	1	48"	cold strip
Inland Steel Co., Indiana Harbor, Ind.	1	54"	2-high skin pass
National Tube Co., McKeesport, Pa.	1		cold sizing
Purdue University, W. Lafayette, Ind.	1	8"	cold mill
Republic Steel Corp., Massillon, O.	1	34"	4-high stainless
Republic Steel Corp., Massillon, O.	1	28"	4-high stainless
Republic Steel Corp., Massillon, O.	1	20"	4-high stainless
Republic Steel Corp., Massillon, O.	1	34"	2-high skin pass
Republic Steel Corp., Youngstown, O.	1		cont. buttweld
Weirton Steel Co., Weirton, W. Va.	†3	32"	structural
Weirton Steel Co., Weirton, W. Va.	1	54"	4-high skin pass
Weirton Steel Co., Weirton, W. Va.	3	70"	3-h. structural
Weirton Steel Co., Weirton, W. Va.	2	48"	2-h. structural
Weirton Steel Co., Weirton, W. Va.	2	36"	2h. beam
Wheeling Steel Corp., Benwood, W. Va.	*1		blooming
Youngstown Sheet & Tube Co., Ind. Har., Ind.	*1	46"	blooming
Youngstown Sheet & Tube Co., Ind. Har., Ind.	1	54"	hot strip
Youngstown Sheet & Tube Co., Ind. Har., Ind.	5	48"	cold strip
Youngstown Sheet & Tube Co., Ind. Har., Ind.	1	100"	broadside
Total	33		

†Stands of rolls. *Replaces blooming mill.

Rolling Mills Building

Company	No. mills	Type mills
Acme Steel Co., Riverdale, Ill.	†1	4-high cold strip
Bethlehem Steel Co., Sparrows Point, Md.	2	cont. buttweld
Columbia Steel Co., Pittsburg, Calif.	1	breakdown
National Supply Co., Etna, Pa.	1	cont. buttweld
Republic Steel Corp., Youngstown, O.	1	cont. buttweld
Rustless Iron Co., Baltimore	1	9" 3-h. merchant
Signode Steel Strapping Co., Chicago	1	reversing
Superior Steel Corp., Carnegie, Pa.	1	4-high cold strip
Weirton Steel Co., Weirton, W. Va.	1	66" 4-h. hot strip
Wheeling Steel Corp., Benwood, W. Va.	1	cont. buttweld
Wheeling Steel Corp., Steubenville, O.	*1	4-high skin pass
Wheeling Steel Corp., Steubenville, O.	1	4-high cold strip
Wheeling Steel Corp., Yorkville, O.	1	skin pass
Youngstown Sheet & Tube Co., Campbell, O.	1	cont. buttweld
Youngstown Sheet & Tube Co., Ind. Har., Ind.	1	cont. buttweld
Youngstown Sheet & Tube Co., Ind. Har., Ind.	1	2-high skin pass
Total	16	

†Tandem. *Replacement; not included in total.

BEFORE YOU BUY ANY WELDER *Make the* AMMETER TEST

With conventional type welding machines, the ammeter reading varies as much as 25%.

With Flexarc welding machines, the ammeter stays put — proof of stable current, stable arc.

STABLE NEEDLE PROVES *Flexarc's* SMOOTHER, STABLE ARC

It's the steady flow of current from your welder that gives the steady flow of metal from the electrode. In buying welding machines make sure that the flow of current is steady — put an ammeter on the working end of the cable. Compare the reading as shown on the Flexarc with the reading shown on any other type of welder.

Note how rock-steady the needle stays when the Flexarc is in operation. Compare it with the needle variations on conventional type welders — the proof is there, proof you can't afford to overlook if you want to get the most welding done for your money.

You can rent a Flexarc — easy terms. Send the coupon for details. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

J-20915

Westinghouse Flexarc Welders

Show Us!

☐ Send us the facts about Flexarc welders, including details of your rental plan.

Name_____

Company_____

Address_____

City_____

Unemployment—Still No. 1 Problem

■ AS THE NEW year dawns, all thinking businessmen continue to view unemployment as the nation's No. 1 problem. Despite the fact that industrial activity has increased rapidly in recent months, the ranks of the unemployed have not been reduced to the degree that might have been expected. According to the National Industrial Conference board, the unemployed in October still numbered approximately 8,149,000. On the basis of normal relationships of the past, this is an appalling number for a month in which steel production was close to 90 per cent of ingot capacity.

This condition is the consequence of unsound national and state laws and policies. These, as made plain in B. K. Price's admirable article in this issue of STEEL (p. 152), make it difficult for industry to provide employment. On the one hand, industry is asked to keep its wages and other costs high. On the other it is asked to keep down prices and profits. Under the controls that now prevail, it is mandatory for individual companies, if they are to survive, to be extremely careful about building up their payrolls.

Compensation Laws Penalize Re-Employment, Keep Down Payrolls

It is no secret, for example, that, despite its present high level of employment (544,874 in October compared with the record 603,106 in August, 1937), the steel industry would have many thousands of additional names on its payrolls were it not for the effects of state unemployment compensation laws. These laws vary somewhat but all amount to pretty much the same thing. In Ohio, New York, Minnesota and Illinois, laid-off employes can collect unemployment compensation up to $240, on the basis of $15 a week for 16 weeks. In Pennsylvania it is $15 for 13 weeks, or $195. In Michigan it is $16 for 16 weeks, or $256. In Indiana it is $15 for 15 weeks, or $225. In Alabama it is $15 for 20 weeks, or $300.

These payments quickly run into large sums which constitute a great burden to the companies involved. Under public pressure against increased prices and profits, the steel industry has no recourse excepting to fight all cost increases. On the basis that the necessity for more help usually is short-lived, it finds it cheaper to pay its existing employes for overtime work. Instead of employing more people in large numbers, it is forced to find ways of holding new employment to minimum. The same is true of industry as a whole and the matter is of growing concern in view of the increasing pressure from many directions for so-called liberalization of the state unemployment compensation laws so as to provide for greater compensation over longer periods.

Free Enterprise, Profit Motive Only Path to Real Prosperity

Industry universally favors national policies aimed at better living conditions, more security for the individual citizen. Its quarrel is with the unsoundness of many of the laws and policies which aim at this objective. Its quarrel is with the viciousness of many motives that are cloaked by these laws and policies. It knows that only a restored recognition of the necessity for encouraging free enterprise through the hope of earning a profit eventually will bring the kind of prosperity desired by the people of this country. Businessmen should have this whole matter foremost in mind during this presidential election year.

The BUSINESS TREND

Prospect of a Durable Goods Recovery Best in 10 Years

■ The pattern of business activity during 1939 has been noteworthy on two counts. Probably the most important development was the upsurge in industrial production which began in midyear and was accentuated by the outbreak of war in Europe. A secondary development, and one closely related to the first, is that a few industrial production indexes set all-time records.

In one respect most business indicators followed the general trend recorded during 1938. The tendency was downward through the early months, followed by a sharp upswing in the second half. However, 1939 differs with 1938 in that the early downward trend was not so sharp, while the recovery movement was one of the swiftest recorded and extended to substantially higher levels than registered late in 1938.

Compared with 1937, the 1939 pattern reveals directly opposite trends. During the first six months of 1937 many business indicators reached the highest levels since 1929. A slight recession occurred in June of that year and developed into one of the sharpest declines in history during the closing months.

It is evident from the foregoing that business during the past few years has been anything but steady. Many benefits that should have been derived from the several periods of good business were lost in the violent reactions that followed. Despite the supposedly stabilizing effects of a planned economy, the business cycle since as far back as 1933 has fluctuated more sharply and more frequently than ever before. The distribution of the business activity throughout a year is as important in some respects as the total volume of business transacted during the year.

Activity during the past year in the iron, steel and metalworking industries, as recorded by STEEL'S index, began to move slightly upward during the summer months. However, following the outbreak of the European war one of the sharpest upturns in history developed. STEEL'S index rose from the 83.7 level in the first week of September to 124.2 in the week ended Dec. 16, a gain of 40.5 points or 48 per cent.

During this period ingot production and electric power output set all-time records. Railway equipment suppliers, machine tool builders and aircraft manufacturers stepped up operations to near capacity levels. In all lines of steel and metalworking industries large order backlogs were accumulated, sufficient in some instances to sustain a good rate of operations through the first quarter of this year.

Sharp gains in farm equipment purchases and the probability that demand from this source will record further improvement during the late winter and early spring months are encouraging. Sales of electrical equipment reached an exceptionally large volume during the past few months and new installations by the electric light and power companies in 1940 seem certain to be well ahead of 1937 and the largest in ten years. The electrical power industry is making plans more confidently for installations two or three years ahead.

Another important factor in the outlook is the encouraging improvement recorded in private residential construction and, perhaps of more immediate importance, the large increase in the

In This Section

volume of plant expansion contracts placed recently and under serious consideration. Whatever their feeling about the future, many concerns are compelled to go ahead with expansion programs or with modernization and replacements to meet present demands.

Late in the year STEEL's index exceeded the highest level reached during 1937, but remained slightly below the high point recorded during 1929 of 125.3.

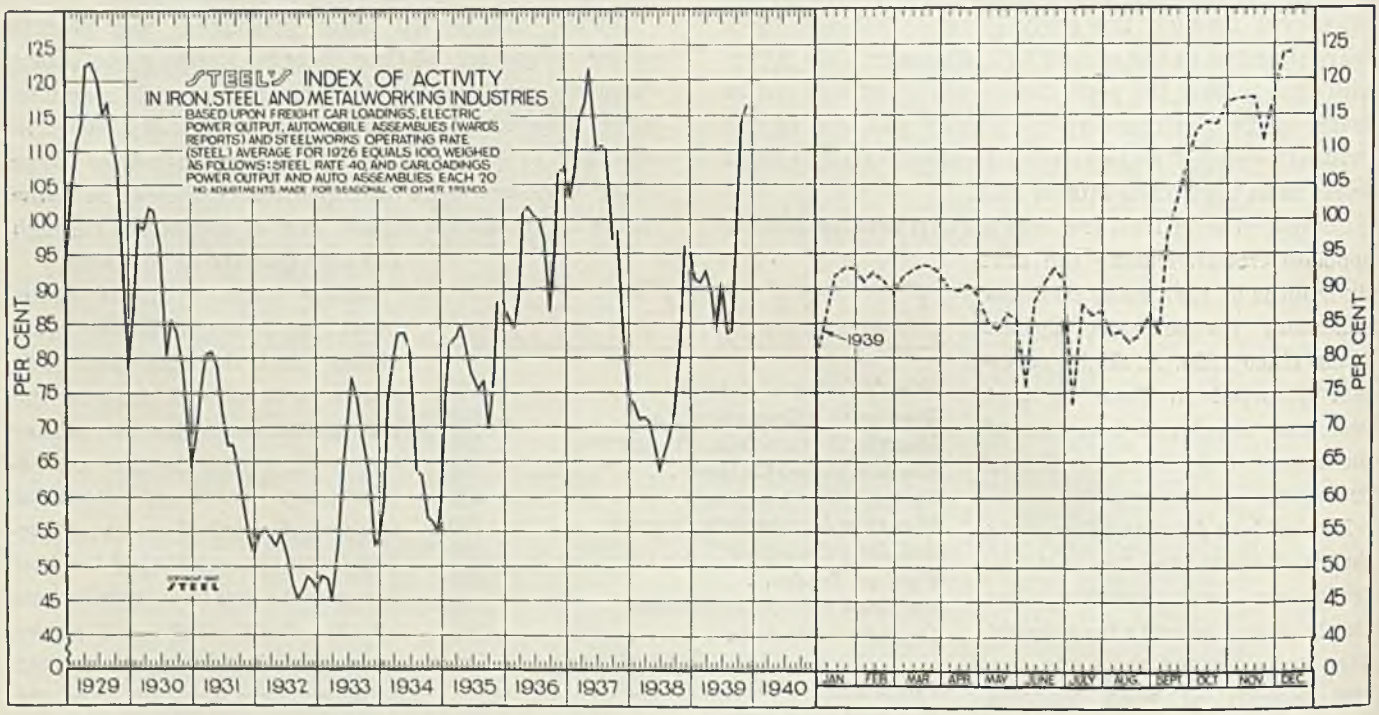
The average of STEEL's index last year approximated 96, compared with an average of 74.9 in 1938. In 1937 the average was 104.1, while in 1929 it was 109.5.

Characteristic of 1939 was the sharp contrast between price and market conditions during the first half with those prevailing later in the year. During the first six months new demand was restricted to actual needs. The trend of prices generally reflected this condition. However, in the early summer months, when business again started on the upgrade, prices firmed. Immediately after the outbreak of war a short-lived stiffening in prices developed. Fortunately a moderate readjustment occurred and the beneficial effects remain. The spurt in business activity, which originated as a forward buying movement in materials, has broadened encouragingly into a moderate revival in capital expenditures.

To what extent this trend will continue depends on whether political policies in the near future will be adjusted to encourage domestic enterprise so that the prospects for business profits will once more induce large numbers of corporations to raise new capital for plant expansions and modernizations. Revision of legislation is highly desirable so as to make it more attractive for investors to take risks involved in purchasing new securities.

While industrialists have wisely kept prices relatively stable during the past few months, the danger of war boom psychology is still present. The position taken by many is to keep costs down, hold prices, wages, and all the other elements in the economic system in balanced relationship, and to make sure that whatever changes are instituted are toward improving the equilibrium instead of disturbing it.

With the capital goods industries as active as is now indicated for the first quarter it would appear doubtful that a major business recession will develop. Despite the possible burdensome inventories in some lines during the early months of this year, business in the first quarter will have the support of a high level of operations in the capital goods industries. The inventory position in most lines of business is not as serious as earlier feared, for consumption is now at substantially higher levels and conditions such that it is necessary to carry supplies of at least 60 to 90 days duration instead



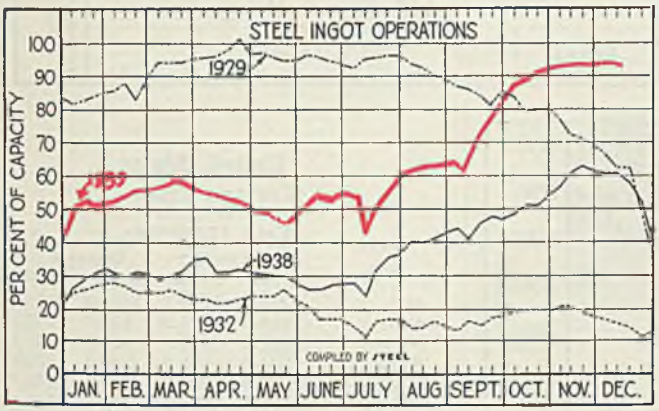
Week ending	1939	1938
Sept. 30	107.9	74.9
Oct. 7	112.5	78.9
Oct. 14	113.9	84.3
Oct. 21	113.6	88.7
Oct. 28	116.2	91.4
Nov. 4	117.1	93.4
Nov. 11	117.2	95.9
Nov. 18	117.3	100.4
Nov. 25	111.4	93.9
Dec. 2	117.9	100.1
Dec. 9	123.9	100.7
Dec. 16	124.2	99.8

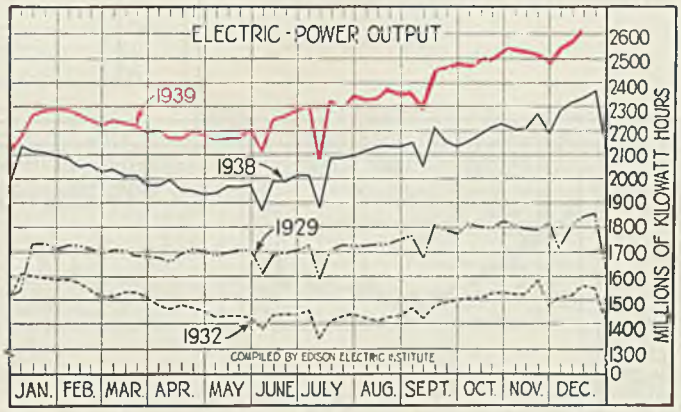
Mo. Data	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	112.2
March	92.6	71.2	114.4	88.7	73.1	68.9	44.5	54.2	80.4	98.6	114.0
April	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	114.0	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	....	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

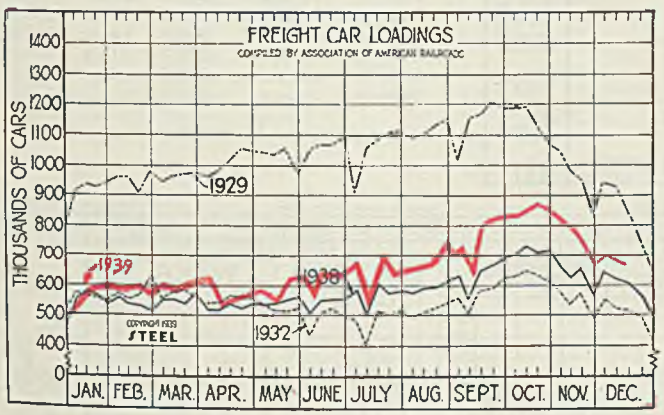
of a much shorter period as was the practice during most of last year.

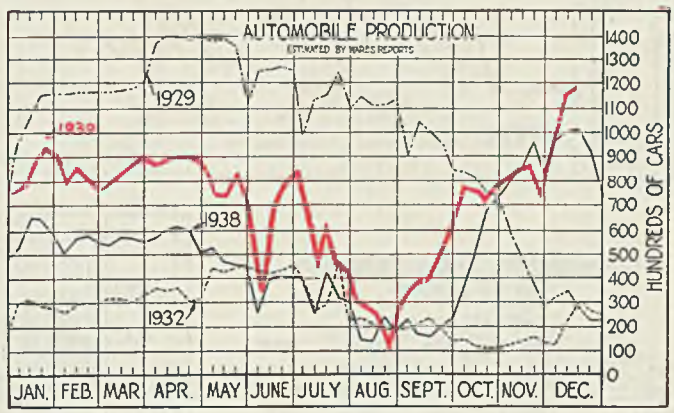
Indications point to an average higher level of industrial activity throughout 1940 than was experienced this past year. As we enter 1940 the unsolved problems are many, but industry is in a stronger position to cope with them than a year ago. At this time last year the rise which we had experienced in business activity had been based primarily on consumer goods recovery. While to a certain extent this condition still exists, there has nevertheless developed with the current upswing a decided improvement in the operations of the durable goods industries. In this recovery of the heavy industries lies a true opportunity to achieve a lasting balanced prosperity.

The war in Europe and the general high level of industrial activity should not absorb all of our interests at this time. The factors which have handicapped industry these past few years are still present. Continued government deficit, unfair labor laws, restrictive regulations and many other detrimental factors still act as a drag on the long term prospect for business activity.









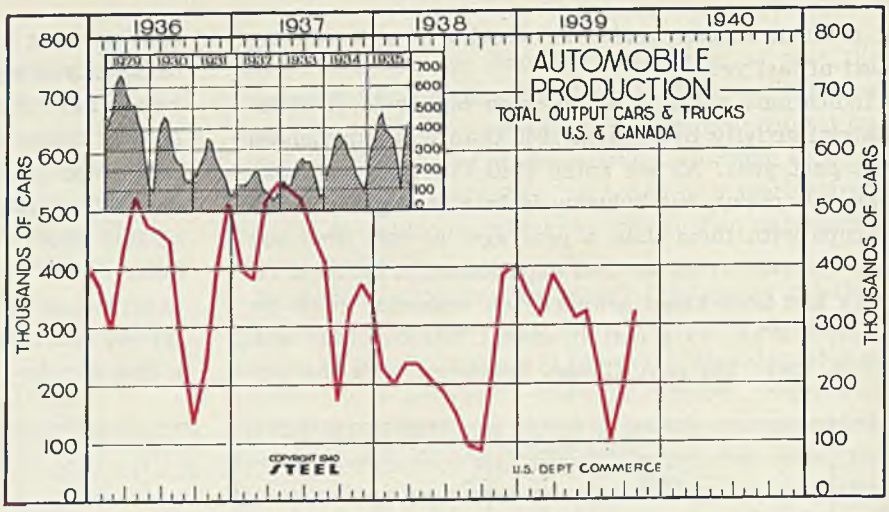
For week ended	National steel rate (%)	Freight car loadings 1000 cars	Electric power output million KWH	Automobile output 1000 units
Jan. 7	51.5	531	2,169	76.7
Jan. 14	52.0	587	2,270	86.9
Jan. 21	51.5	590	2,290	90.2
Jan. 28	51.5	594	2,293	89.2
Feb. 4	53.0	577	2,287	79.4
Feb. 11	54.0	580	2,268	84.5
Feb. 18	55.0	580	2,249	79.9
Feb. 25	55.0	561	2,226	75.7
Mar. 4	56.0	599	2,244	78.7
Mar. 11	56.5	592	2,238	84.1
Mar. 18	56.5	595	2,225	86.7
Mar. 25	55.5	605	2,199	89.4
Apr. 1	54.5	604	2,210	86.0
Apr. 8	53.5	535	2,174	87.0
Apr. 15	51.5	548	2,171	88.0
Apr. 22	50.5	559	2,199	90.3
Apr. 29	49.0	586	2,183	86.6
May 6	49.0	573	2,164	71.4
May 13	47.0	555	2,171	72.4
May 20	45.5	616	2,170	80.1
May 27	48.0	628	2,205	67.7
June 3	52.0	568	2,114	32.4
June 10	53.5	635	2,257	65.3
June 17	52.5	638	2,265	78.3
June 24	54.5	643	2,285	81.1

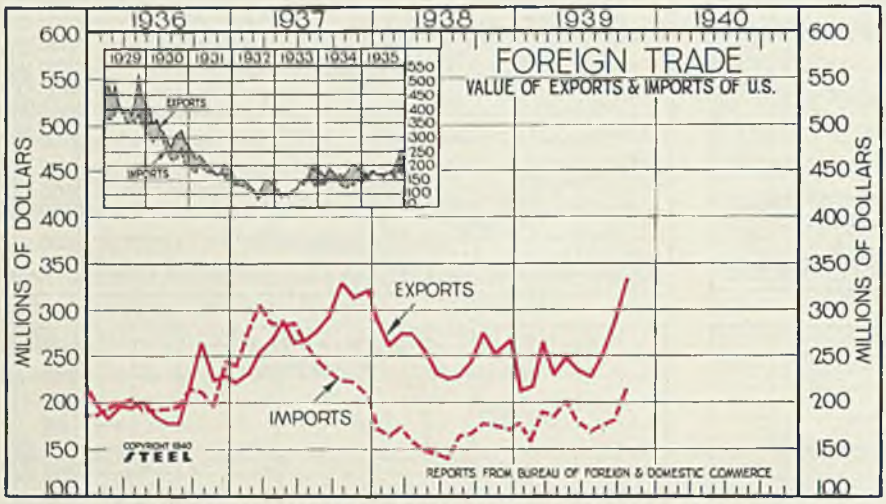
For week ended	National steel rate (%)	Freight car loadings 1000 cars	Electric power output million KWH	Automobile output 1000 units
July 1	54.0	666	2,300	70.7
July 8	42.0	559	2,078	42.8
July 15	50.5	674	2,324	61.6
July 22	56.5	656	2,295	47.4
July 29	60.0	660	2,342	40.6
Aug. 5	60.0	661	2,325	28.3
Aug. 12	62.0	665	2,333	24.9
Aug. 19	63.5	674	2,368	13.0
Aug. 26	63.5	689	2,355	17.5
Sept. 2	64.0	722	2,357	25.2
Sept. 9	62.0	667	2,290	26.9
Sept. 16	74.0	806	2,444	41.2
Sept. 23	79.5	815	2,449	54.0
Sept. 30	84.0	835	2,470	62.8
Oct. 7	87.5	835	2,465	76.1
Oct. 14	89.5	845	2,495	75.9
Oct. 21	91.0	861	2,494	70.1
Oct. 28	92.0	834	2,539	78.2
Nov. 4	93.0	806	2,537	82.7
Nov. 11	93.0	786	2,514	86.2
Nov. 18	93.5	771	2,514	86.7
Nov. 25	93.5	677	2,482	72.5
Dec. 2	94.0	689	2,539	93.6
Dec. 9	94.0	687	2,586	115.5
Dec. 16	92.5	681	2,605	118.4

Automobile Production

(Unit: 1000 Cars)

	1939	1938	1937	1936
Jan.	357.0	227.1	399.2	377.2
Feb.	317.5	202.6	383.9	300.8
March	389.5	238.6	519.0	438.9
April	354.3	238.1	553.4	527.6
May	313.2	210.2	540.4	480.5
June	324.2	189.4	521.1	469.4
July	218.5	150.4	456.9	451.2
Aug.	103.3	96.9	405.1	275.9
Sept.	192.7	89.6	175.6	139.8
Oct.	323.0	215.3	338.0	230.0
Nov.	351.8	390.4	376.6	405.8
Dec.	....	407.0	346.9	519.1
Average	....	221.3	418.0	384.7





United States Foreign Trade

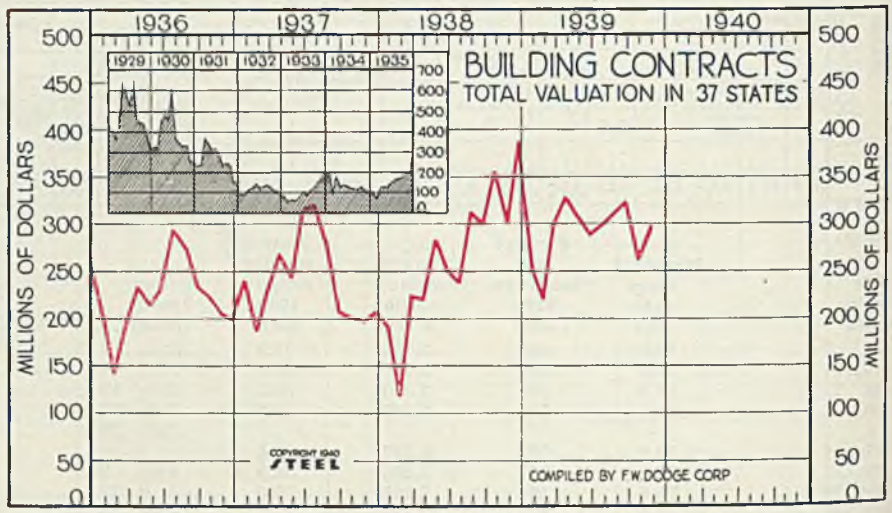
(Unit: $1,000,000)

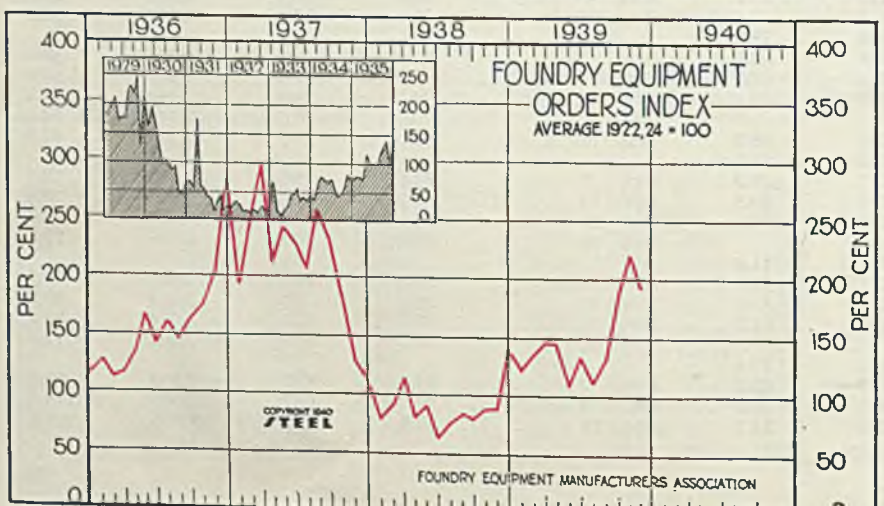
	Exports		Imports	
	1939	1938	1939	1938
Jan.	$212.9	$289.1	$178.2	$170.7
Feb.	218.6	261.9	158.0	163.0
Mar.	267.8	275.3	190.5	173.4
April	231.0	274.5	186.3	159.8
May	249.5	257.3	202.5	148.2
June	236.1	232.7	178.9	145.9
July	229.6	227.5	168.9	140.8
Aug.	250.8	230.8	175.8	165.5
Sept.	288.6	246.3	181.5	167.6
Oct.	332.1	277.7	215.3	178.0
Nov.	....	252.2	....	176.2
Dec.	....	268.6	....	171.5
Total	....	$3093.9	....	$1960.6

Construction Total Valuation In 37 States

(Unit: $1,000,000)

	1939	1938	1937	1936
Jan.	$251.7	$192.2	$242.7	$204.8
Feb	220.2	118.9	188.3	142.1
Mar.	300.7	226.6	231.2	199.0
April	330.0	222.0	269.5	234.8
May	308.5	283.2	243.7	216.1
June	288.3	251.0	317.7	232.7
July	299.9	239.8	321.6	294.7
Aug.	312.3	313.1	281.2	275.3
Sept.	323.2	300.9	207.1	234.3
Oct.	261.8	357.7	202.1	225.8
Nov.	299.8	301.7	198.4	208.2
Dec.	....	389.4	209.5	199.7
Average	....	$266.4	$242.8	$222.3

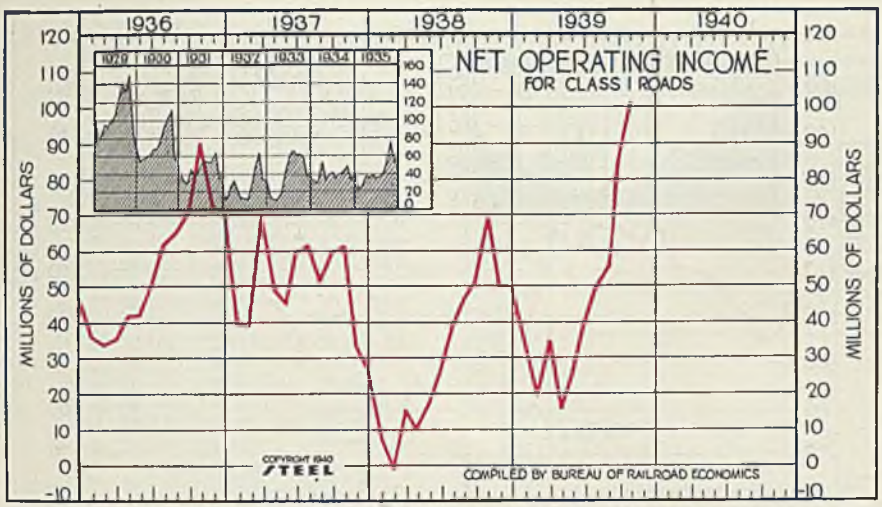




Foundry Equipment Orders Index

1922-24 = 100

	1939	1938	1937	1936
Jan.	122.3	76.8	190.9	127.0
Feb.	135.3	90.4	249.5	110.4
Mar.	146.6	114.6	294.2	115.0
April	146.0	79.3	208.3	134.0
May	108.8	90.6	242.0	165.4
June	134.6	61.2	228.2	141.4
July	111.9	74.2	204.0	159.5
Aug.	131.4	83.3	257.5	144.8
Sept.	184.4	78.7	231.8	161.0
Oct.	220.4	87.9	185.2	173.8
Nov.	192.2	89.7	128.0	200.4
Dec.	....	141.8	111.2	283.3
Average	....	89.4	210.9	159.7



Class I Railroads
Net Operating Income

(Unit: $1,000,000)

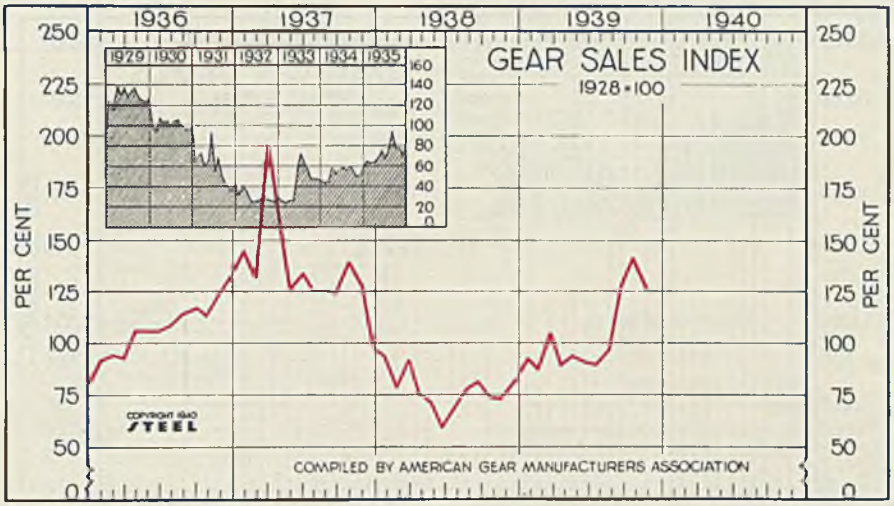
	1939	1938	1937	1936
Jan.	$32.89	$7.14	$38.87	$35.73
Feb.	18.59	1.91*	38.78	33.56
Mar.	34.32	14.73	69.88	35.15
April	15.26	9.40	48.36	41.49
May	25.10	16.67	44.24	41.80
June	39.10	25.16	59.35	50.26
July	49.01	38.43	60.99	61.72
Aug.	54.59	45.42	50.76	64.64
Sept.	86.43	50.36	59.62	70.10
Oct.	101.62	68.57	60.86	89.81
Nov.	....	49.67	32.44	72.33
Dec.	....	49.37	25.90	70.52
Average	....	$31.02	$49.18	$55.63

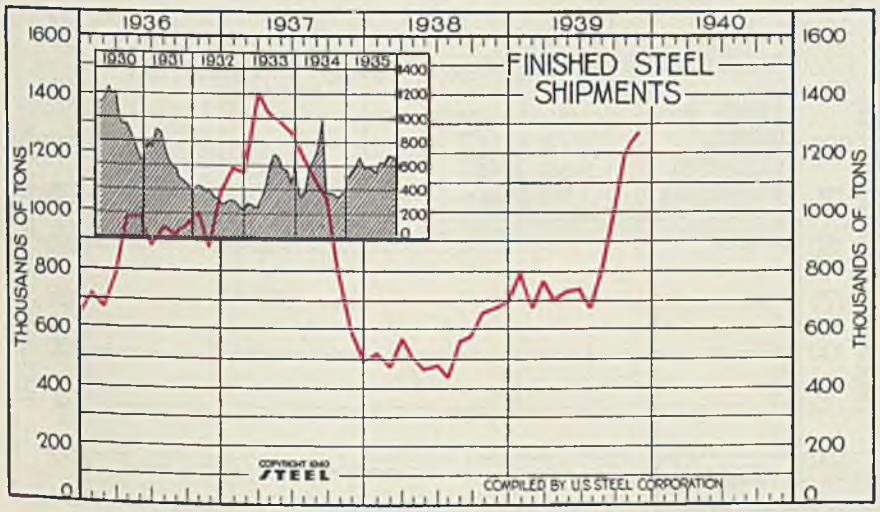
* Indicates deficit.

Gear Sales Index

(1928 = 100)

	1939	1938	1937	1936
Jan.	91.0	93.0	144.0	90.5
Feb.	86.0	77.0	130.5	93.0
Mar.	104.0	91.0	195.0	92.0
April	88.0	74.0	164.0	105.0
May	93.0	70.0	125.5	105.0
June	90.0	58.0	134.0	105.0
July	89.0	67.0	124.0	107.5
Aug.	96.0	76.5	125.0	113.0
Sept.	126.0	80.5	123.0	115.5
Oct.	141.0	72.5	139.5	112.5
Nov.	126.0	72.0	127.5	122.5
Dec.	....	81.0	97.0	132.5
Average	....	76.0	135.5	107.5





Finished Steel Shipments
U. S. Steel Corp.

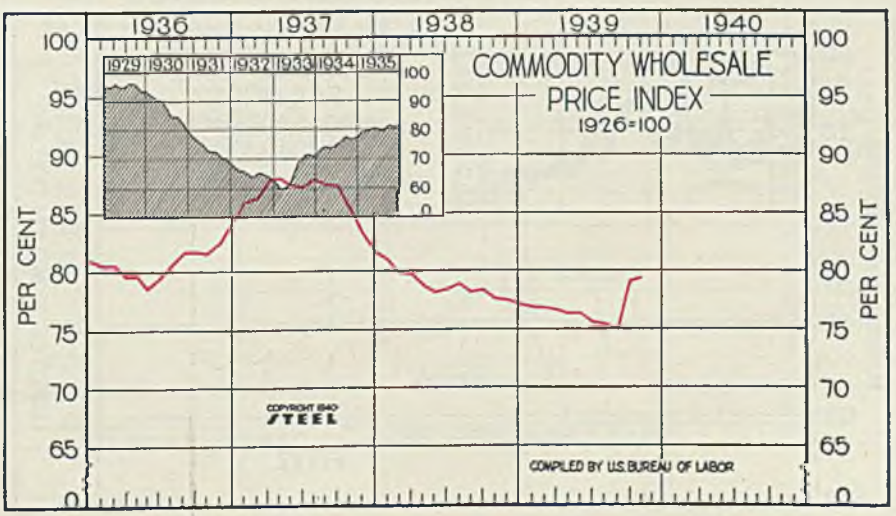
(Unit: 1000 Gross Tons)

	1939	1938	1937	1936
Jan.	789.3	518.3	1150.0	721.4
Feb.	678.0	474.7	1134.0	676.3
March	767.9	572.2	1414.0	783.6
April	701.5	502.0	1344.0	979.9
May	723.2	465.1	1304.0	984.1
June	733.4	478.1	1260.0	886.1
July	676.3	441.6	1187.0	950.9
Aug.	803.8	558.6	1108.0	923.7
Sept.	985.0	577.7	1048.0	961.8
Oct.	1219.0	663.3	792.3	1007.0
Nov.	1270.1	679.7	587.2	882.6
Dec.	.....	694.2	489.1	1067.0
Average	.....	552.1	1069.0	902.1

All Commodity
Wholesale Price Index
U. S. Bureau of Labor

(1926 = 100)

	1939	1938	1937	1936
Jan.	76.9	80.9	85.9	80.6
Feb.	76.9	79.8	86.3	80.6
March	76.7	79.7	87.8	79.6
April	76.2	78.7	88.0	79.7
May	76.2	78.1	87.4	78.6
June	75.6	78.3	87.2	79.2
July	75.4	78.8	87.9	80.5
Aug.	75.0	78.1	87.5	81.6
Sept.	79.1	78.3	87.4	81.6
Oct.	79.4	77.6	85.4	81.5
Nov.	...	77.5	83.3	82.4
Dec.	...	77.0	81.7	84.2
Average	...	78.6	86.3	80.8

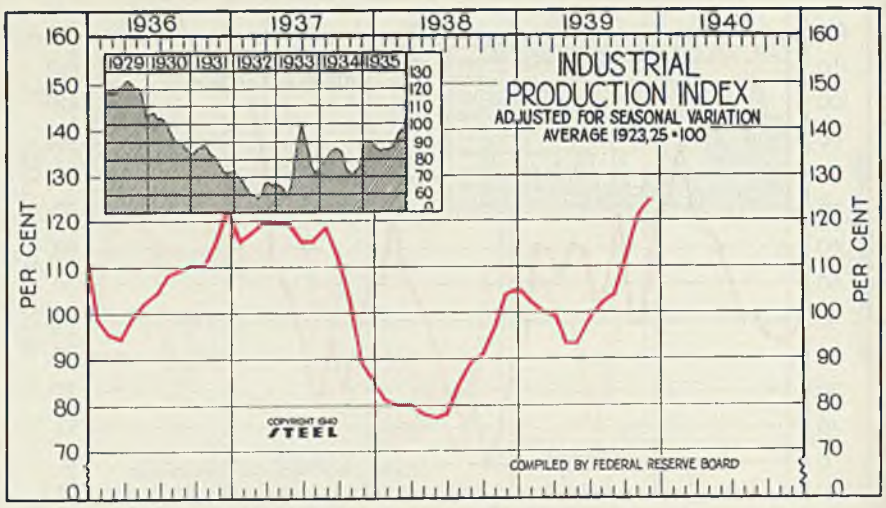


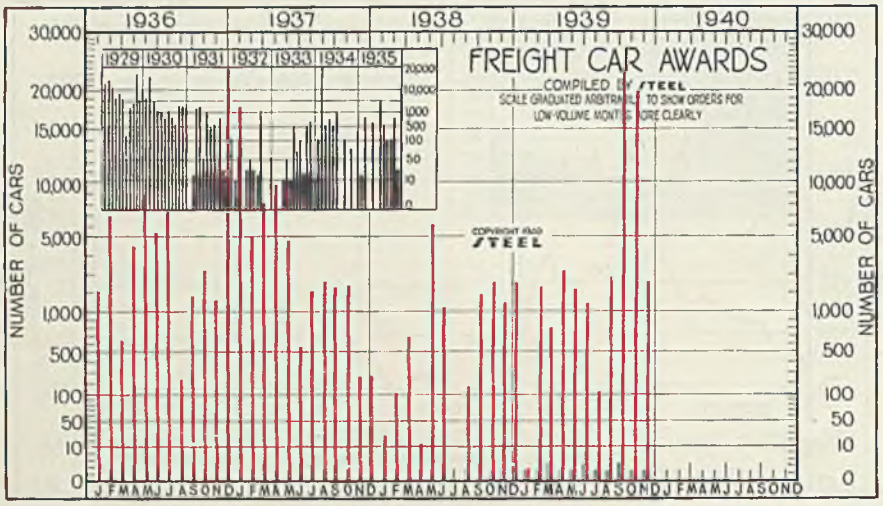
Industrial Production
Federal Reserve Board's Index

(1923-25 = 100)

	1939	1938	1937	1936
Jan.	101	80	114	98
Feb.	99	79	116	94
March	98	79	118	93
April	92	77	118	98
May	92	76	118	101
June	98	77	114	103
July	101	83	114	107
Aug.	103	88	117	108
Sept.	111	90	111	109
Oct.	120	96	102	109
Nov.	124†	103	88	114
Dec.	...	104	84	121
Average	...	86	110	105

†Preliminary.





Freight Car Awards

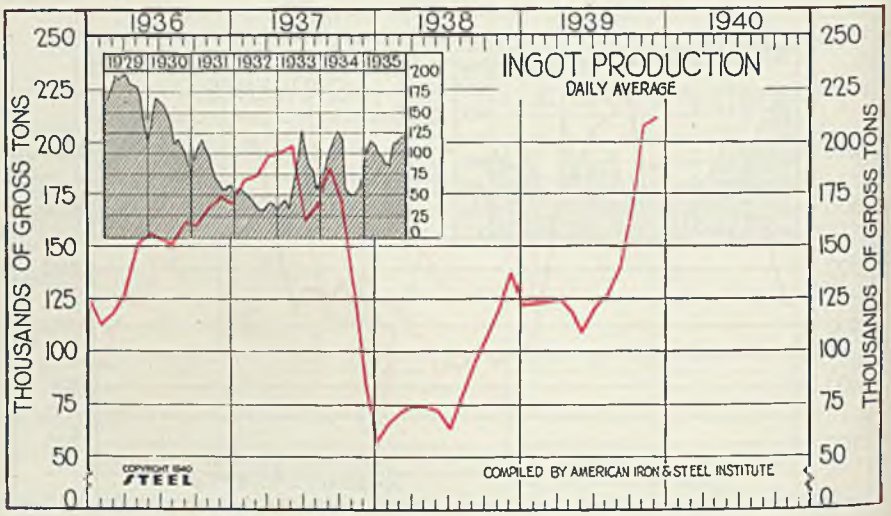
(Hundreds of Cars)

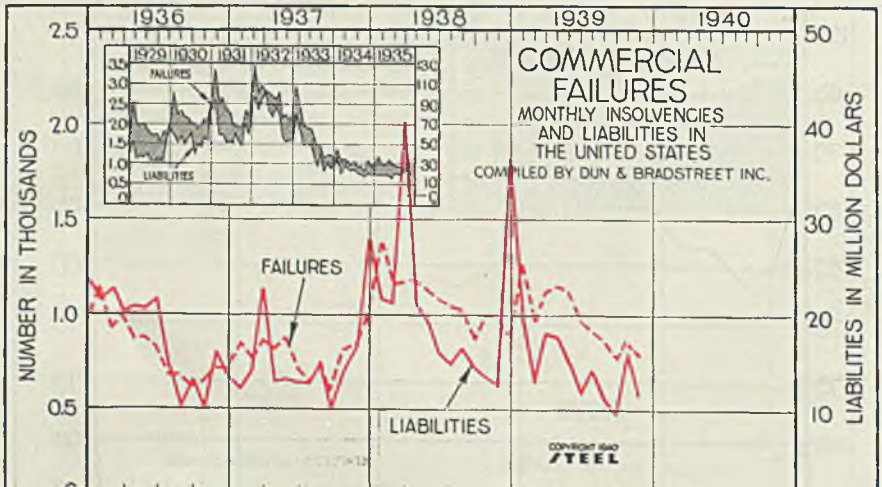
	1939	1938	1937	1936
Jan.	.03	.25	178.06	20.50
Feb.	22.59	1.09	49.72	69.00
Mar.	8.00	6.80	81.55	6.32
April	30.95	.15	97.72	44.27
May	20.51	60.14	47.32	89.00
June	13.24	11.78	5.48	52.00
July	1.10	.00	10.30	72.29
Aug.	28.14	1.82	14.75	2.25
Sept.	230.00	17.50	12.16	17.50
Oct.	196.34	25.37	13.55	22.10
Nov.	26.50	12.32	2.75	15.50
Dec.	....	25.81	2.75	234.50
Total	....	163.03	516.11	645.23

Steel Ingot Production
Daily Average

(Hundreds of Tons)

	1939	1938	1937	1936
Jan.	122.6	66.6	182.2	112.8
Feb.	123.1	71.0	184.4	118.6
Mar.	124.6	74.5	193.5	128.6
April	119.5	74.0	195.1	151.6
May	108.1	72.3	198.2	155.6
June	120.4	63.0	160.9	153.3
July	126.5	79.3	168.8	150.9
Aug.	139.4	94.3	187.0	161.4
Sept.	169.2	106.3	172.1	160.0
Oct.	207.5	119.9	130.5	168.3
Nov.	210.1	137.4	86.2	173.5
Dec.	....	120.9	56.6	170.4
Average	....	90.4	159.6	150.4



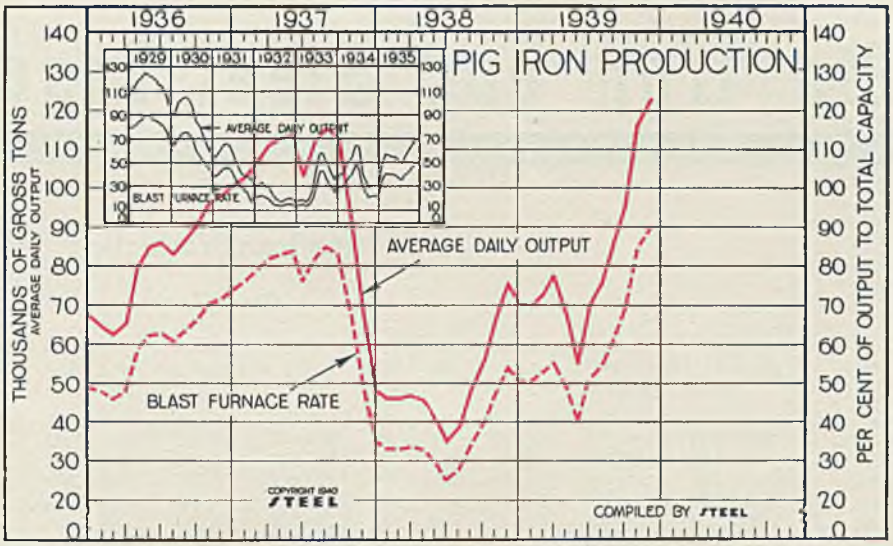


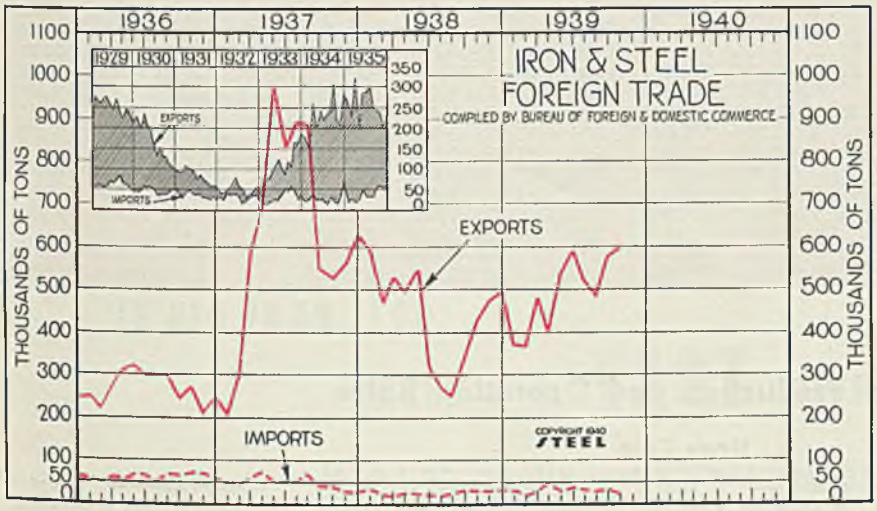
Commercial Failures

	Failures Number		Liabilities (Unit: $1,000,000)	
	1939	1938	1939	1938
Jan.	1,263	1,377	$19.12	$21.42
Feb.	963	1,149	12.79	21.03
Mar.	1,123	1,167	17.92	40.33
April	1,140	1,172	17.49	21.15
May	1,122	1,123	14.76	19.14
June	952	1,073	11.61	15.92
July	917	1,038	14.15	14.76
Aug.	859	1,015	11.26	16.36
Sept.	758	866	9.40	14.34
Oct.	916	997	16.14	13.22
Nov.	886	984	11.88	12.30
Dec.	....	875	....	36.53
Total	12,836	....	....	$246.52

Pig Iron Production

	Daily average gross tons			Blast furnace rate (%)		
	1939	1938	1937	1939	1938	1937
Jan.	70,175	46,608	103,863	51.0	33.6	76.6
Feb.	73,578	46,655	107,857	53.5	33.6	79.5
Mar.	77,201	47,426	111,951	56.1	34.2	82.5
April	68,511	46,267	113,354	49.8	33.4	83.7
May	55,404	40,675	114,360	40.2	29.4	84.3
June	70,647	35,358	103,843	51.4	25.5	76.6
July	76,001	39,131	112,947	55.0	28.2	82.9
Aug.	85,823	48,242	116,676	62.4	34.8	85.7
Sept.	95,802	56,103	113,932	69.7	40.5	83.7
Oct.	117,012	66,694	93,259	85.2	48.0	68.4
Nov.	124,200	76,222	66,901	90.5	55.0	49.3
Dec.	.....	71,378	48,499	...	51.4	35.6
Av'ge	.....	51,752	100,573	...	37.3	74.1





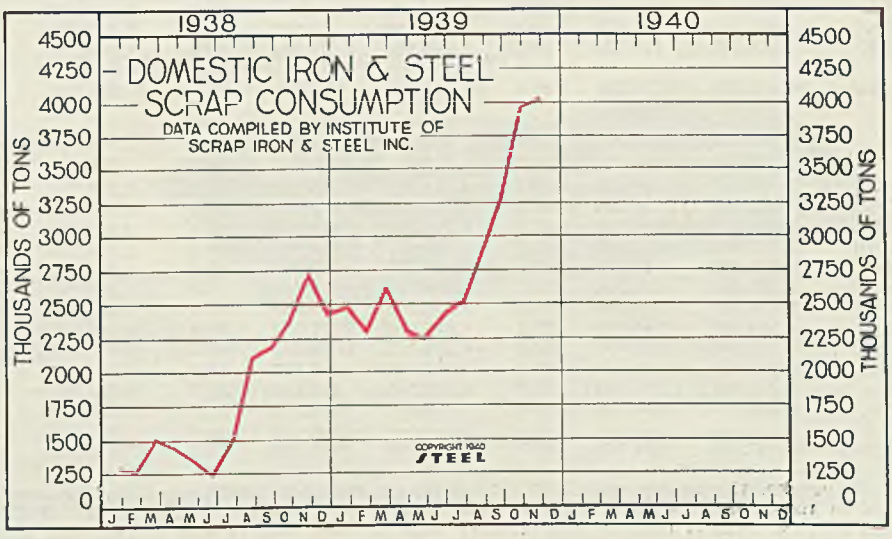
Iron and Steel Foreign Trade

(Thousands of Tons)

	Exports			Imports		
	1939	1938	1937	1939	1938	1937
Jan.	362.7	586.3	201.5	27.7	29.6	43.1
Feb.	359.7	460.6	291.0	19.1	19.6	41.6
Mar.	474.4	526.9	570.6	25.4	11.8	51.8
April	394.0	489.2	683.7	44.1	21.2	68.2
May	532.6	540.6	969.2	28.1	20.8	49.1
June	588.9	312.0	826.6	32.6	15.9	44.8
July	513.7	263.7	889.4	30.8	14.7	47.0
Aug.	477.1	242.1	836.3	28.3	20.0	61.5
Sept.	575.6	346.1	542.7	29.9	28.0	37.1
Oct.	591.9	425.4	522.6	19.2	26.4	37.2
Nov.	...	646.2	556.6	...	27.6	27.0
Dec.	...	490.1	625.4	...	28.8	25.1
Tot'l	....	5152.7	7567.9	...	264.6	533.4

Iron and Steel Scrap Consumption

	Gross tons	
	1939	1938
Jan.	2,495,000	1,332,000
Feb.	2,313,000	1,306,000
March	2,634,000	1,543,000
April	2,317,000	1,477,000
May	2,263,000	1,387,000
June	2,428,000	1,257,000
July	2,551,000	1,520,000
Aug.	2,919,000	2,133,000
Sept.	3,282,000	2,218,000
Oct.	3,974,000	2,393,000
Nov.	4,025,000	2,740,000
Dec.	.....	2,441,000
Total	.....	21,746,000



Pig Iron and Steel Ingot Production

Steel Ingot Figures by American Iron and Steel Institute. Coke Pig Iron by STEEL

Pig Iron Production

Gross Tons

	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily
			1929				1933				1934				1935	
Jan.	328	202	3,433,028	110,742	291	45	568,785	18,348	289	86	1,225,643	39,537	281	89	1,478,443	47,692
Feb.	326	208	3,218,376	114,942	291	44	553,067	19,752	289	90	1,270,792	45,385	281	96	1,614,905	57,675
March	326	213	3,709,518	119,662	291	38	542,013	17,484	289	97	1,625,588	52,438	280	97	1,770,990	57,120
April	326	216	3,663,167	122,106	291	48	623,606	20,786	285	109	1,736,217	57,873	278	97	1,671,556	55,719
May	325	220	3,898,344	125,753	290	61	892,326	28,784	284	117	2,057,471	66,370	275	96	1,735,577	55,986
June	325	220	3,715,104	123,837	289	90	1,264,953	42,165	283	92	1,936,897	64,563	272	91	1,558,463	51,949
July	325	217	3,782,511	122,016	289	105	1,801,345	58,108	282	74	1,228,544	39,630	270	92	1,520,340	49,043
Aug.	325	209	3,746,198	120,845	289	98	1,833,265	59,137	282	61	1,060,187	34,199	270	98	1,759,782	56,767
Sept.	323	204	3,496,454	116,548	289	89	1,507,931	50,264	282	61	899,075	29,969	270	104	1,770,259	59,009
Oct.	318	203	3,588,146	115,747	289	81	1,358,540	43,824	282	65	951,353	30,689	269	116	1,978,379	63,818
Nov.	317	176	3,182,420	106,081	289	77	1,083,740	36,124	281	60	957,906	31,930	268	122	2,066,293	68,876
Dec.	316	156	2,836,917	91,513	289	74	1,192,136	38,456	281	67	1,028,006	33,161	268	120	2,115,496	68,242
Total			42,270,183	*115,808			13,221,707	*36,223			15,977,679	*43,774			21,040,483	*57,694
			1936				1937				1938				1939*	
Jan.	267	118	2,029,304	65,461	243	169	3,219,741	103,863	236	91	1,444,862	46,608	237	118	2,175,423	70,175
Feb.	266	120	1,838,932	63,411	242	176	3,020,006	107,857	236	91	1,306,333	46,655	237	121	2,060,183	73,578
March	265	126	2,046,121	66,004	242	182	3,470,470	111,951	236	90	1,470,211	47,426	237	123	2,393,255	77,201
April	265	143	2,409,474	80,316	241	186	3,400,636	113,354	236	79	1,388,008	46,267	236	102	2,055,326	68,511
May	253	145	2,659,643	85,795	240	170	3,545,180	114,360	236	73	1,260,937	40,675	236	106	1,171,522	55,404
June	253	144	2,596,528	86,551	240	182	3,115,302	103,843	236	67	1,060,747	35,358	235	117	2,119,422	70,647
July	252	146	2,595,791	83,735	237	192	3,501,359	112,947	236	77	1,213,076	39,131	235	129	2,356,036	76,001
Aug.	248	148	2,711,726	87,475	237	191	3,616,954	116,676	237	88	1,495,514	48,242	235	138	2,660,513	85,823
Sept.	247	154	2,728,257	90,942	237	181	3,417,960	113,932	237	97	1,683,097	56,103	235	169	2,874,054	95,802
Oct.	245	161	2,991,794	96,509	237	151	2,891,026	93,259	237	114	2,067,499	66,694	235	188	3,627,384	117,012
Nov.	245	165	2,949,942	98,331	237	114	2,007,031	66,901	236	121	2,286,661	76,222	235	191	3,720,101	124,003
Dec.	245	170	3,125,192	100,813	237	93	1,503,474	48,499	236	115	2,212,718	71,378	....	....	.....	.....
Total			30,682,704	*83,832			36,709,139	*100,573			18,889,663	*51,752			†24,759,218	*83,111

*Average. †Eleven months.

Steel Ingot Production and Operating Rates

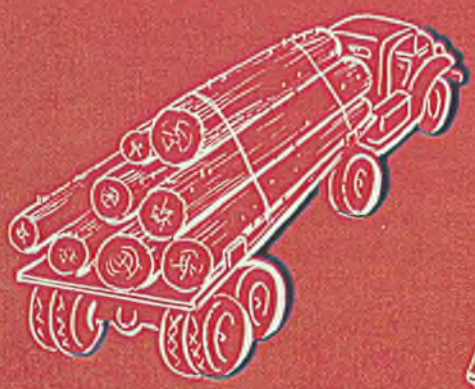
Gross Tons

	†1929 Total	†1929 Daily Av.	% of Capacity	†1933 Total	†1933 Daily Av.	% of Capacity	†1934 Total	†1934 Daily Av.	% of Capacity	†1935 Total	†1935 Daily Av.	% of Capacity
Jan.	4,500,131	166,672	84.9	1,016,870	39,110	17.9	1,997,129	73,968	33.5	2,870,161	106,302	48.0
Feb.	4,328,713	180,363	91.9	1,073,012	44,709	20.5	2,211,944	92,164	41.8	2,774,271	115,595	52.2
March	5,068,176	194,930	99.4	898,236	33,268	15.3	2,798,440	103,646	47.0	2,865,292	110,204	49.7
April	4,950,053	190,387	97.0	1,335,422	53,817	24.7	2,936,064	117,443	53.3	2,640,602	101,562	45.8
May	5,286,246	195,787	99.8	1,976,428	73,201	33.6	3,399,494	125,907	57.1	2,633,661	97,543	44.0
June	4,902,955	196,118	100.0	2,564,420	98,632	45.3	3,059,483	117,672	53.4	2,258,664	90,347	40.8
July	4,850,583	186,561	95.1	3,168,354	126,734	58.3	1,489,453	59,578	27.0	2,267,827	87,224	39.4
Aug.	4,939,086	182,929	93.2	2,863,569	106,058	48.7	1,381,350	51,161	23.2	2,915,930	107,997	48.7
Sept.	4,527,887	181,115	92.3	3,283,079	87,811	40.4	1,268,977	50,759	23.0	2,825,004	113,000	51.0
Oct.	4,534,326	167,938	85.6	2,084,894	80,188	36.8	1,481,902	54,885	24.9	3,142,759	116,398	52.5
Nov.	3,521,111	135,427	69.0	1,521,189	58,507	26.9	1,610,625	61,947	28.1	3,150,409	121,170	54.7
Dec.	2,903,012	116,120	59.2	1,798,606	71,944	33.1	1,964,257	78,570	35.6	3,073,405	122,936	55.5
Total	54,312,279	*174,638	89.0	22,594,079	*72,884	33.5	25,599,118	*82,312	37.3	33,417,985	*107,453	48.5

	†1936 Total	†1936 Wkly. Av.	% of Capacity	†1937 Total	†1937 Wkly. Av.	% of Capacity	†1938 Total	†1938 Wkly. Av.	% of Capacity	1939 Total	1939 Wkly. Av.	% of Capacity
Jan.	3,039,804	686,186	52.3	4,718,436	1,065,110	81.3	1,732,764	391,143	29.1	3,174,352	716,558	52.4
Feb.	2,956,891	714,225	54.5	4,414,699	1,103,675	84.2	1,703,726	425,931	31.6	2,988,649	747,162	54.7
March	3,333,853	752,563	57.4	5,218,326	1,177,952	89.9	2,012,406	454,268	33.7	3,405,370	768,707	56.3
April	3,932,605	914,593	69.9	5,070,867	1,182,020	90.2	1,925,166	448,757	33.3	2,974,246	693,297	50.7
May	4,037,375	911,371	69.5	5,151,909	1,162,959	88.7	1,806,805	407,857	30.3	2,922,875	659,791	48.3
June	3,975,569	926,706	70.7	4,184,723	975,460	74.4	1,638,277	381,883	28.3	3,125,288	728,505	53.3
July	3,914,370	885,604	67.6	4,556,304	1,030,838	78.4	1,982,058	448,429	33.2	3,162,534	715,505	52.4
Aug.	4,184,287	944,534	72.1	4,877,826	1,101,089	83.8	2,546,988	574,941	42.6	3,763,418	849,530	62.2
Sept.	4,151,388	969,950	74.0	4,289,507	1,002,221	76.3	2,657,748	620,969	46.0	4,231,310	988,624	72.4
Oct.	4,534,246	1,023,532	78.1	3,392,924	765,897	58.3	3,117,934	703,823	52.2	5,393,821	1,217,567	89.1
Nov.	4,323,025	1,007,698	76.9	2,154,365	502,183	38.2	3,572,220	832,685	61.8	5,462,616	1,273,337	93.2
Dec.	4,424,367	1,000,988	76.4	1,473,021	333,263	25.3	3,130,746	708,314	52.7	.....	.....	....
Total	46,807,780	*895,329	68.3	49,502,907	*949,423	72.3	27,742,225	*532,072	39.6	‡40,604,479	*850,890	62.3

*Average. †Beginning with 1927, the Institute excludes crucible and electric ingots, which totaled 675,123 tons in 1927, 810,029 tons in 1928, 958,076 tons in 1929, 614,852 tons in 1930, 412,489 tons in 1931, 241,756 tons in 1932, 421,884 tons in 1933, 361,827 tons in 1934, 542,134 tons in 1935, 773,271 tons in 1936, 815,244 tons in 1937 and 468,616 tons in 1938. ‡Eleven months.

★WOOD ★PAPER ★RAYON



YET ON A PRACTICAL BASIS *All* ARE CELLULOSE

IN PIG IRON, TOO,

THERE'S A VAST DIFFERENCE

It is not merely chemical analysis but *physical structure* which determines the value of pig iron.

MELTRITE

is used *exclusively* in scores of foundries, and is the *dominant* pig iron in hundreds of others.

MELTRITE
THE SUPERIOR PIG IRON

PICKANDS MATHER & CO.

CLEVELAND • CHICAGO • DETROIT • ERIE • TOLEDO • MINNEAPOLIS • DULUTH • ST. LOUIS

New York—James C. Alley

Philadelphia—Carson, Marshall & Co. • San Francisco and Los Angeles—H. L. E. Meyer Jr. & Co.

Average Monthly Quotations in 1939

Base or Furnace. Unless Otherwise Specified: Scrap. Delivered to Consumers

PITTSBURGH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Structural Shapes	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
Plates	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Bars	2.25	2.25	2.25	2.25	2.20	2.15	2.15	2.15	2.15	2.15	2.15	2.15
Cold-Finished Steel Bars	2.70	2.70	2.70	2.70	2.70	2.65	2.65	2.65	2.65	2.65	2.65	2.65
Strip, Hot-Rolled	2.15	2.15	2.15	2.15	2.05	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Strip, Cold-Rolled	2.95	2.95	2.95	2.95	2.85	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Standard Spikes	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Plain Wire	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
Structural Rivets	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
Hot Rolled Sheets	2.15	2.15	2.15	2.15	2.05	2.00	2.00	2.00	2.00	2.00	2.00	2.00
No. 24 Galvanized Sheets	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Tin Plate, base box	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
Wire Nails	2.45	2.45	2.45	2.45	2.45	2.45	2.40	2.40	2.40	2.50	2.55	2.55
Steel Pipe, 1 to 3-inch, % discount (base $200 per ton)	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%
Bessemer Pig Iron, Neville Island base	$21.50	$21.50	$21.50	$21.50	$21.50	$21.50	$21.50	$21.50	$22.50	$23.50	$23.50	$23.50
Basic Pig Iron, Neville Island base	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	21.50	22.50	22.50	22.50
No. 2 Foundry Pig Iron, Neville Island Base	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	22.00	23.00	23.00	23.00
Malleable Pig Iron, Neville Island base	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	22.00	23.00	23.00	23.00
Bessemer Ferrosilicon, 10 per cent (Jackson co. base)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	31.00	32.00	32.00	32.00
Billets, Bessemer and Open-Hearth	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Sheet Bars, Bessemer and Open-Hearth	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Wire Rods	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Furnace Coke, spot	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$4.75	$5.00	$5.00
Foundry Coke, spot	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.80	6.00	6.00
Heavy Melting Steel Scrap	15.60	15.65	15.75	15.50	14.55	15.00	15.55	16.15	18.75	23.15	21.85	19.00
Low Phosphorus Scrap	18.65	18.75	19.00	19.00	18.30	18.75	19.00	19.65	23.25	29.40	28.60	25.75
No. 1 Cast Scrap	15.25	15.25	15.25	15.25	14.50	15.00	15.00	15.50	17.90	22.40	21.85	19.75

CHICAGO

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bars	2.25c	2.25c	2.25c	2.25c	2.20c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c
Plates	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Structural Shapes	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Rail Steel Bars	2.10	2.10	2.10	2.10	2.05	2.00	2.00	2.00	2.03	2.15	2.15	2.15
Bar Iron	2.15	2.15	2.15	2.15	2.10	2.05	2.05	2.05	2.05	2.15	2.15	2.15
Cold Rolled Sheets	3.20	3.20	3.20	3.20	3.08	3.05	3.05	3.05	3.05	3.05	3.05	3.05
No. 2 Foundry and Malleable Pig Iron	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$22.20	$23.00	$23.00	$23.00
Southern No. 2 Pig Iron, delivered	21.22	21.22	21.22	21.22	21.22	21.22	21.22	21.22	22.72	23.22	23.22	23.22
Lake Superior Charcoal Iron, delivered, Chicago	28.34	28.34	28.34	28.34	28.34	28.34	28.34	28.34	29.54	30.34	30.34	30.24
Heavy Melting Steel Scrap	$13.75	$14.00	$14.25	$13.35	$12.75	$13.38	$13.55	$13.75	$16.05	$19.25	$17.45	$16.90
Railroad Specialties, Chicago	16.00	16.00	16.25	15.35	14.75	15.31	15.50	15.50	18.00	21.75	21.56	20.30
Rails for Rolling	17.75	17.25	17.25	17.25	17.25	17.63	17.75	17.75	19.65	21.90	20.50	19.85
Car Wheels, Iron	13.75	13.75	13.75	13.00	12.88	13.63	13.75	13.75	16.15	19.25	18.12	17.25
No. 1 Machinery Cast Scrap	12.55	12.25	12.25	12.05	12.25	12.25	12.25	12.25	15.20	17.00	15.75	15.25

EASTERN PENNSYLVANIA

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tank Plates, delivered Philadelphia	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.27½	2.27½	2.22½
Structural Shapes, delivered Philadelphia	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½
Steel Bars, delivered Philadelphia	2.57	2.57	2.57	2.57	2.52	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Bar Iron, common, delivered Philadelphia	2.47	2.47	2.47	2.47	2.42	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Hot Rolled Sheets, delivered Philadelphia	2.32	2.32	2.32	2.32	2.19½	2.17	2.17	2.17	2.17	2.17	2.17	2.27
Basic Pig Iron, delivered	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$23.54	$24.34	$24.34	$24.34
No. 2X Foundry Pig Iron, delivered Philadelphia	23.215	23.215	23.215	23.215	23.215	23.215	23.215	23.215	24.415	25.215	25.215	25.215
Standard Low Phosphorus Pig Iron, delivered	27.74	27.74	27.74	27.74	27.74	27.74	27.74	27.74	28.94	29.74	29.74	29.74
No. 1 Heavy Melting Steel Scrap	15.25	15.25	15.375	15.65	15.25	15.44	15.60	16.44	18.95	22.125	20.70	18.85
No. 1 Railroad Wrought Scrap	15.75	15.75	15.75	16.25	16.25	16.25	16.25	16.50	19.05	22.25	21.75	20.25
No. 1 Cupola Cast Scrap	16.75	16.75	16.75	16.55	16.25	16.25	16.35	16.87½	19.75	23.50	22.25	20.95

COAL TAR PRODUCTS

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Benzol, per gallon producers' plants, tank lots	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c
Toluol, per gallon producers' plants, tank lots	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Solvent naphtha, per gallon producers' plants, tank lots	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Xylol, per gallon producers' plants, tank lots	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Naphthalene, flakes and balls, per pound, producers' plants	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75	6.75	6.75	6.75
Phenol, per pound producers' plants, 1000 pounds and less	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	14.75	14.75
Sulphate of ammonia, per ton bulk F.o.b. Atlantic seaboard	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00

NONFERROUS METALS

Prompt, wholesale prices in cents per pound

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tin, Straits, spot, New York	46.400	45.632	46.197	47.202	49.019	48.845	48.544	48.786	*	*55.646	*52.304	*51.250
Copper, electrolytic, del. Connecticut	11.250	11.250	11.250	10.469	10.058	10.000	10.233	10.491	11.930	12.440	12.500	12.500
Zinc, prime western, East St. Louis	4.500	4.500	4.500	4.500	4.500	4.500	4.514	4.722	6.105	6.500	6.500	6.040
Lead, open market, East St. Louis	4.676	4.657	4.674	4.629	4.600	4.650	4.704	4.893	5.316	5.350	5.350	5.350
Lead, open market, New York	4.826	4.807	4.824	4.779	4.750	4.800	4.854	5.043	5.466	5.500	5.500	5.500
Aluminum, ninety-nine per cent plus	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000
Antimony, American, spot, New York	11.670	11.250	11.269	11.500	11.712	12.000	12.000	12.000	12.910	14.000	14.000	14.000
Nickel, cathodes	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000

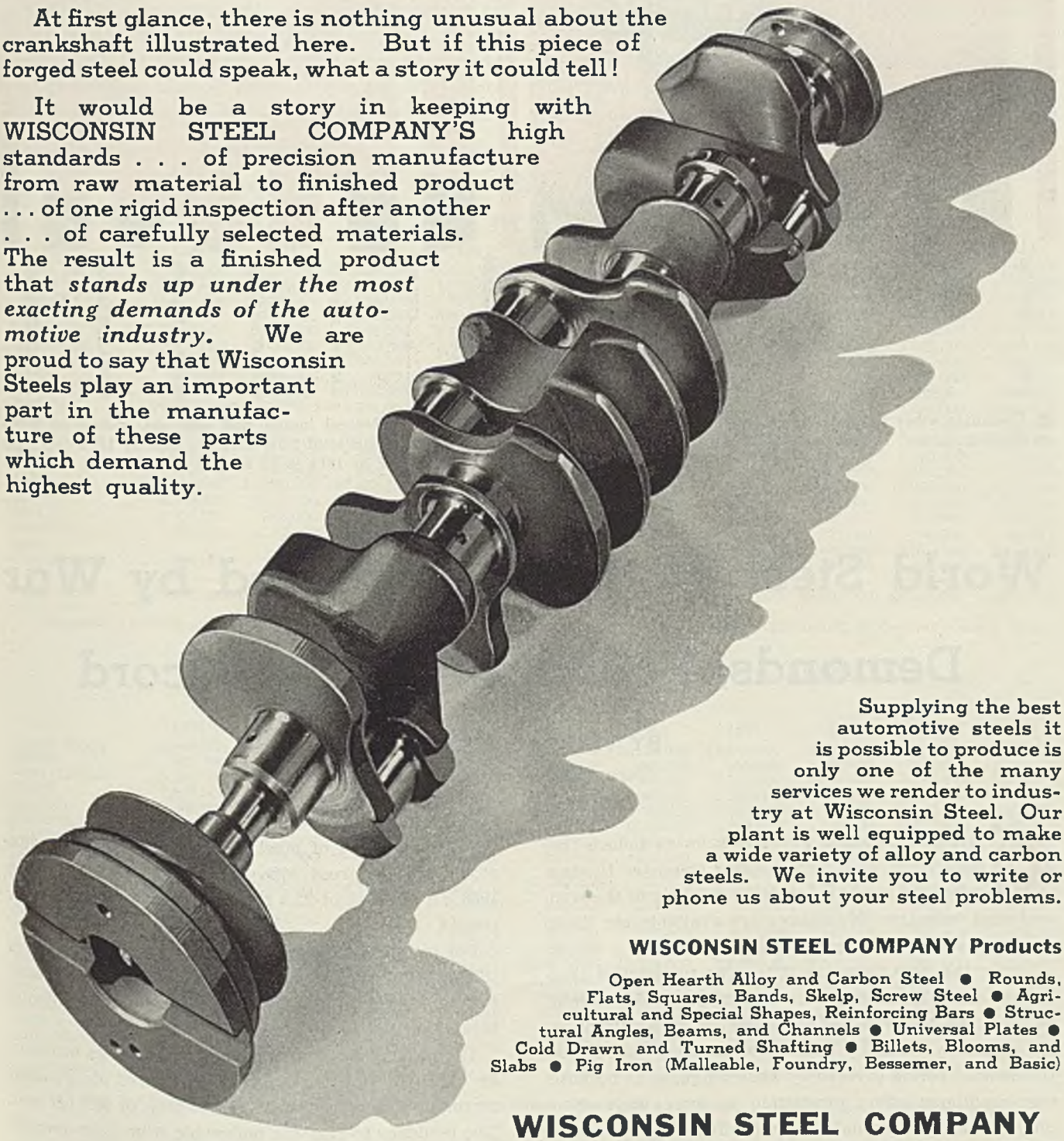
*Nominal

INFINITE CARE

Produced the *STEEL* for This Crankshaft

At first glance, there is nothing unusual about the crankshaft illustrated here. But if this piece of forged steel could speak, what a story it could tell!

It would be a story in keeping with WISCONSIN STEEL COMPANY'S high standards . . . of precision manufacture from raw material to finished product . . . of one rigid inspection after another . . . of carefully selected materials. The result is a finished product that *stands up under the most exacting demands of the automotive industry.* We are proud to say that Wisconsin Steels play an important part in the manufacture of these parts which demand the highest quality.



Supplying the best automotive steels it is possible to produce is only one of the many services we render to industry at Wisconsin Steel. Our plant is well equipped to make a wide variety of alloy and carbon steels. We invite you to write or phone us about your steel problems.

WISCONSIN STEEL COMPANY Products

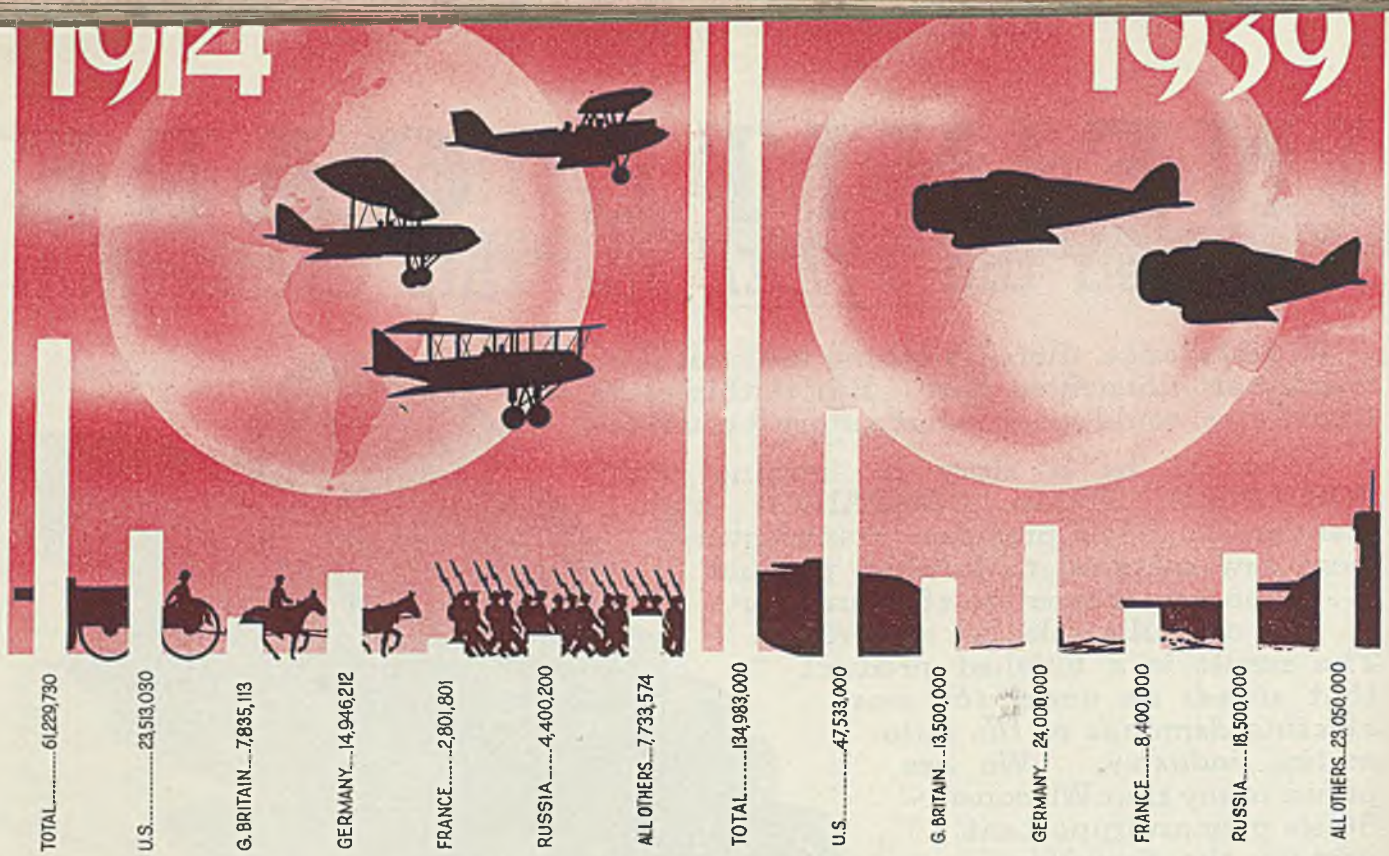
Open Hearth Alloy and Carbon Steel ● Rounds, Flats, Squares, Bands, Skelp, Screw Steel ● Agricultural and Special Shapes, Reinforcing Bars ● Structural Angles, Beams, and Channels ● Universal Plates ● Cold Drawn and Turned Shafting ● Billets, Blooms, and Slabs ● Pig Iron (Malleable, Foundry, Bessemer, and Basic)

WISCONSIN STEEL COMPANY

180 North Michigan Avenue — Chicago, Illinois

WISCONSIN

Alloy and Carbon Steel — **Pig Iron**



■ Countries other than the leading producers in 1939 made 23,050,000 tons of steel ingots and castings, almost as much as United States' output in 1914. They increased their proportion of the world total from 12.6 per cent in 1914, to 17 per cent last year. United States' percentage dropped from 38 in 1914 to 35 in 1939

World Steel Production, Spurred by War Demands, Establishes New Record

BY VINCENT DELPORT
European Manager, STEEL

ONE effect of the war has been to induce the belligerent and some neutral countries to stop releasing monthly statistics relating to the iron and steel industry. No figures are available for these countries since those issued for June or July.

Under the circumstances it will be understood that the estimates given in the accompanying tables cannot be expected to have the same degree of accuracy as those usually given by STEEL, not so much because of the shorter period covered by known figures as because war conditions affect production in more ways than one, and because the nations most affected are the most important iron and steel producers.

It is possible, however, to arrive at certain conclusions enabling output figures to be estimated within reasonable limits, based on a country's capacity of production when known, on the trend of production during the pre-war months, and on the varied influence of war conditions on individual countries.

Subject to these reservations, STEEL estimates the world production of steel ingots and castings in 1939 at 134,983,000 gross tons against 107,687,000 tons in 1938, an increase of 25.3 per cent, and an apparent new record.

For pig iron and ferroalloys the estimated output for 1939 is 100,418,000 gross tons, compared with 80,728,000 tons in 1938, an increase of 24.4 per cent, slightly below the 1937 record.

The production of steel in the United States increased by 18,840,000 tons, or 66 per cent; that of pig iron and ferroalloys increased by 12,782,000 tons, or 66.6 per cent. The tendency to rise was noticeable from June onwards and was particularly marked from October when the output of ingots alone exceeded 5,000,000 tons. The expansion of American production was due to the improvement of industrial conditions and of trade generally. The consequence was that, based on the figures shown, the share of the United States in the world output of steel was 35.2 per cent, against 26.8 per cent in 1938. As regards pig iron United States produced 31.8 per

cent of the world's total, as compared with 24 per cent in 1938.

In Europe the country with the largest steel output is Germany, which now includes Austria. The figures given for iron and steel production in 1939 are based on Germany's capacity of production, taking into account new plants started during the year, on the high rate of output during the first half of the year, and on the necessities of war production. Allowance has been made for the probable slowing down of operations in some of the Saar works during the first stages of the war. Russia comes next. From figures available for first half of the year it would appear the rate of increase over the previous year was much smaller than in earlier years.

Great Britain shows a considerable increase of steel output over 1938. Account is taken of the fact that from September onwards steelworks were operating almost at capacity. Pig iron output did not rise in the same proportion owing to the limited demand for foundry pig iron, which started to expand only towards the end of

(*Please turn to Page* 275)

World Production of Steel Ingots and Castings

Gross Tons

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1929
United States...	47,533,000	28,693,000	51,526,000	48,525,000	34,467,000	26,502,000	23,232,000	13,681,000	25,945,000	56,433,000
Canada	1,300,000	1,156,000	1,352,000	1,078,000	915,000	741,000	403,000	335,000	671,400	1,391,000
Great Britain...	13,500,000	10,398,000	12,984,000	11,785,000	9,859,000	8,850,000	7,024,000	5,261,000	5,203,000	9,636,000
France	8,400,000	6,087,000	7,793,000	6,601,000	6,177,000	6,075,000	6,427,000	5,550,000	7,697,000	9,544,000
Belgium	3,000,000	2,248,000	3,801,000	3,117,000	2,975,000	2,901,000	2,687,000	2,745,000	3,073,000	4,066,000
Luxemburg	1,800,000	1,414,000	2,470,000	1,949,000	1,808,000	1,901,000	1,815,000	1,925,000	2,002,000	2,659,000
Italy	2,350,000	2,286,000	2,054,000	1,992,000	2,174,000	1,820,000	1,755,000	1,369,000	1,430,000	2,109,000
Spain	500,000	465,000	100,000	365,000	555,000	635,000	498,000	525,000	594,000	985,000
Sweden	1,100,000	963,000	1,088,000	962,000	882,000	848,000	620,000	520,000	530,000	683,000
Germany*	24,000,000	22,922,000	19,531,000	18,900,000	16,184,000	11,725,000	7,690,000	5,678,000	8,136,000	15,986,000
Austria	.....	.....	640,000	411,000	358,000	304,000	222,000	201,000	317,000	622,000
Czechia	1,250,000	1,733,000	2,281,000	1,463,000	1,135,000	938,000	749,000	662,000	1,490,000	2,103,000
Poland	1,600,000	1,517,000	1,420,000	1,123,000	930,000	831,000	805,000	542,000	1,020,000	1,355,000
Hungary	750,000	638,000	654,000	543,000	439,000	310,000	224,000	177,000	311,000	505,000
Russia	18,500,000	18,150,000	17,493,000	16,080,000	12,320,000	9,412,000	6,790,000	5,900,000	5,333,000	4,828,000
Japan†	6,300,000	6,000,000	5,718,000	5,174,000	4,858,000	3,682,000	3,150,000	2,300,000	1,834,000	2,249,000
India	1,000,000	966,000	895,000	866,000	862,000	798,000	694,000	570,000	625,000	575,000
Australia	1,200,000	1,151,000	1,074,000	750,000	697,000	518,000	393,000	221,000	360,000	460,000
Saar‡	.....	.....	.....	.....	.....	1,919,000	1,649,000	1,440,000	1,513,000	2,174,000
Miscellaneous ..	900,000	900,000	900,000	800,000	750,000	450,000	350,000	300,000	350,000	400,000
World total.....	134,983,000	107,687,000	133,774,000	122,484,000	98,345,000	81,160,000	67,177,000	49,902,000	68,434,000	118,763,000

*Includes Austrian production from January 1938. †Includes Manchuria and Korea. ‡Included in Germany since 1934.

World Production of Pig Iron and Ferroalloys

Gross Tons

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1929
United States...	31,943,000	19,161,000	37,127,000	31,029,000	21,373,000	16,139,000	13,346,000	8,781,000	18,426,000	42,614,000
Canada	800,000	758,000	979,000	747,000	655,000	438,000	258,000	160,000	466,000	1,160,000
Great Britain...	8,200,000	6,761,000	8,493,000	7,721,000	6,424,000	5,969,000	4,136,000	3,574,000	3,773,000	7,589,000
France	7,800,000	5,964,000	7,787,000	6,130,000	5,696,000	6,053,000	6,223,000	5,448,000	8,068,000	10,198,000
Belgium	3,000,000	2,426,000	3,743,000	3,110,000	2,982,000	2,860,000	2,667,000	2,705,000	3,180,000	4,030,000
Luxemburg	1,750,000	1,526,000	2,473,000	1,955,000	1,842,000	1,968,000	1,858,000	1,929,000	2,020,000	2,860,000
Italy	1,000,000	913,000	849,000	793,000	683,000	564,000	544,000	481,000	532,000	718,000
Spain	500,000	435,000	126,000	250,000	350,000	365,000	334,000	296,000	468,000	740,000
Sweden	625,000	652,000	682,000	623,000	603,000	550,000	341,000	277,000	411,000	516,000
Germany*	20,000,000	18,300,000	15,703,000	15,058,000	12,637,000	8,602,000	5,183,000	3,870,000	5,964,000	13,187,000
Austria	.....	.....	383,000	244,000	190,000	132,000	87,000	93,000	143,000	455,000
Czechia	1,000,000	1,215,000	1,648,000	1,122,000	798,000	591,000	491,000	443,000	1,146,000	1,618,000
Poland	1,000,000	952,000	712,000	575,000	388,000	376,000	301,000	196,000	341,000	693,000
Hungary	450,000	330,000	359,000	301,000	183,000	138,000	92,000	65,000	157,000	362,000
Russia	15,000,000	14,479,000	14,288,000	14,088,000	12,411,000	10,273,000	7,085,000	6,101,000	4,782,000	4,253,000
Japan†	3,250,000	3,000,000	2,758,000	2,823,000	2,739,000	2,400,000	2,019,000	1,525,000	1,385,000	1,491,000
India	1,800,000	1,634,000	1,629,000	1,543,000	1,466,000	1,331,000	1,065,000	914,000	1,072,000	1,343,000
Australia	1,100,000	1,072,000	914,000	783,000	698,000	487,000	336,000	190,000	380,000	420,000
Saar‡	.....	.....	.....	.....	.....	1,797,000	1,567,000	1,327,000	1,491,000	2,071,000
Miscellaneous ..	1,200,000	1,150,000	1,200,000	1,000,000	800,000	700,000	600,000	700,000	800,000	750,000
World total ...	100,418,000	80,728,000	101,853,000	89,895,000	72,918,000	61,733,000	48,533,000	39,075,000	55,005,000	97,073,000

*Includes Austrian production from January 1938. †Includes Manchuria and Korea. ‡Included in Germany since 1934.

Iron, Steel Exports and Imports of Principal Countries

Gross tons—Scrap eliminated

	EXPORTS					IMPORTS				
	1939	1938	1937	1936	1913	1939	1938	1937	1936	1913
United States	2,250,000	2,149,000	3,472,000	1,233,000	2,648,000	310,000	240,000	452,000	528,000	273,000
Great Britain	.....	1,918,000	2,576,000	2,203,000	4,969,000	.....	1,341,000	2,039,000	1,483,000	2,331,000
Germany	.....	2,784,000	3,604,000	3,550,000	6,200,000*	.....	867,000	532,000	508,000	300,000*
France	.....	2,002,000	2,133,000	1,575,000	640,000	.....	92,000	170,000	173,000	185,000
Belgium & Luxemburg ..	.....	2,503,000	3,947,000	3,190,000	1,550,000†	.....	215,000	428,000	423,000	874,000†
Total	.....	11,356,000	15,732,000	11,751,000	16,007,000	.....	2,755,000	3,621,000	3,115,000	3,963,000

*Includes Luxemburg. †Belgium only. Figures for 1939 for European countries not available.

European Iron, Steel Domestic Prices, 1939

At Works or Furnace

BRITISH PRICES IN POUNDS STERLING, PER GROSS TON

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
	L s d	L s d	L s d	L s d	L s d	L s d	L s d	L s d	L s d	L s d	L s d	L s d
Foundry pig iron, silicon 2.50-3.00*	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	4-19-0	5- 8-0	5- 8-0
Basic pig iron*	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	4-12-6	5- 1-6	5- 1-6
Furnace coke	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 4-2	1- 8-0	1- 9-0
Billets	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- -76	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-5	8- 7-6	8- 7-6
Standard rails	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	10- 3-0	10-03-0
Merchant bars†	11-12-0	11-12-0	11-12-0	11-12-0	11-12-0	11-12-0	11-12-0	10-12-0	11-12-0	11-12-0	12-16-0	12-16-0
Shapes†	10- 8-0	10 -8-0	10- 8-0	10- 8-0	10- 8-0	10- 8 -	10- 8-0	10- 8-0	10- 8-0	10- 8-0	11- 8-0	11- 8-0
Plates, ship, bridge and tank†	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	10-19-3	11-10-6	11-10-6
Sheets, black, 24-gage	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	14-15-0	16- 2-6	16- 2-6
Sheets, galvanized, 24-gage, corrugated	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	17- 5-0	18-12-6	18-12-6
Plain wire	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	18- 0-0	18- 0-0
Hoops and bands†	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12- 7-0	12-11-0	13-11-0

*Delivered Middlesgrough. A rebate of 5s. 0d. per ton is granted to uers of pig iron who do not buy foreign.

†A rebate of 15s. 0d. per ton for bars, beams, shapes and plates and hoops is obtainable in the home trade when the purchaser undertakes to buy only British steel, except in authorized cases.

M Up to the end of October the price quoted is for bright or black annealed mild steel wire in +-cwt. coils 0$8 basis; for November and December the price is for mild drawn wire or annealed wire in catch weight coils 6$8 standard wire gauge.

GERMAN PRICES IN REICHSMARKS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Foundry pig iron, silicon 2.50-3.00	63	63	63	63	63	63	63	63	....	....	....	....
Hematite pig iron	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	....	....	....	....
Furnace coke	19	19	19	19	19	19	19	19	....	....	....	....
Billets	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	....	....	....	....
Standard rails	132	132	132	132	132	132	132	132	....	....	....	....
Merchant bars	110	110	110	110	110	110	110	110	No German prices available			
Shapes	107	107	107	107	107	107	107	107	after August.			
Plates, 5 millimeters	127	127	127	127	127	127	127	127	....	....	....	....
Sheets, black, 1 to 3 millimeters, basis	144	144	144	144	144	144	144	144	....	....	....	....
Sheets, galvanized, 24-gage, corrugated	370	370	370	370	370	370	370	370	....	....	....	....
Plain wire	173	173	173	173	173	173	173	173	....	....	....	....
Hoops and bands	127	127	127	127	127	127	127	127	....	....	....	....

FRENCH PRICES IN FRENCH FRANCS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Foundry pig iron, silicon 2.50-3.00	598	620.50	620.50	620.50	626.75	653.50	679.30	679.30	679.30	754	781	781
Furnace coke	225	225	225	225	225	225	225	225	225	225	225	225
Billets	945	945	945	945	945	945	1029	1029	1029	1101	1132	1132
Standard rails	1300	1300	1300	1300	1300	1300	1405	1405	1405	1405	1405	1405
Merchant bars	1202	1202	1202	1202	1202	1202	1304	1304	1304	1395	1434	1434
Shapes	1173	1173	1173	1173	1173	1173	1268	1268	1268	1357	1395	1395
Plates, 5 millimeters	1515	1515	1515	1515	1515	1515	1650	1650	1650	1765	1815	1815
Sheets, black, 2 millimeters	1805	1805	1805	1805	1805	1805	1958	1958	1958	2095	2154	2154
Sheets, galvanized, 0.6 millimeter, corrugated	2700	2700	2775	2775	2775	2775	2750	2850	2850	2850	2850	2850
Plain wire	1600	1600	1600	1525	1450	1880	2000	2000	2000	2000	2000	2000
Hoops and bands	1340	1340	1340	1340	1340	1340	1444	1444	1444	1545	1588	1588

BELGIAN PRICES IN BELGIAN FRANCS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Foundry pig iron, silicon 2.50-3.00	500	482	458	463	500	475	475	540	550	650	700	725
Furnace coke	202	202	202	202	202	202	202	202	202	225	281	310
Billets	860	860	860	860	860	860	860	860	860	860	860	860
Standard rails	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375
Merchant bars	1100	1100	1100	1100	1100	1100	1100	1100	1100	1250	1250	1250
Shapes	1100	1100	1100	1100	1100	1100	1100	1100	1100	1250	1250	1250
Plates, 5 millimeters	1375	1375	1375	1375	1375	1375	1375	1375	1375	1475	1475	1475
Sheets, black, 3 millimeters, basis	1575	1575	1575	1575	1575	1575	1575	1575	1575	1750	1785	1800
Galvanized sheets, corrugated, 0.5 millimeter	2750	2750	2750	2750	2750	2750	2700	2700	2700	2700	2875	3050
Plain wire	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1825	2000
Hoops and bands	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300

European Industry

In The War

Steel Plays Major Part; Strict Control Imposed

BY VINCENT DELPORT,
European Manager, STEEL

■ LITTLE more than 20 years after the last shot had been fired at the end of "the war that was to end all wars," the stupidity and, in certain quarters the malignity, of mankind have turned what might have been a promising record of progress into a sombre reality of strife, hatred and destruction. Thus 1939 ended in the shattering of illusions. Will 1940 see the dawn of a new era?

As could be expected, the whole balance of trade and the flow of production were completely unsettled by war conditions and certain fields of business have been almost completely uprooted. Exchange of goods from country to country has been particularly upset. The steel trade, however, although diverted from its peace time state of equilibrium, has not suffered as a whole and, in fact, has received a marked stimulus in the major producing countries.

Unfortunately, this increased activity has been directed into the most unwholesome channel, a flow of steel which, instead of building up the world, destroys it and ends in a scattered scrap heap. Past experience, shows that such an unhealthy growth of capacity and output can be followed by a long period of weakness.

From the beginning of 1939 the steel industry of Europe as a whole presented a more promising outlook than a year earlier. There was a greater demand from normal fields of consumption which, if the storm had blown over, would certainly have expanded under the stimulating influence of restored confidence and the prospect of a period of political sanity and tranquility.

■ Not only has Britain sent troops to France but it is providing arms and ammunition for them. Photo above is a general view in a royal ordnance factory producing shells. NEA photo

But the Munich scare of September, 1938, with all its implications, and worse still, the invasion and annexation of Bohemia and Moravia in March, 1939, gave the sternest warning to all threatened nations that they must be prepared for the worst. The consequence was formidable activity in all factories equipped for war defense work. The resulting call for iron and steel added its quota to the already intense production of German steelworks.

Thus the steel output of Germany and Great Britain in 1939 exceeded all previous records; that of France rapidly increased to a monthly tonnage that had not been attained for a number of years and the steel producing capacity of Belgium, Luxemburg, Poland and other countries became heavily taxed in the months immediately preceding the outbreak of hostilities.

Iron and steel prices during the normal period of the year were already controlled in most countries. Up to the end of October there was no change in British home prices; Belgian prices were not modified until October. In Germany there was no variation, at least until the war started, and French prices did not change until July.

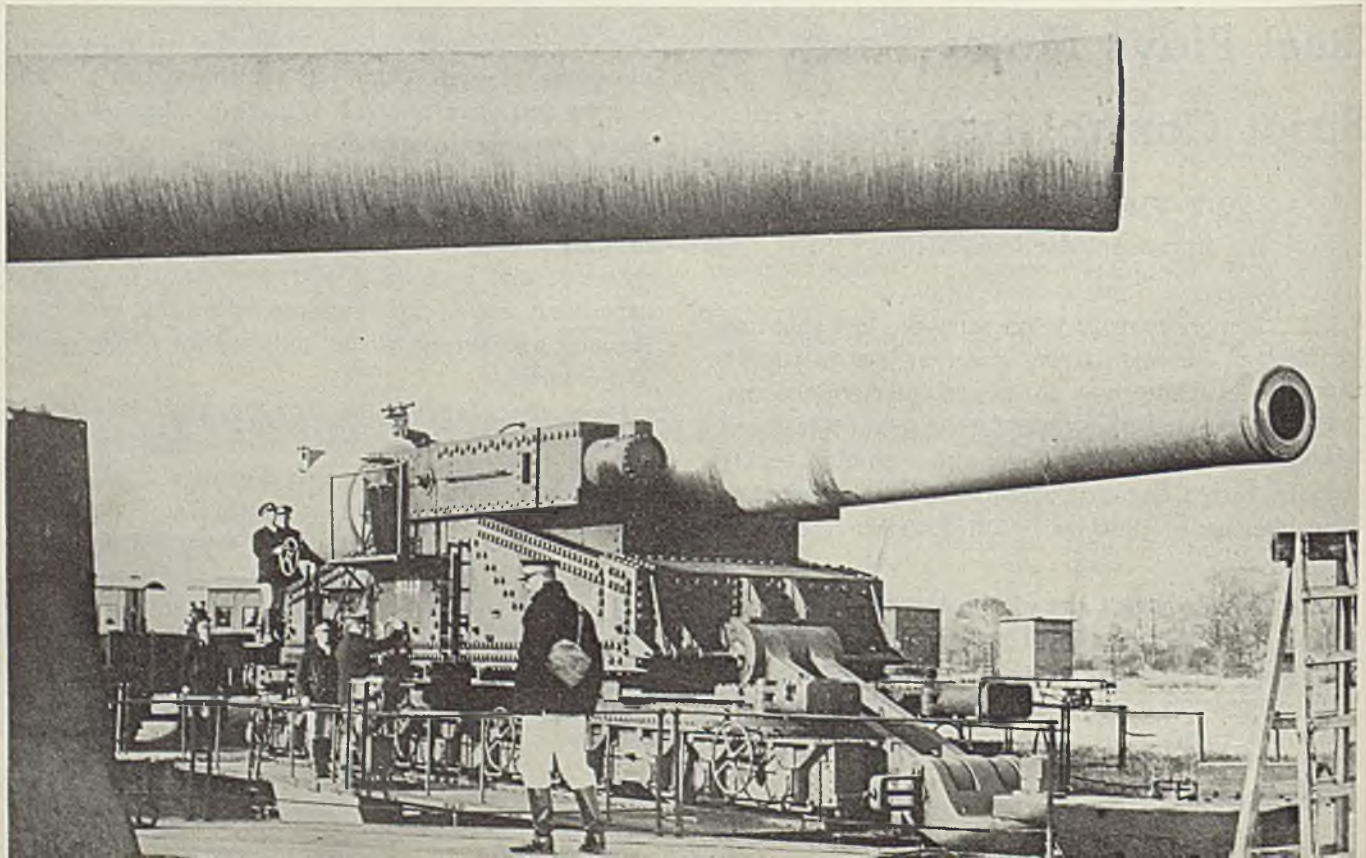
However, production costs were higher, and the French committee of control authorized an increase of selling prices of between 8 and 10 per cent according to product, which took effect in the beginning of July. Prices remained at the new level until the end of the year, but during the last weeks a further increase was expected and business was done subject to possible price variations.

In Belgium prices of a number of products were raised from 8 to 13 per cent as from October, and Nov. 1 a general increase of between 10 and 13 per cent was effected in Great Britain. In these cases the rates of increase were fixed on the basis of actual costs of production. This control of prices was maintained without much difficulty and had advantages from the point of view of consumers, although producers would have liked the increases to have been made earlier. Actual war conditions did not bring about any spectacular rise by the end of the year.

In the export markets prices fluctuated to a much greater degree. Uncertainty and unrest held back business and there was much competition, particularly in South American and Far Eastern markets, for what business was going. As a result, various concessions were granted on the basic prices fixed by the international selling syndicates. Frequent changes were made in the many c.i.f. prices quoted for certain specific markets, and advantages were competed for in regard to freight rates as well as actual prices of steel.

The breaking out of hostilities brought many drastic changes in the structure of the European steel industry. While production in the belligerent countries was intensified, that of Belgium, Luxemburg, Poland and Bohemia was curtailed, at least momentarily, Belgium and Luxemburg were cut off from the supplies of coke and iron ore that they usually received from Germany and France until some kind of arrangement could be made. Polish and Czech production was interfered with by actual war operations and, in some cases, proximity to the front line; the latter factor also had an effect on that portion of steel production that Germany derives from the Saar district.

Export trade came almost to a complete standstill during the first three or four weeks of the war. This was followed by almost panic demand from countries



■ Britain's sandy beaches provide ranges for trying out guns and ammunition. At low tide projectiles are recovered for examination. NEA photo

that had held back their requirements and feared that they would now be cut off. The steel entente automatically ceased to operate and, when a measure of international trade was resumed, prices were uncontrolled and quickly ascended to an almost unprecedented level.

The nearest approach to normal trading conditions continued between Great Britain and France; the representatives of the steel industry of those two nations remained in close contact and the organizations each had set up in their respective territories continued to function; in fact, about Nov. 15 the governments of the two countries decided practically to pool their resources.

Both France and Britain took measures to preserve a footing in export markets, but most of the business went to Belgium and Luxemburg as far as their industries could satisfy the demand; while Germany made vigorous efforts to maintain a flow of trade, particularly with Russia and the Balkan countries.

Referring again to the steel entente, no official notice of its demise had been issued. The framework of the organization remains and its resurrection after the war may be anticipated.

Government Control Only Solution

In order to meet war necessitites, the steel industry has come under direct government control, not only in the belligerent countries but in most neutral ones also. This was inevitable. It entails a considerable amount of formalities, delays and irritation; on the other hand it is the only way to know at any moment the amount of supplies at the disposal of the nation and to ensure that they are directed in the most urgent channels. Despite any advantage accruing to this system it is to be hoped that it has not come to stay and that freedom will be restored to the industry as soon as the war is over.

In the survey of conditions in certain countries of Europe reviewed in the following articles, the places of Poland and Czechoslovakia remain empty. The steel industry of these nations is now being absorbed into the German system and the process is still going on and surrounded with pitfalls. Present conditions of operation in these works can only be surmised. The circumstances of the time have precluded us from presenting our review of conditions in Italy; it can be readily assumed that the Italian steel industry is not idle and that it is playing an important part in the remarkable development of that country and its protection.

The fate of Europe now is in the balance. The future of the European steel industry is closely related to that fate. The map of the European continent has changed dramatically more than once in the past two years. It will no doubt change again, and if one reflection be permitted at the end of this grim story, it is that man still has many a hard lesson to learn before he can aspire successfully to control his destiny.

British Steel Industry Sustains War Machine

BY J. A. HORTON,
British Correspondent

ANY REVIEW of 1939 falls inevitably under two heads, the first covering peacetime activity up to August, the second dealing with the remainder of the year, after Britain and France had entered upon what may be called, for lack of a better term, the second great war.

Britain in 1938 had experienced a lean year, but early in the following quarter the tide had already turned. Production went forward in leaps and bounds as a result primarily of the government's firm resolve to accelerate work on the rearmament program, and thereby prepare to meet whatever lay ahead. Later developments incidentally proved the wisdom of this course.

Steel production in December, 1938, had dropped to 655,700 tons, but by March, 1939, it had grown to 1,170,900 tons and continued at just over the million mark to the end of first half. Similarly pig iron output grew from 445,800 tons in December, 1938, to 743,600 tons in July, 1939.

At the beginning of the year there was a considerable drop in iron and steel prices. A pronounced buying movement was forecast but did not materialize as early as was expected. By the end of first half, however, the combined stimulus of price reduction and armament activity had a tremendous effect.

The decision to provide steel air raid shelters upon a widespread scale threw a large volume of work upon sheetmakers, whose business had previously been at a low ebb, owing to failure of overseas trade, especially in the Far East. Most structural engineers had been engaged for some time upon work for one or other of the government departments.

When the war came, at the beginning of September,

British Production Summary for 1939

(Gross Tons, 000 omitted)

	PRODUCTION				IMPORTS			EXPORTS		
Mo. ave.	Coal	Pig iron and ferro-alloys	Furnaces in blast‡	Steel ingots and castings	Iron ore	Pig iron and ferro-alloys	Steel†	Furnace coke	Pig iron and ferro-alloys	Steel†
1913	23,953	855	338	639	620	18.0	168	...	93.7	320
1936	19,037	643	110	980	496	25.9	98	120	9.3	174
1937	20,034	708	133	1,082	587	59.7	110	138	13.9	203
1938	18,918	564	78	866	431	36.9	75	114	8.4	155
1939										
Jan.	20,357	501	83	812	287	10.2	57	174	7.1	113
Feb.	19,174	516	88	971	362	14.1	75	124	6.4	131
Mar.	21,829	604	95	1,171	400	20.7	82	91	8.9	159
April	17,705	609	100	1,058	443	31.1	61	87	6.3	140
May	19,880	692	113	1,218	547	45.8	97	147	11.8	157
June	19,292	716	114	1,176	640	31.9	168	144	6.7	156
July	17,500	744	115	1,153	552	37.1	184	146	6.1	171
Aug.	15,850	...	...	.....	680	42.4	195	211	7.7	128
Mo. av.	18,948	626*	...	1,080*	489	29.1	115	140	7.6	144

†Includes iron castings, but scrap excluded.
‡Average for 1913. On last day of year or month for subsequent figures.
*For seven months.

the British Iron and Steel federation, with its associated bodies, constituted a system of control ready to hand. Within a few days of the outbreak of hostilities the ministry of supply promptly established control of the industry and fixed maximum prices. These merely stabilized the rates existing prior to the war.

At a later date control was extended to iron and steel scrap and maximum prices fixed. A national campaign was launched for the systematic collection of scrap. Between 170,000 and 180,000 municipal and industrial undertakings were approached by the iron and steel control board requesting the regular collection of all useful scrap material.

Much of the burden in the provision of material falls upon the iron and steel industry, and, with smoothness and adaptability the industry marshalled its forces to prosecute the war with vigor. Plant for steelmaking has been greatly augmented in recent years, and apart from this expansion, considerable reserves in the Dominions can be called upon in case of necessity.

Increasing Steel Capacity

Britain's maximum capacity has been reckoned officially at 14,700,000 tons of ingots per annum. This is based on returns made by makers from actual practice at the various plants. It would appear, therefore, that there is ample margin between the present rate and the maximum, but it can be said that arrangements are being made considerably to increase production.

Steel prices were raised Nov. 1 to meet increased costs of production, including heavy freight insurance charges on imported ore. Pig iron was increased by 9s a ton; billets, rails, shapes and plates by £1 per ton; merchant bars and bands and hoops by £1 4s per ton; black and galvanized corrugated sheets, 24 B.G. by £1 7s 6d per ton. The prices previously applied can be seen in the table of British and Continental prices, on page 270.

Tin plate, which was not previously controlled, was brought into the scheme and the price of I.C. cokes was fixed at £1 1s 6d per basis box. Home iron ore and manufactured steel products, including high speed steel, wire, forgings, and iron and steel castings are now controlled as to price.

The industry has its own machinery for regulating wages. This is in the hands of wages boards representing owners and operatives who, for many years have worked amicably together in the interests of the trade. A sliding scale is in force under which wages fluctuate in accordance with the average net selling price of iron and steel products. This has already resulted in increased wages. Employment showed great improvement as compared with 1938. In September, 1938, unemployment was 27.4 per cent; this had dropped to 5.7 by September, 1939.

With reference to exports, Federation of British Industries took a lead by inaugurating a scheme on the following lines: It is recognized that in some cases the preoccupation of firms engaged upon work of national importance may prevent the acceptance of orders from overseas which otherwise would be welcomed. In these conditions it is understood that arrangements have been made so that inquiries from abroad sent to firms who may not be able to execute them will be forwarded to other business houses in a position to deal with them. In this way, it is hoped, a substantial volume of trade may be retained in this country that otherwise might be placed elsewhere.

The president of the board of trade sent a statement to the Federation of British Industries, the Association of British Chambers of Commerce and the National Union of Manufacturers, pointing out that it is essential in the national interest that exporters should be encouraged to maintain and increase export trade.

Seeks To Hold Exports

Meanwhile the ministry of supply issued instructions to controllers of staff to make every effort to allocate supplies where it appeared to them that the controlled materials were for the manufacture of goods for export, especially where those exports were to be in the form of highly finished goods.

The trend of overseas trade from January to August (after which time publication of detailed statistics ceased in England) showed that exports of iron and steel had not reached the level of 1937 or 1938. For the eight months the figures were, for 1937, 1,783,112 tons; 1938, 1,280,396 and 1939, 1,211,009 tons.

On the import side, however, there had been an expansion, due largely to need for semifinished steel for makers of galvanized sheets. In eight months ending August, 1939, Britain imported 1,148,081 tons of iron and steel, against 1,036,346 tons, and 1,109,964 tons in the corresponding period of 1937 and 1938, respectively. At the end of the year, pressing need for supplies of semifinished steel was still present, and negotiations were being conducted with French, Belgian and Luxemburg producers to supply a large tonnage during the next 12 months.

The rerolling trade must have a constant supply of billets, sheet bars and other material and during the year the difficulty of maintaining activity at the sheet mills, especially, caused much concern and indeed stoppages in rerolling mills. During third quarter, however, some improvement was brought about in this respect and supplies from abroad, including certain Dominions, came to hand despite the enormous difficulties which, since September, were associated with shipping. As a further measure, a plan has been arranged with British manufacturers which if is carried out should insure equitable semifinished steel distribution.

There is not likely to be any difficulty with regard to supplies of pig iron. In 1938 and in the early months of 1939 furnaces were making too much iron, with the result that stocks accumulated. These have since been diminished but not so as to constitute any shortage during the next few months. Iron ore supplies are sufficient, except for certain special grades.

World Steel Production

(*Concluded from Page* 269)

the year. The marked increase of French production began in March and was further intensified as from May. It should be remembered also that 1938 was a year of abnormally low production for France.

As regards Belgium and Luxemburg, later figures were available than for most other countries. Undoubtedly production for 1939 would have been substantially higher if there had not been difficulties in obtaining coke and particularly iron ore from Germany and France in September and the beginning of October.

In assessing Italy's production, account was taken of industrial development in this country, and reconstruction was the guiding factor in regard to Spain. For Czechia and Poland the figures apply to the new boundaries and allowance was made for probable slowing-down of operations during the active war period in these regions in September and the re-adjustment that necessarily followed.

Taking the figures as estimated for 1939, the nations of Europe will have produced 76,750,000 tons of raw steel, as compared with 68,821,000 tons in 1938, an increase of 12.9 per cent. For pig iron and ferroalloys the European output would be 60,325,000 tons as against 53,653,000 tons in 1938, an increase of 12.4 per cent.

In other parts of the world the output of Canada, India and Australia was greater than in 1938, these countries having intensified their production to supplement British requirements of war material. Japanese production has been increased on account of plant extension that has taken place in that country and that will be further developed in 1940.

Based on the figures shown in the tables the tonnage of pig iron produced in the world in 1939 was 75 per cent of the total steel output, practically the same as in 1938.

In regard to iron and steel exports and imports it will be readily understood that it is impossible to estimate tonnages over a 12-month period with only half a year's returns available. Monthly imports and exports fluctuate much more widely than production figures, and the blockade makes all attempts at estimating useless. However, we repeat the table published in last year's STEEL annual, having revised the figures for 1938 on the basis of complete returns for that year.

European Iron and Steel Export Prices, 1939

BRITISH PRICES IN POUNDS STERLING, PER GROSS TON

F. O. B. Ports of Shipment

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Foundry, No. 3, Middlesbrough	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0
Hematite, East Coast	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0
Semifinished Steel												
Billets	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6
Wire rods	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6	11- 7-6
Finished Steel												
Standard rails	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-9	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0	9-10-0
Merchant bars	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 6-3	12- 5-0
Structural shapes	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 0-0	10- 5-6	11- 2-6
Plates, ship, bridge and tank	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9	10-18-9
Sheets, black, 24-gage	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13-13-0	15-12-6
Sheets, galvanized, 24-gage, corrugated	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	16- 6-9	18- 2-6
Hoops and bands	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	12- 5-0	12- 5-0	12- 5-0	12- 5-0	12- 5-0
Plain wire, base	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0
Galvanized wire, base	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0
Tinplate, base box 108 pounds	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 6-0	1-11-3	1-11-6
Ferromanganese, delivered Atlantic seaboard, duty-paid	$92.50	$80.00	$80.00	$80.00	$80.00	$80.00	$80.00	$80.00	$80.00	$100.00	$100.00	$100.00

CONTINENTAL PRICES IN GOLD POUNDS, PER GROSS TON

F. O. B. Channel or Northern Seaports

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Pig Iron	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Foundry, Silicon 2.50-3.00	2- 0-0	1-19-6	2- 0-6	2- 1-3	2- 2-6	2- 3-0	2- 2-0	2- 3-0	2- 3-0	2-19-0	3-10-6	3-10-0
Basic bessemer	1-17-6	1-17-6	1-18-0	1-18-9	2- 0-0	2- 3-0	2- 6-0	2- 6-0	2- 6-0	2- 6-0	2- 6-0	2- 6-0
Semifinished Steel												
Billets	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0	3-15-0
Wire rods	5- 2-6	5- 1-3	5- 0-0	5- 0-0	5- 0-0	5- 1-0	5- 2-6	5- 2-6	5- 7-6	5-10-0	6-16-0	6-15-0
Finished Steel												
Standard rails	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0
Merchant bars	5- 2-6	5- 1-3	5- 0-0	4-17-6	5- 1-3	5- 3-0	5- 2-6	4-17-6	5- 7-6	6- 7-6	7- 7-3	7- 3-0
Structural shapes	4-17-6	4-17-6	4-16-3	4-16-3	4-15-0	4-15-0	4-15-0	4-13-9	5- 2-6	6- 0-0	7- 1-3	6-15-0
Plates, 5 millimeters	5-17-6	5-17-6	5-15-0	5-13-9	5-15-0	5-17-6	6- 0-0	5-17-6	6- 2-6	7- 0-0	9-14-0	9-17-6
Sheets, black, 24-gage, close annealed	7-10-0	7-10-0	7-10-0	7-12-6	7-15-0	7-15-0	7-15-0	7-12-6	7-15-0	8-10-0	10- 0-6	10- 0-0
Sheets, galvanized, 24-gage corrugated	9- 0-0	9- 1-3	9- 4-0	9- 5-0	9- 5-0	9- 3-9	9- 5-0	9- 3-9	9- 5-0	10- 7-6	12- 7-6	12- 5-6
Hoops and bands	5- 7-6	5- 2-6	5- 0-0	5- 2-6	5- 3-9	5- 5-0	5- 3-9	5- 1-3	5- 8-6	6- 7-6	7- 1-6	7- 5-0
Plain wire, base	6-15-0	6-15-0	6-15-0	6-15-0	6-15-0	6-15-0	6-15-0	6-11-3	7- 0-0	8- 0-0	8- 0-0	8- 0-0
Galvanized wire, base	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	7-17-6	8-10-0	9-10-0	9-10-0	9-10-0
Wire nails, base	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 2-6	8- 0-0	9- 5-0	9- 5-0	9- 5-0

French Steel Industry Put on War Footing

BY LEON JAUDOIN,
French Correspondent

BREAKING out of war Sept. 1 makes it necessary to divide any review of conditions during that year into two parts: From January to August and the last three months. No actual comparison is possible between the two periods.

Two facts dominated the general operations of the French iron and steel industry: The threat of German hegemony over Europe, which caused the French considerable anxiety about the possibility of a war and the internal reaction against the lax methods and the socialistic tendencies which had caused trouble in 1936-37 and a general reduction in the rate of industrial productivity.

As a result of these factors a definite improvement in steel production set in during 1939, and while actual figures are not available, it is estimated that for the first nine months, an output of 6,000,000 metric tons will have been exceeded, a similar tonnage applying to pig iron. This compares with 4,553,000 tons of steel ingots and castings, and 4,475,000 tons of pig iron in the corresponding months of 1938.

It is therefore certain that, notwithstanding the difficulties experienced at the beginning of hostilities, the output for 1939 will be considerably over that of the previous year. This expectation is supported by the fact that all French works, even those operating in proximity to the front, have been working to capacity and without interruption. The accompanying table covering first half shows the progression that took place in production. Actually, the output during those six months was the highest reached since 1931 for a similar period.

There was a substantial increase in the proportion of open-hearth steel to the total tonnage, and relatively a still higher proportion of special steel. This was mainly due to the requirements of national defense, which caused specifications in many cases to call for steel, the characteristics of which could be obtained only by the open-hearth process, or for special steels such as stainless and manganese steels for armor plates. A normal development of the uses of stainless and heat and corrosion-resisting steels also took place. As a result of this evolution, several steelworks in eastern France installed large open-hearth and electric furnaces.

With regard to basic bessemer steel, while exports of products of this quality tended to increase, especially to Great Britain, which passed large orders for semi-finished steel, the reduction in domestic demand, particularly by railroads for rails, caused a drop in output.

French Business Progress

(Metric tons 000 omitted)

	PRODUCTION*					Imports			Exports	
Mo. ave.	Iron ore	Coke†	Pig iron and ferro-alloys	No. furnaces in blast‡	Steel ingots and castings	Pig iron and ferro-alloys Coke		Steel§	Pig iron and ferro-alloys	Steel§
1913	3,588	336	756	195	581	256	4.2	10.0	9.0	51
1936	2,775	327	520	84	559	213	5.8	7.7	13.5	149
1937	3,154	355	660	104	660	322	3.6	7.8	37.2	135
1938	2,761	357	505	86	515	197	2.7	3.8	46.7	138
1939										
Jan.	2,746	405	571	87	592	187	2.2	4.0	60.0	178
Feb.	2,597	369	539	88	572	203	4.3	4.0	60.0	148
March	3,000	401	615	90	667	201	4.4	5.0	47.0	173
April	2,759	389	602	92	625	237	3.3	9.0	45.0	134
May	3,091	401	699	102	743	286	4.4	5.0	57.0	162
June	3,188	390	719	106	766	314	4.4	6.0	50.0	209

Data for later months not available.

*Production for 1913 is for France in her present boundaries.
†Coke production at the coal mines. In addition, iron and steel works produce about 3,000,000 tons annually.
‡On last day of year or month.
§Includes ingots, semifinished steel, all rolled products, forgings and scrap.

War Stopped Labor Strife

Since November, 1938, there have been no strikes in the French iron and steel industry, which indicates that any movements of a revolutionary nature that may have existed were extinguished. From the beginning of 1939 the working week of 40 hours was rendered more elastic and industries working for national defense were allowed supplementary hours, and week-end closing was stopped. From the time when Germany invaded Czechoslovakia, measures were taken to intensify industrial production, particularly in regard to aviation and motor engines. As a consequence, unemployment was considerably reduced.

During the first part of the year the syndicates grouped under the Comptoir Siderurgique operated normally. Even the sheet syndicate, the most difficult to operate, functioned smoothly. The wire rod syndicate was definitely consolidated by formation of the wire producers' entente, which had been in the making for many months. An export syndicate for cold-rolled strip was also constituted. The international syndicates related to the International Steel Entente functioned normally until Sept. 1.

The general tendency of French prices to rise influenced steel prices, despite efforts of the French price control committee to keep them down. At the beginning of the year this committee authorized the steel industry to increase the level as from the beginning of January, and a second increase was authorized to take effect from July, not only because it was found that the January increase was not sufficient, but also to meet the cost of modernizing and replacing plant and equipment. These prices, listed in the tables on page 270, include the 9 per cent tax on production and, as from July, an extra "armament" tax of 1 per cent.

At the beginning of the year export prices were weak; billets were quoted at £3 5s 0d (gold), merchant steel at

£4 10s 0d and rails at £5 15s 0d f.o.b. Antwerp. These were basic prices fixed by the Steel Entente, and, as will be seen later, they were considerably increased when war set in.

Prior to the war the industrial mobilization of the nation had already been planned. Each works knew what would be expected from it in war time; it knew where to apply for raw materials and where to ship its products. Establishments that worked specially for national defense could count on a personnel that was to be mobilized *in situ* in order to fulfill the jobs they would have to perform for the manufacture of war material. However, while these plans were ready, French works in peace time were not on a war footing; the result was that when hostilities did break out the switchover had to be made, with its accompanying difficulties of adaptation.

All Industry Controlled

To facilitate this task, a controlling body was set up. This body was the Ministry of Armament, directed by Mr. Dautry, past director of the national French railroad companies. This ministry is responsible for supplying the forces, and also for taking the necessary measures to insure production and to distribute articles essential to the requirements of the country, such as automobile, boilers, machine tools, steel frames, metals, chemicals, etc.

The ministry is divided into a number of sections, one of which is in charge of metallurgical products. The minister is in liaison with the various ministries that are responsible for armament programs and supplies. He has at his disposal the works controlled by the state, can pass orders to private industry and make purchases from foreign countries. He distributes or allocates fuel and power, raw materials, means of production and labor among the various establishments.

In conjunction with the ministry of armament a high commissioner for national economy (national resources) has been appointed, who keeps in touch with the various government departments and with the leading national organizations, in order to co-ordinate means of production. He may suggest to the prime minister any measures that may intensify production at home or in French possessions, or that may improve exchanges, distribution, consumption and credit. He keeps a check on prices and is in charge of the general statistical department. This general scheme is completed by the division of the country geographically into fifteen regions.

Purchases of scrap are centralized for the whole country, including foundries. The central purchasing committee is also in charge of collection of scrap coming from the works and other domestic sources, and allocating home and imported scrap among the various users.

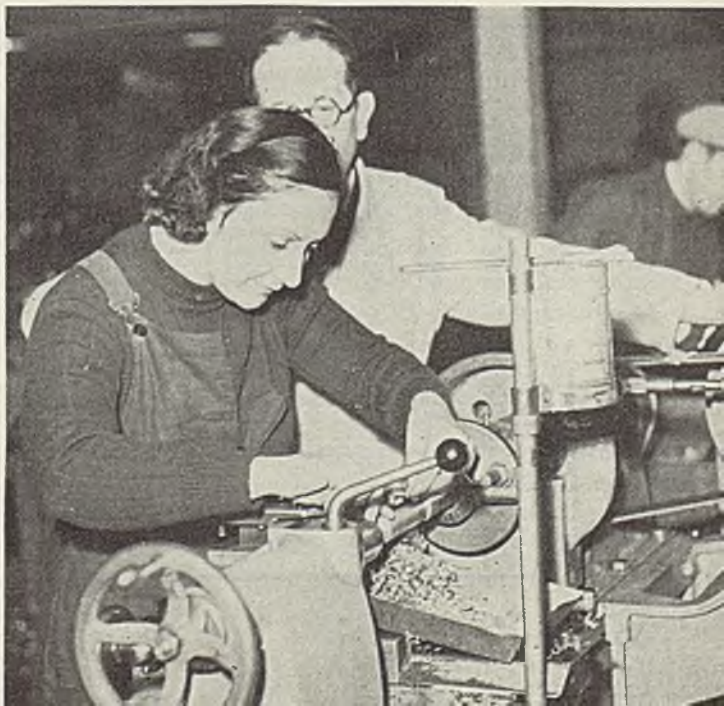
The various iron and steel syndicates continue in being and function as the executive agents of the minister of armament for the products with which they are respectively concerned. One such syndicate is in charge of hematite and basic iron, each of these being handled by a special department, which receives all orders from all classes of consumers. Prices are controlled by the ministry of armament, and at the time of writing an increase is expected owing to the higher price of imported coke. Any price increase is to be based on an examination of costs of production.

Heavy steel products are handled by the Comptoir Siderurgique de France. Orders are classified in order of priority as follows: Orders originating directly from government departments and relating to national defense, and similar orders emanating from public bodies. Such orders are taken care of without formalities and immediately transmitted for execution. Orders emanating from industrial undertakings working on contracts received from the official bodies. Orders for normal civilian requirements, which are taken care of when the requirements of national defense have been met. As for pig iron, steel prices are now controlled by the minister of armament; production costs are being investigated, and in view of the more onerous conditions of working and the increase of prices of imported raw materials, increases of steel prices are to be expected.

Export business is indispensable, particularly in regard to the necessity of obtaining foreign exchange. However, great difficulties were experienced during the first two months of the war, owing to transport difficulties and to adaptation to new conditions. Some tonnages were shipped to Belgium, Holland and certain other neutral countries, but most of the orders placed could not be shipped and have accumulated. This applies also to semifinished steel for Great Britain.

Furthermore, France needs by far the greater part

French women are replacing war industries workers called to the front. After a short apprenticeship they specialize in precision work, often excelling the men. This former modiste is making a machine adjustment under direction of an instructor. NEA photo



of her steel production for her own requirements. Export prices increased by leaps and bounds a few weeks after war broke out, and were no more controlled by the Steel Entente. Demand from export markets is expanding, coming mostly from the Near East, Portugal, Spain and South America. However, uncertainty dominates on most export markets for the time being.

The war brought about further modifications in labor legislation. The working week was increased to 45 hours minimum, with many derogations enabling undertakings to work supplementary hours. Wages for the 45-hour week are the same as for the 40-hour week previously in force. The wages that would have accrued for the extra five hours per week are paid into a fund of "national solidarity" to assist the families of men serving the forces. Any hours worked beyond 45 a week are paid on the basis of 75 per cent of normal hour wages, the balance of 25 per cent also going to the national solidarity fund. In 1938 a tax of 2 per cent on salaries and wages was imposed, this tax has been increased to 4 per cent, and in addition the state retains 15 per cent on wages.

Relations between labor and the employers are regulated by a joint body composed of representatives of the large employers' federations and of the trade unions. These relations are entirely satisfactory and the mixed committee is working smoothly with the object of assisting the nation to win the war.

Producers and manufacturers are subjected to heavy taxation and, in principle, their profit is limited to 4 per cent net of the turnover. There is a tax on production of 9 per cent and an armament tax of 1 per cent, which are included in selling prices.

While forecasts for 1940 are impossible to make there is no doubt that French industry is well prepared and fully equipped to meet all the requirements necessitated by a state of war.

Belgian-Luxemburg Production

(Metric tons 000 omitted)

		——PRODUCTION—— Belgium		Luxemburg		—IMPORTS— —Belgium and Luxemburg—		—EXPORTS— —Belgium and Luxemburg—	
Mo. ave.	Coke	Pig iron and ferro-alloys	Steel Ingots and Castings	Pig iron and ferro-alloys	Steel Ingots and Castings	Pig iron	Steel†	Pig iron	Steel†
1913	294	207	206	212	111	48.0*	26.0*	1.4*	130*
1936	378	263	265	166	166	23.3	19.1	5.2	303
1937	460	317	322	209	209	25.7	19.7	4.1	352
1938	392	205	190	129	120	9.9	7.5	15.4	191
1939									
Jan.	406	231	210	160	138	12.2	8.8	31.3	222
Feb.	368	203	199	154	136	11.2	7.6	28.3	195
March	371	222	225	153	146	12.5	9.9	12.4	212
April	362	225	219	154	149	14.8	7.0	8.8	208
May	417	270	281	184	181	22.4	8.2	9.4	248
June	436	286	305	184	188	17.0	7.1	11.4	324
July	471	295	296	185	178	13.6	6.7	10.9	317
Aug.	470	280	282	164	162	....	...	....	...
Sept.	419	206	212	94	88	....	...	....	...
Oct.	...	256	261	...	..	....	...	....	...

*Belgium only. †Includes iron castings and scrap.

War Limits Luxemburg, Belgian Ore, Coke Supply

European Staff Special

■ BELGIUM and Luxemburg, although neutral countries, have been under the shadow of war clouds that covered Europe during 1939. Placed in the center of a triangle between France, Great Britain and Germany, these two nations, after their experience of 1914, could not ignore the implications of the European political situation. As a result, the industrial activities of Belgium and Luxemburg were largely directed toward national defense.

At the beginning of 1939 steel trade was dull, both in domestic and export markets. The price situation was weak, and concessions up to 5s. (gold) were made for export sale of bars, but without much success. The position as regards structural steel and hoops was better, but the sheet market, particularly galvanized, was unsatisfactory, and price concessions reached 15s per ton.

This weakness of prices was due, not only to the general dullness of trade, but also to the fact that Polish works were keenly competing in certain markets, and, not being officially members of the entente, quoted lower prices than the entente members, as, for instance, in South American markets. Strong competition also had to be met from the United States, Australia and Sweden. However, some business was done, mainly with Argentine and Egypt, despite additional competition between merchant houses accredited by the selling syndicate and free-lance merchants.

April Business Rebound

Toward April the domestic market sustained a setback owing to parliamentary elections in Belgium, which had the usual effect of holding back business. From the beginning of May, the interior market became much more active, owing to unfavorable developments of the European political situation. Price concessions gradually vanished and the increasing volume of orders caused several blast furnaces to be restarted, both in Belgium and Luxemburg, more particularly in the industrial district of Hainaut in Belgium. Periods of delivery were greatly extended, reaching six months for certain products.

Revival of production was also largely due to increasing demand for semifinished steel from Great Britain which was then intensifying her production for requirements of national defense, and whose output of semifinished steel was inadequate. The quota of exports which had been allocated to Belgium and Luxemburg was considerably extended, and during May and June alone, nearly 300,000 tons of British orders were received.

This period was followed by a relative calm in the international markets, but domestic business was then

active and there still was a demand from abroad for galvanized sheets and plates. Events in the Far East also revived trade to some extent in that direction. Generally speaking, summer started with works well occupied and order books well filled.

As a whole, improvement in the Belgo-Luxemburg steel industry in 1939 is illustrated by the fact that for the first nine months steel output in Belgium was 2,229,330 metric tons, against 1,639,694 tons in the first three quarters of 1938, an increase of 36 per cent, mainly in second and third quarters. An increase of the same order was registered in Luxemburg.

During the pre-war period the various syndicates operated normally. Following reconstruction of the French wire products syndicate, the life of the wire rod syndicate, which until then had been rather shaky, was assured. The reconstruction of the foundry iron syndicate was also progressing favorably since differences between certain Belgian and French furnaces had been made up. This syndicate, which is still of a provisional nature, includes the ironmakers of Belgium, Luxemburg, France, and the Dutch furnaces of Ymuiden have also joined. This does not prevent free export of Belgian and French foundry pig iron, but the agreement has resulted in better prices. The international syndicate for cold-rolled strip was set up in 1939.

New Coke, Ore Sources

The war, however, had a marked detrimental effect on the iron and steel industry of Belgium and Luxemburg. The main consequence was the almost immediate drying up of sources of supply of certain raw materials normally obtained from France and Germany. A large tonnage of coking coal was imported from Germany, but that country needed all the output available for her own purpose. Lack of supply from this source was, however, of relatively minor importance to Belgium, who is herself a large coal producer.

A similar situation arose in regard to iron ore, most of which was supplied from France. At the opening of hostilities this supply almost completely stopped, and arrangements had not been made to replace them with ores from Sweden or other sources. Following a few weeks' negotiations it was found that French output of iron ores could be intensified, despite proximity of mines to the fighting zone. On the other hand, France required coking coal, which formerly came from Germany. Finally, an arrangement was arrived at by which an exchange could be made on the basis of 6,000,000 tons of French ore against 4,000,000 tons of coking coal from Belgium over a twelve-month period.

Exchanges of a similar nature were also envisaged as between Belgium and Luxemburg, and Germany. It would seem that the surplus production of Belgian coal may come in as a useful means of exchange with a view to keeping certain export markets open. Switzerland, for instance, would be prepared to purchase coal for domestic use from Belgium, but the transport difficulties are considerable. Another consequence of the war, in neutral as well as in belligerent countries, is the tightening of government control on all basic industries, the steel industry being a prominent case.

As soon as war broke out, export business came to a standstill until about the end of September. Somewhat suddenly, toward the middle of October, inquiries came in abundance, and orders were taken at almost any price, and irrespective of long delays in deliveries. These inquiries came from a variety of markets, but especially from Portugal, Spain and South America. Business with belligerent countries is subject to more protracted negotiations. However, in a general way, the tone of export markets at the end of the year was uncertain and subject to sudden changes of events.

Export Prices Rise Rapidly

In view of the pressing nature of demand that had suddenly developed, and of the restricted volume of products on offer, export prices tended to rise rapidly; quotations in paper pounds were withdrawn and were made in Belgian francs at a rate of 243 Belgian francs to one gold pound. The Belgian selling organization "Cosibel" fixed a scale of minimum prices, which, at the beginning of September had been re-established at the level officially prevailing in 1938, namely £5 5s 0d (gold) for merchant bars and £4 17s 6d for beams. By the beginning of October the minimum had risen to the equivalent of £6 per ton for bars and structural steel, and by the beginning of November, business had actually been done at the equivalent of £7 10s 0d (gold) for bars and £7 5s 0d for structurals; by that time export trade had extended to plates, which were sold at £10 and sheets, while galvanized sheets fetched as much as £12 8s 0d and hoops £6 15s 0d.

The last-named prices were for exports to overseas markets, lower figures applying to European markets, and especially to Great Britain. Actually, producers were unable to cope with demand, partly on account of priority requirements of the domestic market and also because of reduction of output enforced by difficulty of obtaining ore and coke. The output of steel in September was, for this reason 25 per cent less than in August. However, the position improved in October and November.

It will be readily understood that the International Steel Entente died an unofficial death, since the member countries included belligerents on both sides, as well as neutral countries and central European countries that had agreements with the Entente were no more in a position to implement them. No more statistics are communicated to member countries, and each separate group acts according to its own interests and subject to prevailing conditions.

The steel interests of France and Great Britain remain naturally closely connected. As regards Belgium and Luxemburg, these countries now trade freely insofar as market conditions and their position as neutral countries permit them. The outlook for the steel industry of these two countries depends largely upon the fortunes of war.

German Steel Plant "Best In Europe," Lacks Iron Ore

European Staff Special

■ WAR or no war, Germany will have attained an all-time record of steel output for 1939. Statistics available up to and including July give a production of 14,448,554 metric tons of steel ingots and castings, against 13,205,178 tons in the corresponding seven months of 1938. The 1939 figures include Sudetenland as from January and this territory was not included in the 1938 statistics, but even taking this into account, the increase of steel production in the first seven months was well over 1,000,000 tons. For pig iron, the figures were 11,469,208 tons and 10,579,668 tons, respectively, for the seven months and show an increase of about the same proportion.

Other signs of pre-war activities are not lacking: Imports of iron ore in 1938 totaled 21,928,000 metric tons, an average of 1,827,000 tons per month. During the first five months of 1939 the average monthly imports dropped to 1,797,000 tons, due to the low tonnages received in January, February and March, but the significant fact is that in April ore imports were 2,096,000 tons and in May reached 2,245,000 tons. Domestic production of iron ore rose from a monthly average of 929,000 tons in 1938 to 1,230,000 tons throughout the period January-May, 1939, the increase being mainly accounted for by inclusion of Austrian ore.

Pig iron import statistics are striking: Average monthly imports of pig iron and ferroalloys in 1936 were 11,500 metric tons; in 1937 they increased to 15,000 tons and in 1938 to 39,000 tons. In 1938 monthly pig iron imports ranged from 15,000 tons to 50,000 up to September; in October they reached 65,800 tons, in November 96,100 tons and in December 114,500 tons. In January, February and March, 1939, the monthly figures ranged from 100,000 to 120,000 tons, then dropped to less than 50,000 tons.

Exports of steel products from Germany increased markedly in the first months of 1939. They consisted mainly of merchant bars, hoops, plates and sheets, tubes, structural steel, railroad material and wire products. Average monthly exports in 1938 were 232,000 tons, whereas in the first six months of 1939 they increased to 250,000 tons a month, despite the inclusion of Austria and the Sudeten district in German customs territory in the more recent months. It is well known that every effort was made to stimulate exports of German finished products in order to obtain the necessary exchange to pay for imports of raw materials.

Reports from Germany for the pre-war part of the year indicated considerable activities in all industrial fields, including such steel consuming industries as machine tools, automobiles and industrial plant. It is obvious, however, that a large proportion of German steel production went to the making of armaments, war material and implements required for manufacturing them. Statements made by German spokesmen and the German press concerning the nation's state of "preparedness" prove the fact. There is little doubt that already in the months preceding the invasion of Poland the iron and steel works of Germany were working to capacity and that newly erected plant was put into operation as soon as tested and in working order.

German Steel Leads Europe

Germany can boast of having by far the most powerful iron and steel producing and transforming plant in Europe, the greater part of which is of the latest type and efficiency. In addition to existing plant, important new additions are gradually being brought to completion, and Germany controls the steel capacity of Czechia and Poland. As regards the latter, the main Polish works are located in territory allocated to Germany in the Russo-German treaty that followed the combined onslaught. Both in respect to the Polish and Czech works, there is no reason to believe that any have been destroyed, or even extensively damaged during the periods of fighting or occupation, but it is quite probable that operations were, at the time, reduced and irregular.

Reverting to Germany's own plant, it is well known that construction of new plant at the state-owned Hermann Goering works, started in 1937, has been pushed actively, and one blast furnace, with a daily capacity of 1000 tons, was to have started in September. These works are being constructed, partly at Salzgitter in Germany, partly at Linz in Austria, with the special object of making use of German ore of relatively low iron content and high phosphorus. In addition to these completely new works, new plant has been erected and started by privately owned undertakings, particularly the Vereinigte Stahlwerke.

Taking all these factors into consideration, it can be estimated that the present annual capacity of steel pro-

German Business Progress

(Metric tons 000 omitted)

Mo. ave.	Iron Ore Output*	Iron Ore Imports	Coke Output*	Pig iron and Ferroalloys Output*	Pig iron and Ferroalloys Imports	Raw Steel Output*	Steel Exports†§	Finished Steel Output‡
1913	609	1,168	2,639	1,024	11.0	1,116	470	970
1936	631	1,539	2,988	1,275	11.5	1,578	284	1,116
1937	816	1,718	3,408	1,330	15.0	1,631	298	1,176
1938	929	1,827	3,625	1,550	39.0	1,942	232	1,364
1939								
Jan.	1,203	1,603	3,921	1,633	100.4	2,096	227	1,467
Feb.	1,145	1,407	3,582	1,529	120.9	1,955	229	1,358
Mar.	1,330	1,636	3,961	1,730	113.9	2,215	232	1,564
Apr.	1,197	2,096	3,664	1,608	41.6	1,899	247	1,327
May	1,285	2,245	3,792	1,677	24.9	2,070	251	1,459
June	1,364	2,260	3,697	1,651	30.7	2,105	314	1,484
July	.....	.....	.....	1,639	....	2,106	...	.....

Data for later months not available.

*Figures for 1913 are for Germany in her present boundaries without Austria. Figures for iron ore and coke include Austria from January, 1939; figures for pig iron and steel include Austria from January, 1938.
†Includes iron castings and scrap.
§Figures for 1913 are for pre-war boundaries and include Luxemburg.
‡Includes Austria from March 15, 1938.

duction for Germany, including Austrian works, is between 26,000,000 and 27,000,000 tons, and that in a short time it might be increased to 30,000,000 tons. For 1939, assuming that during the last four months production was not impeded, the output would have approached 25,000,000 tons, but owing to the fact that the Saar works are in the war zone, and that operations at the works could hardly have been continued under fire, and allowing for other difficulties, the output of steel for 1939 may be estimated at about 24,000,000 metric tons.

Since Germany lost the iron ore deposits of Alsace-Lorraine in 1918, she has depended to a large extent on imports from foreign sources. Germany has vast reserves of iron ore, but of low quality. In 1938, when Germany produced nearly 23,000,000 tons of steel, the tonnage of domestic ore extracted was 11,145,000, including 2,645,000 tons of Austrian ore. Imports during that year amounted to 21,928,000 metric tons, exports to 5 mililon tons.

Depends on Imported Ore

Therefore, over two-thirds of Germany's consumption of iron ore was purchased from foreign countries. Of the 22 million tons in round figures imported in 1938, 9 million tons came from Sweden, 5 million tons from France, one million from Algeria, Tunis and French Morocco, 1,700,000 tons from Luxemburg, 1,100,000 tons from Norway, 1,100,000 tons from Newfoundland, 1,800,000 tons from Spain and Spanish Morocco, and the balance of 1,300,000 tons from other sources. It will be noted that Russia does not figure in the list of main suppliers.

Obviously the seven million and odd tons originating from France, Northern French Africa and Newfoundland are no longer available to Germany; Spanish arrivals can be practically counted out on account of the blockade. Thus, 40 per cent of ore imports, or 32 per cent of the German consumption of 1938 (about 10,000,000 tons for present requirements) must be made up by considerable effort to increase domestic output, by inducing Luxemburg and Scandinavia to augment their shipments, or by finding new outside sources.

Russia appears to be the only source from which Germany can hope to make up deficiencies. In 1938 Russian ore mines yielded about 28,000,000 tons, but a meager portion was available for export. In her efforts to develop her own iron and steel industry Russia needs all the ore she produces.

The conclusion is that Germany is faced with tremendous difficulties if iron and steel output is to be maintained for long at its present rate, despite the actual plant capacity.

American Exports

(*Concluded from Page* 177)

tons valued at $37,034,379 in the 1938 period. Japan was by far the largest buyer, 1,720,015 tons, the United Kingdom second with 457,983 tons, Italy 334,605 tons, Canada 141,333 tons and China 26,619 tons.

Industrial machinery exports constitute an important feature of trade and in 1939 held close to the 1937 level, which was only 3 per cent below the high point reached in 1929. In that year total exports in this class were $277,764,507. In ten months of 1939 they totaled $239,201,473 and with two months remaining it seemed likely 1939 would equal or surpass the previous record. Figures are available from the machinery division, department of commerce only to the end of October.

In ten months exports of power-driven metalworking machinery were valued at $96,879,922 compared with $97,270,616 for all of 1938, construction and conveying machinery $20,638,342 compared with $23,914,129, mining, well and pumping machinery $53,005,066 compared with $63,583,248 and power generating machinery, other than electric and automotive $11,782,518 against $17,599,292.

No effect of war conditions is discernible in the total figures for machinery, there being little variation from the average through the entire ten-month period.

Aviation

(*Concluded from Page* 170)

came larger and more efficient, engines more powerful and reliable. Into production went four-motored 74-passenger flying boats weighing 42 tons, four-motored 42-passenger land transports, huge four-motored bombers. Developed were two 18-cylinder, 2000-horsepower radial air-cooled engines and a 24-cylinder, 2400-horsepower liquid-cooled inline model.

Planemakers' humming laboratories turned out "reversible pitch" propellers to enable "braking" in flight by reversing normal blade angles; engine synchronizers to eliminate the disturbing beat of motors in multi-engined craft; new cabin heating system to increase passenger comfort; finning systems to speed cylinder cooling; an exhaust gas analyzer; hosts of others.

As aeronautical production gains, allied industries evince greater interest in the field. Last year a number of automobile and machinery firms began aircraft parts manufacture. Doubling during the period, subcontracting business now comprises 20 per cent of total production volume.

Unquestionably becoming urgent is the need for expanding the nation's public, private and military airports, now totaling nearly 2400. Much equipment was installed last year in the way of steel hangars, lighting, radio, power, servicing and shop equipment. New York completed its huge $40,000,000 field at North Beach. Before close of the last session congress boosted to almost $125,000,000 appropriations for improving existing army and navy air bases and building 18 new fields in the United States and territories.

Domestic MARKET Summary

Rapid mid-year upturn brings all-time record in steel production. Prices advance moderately on various adjustments. Year ends at prosperous level

■ LAST year was a period of extremes in the marketing of steel products. Demand and production varied from mediocrity to unprecedented volume. Prices of some finished steel grades fluctuated widely, and scrap quotations soared to a 15-year peak.

Business was somewhat disappointing the first four to five months of 1939. The encouraging upturn of late 1938 tended to flatten out as the new year opened, and the first quarter rise in production was less than seasonal. April and May saw activity decline steadily, steelmaking reaching a bottom of 45.5 per cent in the latter month.

Recovery ensued thereafter, lifting operations approximately 15 points by the end of August. Start of the European war Sept. 1 gave the signal for a rush of buying that eclipsed anything ever before experienced by the industry.

This business did not represent war orders, but the haste of buyers to secure places on mill books was intensified by fears that war conditions would result in higher prices and delayed deliveries. The avidity with which buyers placed orders in a short time developed the loaded order books and the deferred shipments they sought to circumvent.

By Oct. 1 mills were generally sold out of the commoner steel products for the remainder of the year and were able to accommodate little of the increased export demand which appeared after the war started, principally from neutral countries.

The over-night change to a sellers' market was promoted to a large extent by relatively low inventories and by the fact major users became active in buying simultaneously on the prospect of further business recovery. The automotive industry was starting production of 1940 models, involving a sharp increase in steel requirements. Railroads found it desirable to speed up acquisition of equipment and track material to compensate for previous deficiencies in this respect and to meet expected traffic growth.

September was a boom month in railroad purchases, involving 23,000 freight cars, 52 locomotives and 190,000 tons of rails. This was in sharp contrast to restricted demand from the carriers in earlier months. Shipbuilding likewise was accelerated. Building and engineering construction received no marked stimulus in the way of new enterprises, although carrying out of old projects was quickened to avoid price increases and delays in steel deliveries.

An important influence in stimulating merchant bar demand in August and September was the fourth quarter application of higher extras which represented a price increase of varying amount to most buyers. Likewise, the approaching expiration of low-price contracts in sheets placed earlier in the year induced customers to specify fully against these commitments. As a result, what ostensibly was fourth quarter protection, in many instances developed into coverage of six months' requirements.

Caught unawares by the rapidity with which business increased, steel producers encountered delays in placing all facilities in service. Certain open-hearth and blast furnaces required extensive repairs, some of them having been idle for years. Increased coke needs were satisfied only through the starting up of thousands of beehive ovens. Lake Superior iron ore shipments rose sharply.

Scrap consumption spurted, and the market for old material boiled as prices of leading steelworks grades in five weeks shot up more than 40 per cent to exceed any figures since 1923. Steel ingot production was at slightly below 65 per cent the first week of September. By mid-October it had passed 90 per cent, establishing an all-time high for any week on a tonnage basis. Fourth quarter output was the largest in history for that or any other three-month period.

Finished steel prices performed some unusual gyrations in 1939, principally in flat-rolled steel. Weakness in sheets and strip was more or less scattered until

May, when the bottom practically fell from the market. Concessions to a few customers became widespread, and price-cutting grew like a snowball as mills scrambled to undersell each other. The price war finally died out after buyers had taken advantage of cuts ranging up to $11 a ton or more to cover themselves several months ahead—through the year in the case of the automotive industry and some other consumers.

The September buying surge stiffened finished steel prices. Existing levels were extended through fourth quarter, with the provision that all shipments after Dec. 31 would be at prices prevailing at time of delivery.

Contrary to earlier expectations, finished steel prices late in November were reaffirmed in most instances for first quarter delivery. Exceptions were hot-rolled sheets and strip, base prices of which were advanced $2 a ton. The increase in sheets partially was offset by corresponding reductions in certain extras on several sizes. Wire rod quotations for first quarter were changed from a gross ton basis to a price per 100 pounds. This resulted in an increase of $1.60 per net ton on smaller sizes.

Bases and Extras Changed

Prior to the May price unsettlement, hot-rolled sheets nominally were 2.15c, base. Stabilization eventually was attained at a $3 a ton reduction to 2.00c. At the same time, the base quantity was established at 1 ton or over, and deductions for large orders were eliminated.

Previously the base quantity was 1 to 20 tons, with deductions of 5 to 15 cents per 100 pounds granted on lots up to 75 tons or over. This latter setup had prevailed since March, before which time base quantity was 1 to 25 tons and deductions of 5 to 15 cents were allowed on lots up to 150 tons or over.

Galvanized sheets carried an official base price of 3.50c through 1939, but concessions were common through spring and summer. Cold-rolled sheets and hot and cold-rolled strip were reduced $3 a ton in May.

Hot-rolled alloy bars, cold-drawn carbon and alloy bars, concrete reinforcing, merchant rail steel and common iron bars also were affected by changes in quantity and other extras. These generally resulted in higher net prices to buyers. Early in the fourth quarter carbon grades of merchant and reinforcing rail steel, billet reinforcing and common iron bars all were placed on the same base as billet merchant bars, 2.15c.

Bar and flat-rolled steel demand was affected favorably by improvement in automobile and farm equipment production as well as by recovery in operations of domestic appliance manufacturers and miscellaneous consumers. Warehouses also provided larger outlets for these and other products. Distributors profited late in the year by the inability of mills to give prompt delivery on a number of commodities.

Plates and shapes continued through most of the year at 2.10c, base, although concessions prevailed in earlier months. In September, several smaller producers advanced plates $5 a ton, but this increase was not followed universally, and by that time only limited tonnage was still available for fourth quarter delivery.

Fabricated structural shape awards in 1939 increased less than 10 per cent over 1938. However, the rush to close on public works jobs late in 1938 built up that year's total and carried over substantial shipments of plain material into 1939.

Housing projects helped to boost concrete reinforcing bar orders nearly 40 per cent last year. Principal housing developments accounted for more than 25,000 tons of bars. Private building construction provided larger orders for both bars and shapes.

Steel pipe also benefited from gains in building. Demand for oil country goods was restricted part of the year by curtailment of well drilling, but this was offset by increased call for oil and gas line pipe. Nine large pipe lines took 175,000 tons of steel. Cast pipe business was only moderate although more active than the year before. Prices were raised $3 a ton in September, following an increase in pig iron.

Prices of merchant wire products were unsettled until just before the fall pickup in demand. Nails, which prior to September had been quoted nominally between $2.45 and $2.40, were raised 15 cents to $2.55 in that month. Bright wire and wire rods were unchanged until the latter's revision, previously described.

Tin plate demand held well above 1938 levels, production reaching a spring peak of 70 per cent before moderating seasonally. A secondary upturn starting in September was aided by heavy export buying and a sharp spurt in domestic business, carrying operations to practical capacity in the fourth quarter. The market held through the year at $5 per base box.

Semifinished steel continued $34 for rerolling billets, slabs and sheet bars in 1939, a figure prevailing since the middle of 1938.

Raw Materials in Heavy Demand

Pig iron buying was restricted until September by heavy coverage in the fall of 1938, when forward contracting was stimulated by a small price increase. Demand spurted in September in anticipation of an advance of $2 a ton on most grades, and fourth quarter shipments were unusually heavy. This was reflected in record-breaking production of pig iron in the fall.

Scrap markets were fairly steady until September. In the first eight months STEEL'S price composite of leading steelworks scrap grades fluctuated within a range of $1.54. Standing at $15.50 on Sept. 1, the composite shot up 43 per cent to $22.16 the ensuing five weeks as dealers sought to cover short sales and consumers entered the market in anticipation of heavier operations. The market then reacted and continued several dollars lower through the final quarter.

Ferromanganese was reduced $12.50 a ton in January to $80, tidewater. This price held until September, when it was raised to $100. Spiegeleisen also advanced at the latter time, the 19-21 per cent grade moving up $4 to $32 and the 26-28 per cent grade rising $6.50 to $39.50. Certain other ferroalloys, including ferrotungsten, also were strengthened late in the year.

Monthly Price Averages for Eleven Years

Price Averages for Years Prior to 1929 may be found in STEEL for January 7, 1935

Prices of Ores and Alloys

Per Gross Ton

Iron Ore Prices at Date of Buying Movement, Delivered Lower Lake Ports

Season	Date buying movement	Old range Bessemer Ton	Old range Bessemer Cents per unit	Old range Nonbessemer Ton	Old range Nonbessemer Cents per unit	Mesabi Bessemer Ton	Mesabi Bessemer Cents per unit	Mesabi Nonbessemer Ton	Mesabi Nonbessemer Cents per unit	Iron prices, Valley Bessemer	Iron prices, Valley No. 2 Foundry
1939	May 3, 1939	$5.25	$10.194	$5.10	$9.903	$5.10	$9.903	$4.95	$9.612	$21.50	$21.00
1938	May 23, 1938	5.25	10.194	5.10	9.903	5.10	9.903	4.95	9.612	24.50	24.00
1937	Mar. 12, 1937	5.25	10.194	5.10	9.903	5.10	9.903	4.95	9.612	24.50	24.00
1936	Apr. 3, 1936	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	20.00	19.50
1935	May 4, 1935	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1934	May 19, 1934	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1933	June 12, 1933	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	16.00	15.50
1932	June 3, 1932	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	14.50	14.50
1931	Apr. 15, 1931	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	17.00	17.00
1930	Apr. 1, 1930	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1929	Mar. 22, 1929	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	18.50	18.00

Manganese Ore

Dollars Per Gross Ton, Duty Paid, Northern Atlantic Ports, on Basis of 50 Per Cent Ore

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$20.85	$20.85	$20.35	$20.10	$20.10	$20.10	$20.10	$20.10	Nom.	$29.32	$29.32	$29.32
1938	28.10	28.10	28.10	28.10	28.10	28.10	25.60	25.60	25.60	22.60	21.10	21.60
1937	21.10	22.60	22.85	27.60	27.60	27.85	31.85	31.85	31.85	30.60	28.60	28.10
1936*	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	19.10	19.10	20.60
1935	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70
1934	21.70	22.70	22.70	22.70	22.70	22.70	22.70	22.70	23.20	23.70	23.70	23.70
1933	19.95	19.95	19.95	19.95	19.95	20.20	20.45	21.45	21.45	21.70	21.70	21.70
1932	22.70	22.70	22.70	22.70	21.70	21.70	21.70	21.70	21.20	21.20	21.20	20.70
1931	24.20	24.20	23.70	23.70	23.70	23.70	23.70	23.70	23.70	22.70	22.70	22.70
1930	29.95	24.70	24.70	24.70	24.70	24.70	24.70	24.20	24.20	24.20	24.20	24.20
1929	27.70	27.70	27.70	27.70	27.70	27.70	26.70	26.70	26.70	25.70	25.70	25.70

*Effective Jan. 1, duty ½c per pound metallic content; $5.60 gross ton on 50 per cent ore.

Bessemer Ferrosilicon, 10 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$31.00	$32.00	$32.00	$32.00
1938	33.00	33.00	33.00	33.00	33.00	33.00	29.00	29.00	29.00	30.00	30.00	30.00
1937	29.00	29.00	31.80	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1936	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	29.00
1935	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
1934	27.25	27.25	27.25	27.25	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
1933	20.50	20.50	20.50	20.50	20.50	20.75	22.40	24.65	27.00	27.75	27.75	27.75
1932	23.00	22.00	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50
1931	25.00	25.00	25.00	25.00	25.00	25.00	25.00	24.00	23.00	23.00	23.00	23.00
1930	30.00	30.00	30.00	30.00	30.00	29.50	29.00	29.00	25.00	25.00	25.00	25.00
1929	31.00	31.00	31.00	31.00	31.00	31.00	31.00	30.20	30.00	30.00	30.00	30.00

Ferrosilicon, 50 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50
1938	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
1937	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
1936	77.50	77.50	77.50	77.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
1935	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
1934	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
1933	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50
1932	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	76.30
1931	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	77.50
1930	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50
1929	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50

Spiegeleisen, 20 Per Cent

At Producers' Furnaces

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$30.00	$32.00	$32.00	$32.00
1938	33.00	33.00	33.00	33.00	33.00	33.00	28.00	28.00	28.00	28.00	28.00	28.00
1937	26.50	26.00	28.00	30.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1936	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1935	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1934	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1933	24.00	24.00	24.00	24.00	24.00	24.00	27.00	27.00	27.00	27.00	27.00	27.00
1932	27.00	27.00	27.00	27.00	27.00	26.50	25.00	25.00	25.00	25.00	24.25	24.00
1931	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	27.00
1930	34.00	34.00	34.00	34.00	34.00	34.00	33.00	33.00	33.00	33.00	33.00	30.00
1929	34.00	34.00	34.00	34.00	34.00	34.00	34.00	33.20	33.50	34.00	34.00	34.00

Ferromanganese, 80 Per Cent, del. Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$91.58	$85.33	$85.33	$85.33	$85.33	$85.33	$85.33	$85.33	$95.33	$105.33	$105.33	$105.33
1938	107.49	107.49	107.49	107.49	107.77	107.77	97.77	97.77	97.77	97.77	97.83	97.83
1937	84.79	84.79	92.29	99.79	107.29	107.29	107.29	107.29	107.29	107.29	107.39	107.49
1936*	90.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	82.65
1935	89.79	89.79	89.79	89.85	90.13	90.13	90.13	90.13	90.13	90.13	90.13	90.13
1934	90.24	90.24	90.24	90.24	90.24	90.00	89.79	89.79	89.79	89.79	89.79	89.79
1933	73.24	73.24	73.24	73.24	73.24	73.24	84.44	87.24	87.24	87.24	87.24	87.24
1932	79.85	80.24	80.24	80.24	80.24	74.99	73.24	73.24	73.24	73.24	73.24	73.24
1931	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	79.79
1930	104.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	93.25
1929	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	104.79

*Duty of 1 cent per pound contained manganese became effective on ferromanganese Jan. 1, 1936.

Pig Iron Prices

Per Gross Ton

Basic, Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$20.50	$20.50	$20.50	$20.50	$20.50	$20.50	$20.50	$20.50	$21.50	$22.50	$22.50	$22.50
1938	23.50	23.50	23.50	23.50	23.50	23.50	19.50	19.50	19.50	20.50	20.50	20.50
1937	20.50	20.50	23.10	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50
1936	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.25	20.00
1935	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	19.00	19.00
1934	17.00	17.00	17.00	17.60	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1933	14.00	14.00	14.00	14.00	14.40	15.00	15.60	16.00	17.00	17.00	17.00	17.00
1932	15.00	15.00	15.00	15.00	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00
1931	17.00	16.75	16.75	17.00	17.00	17.00	17.00	17.00	17.00	16.60	15.00	15.00
1930	18.50	18.50	18.50	18.50	18.50	18.50	18.25	18.00	17.75	17.00	17.00	17.00
1929	17.50	17.50	17.60	18.00	18.30	18.50	18.50	18.50	18.50	18.50	18.50	18.50

Bessemer, delivered Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$22.34	$23.34	$24.34	$24.34	$24.34
1938	25.26	25.26	25.26	25.34	25.34	25.34	21.34	21.34	21.34	22.34	22.34	22.34
1937	22.31	22.30	24.85	25.26	25.26	25.26	25.26	25.26	25.26	25.26	25.26	25.26
1936	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	21.06	21.81
1935	19.76	19.76	19.76	19.76	19.80	19.81	19.81	19.81	19.81	19.81	20.81	20.81
1934	19.26	19.26	19.26	19.56	19.76	19.76	19.76	19.76	19.76	19.76	19.76	19.76
1933	15.76	15.76	15.76	16.26	16.66	17.26	17.86	18.26	19.26	19.26	19.26	19.26
1932	17.26	16.96	16.76	16.76	16.15	15.95	15.76	15.76	15.76	15.76	15.76	15.76
1931	18.76	18.51	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.16	17.76	15.71
1930	20.76	20.76	20.76	20.76	20.76	20.76	20.46	20.26	24.13	19.36	18.63	18.76
1929	19.96	19.86	20.11	20.26	20.56	20.76	20.76	20.76	20.76	20.76	20.76	20.76

No. 2 Foundry, f.o.b. Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$22.20	$23.00	$23.00	$23.00
1938	24.00	24.00	24.00	24.00	24.00	24.00	20.00	20.00	20.00	21.00	21.00	21.00
1937	21.00	21.00	23.20	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1936	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	20.50
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.75	19.50	19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	15.50	15.50	15.50	15.50	15.90	16.00	16.75	17.00	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.00	15.60	16.00	15.50	15.50	15.50	15.50	15.50	15.50
1931	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.20	17.00	16.60
1930	20.00	20.00	19.50	19.40	19.00	18.40	17.90	17.50	17.50	17.50	17.50	17.50
1929	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

No. 2X Foundry, delivered Philadelphia

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$23.21	$23.21	$23.21	$23.21	$23.21	$23.21	$23.21	$23.21	$24.41	$25.21	$25.21	$25.21
1938	26.21	26.21	26.21	26.21	26.21	26.21	22.21	22.21	22.21	23.21	23.21	23.21
1937	23.14	23.39	25.64	26.14	26.14	26.14	26.14	26.14	26.14	26.14	26.14	26.14
1936	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.93	22.68
1935	20.63	20.63	20.63	20.63	20.68	20.68	20.68	20.68	20.68	20.68	21.68	21.68
1934	19.63	19.63	19.63	20.38	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63
1933	13.76	13.76	13.76	14.51	15.91	16.76	17.28	17.88	18.63	18.63	18.63	19.63
1932	15.76	15.76	15.76	15.66	15.13	14.76	14.76	14.51	14.26	14.16	13.95	13.88
1931	18.26	18.26	18.26	18.26	17.76	17.76	17.76	17.51	17.01	16.01	16.01	15.76
1930	21.56	21.26	20.76	20.76	20.26	20.26	2026	19.76	19.76	19.26	19.13	18.26
1929	22.26	22.01	22.26	22.26	22.76	22.76	22.76	22.26	22.26	22.26	22.26	21.76

No. 2X Foundry, f.o.b. Buffalo

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$22.50	$23.00	$23.00	$23.00
1938	24.00	24.00	24.00	24.00	24.00	24.00	20.00	20.00	20.00	21.00	21.00	21.00
1937	21.00	21.25	23.50	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1936	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	19.75
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	16.50	16.50	16.50	16.50	16.50	16.50	17.10	17.75	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.50	16.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50
1931	18.00	18.00	18.00	18.00	17.60	19.00	19.00	18.75	19.00	18.40	18.00	18.00
1930	19.40	19.00	19.00	19.00	19.00	16.50	16.50	16.50	16.50	16.50	16.50	16.50
1929	19.00	19.00	19.25	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

Southern No. 2, f.o.b. Birmingham

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$17.38	$17.38	$17.38	$17.38	$17.38	$17.38	$17.38	$17.38	$18.58	$19.38	$19.38	$19.38
1938	20.38	20.38	20.38	20.38	20.38	20.38	16.38	16.38	16.38	17.38	17.38	17.38
1937	17.38	17.63	19.88	20.38	20.38	20.38	20.38	20.38	20.38	20.38	20.38	20.38
1936	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.84	15.75
1935	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.75	15.50
1934	13.50	13.50	13.50	14.25	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1933	11.00	11.00	11.00	11.40	12.00	12.00	12.60	13.00	13.50	13.50	13.50	13.50
1932	12.00	11.20	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1931	14.00	13.00	13.00	13.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
1930	14.70	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
1929	16.50	16.50	16.50	15.50	15.50	15.25	14.00	14.00	14.00	14.00	14.00	14.00

Malleable, f.o.b. Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$21.00	$22.00	$23.00	$23.00	$23.00
1938	24.00	24.00	24.00	24.00	24.00	24.00	20.00	20.00	20.00	21.00	21.00	21.00
1937	21.00	21.00	23.60	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1936	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	20.50
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
1934	17.50	17.50	17.50	18.10	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	14.50	14.50	14.50	14.50	14.90	15.50	16.10	16.50	17.50	17.50	17.50	17.50
1932	16.00	15.50	15.50	15.50	15.00	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1931	17.50	17.25	17.00	17.00	17.00	17.00	17.00	17.00	17.00	16.90	16.50	16.00
1930	19.00	19.00	19.00	19.00	19.00	19.00	18.75	18.50	18.35	17.80	17.50	17.50
1929	18.00	18.00	18.10	18.50	18.80	19.00	19.00	19.00	19.00	19.00	19.00	19.00

Standard Low Phosphorus, delivered Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$27.74	$27.74	$27.74	$27.74	$27.74	$27.74	$27.74	$27.74	$28.94	$29.74	$29.74	$29.74
1938	29.63	29.63	29.63	29.70	29.74	29.74	26.74	26.74	26.74	27.74	27.74	27.74
1937	26.63	26.88	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63
1936	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.38	26.13
1935	24.63	24.63	24.63	24.63	24.68	24.68	24.68	24.68	24.68	24.68	24.68	24.68
1934	24.13	24.13	24.13	24.13	24.63	24.63	24.63	24.63	24.63	24.63	24.63	24.63
1933	20.75	20.50	20.50	20.50	21.68	22.00	22.80	23.50	23.13	23.13	23.13	24.13
1932	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1931	24.76	24.76	24.76	24.76	24.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1930	24.76	24.76	24.76	24.76	24.76	24.26	24.26	24.26	24.76	24.76	24.76	24.76
1929	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.76	24.76	24.76	24.76

Lake Superior Charcoal, delivered Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$28.34	$28.34	$28.34	$28.34	$28.34	$28.34	$28.34	$29.54	$30.34	$30.34	$30.34	$30.34
1938	30.24	30.24	30.24	30.34	30.34	30.34	28.34	28.34	28.34	28.34	28.34	28.34
1937	26.54	26.54	28.95	30.04	30.04	30.04	30.04	30.04	30.04	30.04	30.14	30.24
1936	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.50	26.25
1935	24.04	24.04	24.04	24.15	24.25	24.25	24.25	24.25	24.25	24.90	25.25	25.25
1934	23.54	23.54	23.54	23.66	24.04	24.04	24.04	24.04	24.04	24.04	24.04	24.04
1933	23.04	23.04	23.04	23.06	23.04	23.04	23.04	23.04	23.54	23.54	23.54	23.54
1932	22.29	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	24.04	23.04
1931	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	25.54	25.04	25.04	20.79
1930	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1929	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04

Semifinished Material

Per Gross Ton f. o. b.

Open-Hearth and Bessemer Billets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00
1938	37.00	37.00	37.00	37.00	37.00	37.00	34.00	34.00	34.00	34.00	34.00	34.00
1937	34.00	34.00	36.40	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1936	29.00	29.00	28.40	28.00	28.00	28.00	30.00	30.00	30.00	32.00	32.00	32.00
1935	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	28.50	29.00
1934	26.00	26.00	26.00	27.80	29.00	29.00	27.40	27.00	27.00	27.00	27.00	27.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	27.00	27.00	27.00	27.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	33.00	34.25	34.00	34.50	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75

Open-Hearth and Bessemer Sheet Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00
1938	37.00	37.00	37.00	37.00	37.00	37.00	34.00	34.00	34.00	34.00	34.00	34.00
1937	34.00	34.00	36.40	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1936	30.00	30.00	28.50	28.00	28.00	28.00	30.00	30.00	30.00	32.00	32.00	32.00
1935	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	29.50	30.00
1934	26.00	26.00	26.00	28.40	30.00	30.00	28.40	28.00	28.00	28.00	28.00	28.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	29.75	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	34.00	33.25	35.00	35.25	26.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75

Wire Rods, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00
1938	47.00	47.00	47.00	47.00	47.00	47.00	43.00	43.00	43.00	43.00	43.00	43.00
1937	43.00	43.00	46.20	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00
1936	40.00	40.00	40.00	40.00	40.00	38.80	38.00	38.00	38.00	40.00	40.00	40.00
1935	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.50	40.00
1934	36.00	36.00	36.00	37.20	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
1933	36.20	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	36.00
1932	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1931	35.00	35.00	36.00	36.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
1930	40.00	40.00	38.00	38.00	36.40	36.00	36.00	36.00	36.00	36.00	36.00	35.50
1929	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	40.00	40.00

Beehive Coke Prices

Net Ton

Foundry, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.80	$6.00	$6.00
1938	5.25	5.25	5.25	5.25	5.25	5.05	5.00	5.00	5.00	5.00	5.00	5.05
1937	4.25	4.25	4.25	5.05	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
1936	4.00	4.20	4.10	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
1935	4.60	4.60	4.60	4.60	4.60	4.60	4.25	4.00	4.00	4.35	4.35	4.25
1934	4.25	4.25	4.25	4.55	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
1933	2.50	2.50	2.25	2.25	2.25	2.40	2.80	3.10	3.15	3.85	4.25	4.25
1932	3.25	3.25	3.25	3.25	3.15	3.00	3.00	2.90	2.75	2.75	2.65	2.50
1931	3.30	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
1930	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1929	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.55	3.50

Furnace, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75	$4.75	$5.00	$5.00
1938	4.25	4.25	4.25	4.25	4.25	3.90	3.75	3.75	3.75	3.75	3.75	3.75
1937	4.00	4.00	4.05	4.50	4.85	4.65	4.50	4.50	4.45	4.40	4.37	4.37
1936	3.50	3.50	3.50	3.50	3.50	3.50	3.45	3.45	3.90	4.00	4.00	4.00
1935	3.60	3.60	3.60	3.60	3.60	3.50	3.30	3.25	3.25	3.55	3.55	3.65
1934	3.60	3.50	3.35	3.30	3.45	3.60	3.60	3.60	3.60	3.60	3.60	3.60
1933	1.75	1.75	1.75	1.75	1.75	1.80	2.40	2.75	2.50	3.25	3.75	3.75
1932	2.25	2.25	2.25	2.25	2.15	2.00	2.00	2.00	2.00	2.00	1.80	1.80
1931	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40	2.40	2.40	2.35	2.30
1930	3.55	2.60	2.60	2.60	2.55	2.50	2.50	2.50	2.60	2.60	2.55	2.50
1929	2.75	2.90	2.95	2.75	2.75	2.75	2.75	2.75	2.65	2.65	2.65	2.65

Iron and Steel Scrap Prices

Per Gross Ton Delivered

Heavy Melting Steel, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$15.60	$15.65	$15.75	$15.50	$14.55	$15.00	$15.55	$16.15	$18.75	$23.15	$21.85	$19.00
1938	14.05	14.15	13.65	12.79	11.55	11.40	13.75	15.20	15.25	14.95	14.85	15.75
1937	18.95	19.65	22.40	22.75	19.00	18.40	19.40	21.85	20.40	17.15	14.10	12.75
1936	14.50	14.80	15.75	15.75	14.75	13.80	14.15	16.00	17.75	18.15	17.25	18.50
1935	13.50	13.25	12.40	11.70	12.00	12.25	12.30	13.25	13.45	13.65	13.65	14.05
1934	13.05	13.90	14.35	14.15	12.80	11.90	12.00	11.45	10.75	10.50	11.15	12.95
1933	8.35	8.25	8.75	9.90	11.65	11.65	12.70	13.75	13.00	12.45	11.65	11.50
1932	10.25	10.25	10.25	10.20	9.75	9.00	8.35	8.55	9.50	9.50	9.15	8.75
1931	13.00	12.75	12.90	12.50	11.25	10.30	10.50	10.70	10.80	10.45	10.25	10.25
1930	16.55	16.90	16.60	16.05	15.40	15.10	14.90	15.20	15.70	14.80	12.85	12.75
1929	19.00	18.60	18.50	18.60	17.85	18.30	18.45	18.90	18.45	17.30	16.30	15.10

Heavy Melting Steel, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$13.75	$14.00	$14.25	$13.35	$12.75	$13.38	$13.55	$13.75	$16.05	$19.25	$17.45	$16.90
1938	13.25	12.15	12.20	11.45	11.05	10.25	12.05	14.00	13.60	13.05	14.20	13.75
1937	18.25	19.50	20.90	20.75	17.55	16.00	17.75	19.75	17.85	13.95	12.55	11.50
1936	13.40	14.30	14.75	14.35	13.05	12.75	13.25	15.45	16.15	16.25	16.50	16.50
1935	12.15	11.65	10.45	10.05	10.20	10.25	10.40	12.35	12.55	12.50	13.20	13.75
1934	10.44	10.87	12.00	11.75	11.13	9.75	9.55	9.25	8.65	8.75	9.00	10.15
1933	5.25	5.25	5.25	6.55	8.70	8.80	10.45	10.40	9.95	9.35	8.35	8.75
1932	7.25	6.80	6.75	6.55	6.20	5.60	4.50	5.40	5.75	6.00	5.75	5.50
1931	10.00	9.85	9.75	9.60	8.65	8.50	8.50	8.25	7.95	7.75	7.65	7.50
1930	12.65	13.25	13.20	13.00	12.55	12.05	12.00	12.00	12.25	11.55	10.20	10.00
1929	16.50	16.00	15.55	15.95	15.45	14.95	14.75	15.05	15.05	14.45	13.05	12.50

Heavy Melting Steel, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$15.25	$15.25	$15.37	$15.65	$15.25	$15.44	$15.60	$16.44	$18.95	$22.12	$20.70	$19.00
1938	14.95	14.75	14.44	13.45	12.25	11.85	13.72	14.50	14.25	14.65	14.75	15.20
1937	17.50	18.75	19.75	20.44	18.40	17.03	18.40	19.75	19.22	16.55	14.00	14.00
1936	12.37	13.15	13.46	13.75	12.65	11.70	12.25	13.85	15.37	15.65	14.81	15.63
1935	11.40	11.25	10.60	10.15	10.45	10.45	10.30	11.40	12.20	12.00	12.05	12.25
1934	11.63	11.73	11.70	11.50	11.00	10.40	10.25	9.85	9.60	9.50	9.95	10.85
1933	6.50	6.50	6.50	6.90	9.00	9.50	10.55	12.00	10.70	10.20	9.55	10.50
1932	7.50	7.35	7.35	7.20	6.50	6.25	6.25	6.40	7.25	7.25	7.25	6.50
1931	10.50	10.50	10.50	10.00	9.50	8.75	8.25	8.55	8.75	8.20	7.95	7.50
1930	14.50	14.50	14.95	13.95	13.40	13.25	12.50	12.65	13.00	12.00	11.50	11.00
1929	16.50	16.30	16.25	17.00	16.25	16.25	16.50	16.75	16.37	15.80	15.15	14.50

Compressed Sheets, Detroit (Dealers)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$11.95	$12.00	$12.10	$11.50	$10.55	$11.05	$11.95	$12.75	$13.81	$18.35	$17.37	$15.00
1938	10.50	10.50	9.95	8.45	7.60	7.30	10.20	11.45	11.85	11.65	11.80	12.00
1937	15.75	16.10	18.25	19.50	16.55	15.50	17.00	18.25	17.95	14.15	10.20	10.25
1936	10.45	11.55	12.50	12.10	10.85	10.50	11.05	12.75	14.25	14.40	13.60	13.95
1935	10.00	9.60	7.95	7.75	7.95	8.50	8.75	9.80	10.05	10.05	9.75	9.90
1934	8.50	9.40	10.30	9.70	8.90	7.90	8.00	7.80	7.75	7.50	7.75	9.00
1933	4.00	4.00	4.06	5.15	7.50	7.80	8.85	9.50	8.55	7.35	7.00	7.45
1932	5.55	5.75	5.75	5.70	5.10	4.75	3.75	3.80	5.00	5.50	5.05	4.06
1931	8.92	9.45	9.00	9.00	7.75	6.95	6.95	6.80	6.50	6.15	6.00	6.00
1930	12.00	11.75	11.40	11.25	10.85	10.50	10.50	10.85	11.15	10.90	9.65	8.81
1929	14.65	14.45	14.00	14.00	14.00	13.65	14.00	14.00	14.00	13.40	12.15	11.50

No. 1 Cast, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$16.75	$16.75	$16.75	$16.55	$16.25	$16.25	$16.25	$16.87	$19.75	$23.50	$22.30	$21.00
1938	16.25	16.19	15.75	15.30	14.75	14.75	15.85	16.75	16.75	16.75	16.75	16.75
1937	18.85	19.00	20.69	22.50	20.35	18.81	19.55	21.65	20.50	18.95	16.75	16.75
1936	12.75	13.45	17.00	14.88	14.15	13.75	14.31	15.55	16.62	16.65	16.25	17.75
1935	11.60	11.95	11.75	11.55	11.50	11.50	11.50	11.60	12.25	12.25	12.75	12.75
1934	11.50	11.65	12.30	12.50	12.15	12.00	11.25	11.00	11.00	11.00	11.00	12.25
1933	9.00	9.00	9.00	9.10	10.25	10.35	11.20	11.75	12.40	12.00	11.95	12.00
1932	11.20	10.00	10.00	9.50	9.25	9.00	9.00	9.25	9.25	9.00	9.00	9.00
1931	12.80	13.00	13.00	13.00	12.75	12.50	12.50	12.50	12.50	12.50	11.70	11.50
1930	16.00	15.75	15.75	15.50	15.00	14.75	13.50	13.50	13.50	13.50	13.50	12.50
1929	16.75	16.75	16.50	16.50	16.50	16.50	16.50	16.50	16.25	16.25	16.00	16.00

Cast Borings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$8.25	$8.25	$8.55	$8.75	$7.35	$6.75	$8.10	$8.95	$10.00	$12.50	$13.80	$12.25
1938	7.25	7.25	6.75	6.25	6.25	5.90	7.05	7.75	8.15	8.65	8.50	8.50
1937	14.40	14.00	14.40	14.50	14.10	14.00	14.65	15.20	14.90	12.95	8.75	7.25
1936	8.30	8.75	8.70	8.75	8.75	8.05	7.90	10.90	11.95	11.65	11.50	13.00
1935	6.50	6.90	7.00	6.10	6.00	6.65	6.50	7.00	7.30	8.15	8.15	8.00
1934	7.30	8.15	8.70	8.50	8.25	7.75	7.25	7.05	6.25	5.50	5.90	6.00
1933	5.70	5.70	5.55	5.70	6.90	7.65	9.05	9.80	9.05	8.30	7.60	7.50
1932	6.75	6.50	6.75	6.65	6.40	5.50	4.75	5.15	5.95	6.25	6.50	5.90
1931	7.70	7.70	7.65	7.60	7.50	7.75	7.05	7.50	7.45	7.50	7.10	6.80
1930	11.10	12.00	11.15	10.75	10.50	9.88	8.50	8.50	8.90	8.40	7.75	7.15
1929	12.55	12.25	11.50	12.15	11.55	11.85	12.10	12.50	12.40	11.80	11.15	10.75

Machine Shop Turnings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$9.50	$9.50	$9.65	$9.75	$8.50	$8.25	$9.15	$10.15	$11.65	$14.60	$14.75	$13.25
1938	8.00	8.85	7.75	7.05	6.75	6.30	7.85	9.25	9.45	9.65	9.70	10.00
1937	14.15	14.25	15.55	15.25	14.80	14.00	14.05	15.05	14.75	11.75	8.55	7.25
1936	9.75	10.20	10.50	10.50	9.75	9.40	9.50	10.70	12.40	12.45	11.75	12.90
1935	8.95	8.80	7.40	7.40	8.15	8.25	8.15	8.80	9.55	9.70	9.45	9.65
1934	9.05	10.00	10.75	10.15	8.20	7.45	7.50	8.00	7.30	7.00	7.20	8.50
1933	6.25	6.25	6.30	6.75	8.00	8.40	9.35	10.45	9.75	9.30	8.00	8.00
1932	6.95	7.10	7.25	6.75	6.30	5.25	5.00	5.25	5.95	6.00	6.25	6.00
1931	6.00	6.80	7.80	7.30	6.75	6.50	6.70	7.30	7.50	7.20	7.00	7.00
1930	11.50	11.75	11.00	11.00	10.20	9.50	8.70	8.00	8.00	7.20	6.15	6.00
1929	12.50	11.25	10.65	11.05	11.00	11.35	11.85	12.40	12.00	11.40	10.75	10.25

Finished Steel Prices

Per Pound f. o. b.

Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
1939	2.25c	2.25c	2.25c	2.25c	2.20c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c
1938	2.45	2.45	2.45	2.45	2.45	2.45	2.25	2.25	2.25	2.25	2.25	2.25
1937	2.20	2.20	2.40	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	2.05	2.05	2.05
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.85	1.90	1.90	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.75	1.75	1.75
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.60
1930	1.90	1.85	1.85	1.80	1.75	1.75	1.70	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.90

Tank Plates, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
1938	2.25	2.25	2.25	2.25	2.25	2.25	2.10	2.10	2.10	2.10	2.10	2.10
1937	2.05	2.05	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1936	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.55	1.50	1.55	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90

Structural Shapes, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
1938	2.25	2.25	2.25	2.25	2.25	2.25	2.10	2.10	2.10	2.10	2.10	2.10
1937	2.05	2.05	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1936	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.60	1.60	1.60	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90

Hot Rolled Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.15c	2.15c	2.15c	2.15c	2.05c	2.00c	2.00c	2.00c	2.00c	2.00c	2.00c	2.10c
1938	2.40	2.40	2.40	2.40	2.40	2.40	*2.15	2.15	2.15	2.10	2.15	2.15
1937	2.15	2.15	2.35	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	1.95	1.95	2.10
1935	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.90	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.65	1.60	1.55	1.55	1.55	1.65	1.75	1.65	1.70	1.75	1.75	1.75
1932	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	1.90	1.90	1.90	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1930	2.15	2.10	2.10	2.10	2.00	2.00	2.00	1.95	1.95	1.95	1.90	1.90
1929	2.10	2.10	2.10	2.15	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.15

*Succeeded No. 10 blue annealed June 24.

Cold Rolled Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	3.20c	3.20c	3.20c	3.20c	3.10c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c	3.05c
1938	3.55	3.45	3.45	3.45	3.45	3.45	3.20	3.20	3.20	3.20	3.20	3.20
1937	3.25	3.25	3.50	3.55	2.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55
1936	2.95	2.95	2.95	2.95	2.95	2.95	3.05	3.05	3.05	3.05	3.05	3.05
1935	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
1934	2.75	2.75	2.75	3.05	3.15	3.10	2.95	2.95	2.95	2.95	2.95	2.95
1933	2.40	2.45	2.45	2.55	2.55	2.55	2.55	2.60	2.75	2.75	2.75	2.75
1932	2.90	2.85	2.85	2.80	2.80	2.80	2.80	2.70	2.75	2.65	2.60	2.60
1931	3.30	3.30	3.30	3.15	3.05	3.10	3.10	3.10	3.10	3.10	3.10	3.00
1930	3.90	3.90	3.90	3.80	3.80	3.60	3.60	3.60	3.60	3.45	3.35	3.30
1929	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.05	4.00	4.00

No. 24 Galvanized Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
1938	3.80	3.80	3.80	3.80	3.80	3.75	3.50	3.50	3.50	3.50	3.50	3.50
1937	3.40	3.40	3.70	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
1936	3.10	3.10	3.10	3.10	3.10	3.10	3.20	3.20	3.20	3.20	3.20	3.35
1935	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
1934	2.85	2.85	2.85	3.10	3.25	3.25	3.10	3.10	3.10	3.10	3.10	3.10
1933	2.70	2.50	2.60	2.65	2.70	2.70	2.85	2.85	2.85	2.85	2.85	2.85
1932	2.80	2.75	2.80	2.85	2.85	2.85	2.85	2.80	2.75	2.80	2.85	2.85
1931	2.90	2.90	2.90	2.85	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
1930	3.35	3.30	3.30	3.30	3.25	3.20	3.15	3.10	3.00	3.00	2.95	2.90
1929	3.60	3.60	3.60	3.65	3.70	3.65	3.60	3.55	3.50	3.50	3.45	3.40

Cold Finished Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.70c	2.70c	2.70c	2.70c	2.65c	2.65c	2.65c	2.65c	2.65c	2.65c	2.65c	2.65c
1938	2.90	2.90	2.90	2.90	2.90	2.90	2.70	2.70	2.70	2.70	2.70	2.70
1937	2.55	2.55	2.85	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1936	2.10	2.10	2.10	2.10	2.10	2.15	2.25	2.25	2.25	2.35	2.35	2.55
1935	2.10	2.10	2.10	2.00	1.95	1.95	1.95	1.95	1.95	1.95	1.95	2.05
1934	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
1933	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.95	1.95	1.95	1.95	1.95
1932	2.00	2.00	1.90	1.90	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.00
1930	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.05	2.00
1929	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.20	2.20

Tin Plate, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
1938	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	*5.10	5.00
1937	4.85	4.85	4.85	5.25	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35
1936	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1935	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1934	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1933	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.65	4.65	4.65	5.25
1932	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.50	4.25
1931	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75	4.75	4.75
1930	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.00	5.00	5.00
1929	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35

*Refund of 25 cents per box on all contracts Jan. 1 to Nov. 10.

Cold Rolled Strip, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.95c	2.95c	2.95c	2.95c	2.85c	2.80c	2.80c	2.80c	2.80c	2.80c	2.80c	2.80c
1938	3.20	3.20	3.20	3.20	3.20	3.10	2.95	2.95	2.95	2.90	2.90	2.90
1937	2.85	2.85	3.15	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
1936	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.80
1935	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
1934	2.40	2.40	2.40	2.65	2.80	2.80	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.95	1.80	1.85	1.80	1.90	2.00	2.25	2.25	2.30	2.40	2.40	2.40
1932	2.00	1.90	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.95	2.00	2.00
1931	2.25	2.25	2.25	2.20	2.15	2.15	2.15	2.15	2.15	2.15	2.10	2.05
1930	2.70	2.65	2.60	2.55	2.50	2.45	2.45	2.40	2.35	2.35	2.35	2.25
1929	2.85	2.85	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75

Hot Rolled Strip, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.15c	2.15c	2.15c	2.15c	2.05c	2.00c	2.00c	2.00c	2.00c	2.00c	2.00c	2.00c
1938	2.40	2.40	2.40	2.40	2.40	2.40	2.15	2.15	2.15	2.10	2.10	2.10
1937	2.15	2.15	2.35	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	1.95	1.95	2.10
1935	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.95	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.45	1.45	1.45	1.45	1.55	1.55	1.60	1.65	1.70	1.75	1.75	1.75
1932	1.40	1.40	1.40	1.45	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45
1931	1.55	1.55	1.55	1.55	1.50	1.50	1.55	1.55	1.55	1.55	1.50	1.45
1930	1.85	1.80	1.80	1.70	1.70	1.70	1.65	1.65	1.65	1.60	1.55	1.55
1929	1.80	1.85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90

Plain Wire, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c
1938	2.90	2.90	2.90	2.90	2.90	2.90	2.60	2.60	2.60	2.60	2.60	2.60
1937	2.60	2.60	2.85	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1936	2.30	2.30	2.30	2.40	2.40	2.40	2.40	2.40	2.40	2.50	2.50	2.60
1935	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1934	2.20	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1933	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.20
1932	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1931	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1930	2.40	2.40	2.40	2.40	2.35	2.30	2.30	2.30	2.30	2.30	2.30	2.25
1929	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40

Wire Nails, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c	2.40c	2.40c	2.40c	2.50c	2.55c	2.55c
1938	2.75	2.75	2.75	2.75	2.75	2.75	2.45	2.45	2.45	2.45	2.45	2.45
1937	2.25	2.25	2.70	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1936	2.40	2.40	2.15	2.10	2.10	2.10	2.10	2.10	1.95	2.05	2.05	2.20
1935	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.55	2.40	2.40	2.40	2.40
1934	2.35	2.35	2.35	2.50	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.90	1.85	1.85	1.85	1.85	1.85	2.05	2.10	2.10	2.10	2.10	2.35
1932	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
1931	1.90	1.90	1.90	1.90	1.90	1.80	1.85	1.90	1.90	1.90	1.90	1.90
1930	2.35	2.30	2.30	2.25	2.15	2.15	2.10	2.05	2.00	2.00	1.95	1.90
1929	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.50	2.45	2.40	2.40

Rail Steel Bars, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	2.10c	2.10c	2.10c	2.10c	2.05c	2.00c	2.00c	2.00c	2.03c	2.15c	2.15c	2.15c
1938	2.35	2.35	2.35	2.35	2.35	2.35	2.15	2.10	2.10	2.10	2.10	2.10
1937	2.10	2.10	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
1936	1.75	1.75	1.75	1.75	1.75	1.75	1.85	1.85	1.85	1.95	1.95	1.95
1935	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1934	1.70	1.70	1.70	1.79	1.85	1.85	1.77	1.75	1.75	1.75	1.75	1.75
1933	1.50	1.45	1.45	1.45	1.50	1.50	1.50	1.50	1.60	1.70	1.70	1.70
1932	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1931	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.50	1.50	1.50
1930	1.85	1.85	1.85	1.85	1.80	1.75	1.75	1.65	1.65	1.65	1.65	1.65
1929	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.95	1.90

Structural Rivets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c
1938	3.60	3.60	3.60	3.60	3.60	3.60	3.40	3.40	3.40	3.40	3.40	3.40
1937	3.25	3.25	3.45	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
1936	2.90	2.90	2.90	2.90	2.90	2.95	3.05	3.05	3.05	3.05	3.05	3.20
1935	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1934	2.75	2.75	2.75	2.90	3.00	3.00	2.95	2.90	2.90	2.90	2.90	2.90
1933	2.25	2.25	2.25	2.25	2.25	2.35	2.50	2.50	2.50	2.60	2.75	2.75
1932	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1931	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.55	2.30	2.25	2.25
1930	3.10	3.10	3.10	3.10	3.00	2.90	2.90	2.75	2.75	2.75	2.75	2.75
1929	2.85	2.90	2.95	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10

Cast Iron Pipe, Birmingham

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1939	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$42.00	$45.00	$45.00	$45.00
1938	46.00	46.00	46.00	46.00	46.00	46.00	42.60	42.00	42.00	42.00	42.00	42.00
1937	41.00	41.00	44.75	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00
1936	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	41.00
1935	38.00	38.00	38.00	38.50	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00
1934	36.00	36.00	36.00	36.00	36.00	36.40	38.00	38.00	38.00	38.00	38.00	38.00
1933	32.00	32.00	32.00	32.00	32.00	34.25	35.00	35.00	35.00	35.00	35.25	36.00
1932	33.00	32.20	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
1931	37.00	37.00	36.50	35.00	35.00	35.00	35.00	35.00	33.00	33.00	33.00	33.00
1930	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1929	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00

Steel, Iron and Scrap Price Composites

Compiled by STEEL

Iron and Steel Price Composite

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
Jan.	$36.36	$38.95	$36.55	$33.34	$32.58	$31.15	$28.17	$29.65	$31.69	$35.19	$35.94	$33.48
Feb.	36.37	38.90	36.74	33.48	32.54	31.30	27.94	29.24	31.64	34.92	35.96	33.81
March	36.40	38.80	39.92	33.20	32.36	31.38	27.92	29.28	31.65	34.79	35.98	33.90
April	36.34	38.61	40.39	33.10	32.29	32.67	27.78	29.44	31.47	34.16	36.40	33.91
May	35.80	38.50	40.06	32.92	32.35	32.97	28.33	29.34	31.07	33.49	36.53	33.75
June	35.69	38.41	39.82	32.79	32.42	32.96	28.71	29.09	30.82	33.28	36.46	33.59
July	35.82	36.32	40.03	33.49	32.44	32.32	29.67	28.87	30.78	33.00	36.33	33.05
Aug.	35.95	36.50	40.34	33.88	32.68	32.24	29.92	28.77	30.73	32.90	36.36	33.47
Sept.	36.67	36.48	40.16	34.15	32.82	32.15	30.36	28.93	30.61	32.76	36.20	33.90
Oct.	37.62	36.48	39.59	34.67	32.84	32.10	30.53	28.90	30.30	32.35	35.85	34.35
Nov.	37.50	36.39	38.96	34.65	33.15	32.15	30.25	28.79	30.16	31.95	35.60	34.77
Dec.	....	36.36	38.88	35.15	33.31	32.39	31.01	28.28	29.90	31.69	35.43	34.99
Av. for Year	*36.41	37.56	39.29	33.73	32.66	32.15	29.22	29.05	30.90	33.37	36.09	33.91

Includes pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip and cast iron pipe at representative centers. *Eleven months.

Finished Steel Price Composite

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
Jan.	$56.50	$61.70	$55.80	$53.70	$54.00	$51.10	$46.13	$47.28	$49.30	$55.63	$57.83	$55.88
Feb.	56.50	61.70	55.92	53.70	54.00	51.10	45.35	46.72	49.42	55.03	57.83	56.76
March	56.50	61.70	60.70	52.32	54.00	51.10	45.60	47.09	49.42	54.88	57.83	57.23
April	56.50	61.70	61.45	52.20	54.00	53.90	44.94	47.62	49.22	53.66	58.43	56.55
May	56.00	61.70	61.70	52.20	54.00	54.80	45.10	47.62	49.02	52.60	58.53	56.83
June	55.70	61.55	61.70	52.20	54.00	55.08	45.30	47.64	48.60	52.37	58.43	56.55
July	55.62	57.20	61.70	53.40	54.00	54.05	47.20	47.71	48.68	51.90	58.13	56.05
Aug.	55.60	57.20	61.70	53.40	54.02	54.00	47.50	47.46	48.72	51.72	57.93	56.15
Sept.	55.60	57.20	61.70	53.10	53.70	54.00	48.52	47.50	48.72	50.87	57.43	56.38
Oct.	55.90	57.04	61.70	53.90	53.70	54.00	49.20	47.64	48.22	50.13	56.79	56.75
Nov.	55.90	56.68	61.70	53.90	53.70	54.00	49.20	47.20	48.17	49.62	56.48	57.10
Dec.	55.90	56.50	61.70	53.90	53.70	54.00	51.10	46.74	47.74	49.30	56.33	57.63
Av. for Year	56.02	59.32	60.62	53.16	53.90	53.43	47.09	47.35	48.77	52.31	57.66	56.65

Includes plates, shapes, bars, hot strip, nails, tin plate, pipe.

Steelworks Scrap Price Composite

	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928
Jan.	$14.77	$13.85	$18.12	$13.15	$12.03	$11.24	$ 6.23	$ 8.03	$10.49	$14.16	$15.97	$13.50
Feb.	14.87	13.54	19.19	13.83	11.66	11.72	6.33	7.89	10.39	14.42	16.42	13.50
March	14.98	13.20	20.95	14.48	10.75	12.30	6.47	7.94	10.38	14.52	16.24	13.41
April	14.64	12.30	21.27	14.39	10.05	12.15	7.23	7.76	10.12	14.08	16.53	13.54
May	14.05	11.47	18.49	13.40	10.27	11.30	9.23	7.03	9.31	13.65	16.16	13.62
June	14.49	10.89	17.15	12.55	10.45	10.32	9.55	6.62	8.84	13.11	16.04	13.10
July	14.72	13.06	18.51	12.89	10.64	10.30	10.66	6.06	8.70	12.58	16.12	12.57
Aug.	15.30	14.44	20.41	14.66	12.05	9.98	11.57	6.25	8.79	12.62	16.46	13.10
Sept.	17.97	14.23	18.99	16.18	12.65	9.45	10.83	7.04	8.82	12.81	16.39	14.03
Oct.	21.45	14.00	15.93	16.44	12.72	9.40	10.37	6.96	8.50	12.32	15.44	14.94
Nov.	20.06	14.58	13.32	16.05	12.92	9.82	9.64	6.87	8.22	11.17	14.51	15.22
Dec.	....	14.77	13.24	16.92	13.17	11.02	10.12	6.41	8.16	10.77	13.73	15.30
Av. of Year	*16.11	13.36	17.96	14.58	11.61	10.75	9.02	7.07	9.23	13.02	15.83	13.82

Includes heavy melting steel and hydraulic compressed sheets at representative centers. *Eleven months.

Shipbuilding

(*Concluded from Page* 172)

required in their construction. Aggregate carrying capacity was 350,000 tons.

Orders for barges increased sharply near year's end; a substantial number of unfinished units were on the ways Dec. 31 and builders had comfortable backlogs.

Traffic of the three major rivers at Pittsburgh, where barge tonnage is heaviest, showed a healthy increase last year, and barring unfavorable weather, should hold up well through the winter. If activity in steel and coal holds its present pace, new highs in river traffic are likely, and increased barge facilities will be needed.

Demand for barges has become large enough that at least one builder is on a production basis and carries finished barges in stock, to facilitate deliveries and prevent heavy accumulations of unfilled orders.

Welded Barges Favored

Demand has been heaviest for all-welded barges, although a substantial number of riveted units were built.

Ship repair work was in fair volume for most yards. Reconditioning of destroyers built during the World war and to be recommissioned for coastal patrol gave repair work a fillip after the war started.

Although reliable calculations of actual steel tonnage used in shipwork last year are not yet available, the increase may be partially gaged by the fact the tonnage required for the cargo boats awarded by the maritime commission, 380,000 tons, is greater than the total tonnage going into all shipbuilding and ship repair in any recent year.

During the next several years, shipbuilding seems destined to rise in the ranks in steel consuming industries, will take a much larger percentage of total steel production than in the past. During recent lean shipbuilding years, its requirements have not been too impressive, as is indicated by the following figures:

	Tons of steel for ships, repairs	Total finished steel consumed	Percentage consumed by ships
1938	308,451	18,692,957	1.65
1937	320,460	32,695,349	0.98
1936	231,644	29,072,596	0.80
1935	156,890	20,819,710	0.75
1934	154,832	15,870,696	0.98
1933	89,344	13,743,121	0.65
1932	79,650	9,317,974	0.86
1931	179,181	17,396,997	1.03
1930	308,491	25,769,914	1.20
1929	296,554	36,157,095	0.82
1928	150,352	28,537,621	0.53

Construction

(*Concluded from Page* 165)

Trend toward longer I-beam and plate girder bridges continues, reducing shop work in some instances and simplifying actual setting of steel.

American Institute of Steel Construction co-operated in reports on stress distribution in steel rigid frames, plate girder tests, battledeck floors for highway bridges, stress distribution in short columns, perforated cover plates, cold-driven rivet technique, cleaning and dehydrating structural steel and revision of specifications, covering design, fabrication and erection. High costs still retard erection by welding except in specified instances where noise elimination is a desirable factor.

In some directions there appears to be a growing classification of construction, nature of which limits use of structural steel and tends to favor reinforcing steel with concrete. This applies especially to residential projects and large housing structures sponsored by the government, wall-bearing buildings taking a minimum of structural steel. Same situation prevails in sewage disposal plants and waterworks construction. Tonnages of reinforcing steel awards, as reported by STEEL weekly, clearly reveal these facts.

Up to the last quarter, 1939, structural bookings were well in advance of the corresponding figure for 1938, but a heavy influx of public works contracts placed during closing weeks of 1938 as compared with last quarter brought down the total. The last quarter, 1938, brought out a volume of 471,000 tons, fully 75 per cent being public work. As a result of this, backlog available for fabrication at start of this year as compared with Jan. 1, 1939, is somewhat less.

Private construction made a better showing in 1939, representing close to 31 per cent of the total volume compared with less than 25 per cent the previous year. Small jobs, 50 tons or less, were about par with 1938, slightly under 1937, but such purchases picked up slightly the last four months. Railroad bridges accounted for around 4 per cent of the total tonnage.

Few Large Dams

In other directions railroad buying declined slightly Grade crossing and bridge work took close to 33 per cent of volume. Federal, state and municipal construction still maintained the lead in fabricated sales, but were slightly under 1938. Large engineering projects, including dams, furnished less tonnage by a large margin.

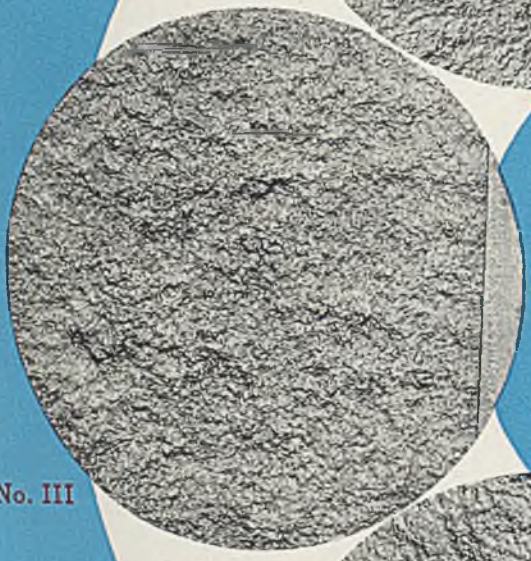
Average selling price per ton of fabricated structural steel was under the two previous years, although some effort was made to firm the market during closing weeks. Meanwhile average base price of plain shapes at Pittsburgh has been relatively steady over a three-year period at slightly under $45 a ton. Average fabricated price during most of 1939 was under $80 per ton. Price per ton for fabrication dipped to approximately $36 per ton at one period.

Prospects for 1940 building were summed up recently by Col. Leonard P. Ayres, vice president and statistician, the Cleveland Trust Co., Cleveland. Admitting war and politics make accurate forecasting impossible, Colonel Ayres predicted contracts for new building will be the largest of any year since 1930, but will not be as large as in that year.

Sine Qua Non of Casting Perfection

Spec. No. I

Spec. No. II

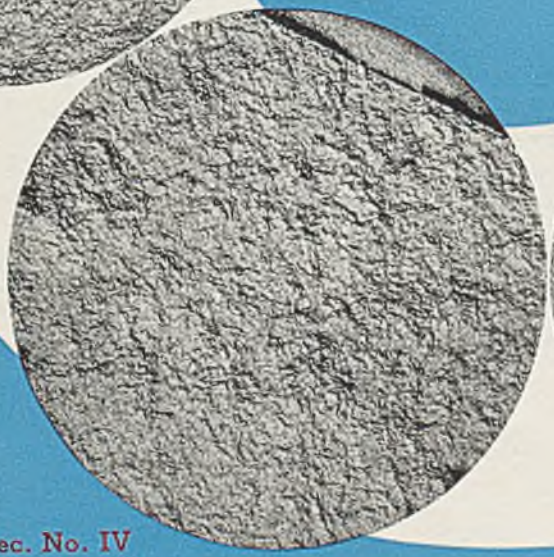


Spec. No. III

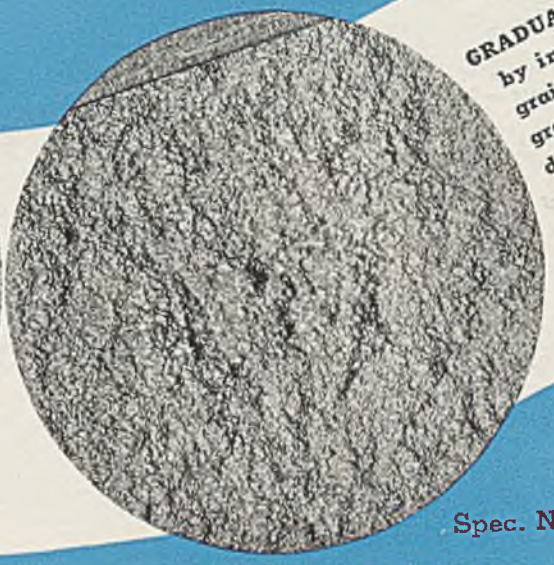
Controlled Grain Structure

GRADUATION—
by increasin
grain size o
grain size
dation
skin to c
by de
stren

Casting Structures of 5 different specifications in 4 in. diameter billets.



Spec. No. IV



Spec. No. V

Licensees

The Acme Foundry & Mach. Co.
Blackwell, Okla.

The Acme Foundry & Mach. Co.
Coffeyville, Kan.

Commercial Iron Works
Los Angeles, Calif.

Dayton & Waldrip Company
Hollydale, Calif.

Gardner-Denver Company
Quincy, Ill.

Gardner-Denver Company
La Grange, Mo.

General Metals Corporation
Oakland, Calif.

Gra-Iron Foundry Corporation
Marshalltown, Iowa

Lufkin Foundry & Machine Co.
Lufkin, Texas

Mt. Vernon Furnace & Mfg. Co.
Mt. Vernon, Ill.

The Murray Company
Dallas, Texas

Spuck Iron & Foundry Co.
St. Louis, Mo.

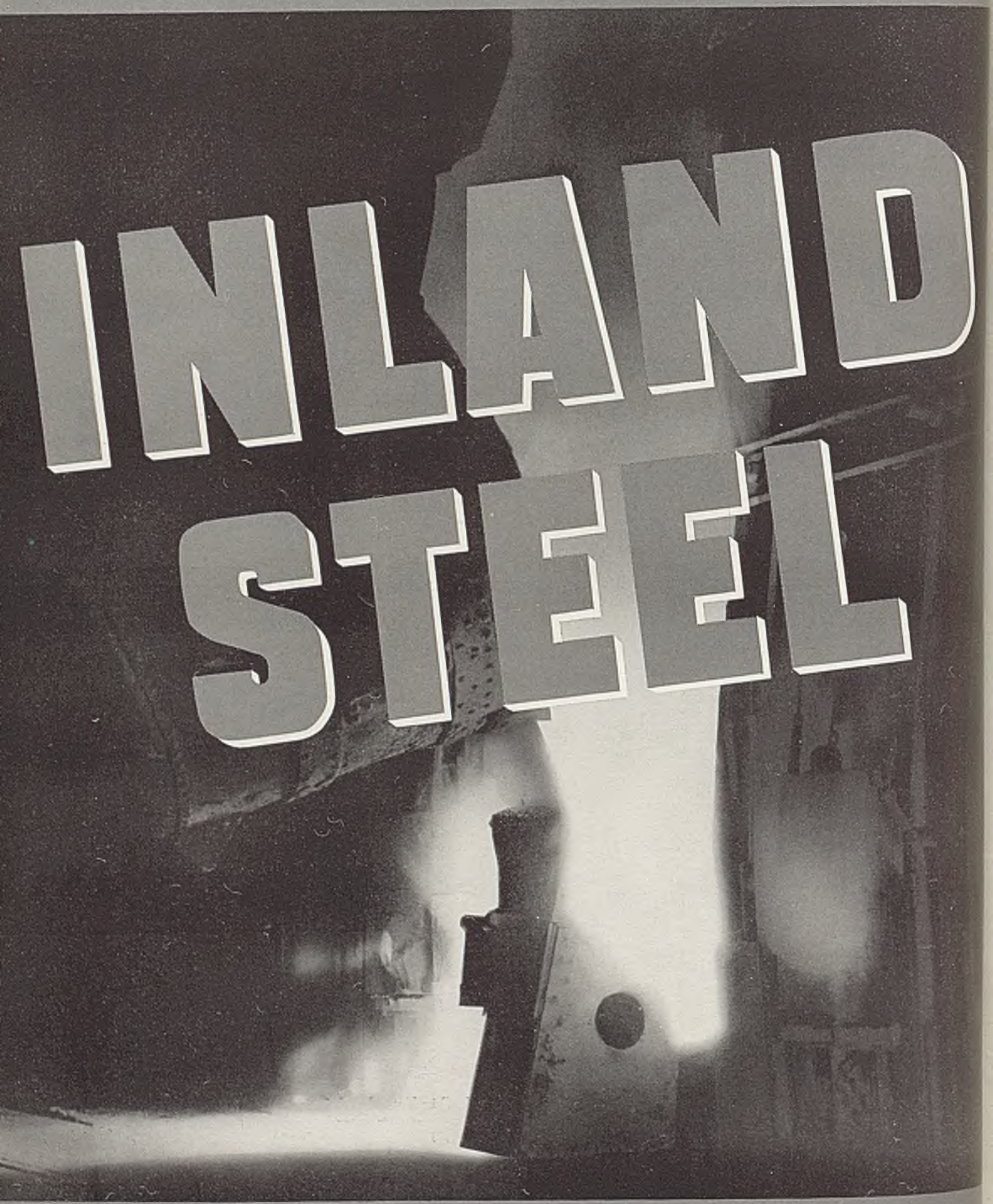
Diamond Iron Works, Inc., and the Mahr Mfg. Co. Division
Minneapolis, Minn.

CONTROLLED SPECIFICATION IRONS
STRUCTURE STRENGTH SERVICE
SORBO-MA

SORBO-MAT PROCESS ENGINEERS

Sheets · Strip · Tin Plate · Bars · Plates · Floor Plates · Structurals · Piling · Rails · Track Accessories

Reinforcing Bars . . . Rail Steel Products . . . Hi-Steel, Ledloy, Copper-Alloy and Semi-Finished Steels



INLAND STEEL CO., 38 S. DEARBORN ST., CHICAGO, ILL

Sales Offices · Milwaukee · Detroit · St. Paul · St. Louis · Kansas City · Cincinnati

Steel Outlook for Continued Activity

Further Buying Looms; Mill Backlogs Are Heavy

MARKET IN TABLOID ★

Demand
Sustained, with much in prospect.

Prices
Steady, with scrap nominal.

Production
Off 15 points to 75.5 per cent.

■ THE LOSS in steelmaking last week due to the holiday season will be partly regained this week. Indications point to a better recovery than in preceding years, due to heavy mill backlogs and consumer requirements.

Christmas observance caused last week's decline of 15 points to 75½ per cent in the national operating rate. While this is 18½ points below the peak of 94 per cent in the early part of December, it is well above the best rate attained in the first eight months last year, and 35½ points over the corresponding week at the close of 1938.

Outlook for early weeks this year is for continued activity at or near pre-holiday levels. Backlogs have been reduced only slightly in December and sufficient tonnage remains to be rolled to keep mills busy through first quarter and in some instances well into second quarter. Substantial orders still are being received and pressure for deliveries continues strong, showing steady consumption of finished steel.

Consumer stocks, while heavier than at midyear, are not out of line with production of finished products and do not yet constitute a serious threat to future buying rate.

Railways' 1940 Requirements May Exceed 1,000,000 Tons

Concrete reinforcing bar sellers find that mill allotments already have been sold out for first quarter even though they recently were increased. Larger orders for automobile sheets are expected soon, to meet needs for spring production. Additional orders for tin plate are likely to be placed before the middle of January.

Railroads are expected to specify more liberally as repair programs are pushed to meet spring needs for rolling stock. Releases on orders for rails will increase as the season for track laying approaches. Much rail tonnage booked last year remains to be rolled and some makers believe 1940 requirements may exceed 1,000,000 tons, if roads are able to finance their purchases.

Observance of Christmas last Monday was the most important factor in the decline in steel production. Pittsburgh was off 21 points to 70 per cent, Chicago 11 points to 81, eastern Pennsylvania 8 points to 77, Youngstown 17 points to 74, Wheeling 9 to 76, Buffalo 5 to 74½, Cincinnati 7 to 75, Detroit 5 to 85, Cleveland 19½ to 68, Birmingham 19 to 75 and New England 14 to 75 per cent. St. Louis held at 77 per cent.

Fairly heavy tonnages of structural and reinforcing steel are pending, most of which probably will be closed early this year. Fabricators have large backlogs and are operating at a high rate.

Holiday Observance Causes Slump in Auto Production

Automobile production slumped sharply last week, due to Christmas observance. Total output was 89,365 units, compared with 117,705 in the preceding week, and 75,215 in the comparable week of 1938. General Motors assembled 38,675 units, against 49,110 in the week before; Chrysler made 22,100, compared with 27,135; Ford's production was 20,660, against 25,800; independent producers assembled 7930, compared with 15,660 in the week ended Dec. 23.

Bessemer and open-hearth steel ingot production in 1939 is estimated at 46,807,000 gross tons, 68 per cent more than in 1938 and exceeded in the past decade only in 1936 and 1937. Last year's output was 7 per cent under 1937, 16½ per cent under peak year 1929, when 54,850,433 tons was produced. October production last year, 5,393,821 tons, was the highest monthly figure on record and compares with the previous high, 5,286,246 tons in May, 1929.

Prices are unusually steady. Scrap seems to be near the bottom of the decline that started in October. STEEL's iron and steel composite remains at $37.10; finished steel composite, $56.10; and scrap, $17.58.

COMPOSITE MARKET AVERAGES

	Dec. 30	Dec. 23	Dec. 16	One Month Ago Nov., 1939	Three Months Ago Sept., 1939	One Year Ago Dec., 1938	Five Years Ago Dec., 1934
Iron and Steel	$37.10	$37.10	$37.19	$37.50	$36.67	$36.36	$32.39
Finished Steel	56.10	56.10	56.10	55.90	55.60	56.50	54.00
Steelworks Scrap..	17.58	17.58	17.75	20.06	17.97	14.77	11.02

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Dec. 30, 1939	Nov. 1939	Sept. 1939	Dec. 1938
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Terre Haute, Ind.	2.15	2.15	2.125	2.05
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.00	2.00	2.15
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.00	2.00	2.00
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.40	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago.	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	2.00	1.92	1.92	1.92

Pig Iron

	Dec. 30, 1939	Nov. 1939	Sept. 1939	Dec. 1938
Bessemer, del. Pittsburgh	$24.34	$24.34	$23.35	$22.34
Basic, Valley	22.50	22.50	21.50	20.50
Basic, eastern, del. Philadelphia	24.34	24.34	23.54	22.34
No. 2 foundry, Pittsburgh	24.21	24.21	23.20	22.21
No. 2 foundry, Chicago	23.00	23.00	23.00	22.20
Southern No. 2, Birmingham	19.38	19.38	18.58	17.38
Southern No. 2, del. Cincinnati	22.89	22.89	22.09	20.89
No. 2X, del. Phila. (differ. av.)	25.215	25.215	24.415	23.215
Malleable, Valley	23.00	23.00	22.00	21.00
Malleable, Chicago	23.00	23.00	23.00	22.50
Lake Sup., charcoal, del. Chicago	30.34	30.34	30.34	29.84
Gray forge, del. Pittsburgh	23.17	23.17	22.15	21.17
Ferromanganese, del. Pittsburgh	105.33	105.33	95.35	97.77

Scrap

Heavy melting steel, Pittsburgh	$18.00	$21.90	$18.75	$15.50
Heavy melt. steel, No. 2, E. Pa.	17.25	19.25	17.10	13.20
Heavy melting steel, Chicago	16.25	17.45	19.25	16.05
Rails for rolling, Chicago	19.75	20.50	21.90	19.65
Railroad steel specialties, Chicago	18.50	21.50	21.75	18.00

Coke

Connellsville, furnace, ovens	$4.75	$5.00	$3.75	$3.75
Connellsville, foundry, ovens	5.75	6.00	5.00	5.00
Chicago, by-product fdry., del.	10.50	11.25	10.50	10.50

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.10c
Chicago, Gary	2.10c
Cleveland	2.10c
Detroit, del.	2.20c
Buffalo	2.10c
Sparrows Point, Md.	2.10c
New York, del.	2.34c
Philadelphia, del.	2.27c
Granite City, Ill.	2.20c
Middletown, O.	2.10c
Youngstown, O.	2.10c
Birmingham	2.10c
Pacific Coast points	2.60c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp.	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c
Philadelphia, del.	2.15c
Boston, delivered	2.46c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.35c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c

Standard Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points	2.75c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Detroit, delivered	2.25c
Cleveland	2.15c

Buffalo	2.15c
Birmingham	2.15c
Gulf ports	2.50c
Pacific Coast points	2.75c

Iron

Chicago, Terre Haute	2.15c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

*New Billet Bars, Base**

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

*Rail Steel Bars, Base**

Pittsburgh, Gary Chicago, Buffalo, Cleveland, Birm.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

**Subject to a deduction of 25 cents per 100 lbs. in lots of 20 tons or over of one size, in lengths of 30 feet or over, for shipment at one time to one destination.*

Wire Products

Pitts-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard and cement coated wire nails	$2.55
(Per pound)	
Polished fence staples	2.55c
Galv. barbed wire, standard 12½ gage two-point hog, 80-rod spool $2.88; two-point cattle, 80-rod spool	$2.70
Annealed fence wire	2.90c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	67.00
Single loop bale tie, (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh $3.70

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.70c
Detroit, delivered	2.80c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo.	0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni.	1.10
5100 0.80-1.10 Cr.	0.45
5100 Cr. spring flats	0.15
6100 bars	1.20
6100 spring flats	0.85
Cr. N., Van.	1.50
Carbon Van.	0.85
9200 spring flats	0.15
9200 spring rounds, squares	0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.10c
Detroit, del.	2.20c
Philadelphia, del.	2.42c
New York, del.	2.46c
Pacific Coast points	2.70c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.20c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Chicago	3.05c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham.	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, for full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts separate 72.5 off; with nuts attached add 15%; bulk 83.5 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Plow bolts	68.5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
6-inch and less	67	70
⅞-1-inch	64	65
1⅛ and larger	62	62

Hexagon Cap Screws

Upset, 1-in., smaller	70.0 off

Square Head Set Screws

Upset, 1-in., smaller	75.0 off
Headless set screws	64.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.85c
Pacific coast ports	2.90c

Rivets, Washers

Structural, Pittsburgh, Cleveland, Chicago	3.40c

⅞-inch and smaller, Pitts., Chi., Cleve. 65-10 off

Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55
11 and 12	63½	54

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64
10-inch lap weld	63½
12-inch, lap weld	62½

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½" O.D.	13	$ 9.72	$23.71
1¾" O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼" O.D.	13	13.79	21.68
2¼" O.D.	12	15.16	.....
2½" O.D.	12	16.58	26.57
2¾" O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½" O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1 "O.D.	13	$ 7.82	$ 9.01
1¼ "O.D.	13	9.26	10.67
1½ "O.D.	13	10.23	11.79
1¾ "O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼ "O.D.	13	14.54	16.76
2¼ "O.D.	12	16.01	18.45
2½ "O.D.	12	17.54	20.21
2¾ "O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½ "O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½ "O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$45.00-46.00
4-in., Birmingham	48.00-49.00
4-in., Chicago	56.80-57.80
6-in. & over, Chicago	53.80-54.80
6-in. & over, east fdy.	49.00
Do., 4-in.	52.00

Class A Pipe $3 over Class B Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅝-inch incl. (per 100 lbs.) $2.00

Do., over ⅝ to 41/64-in. incl. 2.15

Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.45.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt. 1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$4.75- 5.25
Connellsville, fdry.	5.50- 6.00
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.50- 6.75
Wise county fdry.	5.50- 6.50
Wise county fur.	5.00- 5.25

By-Product Foundry

Newark, N. J., del.	11.38-11.85
Chicago, outside del.	10.50
Chicago, delivered	11.25
Terre Haute, del.	10.75
Milwaukee, ovens	11.25
New England, del.	12.50
St. Louis, del.	11.75
Birmingham, ovens	7.50
Indianapolis, del.	10.75
Cincinnati, del.	10.50
Cleveland, del.	11.05
Buffalo, del.	11.25
Detroit, del.	11.00
Philadelphia, del.	11.15

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	25.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (less than 1000 lbs.)	14.75c
Do. (1000 lbs. or over)	13.75c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	6.75c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birdsboro, Pa.	24.00	24.50	23.50	25.00
Birmingham, Ala.§	19.38	.....	18.38	24.00
Buffalo	23.00	23.50	22.00	24.00
Chicago	23.00	23.00	22.50	23.50
Cleveland	23.00	23.00	22.50	23.50
Detroit	23.00	23.00	22.50	23.50
Duluth	23.50	23.50	.....	24.00
Erie, Pa.	23.00	23.50	22.50	24.00
Everett, Mass.	24.00	24.50	23.50	25.00
Granite City, Ill.	23.00	23.00	22.50	23.50
Hamilton, O.	23.00	23.00	22.50	.....
Neville Island, Pa.	23.00	23.00	22.50	23.50
Provo, Utah	21.00	.....	.....	.....
Sharpsville, Pa.	23.00	23.00	22.50	23.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	24.00	24.50	23.50	25.00
Toledo, O.	23.00	23.00	22.50	23.50
Youngstown, O.	23.00	23.00	22.50	23.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	‡Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.45	25.45	24.95	24.95

	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis, northern	23.50	23.50	23.00	.....
St. Louis from Birmingham	†23.12	.....	22.62	.....
St. Paul from Duluth	25.63	25.63	.....	26.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $28.50, base; $29.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$22.50	Lake Superior fur.	$27.00
Pitts. dist. fur.	22.50	do., del. Chicago	30.34
		Lyles, Tenn.	26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $28.50; 6.51-7—$29.00; 7-7.50—$29.50; 7.51-8—$30.00; 8-8.50—$30.50; 8.51-9—$31.00; 9-9.50—$31.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Imported dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Do. domestic	40.00
Do., f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00
Quickset magnesite grains, f.o.b. Chewelah, Wash., net, bulk	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$47.00
Chem. bonded chrome	47.00
Magnesite brick	67.00
Chem. bonded magnesite	57.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	22.00
Do. barge	22.00
No. 2 lump	22.00

Ferroalloy Prices

Ferromanganese, 78-82%, tide., duty pd. $100.00
Do., del. Pitts., 105.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 32.00
Do., 26-28% 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 82.00
Do., 75 per cent 126.00
Spot, $5 a ton higher.

Silicomanganese, 2¼ c. 103.00 2% carbon, 108.00; 1%, 118.00 Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 2.00-2.10

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c
Do., ton lots 11.75c
Do., less-ton lots 12.00c
67-72% carloads, 2% carbon. per lb. contained chrome 17.50c
Do., ton lots 18.25c
Do., less-ton lots 18.75c

	Carloads	Ton lots	Less ton
2% carb.	16.50c	17.25c	17.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. tl., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, tl., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00
15-18% tl., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots. 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, freight allowed, lb. spot carlots, bulk 7.00c
Do., ton lots 7.50c
Do., less-ton lots 7.75c
Do., less 200 lbs. 8.00c
Spot, ¼c higher.

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c
Do, spot 85.00c
88% chrome, contract 79.00c
Do, spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads freight allowed, ton $69.50
Carload, spot 74.50
Less-ton lots, lb. 3.75c

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton $97.50
Do, spot 102.50

34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	5.23	3.51	4.09	8.59	7.19
Philadelphia	3.85	3.85	4.35	3.55	3.55	5.25	3.55	4.55	4.93	3.51	4.06	8.56	7.16
Baltimore	3.95	4.05	4.45	3.70	3.70	5.25	3.55	....	5.05	....	4.05	....	....
Norfolk, Va.	4.15	4.25	....	3.90	3.90	5.45	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	6.40	4.20	4.40	4.50	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.75	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.72	3.20	3.75	8.15	6.75
Detroit	3.58	3.68	3.68	3.75	3.80	5.42	3.43	4.50	4.84	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.67	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.85	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	5.00	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.98	3.54	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.95	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.00	4.00	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	3.90	3.90	3.85	3.85	5.68	3.65	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.71	....	4.69	....	....
Birmingham	3.50	3.60	3.60	3.55	3.55	5.88	3.35	....	4.85	....	4.43	....	....
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	....	4.80	5.00	4.60	....	....
Houston, Tex.	4.05	6.20	6.20	4.05	4.05	5.75	4.20	....	5.25	....	....	....	....
*Seattle	4.00	3.85	5.20	3.40	3.50	5.75	3.70	6.50	4.75	....	5.75	....	....
Portland, Oreg.	4.25	4.50	6.10	4.00	4.00	5.75	3.95	6.50	4.75	....	5.75	....	....
Los Angeles	4.15	4.65	6.45	4.00	4.00	6.40	4.30	6.50	5.25	....	6.60	10.65	9.80
San Francisco	4.00	4.45	6.00	4.00	4.00	5.60	3.85	6.40	5.15	....	6.80	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	4.10	7.31	5.86	5.61	8.56
Baltimore	4.10	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.63	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 300-4999 in San Francisco, Portland; any quantity in Twin Cities; 300-1999 in Los Angeles.

Galvanized Sheets: Base, 0-1499 pounds in New York, 150-1499 pounds in Cleveland, Milwaukee, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-4999 in Portland, Seattle, San Francisco; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, St. Louis, Tulsa; 1500 and over in Chattanooga, Philadelphia; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 or 2000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Dec. 28

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports £ s d	Continental Channel or North Sea ports, gross tons: Quoted in dollars at current value	**Quoted in gold pounds sterling £ s d
Foundry, 2.50-3.00 Si.	$23.64 6 0 0	$28.97	3 8 0
Basic bessemer	....	19.59	2 6 0
Hematite, Phos. .03-.05	24.63 6 5 0	.....	.....
Billets	$29.06 7 7 6	$31.95	3 15 0
Wire rods, No. 5 gage	44.82 11 7 6	60.71	7 2 6
Standard rails	$37.43 9 10 0	$48.99	5 15 0
Merchant bars	2.16c 12 5 0	2.90c	7 12 6
Structural shapes	1.96c 11 2 6	2.85c	7 10 0
Plates, †¼ in. or 5 mm.	2.09c 11 17 6	3.71c	9 15 0
Sheets, black, 24 gage or 0.5 mm	2.75c 15 12 6	3.75c	9 17 6°
Sheets, gal., 24 ga., corr.	3.19c 18 2 6	4.70c	12 7 6
Bands and strips	2.16c 12 5 0	2.81c	7 8 0
Plain wire, base	3.45c 19 10 0	3.04c	8 0 0
Galvanized wire, base	4.09c 23 5 0	3.61c to 3.66c	9 10 0 to 9 12 6
Wire nails, base	....	3.52c	9 5 0
Tin plate, box 108 lbs.	$ 6.21 1 11 6	.....	.....

British ferromanganese $100.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d			French Francs		Belgian Francs		Reich §§Mark	
Fdy. pig iron, Si. 2.5.	$21.28	5 8 0(a)	$15.21	679.30	$24.36	725	$25.33	63	
Basic bess. pig iron	20.00	5 1 6(a)	.....	.....	.....	...	27.94	(b)69.50	
Furnace coke	5.76	1 9 2	5.04	225	10.42	310	7.64	19	
Billets	33.00	8 7 6	25.36	1,132	28.90	860	38.79	96.50	
Standard rails	1.79c	10 3 0	1.41c	1,405	2.06c	1,375	2.38c	132	
Merchant bars	2.25c	12 16 0††	1.43c	1,434	1.88c	1,250	1.98c	110	
Structural shapes	2.01c	11 8 0††	1.40c	1,395	1.88c	1,250	1.93c	107	
Plates, †¼-in. or 5 mm	2.03c	11 10 6††	1.82c	1,815	2.21c	1,475	2.29c	127	
Sheets, black	2.84c	16 2 6§	2.15c	2,154‡	2.70c	1,800‡	2.59c	144‡	
Sheets, galv., corr., 24 ga. or 0.5 mm	3.28c	18 12 6	2.85c	2,850	4.58c	3,050	6.66c	370	
Plain wire	3.17c	18 0 0	2.00c	2,000	3.00c	2,000	3.11c	173	
Bands and strips	2.38c	13 11 0††	1.59c	1,588	2.18c	1,450	2.29c	127	

†British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions.

**Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1	16.50-17.00
Bos. dock No. 1 exp.	16.00-16.50
New Eng. del. No. 1	16.50
Buffalo, No. 1	17.00-17.50
Buffalo, No. 2	15.00-15.50
Chicago, No. 1	16.00-16.50
Chicago, auto. no alloy	15.00-15.50
Chicago, No. 2 auto	13.00-13.50
Cincinnati dealers	14.00-14.50
Cleveland, No. 1	17.50-18.00
Cleveland, No. 2	16.50-17.00
Detroit, No. 1	†13.00-13.50
Detroit, No. 2	†12.00-12.50
Eastern Pa., No. 1	18.50-19.00
Eastern Pa., No. 2	17.00-17.50
Federal, Ill.	14.00-14.50
Granite City, R. R.	14.50-15.00
Granite City, No. 2	13.75-14.25
Los Angeles, No. 1	16.50-17.00
Los Angeles, No. 2	15.50-16.00
L. A., No. 1 f.a.s.	18.50-19.50
L. A., No. 2 f.a.s.	17.50-18.50
N. Y. dock No. 1 exp.	14.50
Pitts., No. 1 (R. R.)	19.50-20.00
Pittsburgh, No. 1	17.50-18.50
Pittsburgh, No. 2	16.50-17.00
St. Louis, R. R.	14.75-15.25
St. Louis, No. 2	13.75-14.25
San Francisco, No. 1	16.50-17.00
San Francisco, No. 2	15.50-16.00
Seattle, No. 1	14.50-15.50
Toronto, dirs., No. 1	10.75-11.25
Valleys, No. 1	18.00-18.50

COMPRESSED SHEETS

Buffalo, new	15.00-15.50
Chicago, factory	15.50-16.00
Chicago, dealers	14.00-14.50
Cincinnati, dealers	13.50-14.00
Cleveland	17.00-17.50
Detroit	†13.75-14.25
E. Pa., new mat.	18.50-19.00
E. Pa., old mat.	15.50-16.00
Los Angeles	12.00-12.50
Pittsburgh	17.50-18.50
St. Louis	11.50-12.00
San Francisco	14.00-14.50
Valleys	17.50-18.00

BUNDLED SHEETS

Buffalo, No. 1	15.00-15.50
Buffalo, No. 2	13.00-13.50
Cleveland	13.50-14.00
Pittsburgh	16.50-17.00
St. Louis	10.00-10.50
Toronto, dealers	9.75

SHEET CLIPPINGS, LOOSE

Chicago	10.50-11.00
Cincinnati dealers	9.50-10.00
Detroit	†9.50-10.00
St. Louis	9.50-10.00
Toronto, dealers	6.75- 7.00

BUSHELING

Birmingham, No. 1	14.00
Buffalo, No. 1	15.00-15.50
Chicago, No. 1	15.00-15.50
Cincin., No. 1, deal.	11.50-12.00
Cincinnati, No. 2	5.00- 5.50
Cleveland, No. 2	12.00-12.50
Detroit, No. 1, new	†12.50-13.00
Valleys, new, No. 1	17.00-17.50
Toronto, dealers	5.00- 5.50

MACHINE TURNINGS (Long)

Birmingham	6.00
Buffalo	10.00-10.50
Chicago	10.00-10.50
Cincinnati, dealers	6.50- 7.00
Cleveland, no alloy	11.00-11.50
Detroit	†7.50- 8.00
Eastern Pa.	12.50-13.00
Los Angeles	4.00- 5.00
New York	†7.00- 7.25
Pittsburgh	12.50-13.00
St. Louis	7.00- 7.50
San Francisco	5.00
Toronto, dealers	6.00- 6.25
Valleys	11.50-12.00

SHOVELING TURNINGS

Buffalo	13.50-14.00
Cleveland	12.00-12.50
Chicago	10.00-10.50
Chicago, spcl, anal.	12.50-13.00
Detroit	†9.50-10.00
Pitts., alloy-free	14.00-14.50

BORINGS AND TURNINGS
For Blast Furnace Use

Boston district	†6.00- 6.25
Buffalo	11.00-11.50
Cincinnati, dealers	5.00- 5.50
Cleveland	12.00-12.50
Eastern Pa.	11.50-12.00
Detroit	†7.50- 8.00
New York	†7.00- 7.50
Pittsburgh	12.00-12.50
Toronto, dealers	5.50- 6.00

AXLE TURNINGS

Buffalo	17.00-17.50
Boston district	†9.50-10.00
Chicago, elec. fur.	16.00-16.50
East. Pa. elec. fur.	17.50-18.00
St. Louis	10.50-11.00
Toronto	6.00- 6.50

CAST IRON BORINGS

Birmingham	8.50
Boston dist. chem.	†9.00- 9.25
Buffalo	11.00-11.50
Chicago	9.00- 9.50
Cincinnati, dealers	5.00- 5.50
Cleveland	12.00-12.50
Detroit	†7.50- 8.00
E. Pa., chemical	14.50-15.00
New York	†7.00- 7.50
St. Louis	6.00- 6.50
Toronto, dealers	5.50- 5.75

RAILROAD SPECIALTIES

Chicago	18.25-18.75

ANGLE BARS—STEEL

Chicago	18.50-19.00
St. Louis	16.00-16.50

SPRINGS

Buffalo	22.00-22.50
Chicago, coil	19.50-20.00
Chicago, leaf	17.50-18.00
Eastern Pa.	24.00
Pittsburgh	23.00-23.50
St. Louis	17.00-17.50

STEEL RAILS, SHORT

Birmingham	17.50-18.00
Buffalo	22.00-22.50
Chicago (3 ft.)	19.00-19.50
Chicago (2 ft.)	19.50-20.00
Cincinnati, dealers	20.50-21.00
Detroit	†20.50-21.00
Pitts., 3 ft. and less	23.00-23.50
St. Louis, 2 ft. & less	19.75-20.25

STEEL RAILS, SCRAP

Birmingham	15.50
Boston district	†14.00-14.50
Buffalo	17.50-18.00
Chicago	16.25-16.75
Cleveland	21.00-21.50
Pittsburgh	22.00-22.50
St. Louis	16.00-16.50
Seattle	18.00-18.50

FROGS, SWITCHES

Chicago	16.00-16.50
St. Louis, cut	15.50-16.00

ARCH BARS, TRANSOMS

St. Louis	16.50-17.00

PIPE AND FLUES

Chicago, net	11.00-11.50
Cincinnati, dealers	11.00-11.50

RAILROAD GRATE BARS

Buffalo	12.00-12.50
Chicago, net	10.50-11.00
Cincinnati, dealers	9.00- 9.50
Eastern Pa.	15.50-16.00
New York	†12.00-12.50
St. Louis	11.50-12.00

RAILROAD WROUGHT

Birmingham	15.00
Boston district	†9.50-10.00
Eastern Pa., No. 1	20.00-20.50
St. Louis No. 1	11.00-11.50
St. Louis, No. 2	14.00-14.50

FORGE FLASHINGS

Boston district	†11.75-12.00
Buffalo	15.00-15.50
Cleveland	16.50-17.00
Detroit	†12.50-13.00
Pittsburgh	16.50-17.00

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	19.00-19.50

LOW PHOSPHORUS

Cleveland, crops	22.50-23.00
Eastern Pa., crops	24.00
Pitts., billet, bloom, slab crops	24.50-25.00

LOW PHOS. PUNCHINGS

Buffalo	20.00-20.50
Chicago	19.00-19.50
Cleveland	19.50-20.00
Eastern Pa.	23.00-24.00
Pittsburgh	22.50-23.00
Seattle	15.00
Detroit	†14.00-14.50

RAILS FOR ROLLING
5 feet and over

Birmingham	17.50
Boston	†15.75-16.00
Chicago	19.50-20.00
New York	†17.50-18.00
Eastern Pa.	23.00
St. Louis	18.00-18.50

STEEL CAR AXLES

Birmingham	19.00-20.00
Boston district	†16.00-16.50
Chicago, net	19.50-20.00
Eastern Pa.	23.00-23.50
St. Louis	20.00-20.50

LOCOMOTIVE TIRES

Chicago (cut)	19.00-19.50
St. Louis, No. 1	16.50-17.00

SHAFTING

Boston district	†18.50-18.75
New York	†18.00-18.50
Eastern Pa.	23.50-24.00
St. Louis, 1¼-3¾".	18.50-19.00

CAR WHEELS

Birmingham, iron	19.00-20.00
Boston dist., iron	†14.50-15.00
Buffalo, steel	21.50-22.00
Chicago, iron	17.00-17.50
Chicago, rolled steel	18.00-18.50
Cincin., iron, deal.	17.00-17.50
Eastern Pa., iron	20.00-20.50
Eastern Pa., steel	23.00-23.50
Pittsburgh, iron	19.50-20.00
Pittsburgh, steel	23.00-23.50
St. Louis, iron	18.00-18.50
St. Louis, steel	17.00-17.50

NO. 1 CAST SCRAP

Birmingham	16.00
Boston, No. 1 mach.	†15.00-15.25
N. Eng. del. No. 2	17.00-17.50
N. Eng. del. textile	18.25-18.75
Buffalo, cupola	17.50-18.00
Buffalo, mach.	18.00-18.50
Chicago, agri. net	13.50-14.00
Chicago, auto net	15.00-15.50
Chicago, railroad net	14.50-15.00
Chicago, mach. net	15.00-15.50
Cincin., mach. deal.	16.50-17.00
Cleveland, mach.	20.00-21.00
Detroit, cupola, net	†14.50-15.00
Eastern Pa., cupola	20.50-21.00
E. Pa., mixed yard	17.00-17.50
Los Angeles	15.50-16.00
Pittsburgh, cupola	18.50-19.00
San Francisco	15.50-16.00
Seattle	16.00-16.50
St. Louis, breakable	14.50-15.00
St. Louis agri. mach.	17.75-18.25
St. L., No. 1 mach.	18.25-18.75
San Francisco	16.00-17.00
Toronto, No. 1 mach., net dealers	15.25-15.50

HEAVY CAST

Boston dist. break.	†13.00-13.25
New England, del.	15.50-16.00
Buffalo, break	15.00-15.50
Cleveland, break. net	15.25-15.75
Detroit, auto net	†15.50-16.00
Detroit, break	†11.00-11.50
Eastern Pa.	18.50
Los Ang., auto, net.	14.50
New York break	†14.50-15.00
Pittsburgh, break	16.00-16.50

STOVE PLATE

Birmingham	11.00
Boston district	†12.50
Buffalo	13.50-14.00
Chicago, net	9.50-10.00
Cincinnati, dealers	9.00- 9.50
Detroit, net	†9.00- 9.50
Eastern Pa.	15.50-16.00
New York, fdy.	13.00
St. Louis	11.00-11.50
Toronto dealers, net	11.00-11.50

MALLEABLE

Birmingham, R. R.	17.50
New England, del.	20.00-21.00
Buffalo	19.50-20.00
Chicago, R. R.	18.50-19.00
Cincin., agri., deal.	14.00-14.50
Cleveland, rail	22.50-23.00
Eastern Pa., R. R.	21.50-22.00
Los Angeles	12.50
Pittsburgh, rail	20.50-21.00
St. Louis, R. R.	16.50-17.00

Ores

Lake Superior Iron Ore

Gross ton, 51½ %
Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract.	9.00-10.00

Foreign Ore
(Prices nominal)

Cents per unit, c.i.f. Atlantic

Manganiferous ore, 45-55% Fe., 6-10% Mn.	14.00-15.00
North African low phos.	14.00
Spanish, No. African basic, 50 to 60%	14.00
Chinese wolframite, short ton unit, duty paid	$23.75-24.00
Scheelite, imp.	$24.00-25.00
Newfoundland fdry. 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$25.00-26.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	48.00-50.00
So. African, 50-52%	48.00-50.00
Indian, 49-50%	nom
Brazilian, 48-52%	48.00
Cuban, 50-51%, duty free	61.20

Molybdenum

Sulphide conc., per lb., Mo. cont., mines	$0.75

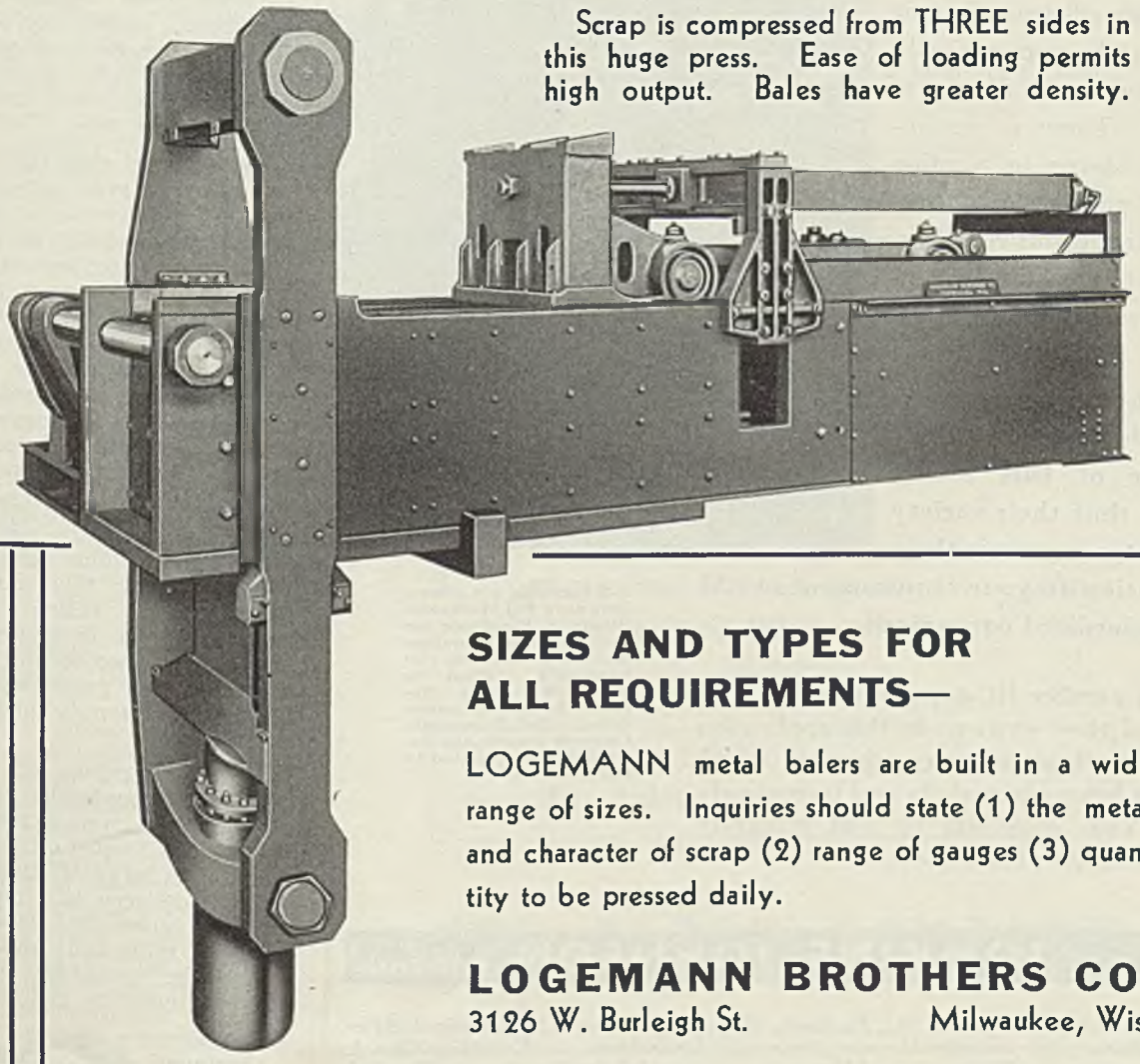
SHEET SCRAP?

Bale it in a LOGEMANN SCRAP PRESS

"Hydraulic-compressed" scrap pressed in LOGEMANN metal balers, commands the best price at all times. It can be more conveniently stored and more economically handled.

It can be readily held for favorable markets. It practically eliminates corrosion, saves much hea in remelting. It easily lo ds car to capacity.

Scrap is compressed from THREE sides in this huge press. Ease of loading permits high output. Bales have greater density.



SIZES AND TYPES FOR ALL REQUIREMENTS—

LOGEMANN metal balers are built in a wide range of sizes. Inquiries should state (1) the metal and character of scrap (2) range of gauges (3) quantity to be pressed daily.

LOGEMANN BROTHERS CO.
3126 W. Burleigh St. Milwaukee, Wis.

Sheets, Strip

Sheet & Strip Prices, Pages 296, 297

Pittsburgh — Although tonnage output this week and last was reduced due to the holiday, sheet mills are running at an unchanged rate. Operations are estimated at about 80 per cent, although active units are virtually at full production. Galvanized output is holding steady at 75 per cent of capacity.

Chicago—Most major consumers are well covered for first quarter and buying last week was light. Needs of automotive interests are expected to be heavier this month with increased demand to be noted in about two weeks. Farm equipment interests are increasing production, requiring more material, particularly for tractors. Most consuming industries are operating at brisk pace, indicating steady call for flat-rolled goods.

Boston—Specifications and buying of cold narrow strip are holding surprisingly well in view of holiday influences and recent heavy shipments, indicating consumption has kept year-end inventories moderate. Production and deliveries, nevertheless, are now well in excess of incoming volume and pressure for steel has eased. Finishing operations remain at peak and although backlogs are being reduced, enough tonnage is on mill books to assure high output during most of the first quarter or at least well through February. Hot strip deliveries are improved with the exception of material entering into specialties which still ranges up to six weeks or more on new business.

New York—Most sheet consumers here have moderate stocks. Consequently a lively resumption of specifications is expected after the inventory season. Most promising in the immediate outlook are requirements of manufacturers of refrigerators and certain other household appliances, who usually get earnestly underway shortly after the turn of the year in building up spring stocks.

Sheet producers have substantial backlogs in most cases, and considering new requirements likely to arise from regular customers, anticipate a rather high rate of production through first quarter. Deliveries on light gage hot-rolled sheets continue more advanced than in most other lines.

Narrow cold strip mill operations will again be practically at capacity this week following a slight drop because of the holidays. Little new business is being booked, but backlogs are large enough to warrant high operations during most of the quarter with an early resumption of buying indicated by limited inventories and sustained consumption. Hot strip deliveries show slight improvement, notably on material destined for rerolled specialties.

Philadelphia—Sheet sellers report consumer stocks are not large and that specifications should show some increase this month. Mill deliveries are easing, with cold-rolled available in four weeks and hot-rolled in two to four weeks except in lighter gages, which cannot be had in quantity under five to six weeks.

Buffalo—Backlogs are being reduced but production is holding close to peak levels of recent weeks. Buying has leveled off but mills report fairly large bookings for first quarter delivery will maintain operations during that period. Inventories of mills and consumers generally are considered light. Improved buying by railroads is anticipated.

Cincinnati—Sheet production will continue close to capacity at the

opening of first quarter, January tonnage to include considerable carryover. Buying has slowed, partly attributed to the holidays. Persistent pressure for deliveries throughout the fourth quarter give proof consumer inventories are low.

Toronto, Ont.—Interest continues active in sheets and producers now are well booked to the end of March and report good inquiries. Most of the sheet buying has been on ordinary peace time account with only a limited demand for war needs, but heavy orders on war account are expected to develop within the next few weeks.

Plates

Plate Prices, Page 296

Pittsburgh—Plate mills are well sold out and considerable difficulty remains in meeting delivery dates. There is a considerable backlog of shipbuilding materials and railroad specifications have begun to appear in increased volume. Construction needs are constant.

Chicago—Buying is seasonally quiet but expected to improve shortly. Releases are fairly high. New projects involving plates are few, but demands of tank fabricators and railroad freight car builders are prominent. Shipments continue heavy and substantial backlogs are being carried over into the new year.

Boston—New orders for plates are slack. Scattered small-lot business is being booked at 2.10c, Eastern Pennsylvania base, the 2.35c quotation having disappeared. Shipyard specifications are steady and are expected to rise this quarter. Except for three small oil storage tanks, aggregating 60,000-gallons capacity, for the Springfield, Mass., armory, specified work is light.

The Worcester car building shop and railroads are likely to take in a fair volume of plates within the next few weeks against orders already placed. Boiler shop buying is lagging, but quality material is relatively firmer than medium black.

New York—Platemakers anticipate a heavy volume of railroad equipment tonnage in first quarter, against orders placed last fall. They also expect increasing ship specifications, notwithstanding the outlook for a rather slim volume of new shipwork. Much of the tonnage for ships placed late last summer and early fall has not yet been released. Oil company demand appears more promising, particularly for later in the quarter, when miscellaneous

tank and boiler work also should be more active than it has been since early fall.

Philadelphia—Platemakers expect early placing of tonnage for two cargo boats awarded last fall to a district yard. New tonnage is generally spotty at the moment with producers counting chiefly on booked orders to keep them busy in the immediate future, especially from car builders and shipyards which are now specifying against contracts.

San Francisco—Improvement is noted in demand for steel plates, with prospect for considerable buying early in the year. Plate bookings aggregated 92,206 tons, compared with 52,961 tons a year ago. Bids will be opened Jan. 5 by the water and power department, Los Angeles, for 18,000 tons of plates for 48 and 60-inch welded steel pipe.

Seattle — Demand for plates is nominal, mostly repair jobs requiring small tonnages. Bremerton, Wash., opened bids Dec. 27 for 10,000 feet of 24-inch water pipe, totaling 350 tons.

Toronto, Ont.—Inquiries for plates are appearing and it is stated that Canadian producers have sufficient orders on hand and in prospect to take care of production for some months. Large purchases for export will be necessary to take care of heavy demand for the next few months.

Plate Contracts Placed

840 tons, 11 tanks, Carbide & Carbon Chemical Corp., South Charleston, W. Va., to Chicago Bridge & Iron Co., Chicago.

510 tons, tank storage, 140,000-barrel capacity, Humble Oil & Refining Co., Baytown, Tex., to Chicago Bridge & Iron Co., Chicago.

130 tons, six tanks, Pennsylvania turnpike commission, Lancaster, Pa., to Lancaster Iron Works, Lancaster, Pa.

Plate Contracts Pending

18,000 tons, for 48 and 60-inch welded pipe, water and power department, Los Angeles; bids Jan. 5.

Bars

Bar Prices, Page 296

Pittsburgh—The order jam on bar mills is beginning to clear and most producers believe a more equitable distribution will be possible within the next six weeks. Backlogs are high and are expected to move higher with new automotive buying in January. Most tonnage is still coming from miscellaneous sources, however, and average orders are small. Warehouse buying has been active, and the holiday season has enabled producers to catch up somewhat on deliveries.

Chicago—Improved railroad car and farm equipment consumption is indicated this month. Automotive needs are heavy, especially prominent in alloy bars. Orders are light, but backlogs continue heavy. Brisk operations of consuming industries keeps bar prospects bright for first quarter. Most consumers are well covered on first quarter needs and additional buying is not expected to be large.

Boston—Demand for alloy steel bars has declined slightly, but this is considered temporary in view of expected high consumption by machine tool, government shop, shipyard and miscellaneous industrial consumers. Stocks of secondary distributors of alloy stock are small and some sizes and grades are in short supply with mill deliveries delayed. Hot-rolled merchant bar buying has declined with deliveries improved.

New York—Bar demand is expected to continue active. Stocks of consumers and jobbers are not large, and much work requiring bars appears definitely in sight. Machine tool, car and shipbuilders

have large orders on hand. Automotive demands continue promising, with those of government shops. Special alloys carbon and cold-drawn grades have excellent prospects.

Philadelphia — Commercial bar sellers have little tonnage for delivery under five weeks, with specifications holding particularly considering the holidays and inventory season. Demand for alloy and cold-drawn bars has been particularly pressing.

Buffalo—With consumers continuing to call for substantial tonnage, bar rolling schedules are practically at capacity. Large deliveries are also pending for first quarter. Diversified buying indicates various manufacturing consumers are building up depleted inventories.

Pipe

Pipe Prices, Page 297

Pittsburgh — Although pipe line tonnage has moved somewhat better and short lines have accounted for fair tonnages, oil country needs for 1940 remain the big question in tubular goods business. In other divisions incoming orders have recovered slightly from the low of early December, and aside from the effect of the holidays, volume is substantial.

Backlogs are high in standard pipe, mechanical tubing and pressure tubing.

Boston—Buyers with blanket contracts for cast iron pipe in numerous instances exceeded original estimates and buying in volume is not expected until about mid-quarter. Merchant steel pipe demand in small diameters and lots is steady but not impressive with prices shaded in some districts. Wrought pipe moves in small lots only.

San Francisco—Demand for cast iron pipe is quiet, the only award of size being 205 tons for El Centro, Calif., to United States Pipe & Foundry Co., Burlington, N. J. Pipe bookings totaled 43,016 tons, compared with 37,829 tons a year ago.

Cast Pipe Placed

205 tons, for El Centro, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

154 tons, 6 to 16-inch for Yakima, Wash., to Hugh G. Purcell, Seattle, for U. S. Pipe & Foundry Co.

109 tons, cast iron pipe and accessories for Yakima, Wash., to Pacific States Cast Iron Pipe Co., Provo, Utah.

Cast Pipe Pending

256 tons, 4 to 10-inch for navy project, Tongue Point, Oreg.; bids in.

Wire

Wire Prices, Page 297

Chicago—Orders are lighter. Some sources of demand, such as road builders, are operating slower but needs of automotive, tractor and farm equipment interests will be heavy this month. Backlogs are substantial, indicating heavy production.

Boston—Lower volume of incoming wire business has not materially eased pressure on mills for shipments and operations in most departments are near capacity. Much of the tonnage on mill books is for specialties on which it is difficult to shorten process of production. On this class of goods pressure has not been cleared, although progress has been made. Deliveries on common wires are better, including most grades of manufacturers' wire.

New York—Resumption of wire buying in volume is expected early this quarter, incoming tonnage having dropped to a minimum during the last 10 days, due to the holidays. Most business originally booked for fourth quarter shipment has been delivered, although some tonnage went over into the new year. Inventories of consumers are generally moderate and consumption in most industries is holding.

Rails, Cars

Track Material Prices, Page 297

Railroad buying in the final week of 1939 was practically absent, a few scattering car and locomotive orders being placed. Some steel requirements for repair and maintenance are being figured and will be placed early in 1940.

Rail mills are running at a modate rate, which will be quickened as specifications for spring laying are issued. Rail backlogs are excellent, total placed in 1939 being estimated at 850,000 to 900,000 tons, with 1940 expected to pass 1,000,000 tons if financing can be arranged.

Car Orders Placed

Interstate Commerce commission, four riveted aluminum alloy tank cars for experimental service; authorization granted American Car & Foundry Co., New York, for construction.

Interstate Commerce commission, five fusion-welded cars, authorization made to American Car & Foundry Co., New York, for instruction.

Lake Terminal, 100 70-ton gondola cars, to American Car & Foundry Co., New York.

Richmond, Fredericksburg & Potomac, six steel baggage-express cars to the American Car & Foundry Co., New York; previously noted as placed with an unstated builder.

Locomotives Placed

Chicago, Burlington & Quincy, one 4-8-4 type locomotive; to own shops.

Panama Canal, five 2-6-0 type locomotives, to American Locomotive Co., New York.

Semifinished Steel

Semifinished Prices, Page 297

Year-end adjustments on requirements of nonintegrated companies here have been a deterring factor in semifinished steel bookings recently. However, this has made little difference in the backlogs, and delivery problems are still appearing in wire rods and in skelp. Rod mills indicate the situation will be cleared up by the end of January. Specifications against skelp orders are still high and shipments are moving in good volume. There is still pressure for delivery in billets and sheet bars in some cases.

Shapes

Structural Shape Prices, Page 296

New York—Leading structural awards include 1500 tons for a state hospital building, Kings Park, N. Y., and 725 tons, 12-story apartment. Aggregate volume being placed is small and pending tonnage at the start of the year is light.

American Institute of Steel Construction reports bookings for November at 91,556 tons, compared with a revised figure of 112,597 in October and 153,084 tons in November, 1938. Eleven months' bookings this year totaled 1,206,662 tons, compared with 1,093,194 tons in the corresponding period in 1938. Shipments in November were 123,201 tons, compared with a revised figure of 132,132 tons in October and 99,872 tons in November, 1938. Ten months' shipments were 1,317,141 tons in 1939, compared with 1,052,306 in the same period, 1938.

Pittsburgh — New construction work is lighter both in awards and inquiries, due largely to the year-end holiday. Weather conditions in some sections have had an unfavorable effect. New jobs are well distributed among industrial and public works projects. Shipments have been somewhat ahead of new placements, although some delivery problems still exist.

Chicago—Releases are fairly well maintained but buying is slow. Fabricators are only moderately active and few new projects have appeared. Some increase in private construction is indicated for first quarter. American Bridge Co. has booked 1200 tons for state grade separation at Seventy-ninth street and Kedzie avenue, Chicago.

Boston—Active structural steel inquiry is light and contracts placed have dropped to the lowest point in months. Unplaced bridges, bid or being estimated, approximate 850 tons, mostly small. Outlook for public works is dull with the exception of housing, most of reinforced concrete. A fair number of small industrial plant expansions are expected to proceed early this year.

Philadelphia—Structural fabricators in this district are figuring little tonnage but have work on hand sufficient for another month's activity.

San Francisco—Bookings of structural steel on the Pacific coast aggregated 177,870 tons, against 164,769 tons in 1938. Current business is small but considerable tonnage is expected to come out early in the year. General contract for two dry docks at Pearl Harbor, T. H., requiring 2500 tons of H columns, sheet piling, plates and shapes, has been awarded to Hawaiian Dredging Co., Honolulu, T. H., and Pacific Bridge Co., San Francisco.

Seattle—Siems-Spokane Co., Johnson, Drake & Piper Inc. and Puget Sound Bridge & Dredging Co., joint contractors for the navy's Alaskan air bases, have awarded all structural items required for the projects at Sitka and Kodiak, Alaska, to the Columbia Steel Co. Tonnages

Shape Awards Compared

	Tons
Week ended Dec. 30	14,777
Week ended Dec. 23	23,268
Week ended Dec. 16	25,806
This week, 1938	32,921
Weekly average, year, 1938	21,568
Weekly average, 1939	22,411
Weekly average, November	23,003
Total, 1938	1,121,442
Total to Dec. 31, 1939	1,165,386

Includes awards of 100 tons or more.

are unknown as complete plans have not been received, but will total several thousand tons. Bids will be out soon for the Washington state steel cantilever bridge, 1265 feet overall over the Columbia river at Kettle Falls, expected to call for more than 1000 tons of shapes.

Shape Contracts Placed

2560 tons, Lake road generator station, Cleveland, to Fort Pitt Bridge Works, Pittsburgh.

2500 tons, including sheet piling, H columns, shapes and plates, for two dry docks at Pearl Harbor, T.H., to Hawaiian Dredging Co., Honolulu, T. H., and Pacific Bridge Co., San Francisco, at $6,250,268.

1540 tons, seaplane hangar, naval air station, Pensacola, Fla., to Ingalls Iron Works, Birmingham, Ala.

1200 tons, state grade separation, Seventy-ninth street and Kedzie avenue, Chicago, to American Bridge Co., Chicago.

1090 tons, bridge FAP-324-B (1) Woodward county, Oklahoma, to Capitol Steel & Iron Co., Oklahoma City.

725 tons, 12-story apartment, Thirty-fifth street and Lexington avenue, New York, to Schacht Steel Construction Co., New York.

710 tons, warehouse building, Chicago, to American Bridge Co., Pittsburgh.

470 tons, grandstand extension, for Empire City Racing association, Yonkers, N. Y., to American Bridge Co., Pittsburgh.

400 tons, industrial laboratory unit, solvents building, etc., for United States government, Wyndmoor, Pa., to Bethlehem Steel Corp., Bethlehem, Pa.

360 tons, warehouses, Kelly Field, Texas, to Mosher Steel Co., Dallas.

340 tons, buildings, for Railway Express Agency, New York, to Bethlehem Steel Corp., Bethlehem, Pa.

275 tons, Ballona Creek bridge, California, to Columbia Steel Co.

250 tons, Woolworth store, Saginaw, Mich., to American Fabricated Steel Co., Philadelphia.

250 tons, draft tube gates, Tennessee valley authority, Wheeler, Ala., spec. 206032, to Carolina Steel & Iron Co., Greensboro, N. C.

250 tons, finishing and pipe storage building, National Supply Co., Etna, Pa., to Pittsburgh Bridge & Iron Co., Pittsburgh.

225 tons, structural steel, lock, Watts Bar dam, Tennessee, to Lakeside Bridge & Steel Co., Milwaukee, spec. 226261, Tennessee valley authority, Knoxville, Tenn.

200 tons, lift bridge, Kentucky dam, Kentucky, to Continental Bridge Co. Tennessee valley authority spec. 179786, Knoxville, Tenn.

200 tons, bridge, Batesville, Miss., to Vincennes Steel Corp., Vincennes, Ind.

200 tons, state bridge, Allentown, Pa., to Bethlehem Steel Corp., Bethlehem, Pa.

185 tons, chemical building for Rohn & Hass, Bristol, Pa., to Bethlehem Steel Co., through Frank V. Warren, general contractor, Philadelphia.

180 tons, state bridge, Millville, Pa., to Anthracite Bridge Co., Scranton, Pa.

150 tons, fire control building, Frankford arsenal, to Roy A. Robinson, Philadelphia, through Barclay White Co., Philadelphia.

150 tons, assembly building, for Wright Aeronautical Corp., Paterson, N. J., to Republic Steel Corp., Cleveland.

132 tons, sheet piling, bureau of reclamation project, Knightsen, Calif., to Bethlehem Steel Co., Bethlehem, Pa.

120 tons, bridge 1876, Scottsburg, Ind., to Midland Structural Steel Co., Cicero, Ill.

115 tons, chemistry building, Washington and Jefferson college, Washington, Pa., to O'Brien Steel Construction Co., Washington, Pa.

Unstated, materials for navy's Alaskan air stations at Kodiak and Sitka, Alaska, to Columbia Steel Co., San Francisco.

Shape Contracts Pending

1900 tons, boiler rooms and precipitator, unit 2, for Consolidated Gas-Electric Light & Power Co., Baltimore.

1800 tons, bulb angle curbing, Manhattan and Brooklyn, N. Y., for city of New York.

1000 tons or more, Washington state Kettle Falls bridge; bids at Olympia soon.

900 tons, prison buildings, Green Haven, N. Y., for state.

600 tons, state bridge FAP-820-A, Muscatine, Iowa.

600 tons, extension to warehouse, for

Anchor Hocking Glass Co., Lancaster, O.

550 tons, state bridge over Ottawa river, Lucas county, Ohio.

370 tons, state overpass, Sussex county, New Jersey, Highway Corp., Newark, N. J., low; 115 tons reinforcing bars also required.

300 tons, power plant, University of Illinois, Champaign-Urbana, Ill.; bids Jan. 10.

270 tons, steel sheet piling, Puget Sound navy yard quay walls; A. W. Quist, Seattle, low, $108,019.

250 tons, store, Market street, Philadelphia; bids recently postponed with plans to be revised.

220 tons, manufacturing building, for Cincinnati Milling Machine Co., Cincinnati.

195 tons, state bridge over Pennsylvania-Reading Seashore line, Atlantic county, New Jersey; Cayuga Construction Co., New York, low.

170 tons, building, for Michigan Paper Co., Plainwell, Mich.

165 tons, county home, Bradford county, Pennsylvania.

160 tons, test chamber and wind tunnel, Wright Field, Dayton, O., for U. S. war department.

160 tons, state undercrossing King county, Wash.; bids in at Olympia.

150 tons, high school stadium, Dunmore, Pa.

140 tons, office building, for Electric Boat Co., Bayonne, N. J.

135 tons, building, for Hayden Chemical Corp., Garfield, N. J.

125 tons, state bridge and road work, route 35, section 148, Middlesex county, New Jersey; Eisenberg Construction Co., Camden, N. J., low; 203 tons reinforcing bars also required.

115 tons, store building, for F. W. Woolworth Co., Middletown, Conn.

110 tons, Cuthbert road bridge, Camden county, New Jersey; Ole Hansen, Ventnor City, N. J., low on general contract.

100 tons, store alterations, Sears-Roebuck & Co., State street, Chicago, bids in.

Reinforcing

Reinforcing Bar Prices, Page 297

New York—Reinforcing steel buying is light, and, although new work coming out slowly, the volume of pending tonnage, bid or being estimated, is gradually mounting. A Coney Island sewage disposal plant, closing Jan. 4, takes 713 tons and a housing project, South Norwalk, Conn., bids Jan. 12, takes several hundred tons. Prices, while not tested on tonnage, are holding fairly well on small lots.

Chicago—Substantial new projects are lacking, but some improvement in demand is expected to appear soon. Buying has been lighter but still considered good for this time of year. Small-lot jobs continue fairly numerous, but larger tonnages are few, being confined chiefly to local subway and water works construction.

Pittsburgh—Awards and inquiries are heavier than usual during this season. The price situation is unchanged, with quotations firm in all sections. Delivery problems are still appearing, although bar mills indicate a better share of their tonnage will be devoted to reinforcing steel during the first quarter.

Boston—For the first quarter federal-sponsored housing projects are expected to furnish most reinforcing steel tonnage, the outlook in

Concrete Bars Compared

	Tons
Week ended Dec. 30	4,780
Week ended Dec. 23	6,896
Week ended Dec. 16	3,348
This week, 1938	5,153
Weekly average, year, 1938	6,959
Weekly average, 1939	9,197
Weekly average, November	5,806
Total, 1938	361,905
Total to Dec. 31, 1939	478,227

Includes awards of 100 tons or more.

other directions being meager. Few jobs of more than 100 tons each in other directions are being estimated and buying is mostly in small lots. A New Haven, Conn., housing unit up for bids takes 1500 tons. Prices, although not tested on tonnage, are inclined to be easier. Indications are that highway needs during the first half of the year in New England will be sub-normal.

Philadelphia — Reinforcing steel sellers are figuring on a few scattered state highway jobs in Pennsylvania, bids Jan. 5 and several in New Jersey are pending, bids having been taken. New Jersey's 1940 program will be substantially higher than last year, the road commissioner announces. Latest New Jersey openings were Dec. 29 and included 380 tons of road work in Morris county, and 300 in Monmouth and Middlesex counties.

San Francisco—Awards of reinforcing bars for the year aggregated 163,556 tons, compared with 157,440 tons in 1938. The largest award for the week was 120 tons for a bridge in Fresno county, California, to Gillmore Fabricators Inc., San Francisco.

Seattle—Rolling mills are reaching the end of their backlogs but important new projects are expected to be out soon. Bids are in for two Washington state projects involving 150 tons. A. W. Quist, Seattle, is low bidder to Puget Sound navy yard for construction of proposed quay, calling for 120 tons.

Reinforcing Steel Awards

2100 tons, docks 2 and 3, specification 9100, bureau of yards and docks, navy department, Pearl Harbor, T. H., to Hawaiian Dredging Co. Ltd. and Pacific Bridge Co., San Francisco, on joint bid.

1000 tons, outlet works, for army engineers, Woodward, Okla., to Colorado Fuel & Iron Corp., Denver; through Capitol Steel Works, Oklahoma City, Okla.

530 tons, engine and laboratory building, Philadelphia, for United States navy, to Republic Steel Corp., Cleveland.

300 tons, Forest Hills high school, Rego Park, N. Y., to Isteg Steel Corp.; Petey & Fuhrman, contractors.

280 tons, Pershing road housing, Zanesville, O., to Truscon Steel Co., Youngstown, O.; Paul & Adams, contractors.

250 tons, invitation 25719, procurement division, treasury department, Louisville, Ky., to Youngstown Sheet & Tube Co., Youngstown, O.

200 tons, grain elevator, Glidden Co., Chicago, to Truscon Steel Co., Youngstown, O.; MacDonald Engineering Co., contractor.

120 tons, bridge, Fresno county, California, to Gillmore Fabricators Inc., San Francisco.

Reinforcing Steel Pending

7500 tons, west substructure, city filtration plant, Chicago; bids rejected by department of public works; new bids early in January.

2800 tons, Terrace Village housing, Pittsburgh; Hunkin-Conkey Co., Cleveland, low.

1000 tons, James M. Baxter housing, Newark, N. J.; bids Dec. 21.

750 tons, Toby Creek outlet works and pumping station, Wilkes-Barre, Pa.

700 tons, Coney Island sewage plant, Brooklyn, N. Y.; bids Jan. 4.

450 tons, gas holder, Prince George county, Maryland.

400 tons, government dam, York, Pa.; Benjamin Foster Co., Philadelphia, low.

390 tons, ventilating building, Allegheny Mountain tunnel, Somerset county, Pennsylvania.

362 tons, Indian Rock dam, army engineers, Susquehanna river flood control, Baltimore; Benjamin Foster, Philadelphia, low.

200 tons, grade elimination, contract W-312-1-643, Antietam, Md.; bids Dec. 28.

160 tons, sewage treatment plant, Quincy, Ill.

140 tons, bridge, Woodward, Okla.

130 tons, building, Roth Packing Co., Waterloo, Iowa.

118 tons, hangar and technical school, army air corps, Chanute Field, Rantoul, Ill.

Unstated tonnage, power plant, Uni-

versity of Illinois, Champaign-Urbana, Ill., bids Jan. 10.

Unstated tonnage, gymnasium, Northwestern university, Evanston, Ill., rebidding. R. C. Wieboldt, Chicago, contractor.

Pig Iron

Pig Iron Prices, Page 298

Pittsburgh—Some pig iron buying has appeared in small quantities, mostly fill-in tonnage. The market is stable and operations remain at peak. Foundry activity is fairly high and merchant iron is moving in good quantity. Ferromanganese production has been moved up, with an additional stack put on production within the past week.

Chicago — December shipments varied only slightly from those of November, declines in most cases not being significant. Foundry operations have eased, temporarily, it is believed, as increased melt is expected to be noted some time this month. By-product foundry coke shipments in December were about 8 per cent below November. Actual purchasing involves only small, fill-in lots. Most consumers are well covered for first quarter. Considerable iron purchased on old $21 contracts is being carried over and will be cleaned up as early as possible.

Boston — Pig iron consumers are gradually covering for first quarter requirements, most melters with low stocks having already done so. On the other hand numerous buyers having taken tonnage included in fourth quarter coverage have sufficient supplies to carry them well into the current quarter. Foundry melt is well maintained, but some scattered declines are noted among foundries affiliated with the heating industry.

New York—As consumers have fair stocks and substantially more under contract, pig iron sellers do not look for appreciable improvement in buying by domestic consumers much before the middle of February. Machine tool builders are expected to be heaviest consumers for some time, although sharp improvement in demand from pipe foundries should be noted. Foreign demand continues relatively inactive.

Philadelphia—Pig iron sellers anticipate little buying before February. Many consumers have some tonnage to be delivered on contracts placed in September before the $2 advance.

Buffalo—Producers report heavy bookings for the first quarter of 1940 and no disappointment is apparent over the current seasonal decline in shipments. Volume for first quarter is expected to be good but not quite as large as recent peak months. Both producers and consumers move into the new year with sparse inventories. A fair number of releases have already been received for delivery in January.

Cincinnati—Pig iron specifications have receded less than usual in the holiday season, tonnage for December being close to that of November. Foundry melt declined moderately on seasonal influence. Specifications indicate a quick pickup as first quarter opens. Prices of by-product foundry coke are reaffirmed for January.

Seattle—Demand for pig iron is easier as foundries are down for the holidays. Business has improved during the last three months. Announcement is made that Columbia iron, which supplies most of this market, will remain unchanged at $21 base during first quarter. Some Burne iron is coming from India but volume is not large.

Toronto, Ont.—First quarter demand for pig iron is developing slowly, with business for the week almost at a standstill. The slump

in business is credited to the holidays as well as to the fact that most melters covered too heavily for last quarter and now are well supplied with iron for needs over the next month or six weeks.

Scrap

Scrap Prices, Page 300

Pittsburgh—Local scrap markets are dull. Although no new weakness has appeared, the market is not sound and nearly all quotations are nominal. Some sources expect buying early in the new year, although there is no indication that substantial tonnages will be placed. Shipments have been held up by some mills. Cast grades are a little more active and some foundry buying has been noted over the past week.

Chicago—Market remains quiet and substantially unchanged since the most recent mill sale involving No. 1 heavy melting steel at $16.50. Light trading continues within the quoted range of $16 to $16.50. Little immediate activity is looked for, although the trade is optimistic over mill needs fairly early in the new quarter. Purchases the past five or six weeks have been light, and heavier buying is expected this month if ingot operations return to the nineties. Foundry needs, light recently, also may improve this month.

Boston—Scrap buying by steelworks and foundries is light. Prices, although not subject to much test on actual business, are weak, although declines are narrow. District foundries continue to resist quotations on cast grades and foundry yard supplies in some instances are fairly substantial. Buying for export is steady, but at reduced rate.

Philadelphia—Scrap is quiet with old compressed sheets down 50 cents to $15.50 to $16.00, delivered and steel shafting off slightly to $23.50 to $24.00.

Buffalo—Dealers are not expecting fresh business until after the turn into the new year. Major activity is covering operations by dealers who still have about 20,000 tons on books.

Cincinnati—Iron and steel scrap is dull. Some nearby outlets have suspended shipments, possibly to avoid augmenting inventory, and mills rely on stocks and receipts against contracts. Prices are slightly weaker, but without test.

St. Louis—The market for iron and steel scrap continues weak and dull. Aside from the purchase of about 3000 tons of steel specialties at lower figures, nothing was done.

Quite generally it is thought that buying in quantity will take place after the turn of the year. The melt has been well sustained and mills have drawn heavily on their reserves.

Seattle — Exporters are greatly perturbed because of the uncertainty of commercial relations with Japan and have asked the state department to assure continuity of trade while a new treaty is under negotiation. Meanwhile all business with Japan has been stalemated. Houses having commitments must get them aboard before Jan. 26. Space is scarce and because of demand for prompt shipment, charters have been done at around $11, free in and out, a rise in a fortnight of $2. Because of conditions the market is weak and buying is at a minimum. No firm quotations are announced.

Toronto, Ont.—Demand for iron and steel scrap continues active with consumers and dealers showing keen interest. During the week local dealers advanced buying prices on new loose clippings $2 per ton to $9

per gross ton. Iron scrap developed weakness with all cast grades and stove plate down 50 cents per ton. Other materials were firm.

Warehouse

Warehouse Prices, Page 299

Chicago — December letdown in demand was less than seasonal. Improvement in buying is looked for around the middle of January, after inventories, shutdowns and other seasonal factors are out of the way. Steel bars and bar shapes, flat-rolled material and plates continue to meet the best call, with heavy structural items and concrete reinforcing bars comparatively quiet.

Boston—Warehouse volume in December was only slightly under that of November and fourth quarter was best of 1939. Demand for alloys, including bars, sheets and miscellaneous goods, is notably active, and with delayed deliveries on some alloy materials, distributors find it difficult to satisfy all such requirements.

Philadelphia — December warehouse sales were off seasonally but jobbers report an average gain of 40 per cent for 1939 over 1938. Prices are unchanged.

Buffalo—Distributors believe the outlook for the new year is bright. Consumers were busy during the holiday week adjusting inventory position and the usual seasonal recession in new business took place.

Cincinnati—Sales from warehouse continued good through the holidays, contrary to usual trends. Tonnage fully matched November volume.

Tin Plate

Tin Plate Prices, Page 296

Operations are estimated at 80 per cent this week and will probably hold close to that figure next week. Orders which have been light during this month, due largely to the inventory factor, are expected to regain their losses during January, with some early buying of sanitary cans indicated in the domestic market. Export demand is steady and little change is expected in this market.

Steel in Europe

Foreign Steel Prices, Page 299

London — (*By Cable*) — Holidays brought fewer new orders to steelmakers in Great Britain but there was little interruption to production. Record outputs are expected for iron and steel in 1939. A large order has been placed for railroad rolling stock to be used in France. Tin plate trade is fully active. Domestic and export demand exceeds supply, with mills operating at 75 per cent of capacity.

Tin plate manufacturers in South Wales during the week ending Dec. 16 booked orders for 1,812,341 base boxes, over half being for delivery well into second half, 1940, and 1,564,027 boxes were on export account. Unfilled orders Dec. 16 were at the record total of 10,486,729 boxes. South Wales tin mills are understood to be operating at 75 to 77 per cent of capacity.

Belgium and Luxemburg report heavy export demand but the government curtails permits for shipment abroad. Belgian domestic prices are up.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 297

New York—Bolt and nut makers generally have adopted the new

price schedules on special sizes and on special head types of bolts not carried in standard stocks. However, these schedules are yet to be thoroughly tested. Meanwhile, bolt and nut makers enter the new year with substantial backlogs.

Ferroalloys

Ferroalloy Prices, Page 298

New York — An increase in base prices, effective Jan. 1, resulted in a flurry in the movement of chrome alloys last month, when there was also some anticipatory business in other alloys as well, due to minor revisions, chiefly in charges for packing and grinding. In general, however, ferroalloy movement in December was less than the preceding month, due primarily to a decline in shipments of ferromanganese.

Metallurgical Coke

Coke Prices, Page 297

Seattle—Foundries in this area, unable to obtain English coke, which is ordinarily used here, are buying supplies in the mid-West, mostly Indiana and Milwaukee, some from Alabama. Domestic coke is $2 higher than imported under normal conditions and prices are based on quotations each month. English coke is entirely out of this market due to difficulty of obtaining steamer space.

Equipment

Seattle—Demand for machinery is seasonally off but public works agencies are active. Bonneville authority has called bids Jan. 28 for 28 oil circuit breakers, 115 and 69-kv, Spec. 689; Jan 20 for seven 10,000-kva transformers for St. Johns station, Spec. 691; and Jan. 6 for outdoor bus insulators, Spec. 670. Graybar Electric Co., Portland, is low to same office at $50,079 for furnishing radio telephone system for Ampere station. U. S. engineer, Portland, has bought a crawler tractor from the Loggers & Contractors Machinery Co., Portland, Oreg. Lighthouse Electric Co. is low to Tacoma for furnishing four transformers for the light system. Denver has called bids Jan. 4 for furnishing oil purifier, filter and other equipment for the Coulee power plant, Spec. 1319-D. Bids to Puget Sound navy yard Jan. 8 call for a large number of tools and accessories.

Nonferrous Metals

New York — Trading in nonferrous metal markets was restricted last week to the holidays. Prices held unchanged, except those on tin which weakened on lack of buying interest. Traders remained optimistic, however, since the decline in consumption has been less than seasonal.

Copper — Sales dropped well below the recent daily average in the producers' market and were slow in the outside and export markets. All first hands continued to quote electrolytic at 12.50c while resale eased to around 12.55c and export to 12.50c, f.a.s.

Lead — Consumers of lead again placed a moderate volume of business which was well distributed geographically and among various classes of consumers. Prices held at 5.35c, East St. Louis.

Zinc — The market did not receive an adequate test and, therefore, only one leading seller was officially at the 6-cent level. Other interests continued to quote 6.50c, East St. Louis, but some likely would have booked orders at the lower level had

Nonferrous Metal Prices

Dec.	Copper Electro, del. Conn.	Copper Lake, del. Midwest	Copper Casting, refinery	Straits Tin, New York Spot	Straits Tin, New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
23	12.50	12.50	12.25	50.25	48.00	5.50	5.35	6.00	20.00	14.00	35.00
25	Holiday										
26	12.50	12.50	12.25	49.75	47.25	5.50	5.35	6.00	20.00	14.00	35.00
27	12.50	12.50	12.25	50.00	46.87½	5.50	5.35	6.00	20.00	14.00	35.00
28	12.50	12.50	12.12½	49.50	46.37½	5.50	5.35	6.00	20.00	14.00	35.00

*Nominal.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 12.50c Conn. copper

Sheets

Yellow brass (high) 19.31
Copper, hot rolled 21.12
Lead, cut to jobbers 8.75
Zinc, 100 lb. base 11.25

Tubes

High yellow brass 22.06
Seamless copper 21.62

Rods

High yellow brass 15.23
Copper, hot rolled 17.62

Anodes

Copper, untrimmed 18.37

Wire

Yellow brass (high) 19.56

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York 8.37½-8.50
Cleveland 8.75- 9.00
Chicago 8.75-9.00
St. Louis 8.25-8.50

Heavy Copper and Wire

New York, No. 1 .....10.00-10.25
Cleveland, No. 1 .....10.00-10.25
Chicago, No. 1 .....10.00-10.25
St. Louis 9.25-9.75

Composition Brass Turnings

New York 8.00-8.25

Light Copper

New York 8.00-8.25
Cleveland 8.00-8.25
Chicago 7.87½-8.12½
St. Louis 7.25-7.50

Light Brass

Cleveland 4.75-5.00
Chicago 5.62½-5.87½
St. Louis 5.00-5.50

Lead

New York 4.85
Cleveland 4.37½-4.50
Chicago 4.25-4.50
St. Louis 4.00-4.25

Zinc

New York 3.50-3.75
Cleveland 3.25-3.50
St. Louis 3.25-3.50

Aluminum

Mixed, cast, Cleveland.....10.25-10.50
Borings, Cleveland 7.75-8.00
Clips, soft, Cleveland 15.75-16.00
Misc. cast, St. Louis 8.75-9.00

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads..13.00
Standard No. 12 aluminum...15.00-15.50

firm bids been received. Galvanized sheet production held at 75 per cent of capacity before the holiday shutdowns, only four points under the high for recent years.

Tin — Although sales in Singapore increased rather sharply to the best level since the removal of price restrictions, only a small volume of business was booked here. Interest was still centered in purchases by government agencies, following the awarding of contracts for 3100 long tons by the treasury on Dec. 22. The navy will open bids Jan. 4 on 90 long tons but has not awarded the contract on its previous inquiry on which American Tin Consolidated Co. of Marquette, Mich., entered the low bid. Straits spot eased from 50.25c at the end of the previous week to around 49.50c.

Antimony — Only routine business was booked with prices unchanged on the basis of 14.00c, New York, for American spot and nominally 16.50c, duty paid New York, for Chinese spot.

PRODUCTION

STEELMAKING DROPS 15 POINTS, DUE TO HOLIDAY

■ STEELWORKS operations last week declined 15 points to 75½ per cent, due to the holiday. Eleven districts reported losses, while one was unchanged. Last year the rate was 40 per cent; two years ago, 21 per cent.

Cleveland—Off 19½ points to 68 per cent for the week. This week will regain the former level as there will be no shutdown.

New England—Curtailed 14 points to 75 per cent.

Birmingham, Ala. — Minus 19 points, to 75 per cent.

St. Louis—Unchanged at 77 per cent. Two furnaces will be added this week carrying the rate above 80 per cent.

Cincinnati—Declined 7 points to 75 per cent. Rebound of at least 10 points is expected this week as several interests will not suspend New Year's day.

Central eastern seaboard — Down 8 points to 77 per cent. Return to 85 per cent or higher anticipated by mid-January.

District Steel Rates

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Dec. 30	Change	Same week 1938	Same week 1937
Pittsburgh ...	70	—21	26	15
Chicago	81	—11	46	22.5
Eastern Pa. ...	77	— 8	29	30
Youngstown ..	74	—17	32	14
Wheeling	76	— 9	50	19
Cleveland	68	—19.5	50	18
Buffalo	74.5	— 5	39.5	16
Birmingham ..	75	—19	77	63
New England..	75	—14	70	19
Cincinnati	75	— 7	50	36
St. Louis	77	None	42.5	15
Detroit	85	— 5	79	33
Average	75.5	—15	40	21

Buffalo—Receded 5 points to 74½ per cent.

Chicago—Off 11 points to 81 per cent due to furnace repairs and holiday shutdowns.

Pittsburgh—Operations averaged 70 per cent last week. On a daily basis mills operated at about 85 per cent.

Wheeling—Dropped 9 points to 76 per cent because of the short week, active furnaces being unchanged.

Youngstown, O. — Dropped 17 points to 74 per cent, though production was at 89 per cent on the active days. Mills will not close for New Year's day, this week's rate being scheduled at about 89 per cent.

Detroit—Lost 5 points, averaging 85 per cent.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1937	1938	1939
Jan.....	399,186	226,952	356,950
Feb.....	383,900	202,597	317,517
March....	519,022	238,447	389,489
April.....	553,231	237,929	354,263
May.....	540,377	210,174	313,214
June	521,153	189,402	324,235
July.....	456,909	150,450	218,478
Aug.	405,072	96,946	103,343
Sept.....	175,630	89,623	192,672
Oct.....	337,979	215,286	323,017
Nov.....	376,629	390,405	370,194
11 mos....	4,669,088	2,248,211	3,263,372
Dec.....	347,349	406,960	.....
Year	5,016,437	2,655,171	.....

Estimated by *Ward's Reports*

Week ended:	1939	1938†
Dec. 2	93,638	97,795
Dec. 9	115,488	100,705
Dec. 16	117,805	102,905
Dec. 23	117,705	92,890
Dec. 30	89,365	75,215

†Comparable week.

	Week Ended Dec. 30	Dec. 23
General Motors	38,675	49,110
Chrysler	22,100	27,135
Ford	20,660	25,800
All others	7,930	15,660

Correction

■ A number of omissions inadvertently were made in listing the licensees of the Nitralloy Corp., 230 Park avenue, New York, in that company's advertisement in this issue, pages 44-45. The correct list follows:

Manufacturers of Nitralloy Steel

Allegheny Ludlum Steel Corp., Watervliet, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, New York.
Firth-Sterling Steel Co., McKeesport, Pa.
Vanadium-Alloys Steel Co., Pittsburg.
Republic Steel Corp., Massillon, O.
Timken Roller Bearing Co., Canton, O.

Manufacturers of Nitralloy Steel Castings

Lebanon Steel Foundry, Lebanon, Pa.
Empire Steel Castings Co., Reading, Pa.
Massillon Steel Castings Co., Massillon, O.
Milwaukee Steel Foundry Co., Milwaukee.
Warman Steel Castings Co., Los Angeles.

Operating and Accredited Nitriding Agents

Camden Forge Co., Camden, N. J.
Commercial Steel Treating Co., Detroit.
Lakeside Steel Improvement Co., Cleveland.
Lindberg Steel Treating Co., Chicago.
Link-Belt Co., Philadelphia.
Metallurgical Laboratories Co., Philadelphia.
New England Metallurgical Corp., South Boston, Mass.
Pittsburgh Commercial Heat Treating Co., Pittsburgh.
Queen City Steel Treating Co., Cincinnati.
Wesley Steel Treating Co., Milwaukee.
Ontario Research Foundation, Toronto, Ont.

Manufacturers of Furnaces Suitable for Nitriding

Electric Furnace Co., Salem, O.
Leeds & Northrup, Philadelphia.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Allegheny Ludlum To Enlarge Foundry

■ New buildings will be erected immediately on the 6½-acre property recently acquired by Allegheny Ludlum Steel Corp. at Buffalo. Buildings will house new equipment to supplement its electric steel melting furnace, reported to be the only one of its type devoted exclusively to making stainless steel castings. By the hollow electrode method of melting, alloys are added without setting up decarburization.

Otis Steel's Development Illustrated in Booklet

■ Development and history of Otis Steel Co., Cleveland, is comprehensively illustrated in a 36-page booklet it recently published. A complete picture of the company's facilities is presented.

Organized by Charles Augustus Otis, Otis Steel built its Lakeside works in 1873. It was the first company organized solely for production of acid open-hearth steel. In 1880 it built the first basic open-hearth in this country.

Producing plates, porcelain enameling sheets, cold-rolled strip, cold-rolled sheets, hot-rolled sheets, hot-rolled strip, tin-mill enameling stock, open-hearth and electric steel castings, the Otis company is a self-contained unit from ore to finished product.

Henry G. Dalton Dies; Rose from Clerk to Honored Industrial Leader

■ HENRY G. DALTON, senior partner in Pickands, Mather & Co., Cleveland, and chairman, Youngstown Sheet & Tube Co., Youngstown, O., died Dec. 27 in Cleveland. Mr. Dalton, who was 77, had been confined to his home by illness for more than a year, developed bronchopneumonia following an operation for acute appendicitis Dec. 20.

Mr. Dalton joined Pickands, Mather & Co. as its first employe, a clerk, in June, 1883. He then was 21 years old and previously had been employed on the Cleveland ore docks. His advance in the new firm was rapid and in 1893 he was made a partner. Upon the death of Samuel Mather in October, 1931, Mr. Dalton became senior partner.

Through his 56 years' association with Pickands, Mather Mr. Dalton saw total steel production grow from 1,600,000 tons a year to 54,000,000 tons, as in 1929. In the Lake Superior iron ore district, where his influence has left its mark, he saw production grow from approximately 2,300,000 tons in 1883 to well over 66,000,000 tons in 1929. Identified closely with transportation of raw materials on the Great Lakes, he watched this business develop from sailing schooners and small wooden steamers to today's great fleets of steel freighters.

Henry G. Dalton

Offered Job by Mather

Mr. Dalton concluded his formal education when he was 14 and obtained a job as handy boy at the New York, Pennsylvania & Ohio railway dock, Whisky Island, Cleveland. His industriousness attracted the attention of Samuel Mather and when Mr. Mather, Col. James Pickands and Jay C. Morse organized Pickands, Mather & Co. young Dalton was offered a position.

In its early days, the company's operations were largely a commercial business, producing iron ore and selling it to blast furnace and steel companies. Later the company built or bought blast furnaces for the consumption of their own ore.

Then came the era of steel company consolidations and the acquisition by them of their own supplies of ore. But neither the blast furnace interests nor the numerous independent steel companies were sufficiently large to justify the independent development of diversified mining reserves and operations necessary to give to each at reasonable cost the variety of ores required. Almost from the start the advantages to be gained for independent steel companies through joint ownership and development of mining properties became apparent.

Result was the organization of

many mining companies in which Youngstown, Lackawanna, Inland, Republic, Bethlehem, Pittsburgh Steel, International Harvester and other independent steel companies, as well as the company's own blast furnaces, were interested.

Mr. Dalton's first direct connection with the steel business was with the Youngstown Sheet & Tube Co., of which he was director and vice president for many years, taking an active part in its growth and development. In 1932, he succeeded James A. Campbell as board chairman.

About 1912 he was elected to the board of the Lackawanna Steel Co., Buffalo, and this brought him to the board of Bethlehem Steel Co. upon its acquisition of the Lackawanna plant in 1923. He later resigned from the Bethlehem board.

Mr. Dalton also was president of the Interlake Steamship Co. which operates a fleet of 47 vessels, one of which bears his name. He served as director for several railroads, banks and industrial companies. During the World war he was a member of the steel committee of the war industries board.

Honored for Public Service

Step by step with his widening business activities Mr. Dalton developed an active and constructive interest in the civic and political welfare of his community and in 1938 was awarded the Cleveland medal for public service by the Cleveland chamber of commerce.

He was a member of the board of trustees of Western Reserve university, Cleveland, and of Kenyon college, Gambier, O. In 1925 he built for the latter a science building named for his long-time friend and partner, Samuel Mather. Both colleges had awarded him honorary degrees.

A charter member of the American Iron and Steel institute, he was elected a director in 1931, succeeding Mr. Mather. His present term expires in 1940.

During country-wide agitation for a constructive federal policy for the development of an American merchant marine in 1925, President Coolidge called on Mr. Dalton to review the entire situation and outline for the government a complete policy and program involving the handling of the shipping board and the Emergency Fleet Corp. President Hoover in 1930 named him to a commission especially appointed to study policies of the shipping board with reference to rival bids for transatlantic service.

It was characteristic of the man that he did not mention the honors conferred on him. His business associates usually heard of them from other sources.

"Outlook Brighter, but Uncertainties Remain"

■ "We look forward to the new year encouraged by the substantial improvement that has taken place in the steel industry during the past four months," said E. R. Stettinius Jr., chairman, United States Steel Corp., in a year-end statement. Prospects for more employment and wages and an increase in return on investment are brighter.

"Many uncertainties and many difficulties are yet to be solved before a sound basis for sustained progress can be realized. The future course of American business depends, to a large extent, upon the solution of our domestic problems . . . Business future should also be measured in terms of the uncertainty which surrounds the termination of world-wide conflict, particularly in Europe. No healthful or sustained prosperity can be predicted on industrial stimulation which in considerable measure is temporarily inspired by war demands. All responsible members of American industry earnestly pray for an early peace on a permanent basis."

MEN OF INDUSTRY

■ MYRON C. TAYLOR, former board chairman, United States Steel Corp., has been appointed special peace ambassador to the Vatican, without portfolio. Selection by the President of the financier and industrialist is interpreted as a significant gesture recognizing industry's reiterated aversion to war.

Mr. Taylor is acquainted with many personages in the Roman Catholic hierarchy and the Italian government. As a young man he spent considerable time in Washington where he became well acquainted in diplomatic circles, and later his wide business associations brought him in contact with men who shaped policies of great nations.

He has spent considerable time in Italy where he maintains a residence, Villa Schifanoia, near Florence.

Since his retirement from the U. S. Steel chair he has been active in aiding European refugees.

Myron C. Taylor

♦

Dr. Victor Paschkis has joined the staff of Ajax Electric Co., Philadelphia. He formerly was with A. F. Holden Co.

♦

Howard A. Lewis, the past ten years treasurer, Nash-Kelvinator Corp., Detroit, has been elected a vice president. G. V. Egan, assistant treasurer, has been promoted to the position of treasurer.

♦

Harold W. Stoddart, associated with Worthington Pump & Machinery Corp., Harrison, N. J., about 20 years, and since the early part of this year serving as assistant manager of the turbine well pump division, has been promoted to manager of that division.

♦

Dr. William A. Mudge has been appointed to the technical service division, New York office, International Nickel Co. Inc. The past 17 years Dr. Mudge has served as superintendent of research, superintendent of the refinery, and works metallurgist at the company's Huntington, W. Va., rolling mill.

♦

Francis H. Brownell has been elected chairman of the board, Revere Copper & Brass Inc., to succeed the late Barton Haselton. C. Donald Dallas, president, has been elected chairman of the executive committee, succeeding Mr. Brownell, who has resigned from that post.

♦

William Pohn, Pohn Iron & Metal Co., Chicago, has been elected president, Chicago chapter, Institute of Scrap Iron and Steel Inc. Other officers are: First vice president, Harry S. Lewis, Price Iron & Steel Co., Chicago; second vice president, Frank Grossman, Grossman Bros. Co., Milwaukee; third vice president, Frank Parker, Iron & Steel Prod-

ucts Inc., Chicago; secretary, Ralph Michaels, Hyman-Michaels Co., Chicago; treasurer, Henry Rosenthal, Briggs & Turivas, Blue Island, Ill.

♦

W. R. Wood, who has served as supervisor of tubing sales for Hamilton Steel Co., Cleveland, has been named Chicago district sales representative, Ohio Seamless Tube Co., Shelby, O. W. J. Miller succeeds Mr. Wood at the Hamilton Steel Co., which firm continues to act as distributor for Ohio Seamless Tube.

♦

R. E. Densmore, associated with the refrigeration industry 25 years, has resigned his position with Norge Corp., Detroit.

♦

Fred K. McCarthy, assistant sales manager, has been named manager, Cincinnati branch, National Lead Co., succeeding the late William A. Dail.

♦

Harry E. Schank, associated with McCord Radiator & Mfg. Co., Detroit, since 1922, and the past 11 years in charge of radiator design and development, has been named chief engineer.

♦

Dr. William Lloyd Evans, head of the department of chemistry, Ohio State university, Columbus, O., has been elected president, American Chemical society for 1941. He will assume office as president-elect on Jan. 1, 1940, when Dr. Samuel Colville Lind, dean of Minnesota University Technology institute, becomes president.

♦

Otto H. Falk, chairman of the board, Allis-Chalmers Mfg. Co., and vice president of Falk Corp., Milwaukee, and H. B. Kraut, president and general manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., have been elected directors, Wisconsin Manufacturers' association.

♦

T. T. Sullivan, secretary-treasurer and vice president, Stewart-Warner Corp., Chicago, has resigned as secretary-treasurer, but will continue as a vice president and director. He has been associated with Stewart-Warner 28 years. E. H. Farrell, controller, has been elected treasurer, and Lynn A. Williams Jr., the past several years assistant secretary, has been made secretary.

♦

Dr. Charles M. A. Stine, director of research and vice president, E. I. du Pont de Nemours & Co., will be presented with the Perkin medal at a joint meeting of the Society of Chemical Industry, American Chemical society, American Institute of Chemical Engineers, Electrochemical society and Societe de Chimie Industrielle in New York, Jan. 12, for valuable work in applied chemistry.

♦

C. M. Mackall, formerly assistant manager of sales, Philadelphia district, Bethlehem Steel Co., has been appointed assistant general manager of western sales, with headquarters at Detroit. S. C. Husted, formerly assigned to sales duties at Philadelphia, has been named assistant manager of sales there, succeeding Mr. Mackall. E. H. Gumbart Jr., heretofore attached to the alloy steel sales division at Bethlehem, Pa., has been made manager of sales, Cincinnati district. He succeeds J. H. Richards, who has been assigned to sales duties in the bolt and nut division at Bethlehem.

♦

J. G. Carruthers, assistant western manager at Cleveland for Bethlehem Steel Co., has resigned. Mr. Carruthers in 1922 joined Otis Steel Co., Cleveland, as general manager of sales and member of the board of directors, subsequently being elected vice president. In 1935 he left Otis and joined Bethlehem, becoming assistant western manager in 1936.

DIED:

JOHN P. BEAL, 53, president, F. H. Crawford & Co. Inc., New York, steel mill equipment, in Montclair, N. J., Dec. 20. He began his career in the steel industry with American Bridge Co., Pittsburgh, and served as secretary-treasurer, American Steel Export Co., New York, from 1915 to 1923, when he became president of the Crawford company. He also served as president, Beal & Bennett Machinery Inc., New York.

♦

Gustav A. Koschin, 65, founder and president, Koschin Co., Milwaukee, designer and builder of special electrical machinery, at his home in Milwaukee, recently.

♦

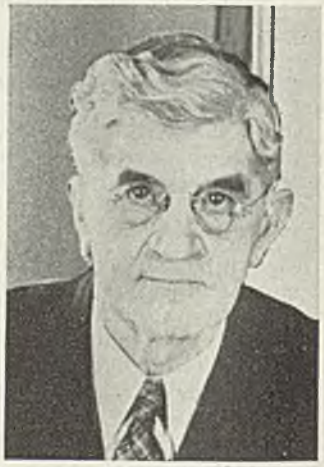
William W. Hearne, well known Philadelphia ore merchant, whose death was recorded briefly in STEEL, Dec. 25, page 21, had been identified with the iron and steel industry since 1883, at which time he became affiliated with the old firm of Matthew Addey & Co., Cincinnati. Later, as a partner of Matthew Addey, he opened offices in Philadelphia in 1898 and was president of the Princess Furnace Co., Philadelphia, until its purchase by Frazier & Co., that city. At the time of his death, Mr. Hearne represented Fergusson, Wild & Co. Ltd., London, iron and manganese mine owners, for 30 years, and for nine years had been associated with F. W. Marshall & Co., which will now succeed him in his business activities. Mr. Hearne was born in Chillicothe, O., Aug. 26, 1859, and was graduated from Kenyon college, Gambier, O., in 1883.

♦

Victor W. Kliesrath, 58, vice president, Bendix Aviation Corp., South Bend, Ind., Dec. 21 at his home in Port Washington, L. I.

♦

J. E. Frantz, 72, president, Landis Tool Co., Waynesboro, Pa., Dec. 16. Mr. Frantz associated himself with Landis Bros. in Waynesboro in 1890, shortly after they began the manufacture of the first Landis



J. E. Frantz

grinders. When the plant was destroyed by fire in 1897 he was largely responsible for the formation of the present organization and became its first secretary and treasurer. He was named general manager in 1906, and president in 1925.

♦

George D. Hayes, 74, manager at Buffalo for United States Cast Iron Pipe Co., Dec. 18 in Buffalo.

♦

William Aller Lawrence, 72, who retired five years ago as president, Standard Metal Mfg. Co., Newark, N. J., of which he was founder 35 years ago, at his home in East Orange, N. J., Dec. 17.

♦

Robert G. Cartus, 59, who used his early training as a steel mill executive to build up one of Buffalo's largest coal and coke businesses, in Buffalo, Dec. 25. Born in Pittsburgh, he joined Carnegie Steel Co. as a clerk at the age of 17, later becoming associated with Lackawanna Steel Co. He then organized his own business and at the time of his death, was handling the entire coke output of Bethlehem Steel Co.'s Buffalo plant.

Activities of Steel Users, Makers

■ YOUNGSTOWN Sheet & Tube Co., Youngstown, O., is installing equipment in its open-hearth department to handle hot blown metal from the bessemer converter. The purpose is to shorten the time of the open-hearth melts and to increase output.

♦

Line Material Co., Milwaukee, has removed its executive and sales offices to 740 North Second street.

♦

Acme Foundry Co., Detroit, is installing a laboratory for sand testing and metallographic research.

♦

Iron & Steel Products Inc., Chicago, has closed its Tulsa, Okla., branch office and all matters will be handled from Chicago for the time being.

♦

Standard Pressed Steel Co., Jenkintown, Pa., has begun erection of an addition to its main plant, 80 x 140 feet, to contain approximately 12,000 square feet of floor space.

♦

Wheelco Instruments Co., Chicago, manufacturer of indicating and control instruments, has appointed Rodgers Engineering Co., Dallas, Tex., its representative in the north Texas territory.

♦

Worthington Pump & Machinery Corp., Harrison, N. J., has been awarded contract by Atlantic Refining Co., Philadelphia, for cargo discharge and circulating pumps for a 19,405-ton all-welded tanker to be built for the Atlantic company at the Sun Shipbuilding & Dry Dock Co. yards, Chester, Pa.

♦

Porcelain Steels Inc., recently organized, has purchased a plant in Cleveland, to manufacture hot water tanks with exterior and interior finished in porcelain enamel. The company will also make enameled corrugated roofing. Offices are at 677 Union Commerce building, and plant is at Cedar and Ashland roads. Donald D. Smith is president, and C. E. Murphy, plant manager.

♦

Gar Wood Industries Inc., hoist and body division, Detroit, has appointed the following hoist and body distributors: Robert P. Stapp, 209 South Eighteenth street, Birmingham, Ala.; Lundberg Equipment Co., 257 North Main street, Logan, Utah; Cate Equipment Co., 722 South State street, Salt Lake City; Wilson Equipment & Supply Co., 902 West Twenty-second street, Cheyenne, Wyo. M. P. Arnold has been made Buffalo branch representative at Rochester, N. Y.

♦

Austin Co., Cleveland, has been awarded contracts for the design and construction of a welded rigid frame factory for the Portland Mfg. Co., Portland, Mich. This newly organized automotive parts manufacturing firm has acquired a 90-acre tract and is proceeding at once with construction of the initial unit in a plant designed for ultimate expansion to a total of 100,000 square feet.

♦

United States Rubber Co., New York, has booked orders for approximately 150,000 feet of fire hose for two large building projects, now being completed, which are the two final units in New York city's Rockefeller Center developments, and the Metropolitan Life Insurance Co.'s group of apartment buildings in the Bronx.

Ledloy Production Abroad Increasing

■ Ledloy, lead-bearing, open-hearth steel introduced by Inland Steel Co., Chicago, in 1937, is winning acceptance in foreign countries, company reports. Domestic licensees are increasing exports and a number of foreign manufacturers are taking out licenses to produce the steel in their own countries.

In England, the steel is produced by Guest, Keen & Nettlefolds Ltd., through its subsidiary, Exors of James Mills Ltd., Bredbury, and by Guest, Keen & Baldwins Ltd., Cardiff. United Steels Ltd. and the Parkgate Steel & Iron Co. Ltd. will be in production soon. Leading British warehouses stock the products. Ledloy Ltd., a new company, has been organized to co-ordinate production and distribution, and will direct production at Tata Steel & Iron Co.'s works in India.

In Australia, Ledloy is stocked by the Broken Hill Proprietary interest, and in South Africa by Iscor Steel Works.

Licenses have been granted to Bofors (Aktiebolaget Bofors), Bofors, Sweden, and to Uddeholms and the Sandvik Steel Works Co. Ltd., Sandviken, Sweden. French interests have formed SOFAM, which has granted sub-licenses to several producers. In Holland, Ledloy is cold drawn and stocked by N. V. Handelmij, R. S. Stokvis & Zonen. Switzerland and other nonproducing countries warehouse the steel.

16,000 Added to Steel Payrolls in November

■ More than 561,000 employes were at work in the steel industry in November, an increase of approximately 16,000 over the preceding month, according to the American Iron and Steel institute. November payrolls totaled $86,682,000, against $83,421,000 in October, and $61,054,000 in November a year ago, when 450,000 were engaged. An average of 49.5 hours per week was worked in November, compared with 38 hours in October and 34.2 hours in November last year.

For comparative statistics since 1933, see page 330.

Copperweld Steel Calls Indebtedness Certificates

■ Copperweld Steel Co., Glassport, Pa., has called for redemption Jan. 15 all outstanding 4 per cent certificates of indebtedness not due until 1946-47. Funds to pay off the certificates have been deposited with the Peoples-Pittsburgh Trust Co., Pittsburgh. Interest will be paid in full to Jan. 15.

The certificates were issued in 1936-37 as dividends on the company's common stock. Of approximately $430,000 originally issued less than $200,000 is outstanding.

Expert Steel Hearings To Be Resumed Jan. 15

■ While no definite date has yet been set by temporary national economic committee for further steel hearings, Jan. 15 has been mentioned as a possible date for resuming. Owing to the fact committee has not yet completed hearings now before it, date may be a week or so later. About one week will be required to complete the steel hearings.

Bar Mill Wages Steady

■ Wage rates in mills represented by the Western Bar Iron association having contracts with the Amalgamated Association of Iron, Steel and Tin Workers will remain unchanged in January. Monthly sales examination last week resulted in a card rate on boiling, bar and 12-inch mills of 2.15c; and on guide and 10-inch mills, 2.25c. The rates have been unchanged since last June.

Reviews Progress In Aluminum

■ "TOTAL sales volume of Aluminum Co. of America in 1939 was the largest in the company's history," declared George H. Gibbons, vice president, last week. "The year was abnormal because preparations for defense and war abroad contributed to the demand for aluminum. Nevertheless, continued increase in domestic consumption of the metal indicates another good year in 1940.

"Expectation of lower costs and the completion in 1939 of a $26,000,000 expansion program started in 1937 led the company recently to restate that the benefits of extensive research and development will be shared with consumers of aluminum. The company has already announced that it will not increase its domestic prices for aluminum ingots during the first quarter of 1940.

"As we face the new year, it is reasonable to hope that the relationship of the price of aluminum to the prices of competing materials may become such as to extend the advantages of this light, strong metal into many additional applications.

"Most Powerful Testing Machine"

"Late in 1939 the company announced plans for starting construction soon on a new metal-producing plant near Vancouver, Wash., in the Portland, Oreg., district. It has signed a 20-year contract with the Bonneville power administrator for a substantial supply of electric power. The new plant will, at the outset, produce 30,000,000 pounds of aluminum annually and, combined with the company's four existing plants, will bring the company's capacity to more than 400,000,000 pounds a year. The plant will require about 12 months for completion.

"The newest addition to the Aluminum Research Laboratories at New Kensington, Pa., is the world's most powerful testing machine which will go into operation early in 1940. It is expected to hasten further advances of aluminum in railroading and for other heavy-duty purposes, such as cranes, dragline booms, girders and many other applications.

"Truly a scientific marvel, the new machine will be capable of exerting a force of 3,000,000 pounds in compression and 1,000,000 pounds in tension, at speeds as high as 36 inches a minute. It will enable our scientists to make heroic tests of great girders and beams in the full size of their complete structure rather than in mere sections. It will measure accurately a pulling force as great as that exerted by 50 modern passenger locomotives in tandem or a force as small as that required to crack an egg-shell.

"Shortly to be put in service is a new aluminum corrugating press which will permit the manufacture of corrugated aluminum for service where strong rigidity is required, as in airplane wings, in lengths not now possible. The nation's largest forging hammer, recently installed in one of the company's plants, is in 1940 expected to result in improved airplane propellers, engine crankcases and landing gears.

"The amount of aluminum going into aviation last year was double that of 1937, the previous peak, and is still increasing . . . Employment of aluminum for truck bodies in 1939 was double that of 1938. Sales of aluminum for windows, spandrels and other architectural purposes were up 80 per cent . . . Electrical conductor continues as a major application of aluminum; more than 100,000 miles of aluminum cable, steel reinforced, going into REA projects in 1939 raised the total miles of such cable to 850,000 in this country."

Cleveland-Cliffs Spans 90 Years

■ CLEVELAND-CLIFFS Iron Co., Cleveland, this year will celebrate the ninetieth anniversary of its founding. It dates back to discovery of iron ore near Negaunee, Mich. In 1845 the Jackson Mining Co. was formed by citizens of Jackson, Mich., the properties being acquired eventually by Cleveland-Cliffs.

The Cleveland Iron Mining Co. was incorporated in 1850 by a group composed of Samuel L. Mather, father of the late Samuel Mather and of William G. Mather, now chairman of Cleveland-Cliffs; John Outhwaite, Morgan L. Hewitt, S. Chamberlain, Isaac L. Hewitt, Henry F. Brayton and E. M. Clark.

In 1854 fully 1000 tons of ore was hauled in wagons to Marquette, Mich., loaded into vessels, carried around the rapids at Sault Ste. Marie, Ont., and again loaded into boats to be shipped to Cleveland and there distributed to Pennsylvania and Ohio blast furnaces. In that year also a strap-rail railroad was built jointly by the Jackson and Cleveland companies from the iron mines to Marquette. This was succeeded by the Iron Mountain railroad in 1857.

The ship canal at Sault Ste. Marie was finished in 1855 and the Cleveland Iron Mining Co. shipped 1449 tons through it that year.

In 1890 the Iron Cliffs Co. was acquired, these two interests forming the Cleveland-Cliffs Iron Co.

Two charcoal blast furnaces were built in 1858-59 by the Iron Cliffs Co., at Negaunee, Mich. The Cleveland-Cliffs Iron Co. in 1895 built a charcoal furnace at Gladstone, Mich., and also stacks at Marquette, Mich. In 1935 the Cliffs Dow Chemical Co. replaced the last charcoal stack at Marquette with a chemical products plant.

Cleveland-Cliffs in 1915 obtained the principal interest in the Cleveland Furnace Co., with two modern blast furnaces and by-product coke ovens. In 1919 the Cleveland Furnace Co. was merged into the Otis Steel Co. Its manufacturing interests were enlarged by joining with the Trumbull Steel Co. in building a blast furnace at Warren, O.

In 1909 the Cleveland-Cliffs company purchased an interest in a large bituminous coal area in Greene county, Pennsylvania, operated now as the Mather Collieries. In 1917 it also acquired coal mines in West Virginia.

Cleveland-Cliffs has been a leader in developing scientific mining on the Lake Superior ore ranges.

Government Contracts Analyzed by N. A. M.

■ Principles and procedures relating to contracts between government and private business are analyzed in the November-December issue of the National Association of Manufacturers' *Law Digest.*

Pointing out that combined agencies of the federal government now represent "perhaps the largest purchasing agent" in the American market, the study explains present requirements of government supply contracts and the potentialities in proposed amendments to the Walsh-Healey act.

Chief topics treated: General principles and procedures on entering into government contracts; standard contract forms; laws which may be part of contracts; procedure for payment; disputes and appeals; war-time contracts.

■ Employes of Inland Steel Co.'s Morris and Greenwood mines, Ishpeming, Mich., held their traditional Christmas party last week, 1400 feet underground. Miners gathered to sing carols and exchange gifts.

Awards Totaling $200,000 Offered In New Welding Progress Program

■ A TWO and one-half year program of scientific study which will culminate in payment of $200,000 in awards, and which should produce widespread social and industrial benefits, is announced by the James F. Lincoln Arc Welding foundation, Cleveland.

The 458 awards are established for studies bringing out benefits of a social, economic or commercial nature, such as reduction or elimination of hazards to safety and health, greater availability of comforts and conveniences through reduced prices, greater utility and durability of machines and structures as well as industrial benefits such as cost savings and other advantages in manufacture, fabrication or construction.

Studies encouraged with a view to creating such large-scale benefits will concern machines, products and structures of all types including: Automobiles, trucks, buses, airplanes, locomotives, freight and passenger cars, street cars, ships and boats of all types, buildings, bridges, houses, furniture, heating and air conditioning equipment, electric refrigerators, farming machinery, road-building equipment, as well as industrial machines and products of every conceivable kind.

Grand Award $13,700

Awards ranging from $13,700 to $100, and embracing the 12 classifications and 46 divisions into which the industrial field has been divided for purposes of participation consist of the following:

The first grand award, which will be paid for the best progress report submitted, will total $13,700.

Three main program awards of $10,000, $7500 and $5000.

Forty-eight classificational awards: first, second, third and fourth awards of $3000, $2000, $1000 and $800, respectively, in each of 12 classifications.

One hundred and eighty-four divisional awards: first, second, third and fourth awards of $700, $500, $250 and $150, respectively in each of 46 divisions.

Two hundred and twenty-three honorable mention awards of $100 each for papers which do not share in any other award.

Innumerable subjects are suitable for study. The 12 classifications and 46 divisions of participation cover every conceivable machine, building, structure or product made of ferrous or nonferrous metal.

Participation in the program is open to everyone who plays any part in actually bringing about progress in the executive, design, fabrication, manufacture, construction or maintenance phase of product or structure development.

One author, or a group of authors, may submit a study. Any company or concern may submit more than one study, provided each is on a different subject and is prepared and submitted by a different author or group of authors.

Studies may bring out any and all social, scientific, economic and commercial benefits which attest progress in industrial development. Studies must, however, report progress which can be attributed to application of the electric arc process of welding within the 2½-year period, Jan. 1, 1940, to June 1, 1942. Such progress may involve one of the following: (a) Redesign and man-

ufacture or construction of an existing machine, structure, building, manufactured or fabricated product of ferrous or nonferrous metals; (b) new design and manufacture or construction of a machine, building, etc. as in (a); (c) organization, development and conduct of a welding service; (d) development, planning and performance of maintenance or repair work with arc welding.

All those planning to qualify should record, for future reference, data in the form of designs, charts, photos, notes and other pertinent information on operations as of Dec. 31, 1939.

1939 Second in Scrap Exports

■ NINETEEN THIRTY-NINE was the fourth highest year in history for the iron and steel scrap industry in point of domestic consumption and the second largest for exports, according to Edwin C. Barringer, executive secretary, Institute of Scrap Iron and Steel Inc., New York.

Domestic consumption, estimated at 34,800,000 gross tons, was exceeded only in 1937, 1936, and 1929. It was within 8½ per cent of the record use of 38,006,272 tons in 1937, and an increase of 62 per cent over 1938.

Of the 1939 consumption, approximately 70 per cent went into the production of new steel, 20 per cent into castings, and 10 per cent for miscellaneous uses.

Exports at approximately 3,500,000 tons compared with 2,998,591 tons in 1938 and the record of 4,092,590 tons in 1937. The increase in exports in 1939 was measurably smaller than that in domestic consumption, and exports amounted to only 9.1 per cent of the total use of scrap, compared with 12.4 per cent in 1938 and 9.7 per cent in 1937.

For the manufacture of steel for the common uses, such as for automobile bodies and frames, railroad track material and rolling stock, containers, structural steel for buildings and bridges, and similar products, the average charge of raw materials into the steel furnace in 1939 was about 49 per cent scrap and 51 per cent pig iron. For some specialties, like stainless steel, 100 per cent scrap was used.

In 1939, Pennsylvania maintained its pre-eminence as the leading scrap consuming state, accounting for 22 per cent of the domestic total or about 7,650,000 tons. Ohio was second at 19½ per cent or 6,775,000 tons; Indiana third at 11 per cent or 3,800,000 tons; Illinois fourth at 9 per cent or 3,130,000 tons; Michigan fifth at 8½ per cent or 2,950,000 tons; Maryland-Kentucky sixth at 5 per cent or 1,750,000 tons; New York seventh at 4½ per cent or 1,575,000 tons; Alabama eighth at 4 per cent or 1,400,000 tons.

An important new trend in 1939 was the increased use of steel scrap by gray iron foundries to impart greater strength and other desirable physical properties to their castings.

Ninety Years in Business, Builds New Warehouse

■ Climaxing 90 years of business in southern California, Ducommun Metals & Supply Co., Los Angeles, has completed erection of a modern warehouse in Vernon, Calif. The new plant is to be used as a storehouse and distributing center for a stock of iron, steel, nonferrous metals, pipe, valves and fittings.

Ducommun was founded during the 1849 gold rush. Charles L. Ducommun, a Swiss watchmaker, trekked across the Santa Fe trail and set up a small general store in Los Angeles, catering to gold miners, Spaniards and Indians. The company now employs more than 300, and still is operated by members of the founder's family.

Recovery Marks 1939 in Steel

By WALTER S. TOWER
Executive Secretary, American Iron and Steel Institute

■ STEEL ingot production in the United States rose to new heights in the closing months of 1939. For the year, output is estimated at 46,800,000 gross tons, compared with 28,200,000 gross tons in 1938, and with 50,318,000 gross tons in 1937. In various respects, the steel industry closed the year in a more satisfactory condition than has been the case for several years.

Average rate of operations for first quarter was 54.5 per cent of capacity. For the second quarter it stood at 50.8 per cent, rising to 62.2 per cent in the third quarter and to an estimated 91.2 per cent in the fourth quarter.

Slightly more than one third of the year's steel output was produced in the final three months. October, November and December broke all earlier monthly records in tonnage produced.

Upturn in steel activity started in May and continued steadily through the summer. Early September operations were greatly accelerated coincident with the outbreak of the war in Europe. However, the war exerted only an indirect influence. According to reliable opinion, few orders for steel have been placed by any of the belligerents.

Earnings Show Improvement

One important cause of the sharp upturn was the prompt decision of steel users to rebuild their stocks of steel. In many cases these stocks were subnormal, a condition which called for prompt correction in view of the indicated increase in industrial activities and possible uncertainties of continued quick deliveries. No evidence has appeared that inventories of steel are being increased beyond reasonable levels.

Two other specific causes of the rise in steel output to such high levels were the great volume of automobile production in the last quarter, and the unexpectedly large increase in demand from the railroads. Shipbuilding also continued active.

With advancing operations there were steady gains in employment and earnings of wage earners.

Average employment for 1939 was 482,000, but in October the total stood at 545,000. Average weekly earnings in October were $32, a gain of $8 per week since mid-summer. Employes were working an average of 38 hours each week compared with 31 hours in October of 1938. Average hourly earnings at 84 cents were the highest for any year in the history of the industry, and total payrolls in the industry in 1939 were $810,000,000 against $600,000,000 in 1938.

Rising operations have resulted in some improvement in earnings. During the past ten years the annual return on invested capital in the steel industry has averaged only 2.4 per cent. In the first half of 1939 the industry earned $25,450,000, equivalent on an annual basis to a return of 2.1 per cent on capital investment. This compares with a loss of $18,000,000 in the first half of 1938.

Further gains in earnings for most companies were reported for the third quarter and continued betterment is expected for the fourth quarter.

During September the price of many raw materials used in the steel industry advanced sharply. However, the prevailing published prices of finished steel were reaffirmed by leading companies both for the fourth quarter and for the first quarter of 1940. That action was

widely regarded as a desire on the part of the steel companies to avoid any step which might stimulate inflationary tendencies in commodity prices.

It is worth noting that although average steel prices are less than 3 per cent above the 1929 level, average wage rates in the industry are nearly 30 per cent over 1929.

In November various executives in the industry appeared before the temporary national economic committee in Washington. Chiefly the testimony made clear that keen competition exists in the industry in all its phases, including prices. Another point emphasized is that the steel industry has no desire for war business.

Nickel Consumption at All-Time High in 1939

■ World consumption of nickel in all forms during the first ten months of 1939 totaled approximately 206,000,000 pounds. This compares with 160,000,000 pounds and 201,000,000 pounds, respectively, for the like periods of 1938 and 1937, a gain of 28.8 per cent over the former and 2.48 per cent over the latter.

Due to increased sales of nickel during last quarter, principally in the United States, the world undoubtedly used more nickel in 1939 than in any previous year in the life of the nickel industry, according to a review by the International Nickel Co. of Canada Ltd., Copper Cliff, Ont.

This record consumption may be attributed to great improvement in the heavy industries in the United States and Canada and to the increased activity in Europe and other parts of the world, to augment production of war supplies. New applications developed during recent years have accelerated substantially the consumption of nickel steels and alloys in a great diversity of forms and compositions.

An estimate of the purposes to which nickel was put in 1939 credits steels with 6 per cent, including structural, stainless and corrosion resistant steels, heat resistant steel and castings. Nickel cast iron absorbed 3 per cent, nickel-copper alloys and nickel silvers 10 per cent, monel and similar metals 10 per cent and others in smaller proportion.

World Tin Stocks Up

■ World stocks of tin increased 4046 gross tons during November, according to the International Tin Research and Development council, The Hague. Stocks in November were 50,607 tons, against 46,551 tons in October and 48,721 tons in November, 1938.

Steel Employment, Average Hours, Wages

Employes on hourly, piecework or tonnage basis

1933	Number employes	Total hours worked	Average hrs. per week per employe	Total wages (dollars)	Average earnings per hr. (cts.)	Total wage, salary employes	Total payrolls (dollars)
June	305,239	51,645,321	39.4	24,441,054	47.3	338,146	30,560,761
Sept.	380,271	52,252,033	32.0	29,608,107	56.7	417,020	37,322,250
Oct.	378,862	52,308,897	31.2	30,291,985	57.9	416,277	38,334,978
Nov.	362,206	43,044,055	27.8	24,838,494	57.7	399,569	32,671,936
Dec.	357,424	45,736,252	28.9	26,439,830	57.8	394,943	34,323,694
1934							
Jan.	355,292	45,898,885	29.2	26,737,393	58.3	393,013	34,877,542
Feb.	365,305	46,655,614	31.9	27,394,221	58.7	403,298	35,424,791
March	380,471	56,047,913	33.3	33,010,060	58.9	419,277	41,263,370
April	392,069	56,723,813	33.7	36,778,026	64.8	431,086	45,471,878
May	409,698	66,450,593	36.6	42,916,172	64.6	449,362	51,895,931
June	415,547	63,589,289	35.7	40,630,314	63.9	455,966	49,466,644
July	383,673	41,381,779	24.4	26,150,272	63.2	424,126	34,913,521
Aug.	364,583	40,447,674	25.0	25,691,520	63.5	404,793	34,362,208
Sept.	343,064	33,203,234	22.6	21,244,286	64.0	381,828	29,142,892
Oct.	342,772	38,621,836	25.4	24,699,063	64.0	381,431	32,723,909
Nov.	343,219	38,793,790	26.3	25,082,162	64.7	381,663	32,937,099
Dec.	347,872	42,137,923	27.4	27,410,206	65.0	386,345	35,362,732
Total	369,845	569,093,876	29.5	357,293,012	62.8	409,349	457,842,517
1935							
Jan.	368,095	54,783,373	33.6	35,879,072	65.5	407,071	44,328,552
Feb.	381,010	54,221,180	35.6	35,652,577	65.8	420,397	44,212,859
March	385,506	57,882,810	33.9	38,053,190	65.7	425,189	46,764,185
April	384,546	56,368,953	34.2	37,174,010	65.9	424,623	45,890,244
May	381,303	57,326,908	33.9	37,529,522	65.5	421,470	46,493,536
June	376,431	50,777,987	31.4	33,080,422	65.1	416,732	41,902,874
July	375,348	52,309,007	31.5	33,855,040	64.7	415,937	42,725,150
Aug.	383,090	59,405,552	35.0	38,842,086	65.4	423,925	47,890,277
Sept.	387,924	56,485,479	34.0	36,863,891	65.3	429,217	45,892,839
Oct.	395,222	64,504,137	36.8	42,190,687	65.4	436,554	51,456,368
Nov.	396,949	60,819,820	35.7	40,027,160	65.8	438,370	49,170,940
Dec.	408,510	63,095,080	35.0	41,383,845	65.6	451,810	51,065,900
Total	385,328	687,979,926	34.2	450,531,502	65.5	425,941	557,793,724
1936							
Jan.	410,613	67,323,251	37.0	43,924,635	65.2	453,964	53,783,156
Feb.	408,976	62,310,069	36.8	40,496,550	65.0	452,649	50,249,537
March	413,645	67,850,000	37.2	44,477,510	65.6	458,070	54,399,880
April	434,594	76,244,541	40.9	49,911,816	65.5	480,119	60,150,807
May	455,765	79,890,221	40.5	52,291,495	65.5	491,864	62,757,288
June	451,299	78,989,190	40.8	52,522,262	66.5	498,243	62,990,808
July	467,065	80,526,023	39.0	53,823,890	66.8	514,742	64,497,877
Aug.	472,851	83,111,766	39.7	55,204,695	66.4	522,369	66,338,141
Sept.	476,593	82,656,665	40.5	54,480,950	65.9	526,717	65,611,223
Oct.	480,790	90,604,687	42.5	59,650,455	65.8	531,358	71,110,193
Nov.	478,108	83,473,936	40.7	57,652,243	69.1	529,208	69,286,257
Dec.	485,236	89,066,999	41.5	64,439,010	72.3	537,147	76,884,375
Total	452,128	942,047,348	39.8	628,875,511	66.8	499,704	758,059,542
1937							
Jan.	495,559	88,905,739	40.5	64,031,845	72.0	547,997	76,423,054
Feb.	502,688	85,502,314	42.5	61,765,546	72.2	556,077	74,277,665
March	520,487	98,100,014	42.5	77,278,240	78.8	577,050	90,863,016
April	530,098	93,979,207	41.3	79,885,171	85.0	589,351	94,321,859
May	533,550	91,194,218	38.6	78,382,248	86.0	595,354	92,941,305
June	495,260	83,391,779	39.2	72,582,963	87.0	555,743	87,519,613
July	532,694	87,769,974	37.3	75,661,847	86.2	593,906	90,549,660
Aug.	541,004	90,810,261	37.9	77,570,340	85.4	603,106	92,663,389
Sept.	540,389	85,011,778	36.8	71,140,268	83.7	602,729	86,160,875
Oct.	524,837	74,271,018	31.9	61,242,513	82.5	586,644	76,191,149
Nov.	490,238	57,939,478	27.6	47,213,654	81.5	551,158	62,119,455
Dec.	448,504	46,472,266	23.4	37,966,458	81.7	507,814	52,062,129
Total	512,942	983,348,046	36.8	804,721,093	81.8	572,244	976,083,169
1938							
Jan.	416,241	42,209,263	22.9	33,974,000	80.5	474,759	47,578,375
Feb.	402,750	40,128,200	24.9	32,618,070	81.3	460,617	45,599,050
March	397,538	47,057,185	26.7	38,499,749	81.8	454,997	51,386,004
April	387,650	42,490,753	25.6	35,096,911	82.6	444,781	47,809,421
May	378,680	40,907,993	24.4	34,189,756	83.6	435,589	46,756,699
June	368,239	40,380,352	25.6	34,125,126	84.5	424,703	46,705,739
July	368,003	39,446,563	24.3	33,442,475	84.8	424,354	45,802,450
Aug.	371,030	48,362,994	29.4	40,226,308	83.2	426,892	52,711,993
Sept.	375,400	48,271,926	30.0	40,054,206	83.0	430,882	52,364,808
Oct.	380,652	52,620,518	31.2	43,766,299	83.2	435,929	56,176,206
Nov.	394,832	57,884,241	34.2	48,357,224	83.5	450,244	61,053,955
Dec.	393,541	55,717,003	32.0	46,503,822	83.5	449,122	59,254,287
Total	386,213	555,476,991	27.6	460,853,946	83.0	442,739	613,198,987
1939							
Jan.	394,312	55,975,873	32.0	46,238,606	82.6	450,606	59,348,052
Feb.	396,495	53,109,307	33.5	43,897,977	82.7	452,872	57,044,172
March	398,702	61,299,855	34.7	50,774,840	82.8	455,304	64,174,479
April	395,791	54,502,035	32.1	45,197,106	82.9	452,388	58,517,980
May	390,825	56,534,423	32.7	47,187,702	83.5	447,507	60,372,026
June	393,956	56,691,814	33.5	48,080,695	84.8	450,718	61,149,900
July	396,107	54,402,875	31.0	46,758,412	85.9	452,900	59,900,418
Aug.	401,328	64,385,530	36.2	54,552,381	84.7	458,358	67,894,197
Sept.	443,796	66,571,820	35.0	56,353,266	84.7	501,604	69,735,260
Oct.	485,876	81,884,626	38.0	64,248,454	84.6	544,874	83,421,050

Figures from American Iron and Steel Institute.

Steel Wage History

	Hourly wage	Per cent advance	Per cent advance over 1915
1915	20.0	....	....
Feb. 1, 1916	22.0	10	10
May 1, 1916	25.0	13.6	25
Dec. 15, 1916	27.5	10	37.5
May 1, 1917	30.0	9	50
Oct. 1, 1917	33.0	10	65
April 16, 1918	38.0	15	90
Aug. 1, 1918	42.0	10.5	110
†Oct. 1, 1918	46.2	10	131
†Feb. 1, 1920	50.6	10	153
†May 16, 1921	40.5	*20	102.5
July 16, 1921	37.0	* 8.6	85
Aug. 29, 1921	30.0	*18.9	50
Sept. 1, 1922	36.0	20	80
April 16, 1923	40.0	11	100
‡Aug., 1923	44.0	10	120
Oct. 1, 1931	39.6	*10	98
May 16, 1932	33.7	*15	68.5
Aug. 19, 1933 (Code)	40.0	18.7	100
April 1, 1934	44.0	10	120
Nov., 1936	52.5	19	162
March, 1937	62.5	19	212.5

*Reduction. †Basic 8-hour day in effect; time and one-half for overtime. ‡Twelve-hour day abolished; pending general adjustment, labor on 8-hour day was paid 50 cents; on 10 hours, 44 cents. Rates are those announced by the United States Steel Corp.

War and Politics To Shape 1940 Pattern

(*Concluded from Page* 158)

law violations have been the focal point of much attention. Amendment of the Sherman act by the Clayton act in 1914 exempted labor unions for antitrust statutes, declaring that "the labor of a human being is not a commodity or an article of commerce," exempted labor unions from antitrust statutes as long as they are "lawfully carrying out the legitimate objects" for which they were organized. Much of the future course of antitrust prosecutions as they affect labor unions appears to depend upon the interpretation of this last clause.

Department of justice, which has obtained the indictment of one union and five officers in a jurisdictional dispute between two unions in the building trades in the District of Columbia on charges of antitrust law violation, has been in receipt of many outside requests for clarification of policy and it was in partial response to this demand that Assistant Attorney General Thurman Arnold recently wrote an open letter to a labor union in Indianapolis.

Stating that "it is only such boycotts, strikes or coercion by labor unions as have no reasonable connection with wages, hours, health, safety, speed-up system, or the establishment and maintenance of the right of collective bargaining which will be prosecuted," Mr. Arnold enumerated some types of "unreasonable restraint" against which the department intends to proceed.

These included unreasonable restraint designed to prevent the use of cheaper material, improved equipment or more efficient methods; to compel the hiring of useless and unnecessary labor; to enforce systems of graft and extortion; to enforce illegally fixed prices; and to destroy an established and legitimate system of collective bargaining.

These restraints, he contended, are not only against the public interest, but against the interest of the rank and file of labor itself. Whether the courts can consistently uphold his interpretations remains to be seen, but in any event they are regarded an excellent start.

Many constructive suggestions have been offered by industry for revising the Wagner act; none appears more pertinent than those submitted by Walter S. Tower, executive secretary, American Iron and Steel institute, last year before the senate committee on education and labor. He proposed seven changes, which he said the steel industry regarded as necessary to accomplish the act's declared purposes:

1—To provided full protection to

employes in the exercise of their collective bargaining rights against interference, restraint or coercion by anyone.

2—To safeguard the right of free speech by specifically permitting employers to express opinions and to confer with and advise their employes.

3—To permit a direct appeal to the courts by both employes and employers from labor board decisions regarding the representation of employes.

4—To provide that, in any court proceeding to enforce or review a board decision, findings or fact by the board shall be conclusive only if supported by the evidence.

5—To limit the time within which the board may issue a complaint involving an alleged unfair labor practice.

6—To place the prosecuting and judicial functions under the act in separate and independent bodies.

7—To enlarge the body which shall adjudicate cases under the act sufficiently to insure full consideration by one or more of its members of all cases presented to it.

Also emphasized in many quarters is the importance of the recognition of the right of an employer to apply to the labor board for a prompt determination of the identity of the bargaining agency with which the law requires him to deal. Within the past year the board has recognized this right, but employers believe it is a right which should be reinforced by law and not be left to the discretion of the board as something it could abrogate at will or be dilatory in enforcing.

A list of "unfair labor practices" for labor, as well as for management, is still being strongly urged in the name of simple justice and as an essential in the smoother operation of the law.

While much criticism has been directed at the act's administration, there is wide acceptance of the fact among critics that many difficulties are inherent in the law.

Labor strife in the steel industry in recent months has abated somewhat—clearly at least there have not been the pyrotechnics that featured certain other periods since the law's enactment. Some see in this a disposition on the part of CIO to withhold demands pending the outcome of the Bethlehem Steel Co.'s court appeal from a labor board order to disestablish employe organizations in Bethlehem plants.

New Dealers Plan Defense

Shaping of national defense and mobilization plans in closer conformance with New Deal philosophies is indicated, not so much by what has been specifically revealed with regard to details as by the personnel now engaged in the administration and principal planning of the work. More and more, it appears, the disposition has been to merge all such activities under regular government departments and agencies, on the theory that inasmuch as they do the economic planning in peace times they are equally capable of doing whatever might be necessary in times of war. As a result some look for a shift to greater government control of businesses considered vital in the preparedness program.

At least two especially appointed "war" agencies went by the boards last fall, the latest being the national defense power committee, headed by Louis Johnson, assistant secretary of war, who stressed cooperation with the utility industry and the expansion of private investment in the field. This became absorbed by a committee headed by Harold L. Ickes, secretary of Interior.

The other was the war resources board, set up last August under the chairmanship of Edward R. Stettinius Jr., chairman, United States Steel Corp., with Karl T. Compton, president, Massachusetts Institute of Technology, Walter S. Gifford, president, American Telephone &

Telegraph Co., Harold G. Moulton, president, Brookings institute, John Lee Pratt, a director, General Motors Corp., and Gen. Robert E. Wood, chairman, Sears, Roebuck & Co., members.

This committee based its study largely on an industrial mobilization plan made available through the war department and submitted its findings in October, at which time it disbanded. These findings for "obvious" reasons were not made public, although the war department plan was known to divide the study in two parts, the first dealing with utilization of natural resources and mobilization in time of war and the second with army and navy procurement planning in time of peace.

Co-ordinating measures, organization plans and war resources administration were outlined under one part, along with detailed plans for war service committees, postwar adjustment and other emergency administrations. General policies, organization through peacetime planning and the army and navy munitions board were among subjects considered in the second part.

Third published revision of the industrial mobilization plan since 1931, the report discussed such matters as priority, classification ratings, allocations, licenses, embargoes, price control, control of foreign trade and organization of government corporations.

May Change Securities Act

With this report before it, the major problems the war resources board sought to solve were: Prevention of inflation; minimizing labor competition and migrations, requiring in all likelihood the removal of hour-restricting legislation; curbing of out-of-line increases in wages and cost of living; and restraint of profiteering.

Enlargement of the strategic materials program is regarded as a likely phase of the proposed expansion of the national defense program.

To facilitate corporate financing, the securities act may be modified to provide for the simplification of the filing of statements in the registering of security issues, a process which at present is exceedingly irksome and difficult. Results of experts assigned to this problem of simplification are expected to be approved by the SEC soon.

Another specific modification said to be under consideration by the commission is the revision or abolition of the "20-day clause", which now requires a corporation to wait for 20 days after registering its securities before offering them for sale, thus jeopardizing the success of an issue because of the possibility of a change in the money market within the 20-day period.

This, it is said, has diverted much financing from public to private channels, by virtue of the fact that insurance companies and other large institutional buyers can make firm bids, once assured of the merits of a given issue, without the 20 days' delay and its accompanying hazard. This has meant a distinct loss of business to investment bankers and underwriters, who normally represent an important cog in the capital market machinery and through whom badly needed capital of the individual investors is reached.

It is authoritatively estimated that from 1935 to the present, private financing, which has proved simpler and less expensive, has increased from 10 to 45 per cent of the total.

Another change reported under contemplation would relieve some of the restrictions, now imposed under the controversial section 16 of the act, on market activities of officers, directors and 10 per cent equity holders in transactions involving securities of their own companies.

Heat Treating

(*Continued from Page* 200)

Homerberg, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., lists progress and improvement of atmosphere-controlled furnace equipment, and improvements and new applications of induction heating, the latter now being used for hardening interior as well as exterior surfaces. Flame hardening has been improved and has found new applications. Powder metallurgy is moving ahead and rapidly gaining importance.

Dr. Homerberg also mentions the possibility of increasing greatly the toughness of high speed steel by quenching into a medium at 400-500 degrees Fahr. from the tempering temperature and holding for a sufficient time to permit the transformation of the residual austenite to a structure resembling bainite. The commercial application of austempering is regarded as most promising.

In connection with the recent uplift in production and fabrication of metals, partly due to effects of the European war, R. L. Dowdell, professor of metallography, University of Minnesota, Minneapolis, expresses a hope that demand for tonnage will cause less sacrifice of quality than was experienced in the World war. The American goal is still better products for less money. Industrial research is moving at a faster pace. Quality of heat treated products is improving largely due to the wider and more intelligent use of atmosphere control. Electrolytic manganese, recently made commercially available, is finding many applications in the field of special alloys. This development of manganese alloys will bear close watching, Dr. Dowdell asserts.

So impressive has been progress in application of high-frequency current for localized heating and heat treating that W. B. Coleman, president, W. B. Coleman & Co., Philadelphia, believes that the future will see the method expand broadly. He also expects that powdered metals soon will become an important phase of metallurgy.

Copper in Gray Iron

Mr. Coleman reflects that a decade ago foundries would not tolerate copper in gray iron and went to great lengths to keep it out. Today, this element is used as an alloy in iron and is regarded as having a beneficial effect. Some of the alloys recently tried in steel have not been tried in gray iron. It would not be surprising, however, to see some move in this direction.

A new system of control for automatic regulation of electric furnaces is applicable to heat treating equipment and is particularly suitable for applications requiring closer temperature control and which are to operate over a wide range, states R. M. Cherry, industrial department, General Electric Co., Schenectady, N. Y. This control varies the energy input by automatically varying the voltage impressed on the heating unit, and replaces the "on" and "off" method of control.

Marking or scratching the surface of bright steel strips is avoided in a new type continuous electric furnace arranged to support the strips on rolls outside the heating chamber at each end, where they as well as the strip are relatively cool. The strip, according to Mr. Cherry, hangs in a free catenary between the rolls, so the high-temperature portion of the strip is untouched. The new furnace has the usual extended cooling chamber to cool the strip below oxidizing temperature before it emerges.

For foundries where production does not warrant a continuous-type furnace, a two-chamber, electrically-heated elevator furnace was produced for annealing malleable iron castings. After completion of the high-temperature portion of the cycle, Mr. Cherry explains, the car is lowered from that chamber and

placed in the low-temperature chamber, whereupon a new cold charge is placed in the high-temperature chamber. Such a furnace eliminates time required for cooling the furnace and time and energy for reheating as required with a single chamber furnace.

Use of oxyacetylene flame technique is rapidly coming to the fore as a major production process for heat treating, hardening, and softening a wide variety of steel products, particularly those too large for furnace treatment or those requiring that only localized areas be processed. Hardening of teeth on gears is a typical application. Procedure and equipment for flame treatment have advanced rapidly and are now well standardized.

Flame-strengthening is the newest and least known of the flame processes, state engineers of the Linde Air Products Co., New York. Similar to flame hardening, its purpose is to strengthen highly-stressed parts locally in regions of excessive concentration of stress. The process is directed particularly at parts which are to be subjected to repeated stresses and which are thus subject to failure by fatigue. It may be applied to sections of a part which will never be subjected to wear for the purpose of increasing their physical resistance against formation and propagation of fatigue cracks. Flexibility of the process makes it possible to effect cost savings in comparison with complete heat treatment, where, in many instances, 100 per cent of a part would be fully hardened and drawn merely to increase the strength of the 1 per cent which may be subjected to maximum stresses.

Special Heating Heads Used

To produce the desired contours of strengthened metal and to control the fadeout of this strengthened section into the base metal in regions of lower stress, and thus prevent sharp discontinuities, it is desirable to employ special heating heads where complexity of the part does not lend itself readily to the use of simple or standard-type of equipment.

Flame hardening of external rounds, such as rolls, and internal rounds such as cylinder walls, liners, etc., is being employed in an increasing number of plants, reports G. V. Slottman, acting manager, applied engineering department, Air Reduction Sales Co., New York. Because of the relatively low expense and ready portability of the equipment needed for flame hardening, this process has appealed to those who have localized hardening problems. Production demands for lathe beds, gears, crankshafts, etc., have practically compelled manufacturers to investigate and often adopt flame hardening.

Commenting on the increasing acceptance of flame hardening, M. T. Roberts, chief metallurgist, Harnischfeger Corp., Milwaukee, states that size of the piece or the area to be hardened seldom becomes a factor in making cost prohibitive as is so frequent with other methods of hardening. Many parts of complicated construction can be benefited by preferential heat treatment of this process where other methods would prove either impossible or at least commercially impractical. One feature not to overlook is speed of the process.

Some erroneous ideas concerning flame hardening seem to have taken root, warns W. G. Hamilton, Accurate Steel Treating Co. Inc., Chicago. The thought seems to prevail that alloys can be used in the steel to produce hardnesses of 600 to 700 brinell. For certain classes of work in which the surface is subject to abrasion only, this may be true, but the practice is not recommended where the surface is subject to high fatigue stresses. Proper selections of alloy and resulting

hardness is of more importance than many originally believed. Even more care is advisable in selection of steels for flame hardening than for a job to be furnace heat treated to the same hardness.

Experience of 1939, states Mr. Hamilton, has shown a definite need for flame hardened teeth in the gear industry. Much has been learned about where the procedure can be used and where it cannot. Undoubtedly, 1940 will see more progress and wider applications.

Hardening the ways on gray iron lathe beds by flame treatment is now standard production practice of the Monarch Machine Tool Co., Sidney, O., reports F. C. Dull. Composition of the iron used permits hardening to desired depth and hardness without heat checking and with a minimum of distortion. Lathes with flame-hardened ways are maintaining their original accuracy and efficiency over appreciably longer periods.

A salt bath for high temperature heat treatment of copper alloy rods, mentioned a year ago by H. P. Croft, chief metallurgist, Chase Brass & Copper Co., Cleveland, has now been refined to such an extent that it has been put on a production basis. This development was necessitated by the fact that present annealing furnaces are not always suitable for temperatures at which solution treatments of age hardenable copper alloys must be carried out. Further, such temperatures produce severe scaling and loss of hardening constituents near the surface. This can be avoided by annealing in a reducing or neutral salt.

The equipment, says Mr. Croft, uses a rammed refractory pot and a finely divided covering for the salt. It is heated by three pairs of electrodes—the salt is molten at 1500 degrees Fahr. and operates satisfactorily up to 1900 degrees. Production is 1200 to 1600 pounds of rods per hour. Use of the bath has reduced nonhardenable skin from a depth of 0.005-0.010-inch to an average between 0.001-0.002-inch.

Materials Handling

(*Continued from Page 208*)

a procedure becoming increasingly necessary.

In field of crane and hoist applications, B. Van Horn, Harnischfeger Corp., Milwaukee, points out need for dock cranes of the whirling-boom type or hinged boom cranes with man trolleys arranged with hook and sling, magnet or bucket applications for loading and unloading ships. Such equipment will eliminate excessive costs which still exist at many docks and piers. He believes there is a great field for reducing cost of loading and unloading cargoes on waterway shipping.

Heavier unit loads have necessitated development of a heavier tramrail system for loads up to 5 tons, according to C. L. Peterson, Cleveland Tramrail division, Cleveland Crane & Engineering Co., Wickcliffe, O. The new system is complete with heavier arch-beam rails, switches, carriers, etc., and handles 5-ton loads over spans up to 25 feet. It can be connected to the lighter systems already in use with increased flexibility and coverage. Larger load capacities permit reduction of handling cost of many materials since larger amounts can be handled, thus reducing handling time and increasing efficiency.

Of the many new accessories developed for crane and hoist use, one of the most interesting is pointed out by F. W. Jessop, president, Ohio Electric Mfg. Co., Cleveland. This is a duplex magnet consisting of two or more specially designed magnets having greatly increased cross section and solidly connected together. Such units are especially suitable for piling coils tightly and for handling them between closely stacked piles. As many as four relatively small magnets in a clover-leaf

group take full advantage of magnetic cross section of the material.

L. C. Blake, Curtis Pneumatic Machinery Co., St. Louis, calls attention to increased use of air and hydraulic cylinders to operate lift platforms for such widely varying applications as freight elevators, feeding platforms for presses and similar equipment. Such a platform used in the shipping department permits ready transfer of hand trucks and cases into highway trucks, thus greatly facilitating loading operations.

It is becoming increasingly difficult to secure men to do the hard work in handling pieces in and out of forge furnaces as well as manipulating under the forge hammer, states Edgar E. Brosius, president, Edgar E. Brosius Inc., Pittsburgh. Result has been development of new mechanical manipulators which not only charge and draw the furnace, but also manipulate the work under the forging hammer. Recently two such machines were furnished capable of handling pieces up to 4000 pounds in weight and a 6000-pound capacity machine is now being constructed.

Great advances in handling ores underground have occurred in the past year according to G. W. Morrison, Ingersoll-Rand Co., Phillipsburg, N. J., in connection with scrapers for moving the ore. This company recently issued a 188-page handbook entitled "Modern Methods for Scraper Mucking and Loading" detailing these advances.

Stamping

(*Continued from Page* 214)

highly strained metal and the consequent stresses induced.

While in the past, Mr. Poto says, almost all attempts to produce such a grade of drawing steel have been made with rimmed steel as a base, freedom from secondary blowhole laminations, uniform physical properties and nonaging characteristics of killed steel led to intensive efforts during the past year to produce a drawing steel in this grade. Although more costly to produce, the nonaging sheet is displacing the older type for the more difficult stampings with results remarkably successful to date. Mr. Poto also points out the greater attention being paid to steel mill finishing equipment; the increased knowledge of the relationship between attainment of the desired physical properties to finishing temperature, rate of band cooling, amount of cold reduction, annealing time and temperature; and the growing tendency to study the user's individual needs and methods of fabrication which no doubt will continue. Further improvements in quality of products from continuous mills probably will result from greater refinements and processes and a better understanding of the various factors.

An increased use of automobile steel in coil form by stamping manufacturers is noted by Dr. Anson Hayes, director, research laboratories, American Rolling Mill Co., Middletown, O. He remarks there has been a steady progress in the direction of stampings of more intricate shape and of larger sizes requiring higher degrees of perfection with respect to basic defects in the metal and requiring marked improvement in forming properties. Temporarily, according to Dr. Hayes, there has been less tendency toward lighter gages of metal than in the past.

Noteworthy new developments in stainless steel applications mentioned by E. J. W. Ragsdale, chief engineer, Edward G. Budd Mfg. Co., Philadelphia, are those connected with aircraft parts and the chemical industry. The first makes use of the high-tensile strength of cold-rolled stainless steel while the sec-

ond emphasizes corrosion resistance. In both, the problem has been the use of thin metal so formed and fabricated that full strength of the material can be utilized.

Another phase of stainless steel fabrication put on a commercial basis during the past year, reports Mr. Ragsdale, has been in highway trucks and trailers. Saving of weight, lower maintenance and bright appearance of stainless steel in such equipment are having an increasing appeal to truckers and public.

Confidence is expressed by D. McM. Blackburn, production manager, Hendrick Mfg. Co., Carbondale, Pa., that 1940 will see continued increases in uses of perforated metals. Screens now can be made with any shape or size opening—round, square, squaround, hexagon, slotted, tapered, etc., and from various kinds of metals including stainless, alloy and nonferrous. Particular attention is being paid to the acid, corrosion, heat and abrasion-resisting qualities of the screens. For ornamental and architectural purposes, patterns in perforated metals have been developed to resemble ancient Egyptian basket and rush weaves, rare old laces, lattices and canes and many others intended for more utilitarian purposes but nevertheless are pleasing to the eye. Finishes include dull satin, rich mahogany, dark walnut and mirror bright.

In the field of heavy forming there has been a notable advance in manufacture of drum shells for custom-built high-pressure welded boilers. A. J. Moses, general manager, Hedges-Walsh-Weidner division, Combustion Engineering Co. Inc., Chattanooga, Tenn., reports the installation by his company of a 6000-ton hydraulic press with universal dies for forming heavy steel plates weighing up to 30 tons each, ranging up to 6¼ inches in thickness, from 2 to 6 feet in diameter and up to 40 feet in length.

The installation consists of two 3000-ton presses spaced for a 40-foot clearance between them and employing a stationary bottom beam and a moving top beam to connect stationary and moving platens, respectively, of the presses. The two hydraulic main pressure rams are synchronized hydraulically and a special overhead crane and hydraulic manipulators at floor level are provided for handling of plates. The usual procedure on extremely heavy plates, according to Mr. Moses, is to perform about half of the forming while the plates are hot and finish with plates cold. By extending use of hot forming, he believes, equipment will adequately meet requirements for some time to come.

Short Run "Stampings"

A method of producing short runs of what ordinarily would be stampings, without the aid of dies, is discussed by L. A. Wilkie, president, Continental Machines Inc., Minneapolis. The procedure is to stack plates up to a thickness of 12 inches, tackweld the edges while plates are held tightly to form a solid block, then by means of a saw having an unusually narrow blade, saw contour of the desired shape—thus a large number of pieces are made in one sawing operation. Refinements in "slug for the punch" die-making technique also are reported by Mr. Wilkie. In this method of die making, a starting hole for the saw blade is drilled in the block at about 7 degrees inclination from the longitudinal axis and work table of the band saw then inclined about 10 degrees. After sawing of die contour with a narrow-blade, slug is removed from center and used as the punch.

Mentioning the streamlined appearance of modern oil-operated, self-contained hydraulic presses, F. G. Schranz, general manager, Baldwin-Southwark Corp., Philadelphia, emphasizes the useful as well as ornamental purposes served by such a design. Pumping unit, motor, oil-

supply tank and connecting pipes have been gathered into the press and hidden by a neat symmetrical cover. This has resulted not only in improved appearance but also in better utilization of floor space.

This view is amplified by W. F. Longfield, chief engineer, Cleveland Punch & Shear Works Co., Cleveland, in pointing out use of herringbone gears running in a bath of oil making possible smaller diameter gearing and faster speeds with a smaller and faster clutch. This together with the adoption of the V-belt drive, afforded the opportunity to place all of the drive mechanism in the crown of the press, thereby eliminating all outboard bearings and overhanging drives to reduce floor space, maintenance and provide smoother and quieter operation.

Another improvement in presses has been adoption of air or hydraulically-operated adjustable-capacity friction clutches which are automatically thrown out on top center and which, after slide reaches bottom center, leave operator free for next operation. In addition, operator has complete and instant control of the down stroke, an especially important feature when work is improperly located in the dies. Worthy of mention also are improvements in handling of stock material. These include automatic operations accomplished by keeping formed parts tied in on the strip till last operation has been performed; station-feed presses utilizing suction cups to lift blank off a stack which then is automatically raised thickness of sheet; and weighing of a blank before entering press to make sure only one blank has been fed and of the correct gage.

To overcome disadvantages of coil feeds on automatic blanking presses driven from main press drive, states Mr. Longfield, a separate hydraulic variable-speed drive has been developed providing inching forward and reverse to facilitate starting a new coil or removing a partially blanked coil. Drive also takes up loss in feed due to lag in press mechanism and allows backing up of a coil to straighten a sheet which may have been caught in a die. These separate feed mechanisms are timed with main drive and are capable of slowing down for an accurate stop at slow speeds and stopping quickly in an emergency.

Forging

(*Continued from Page* 216)

engineer, Transue & Williams Steel Forging Corp., Alliance, O.

He further remarks that inasmuch as a large number of forgings of this type are for ordnance equipment, the present emergency has created a production volume with quality standards formerly observed only on hand finished parts. Where specifications heretofore required only the usual check of chemical and physical properties, today the drop forger must guarantee an absolutely perfect surface finish on highly stressed parts, especially those used in aircraft and diesel engine construction. Mr. Thompson says the progressive attitude of the industry and its ability to keep pace with the perfection requirements is clearly demonstrated by the large expenditure being made for magnetic inspection apparatus.

The two outstanding phases of interest in the forging industry this last year, according to R. E. W. Harrison, vice president, Chambersburg Engineering Co., Chambersburg, Pa., has been the growing use of large-capacity steam and air drop-hammers and the cold forging of duralumin parts for metal aircraft uses.

He also makes the observation that these developments have been entirely proved by established production records and for that reason are two solid accomplishments of the industry for 1939. Contribution of forging machinery manufacturers to the aircraft industry has been improvement in air drop stamping ma-

chines providing a delicacy of control and permitting a greater flexibility in variety of parts that can be manufactured.

Increased use of die-pressed copper alloy forgings is seen by Charles B. Jacobs Jr., American Brass Co., Waterbury, Conn. In many cases, he says, a die-pressed part which is twice wrought, inasmuch as the forging blanks are extruded, is more economical than a part made in some other way because rejections are low and little machining usually is required to finish the part. He cites increased use of die-pressed bronze-aluminum alloy forgings for intake and exhaust valves of airplane engines. The plumbing industry is becoming a larger consumer of die-pressed forgings for valve bodies, faucets and handles. Textile machinery also is making an increased use of die-pressed parts.

Many forged parts now also are being used for fabrication and assembly of many different types of equipment.

As a result of advances in die design making possible finish-forged parts with deep impressions on a commercial basis, states W. W. Sieg, general manager, Titan Metal Mfg. Co., Bellefonte, Pa., the brass forging industry as a whole is enjoying one of its best years. How much of this has been brought about by competition of brass die-castings having deep-cored holes is not known, adds Mr. Sieg, but the year 1939 was well ahead of production achieved in the boom year of 1929, and only several million pounds under the best year enjoyed by the industry, 1937, when a production of over 24,000,000 pounds of forgings was reported.

Indicative of today's progress, he continues, are brass forgings with impressions deep into the part, thin webs, and utilization of the extrusion principle on forging presses used in the manufacture of valve stems. Such matters would not have been undertaken a few years ago as they would have been thought impossible commercially.

Optimism in business also is reflected by the statement of Macdonald S. Reed, chief engineer, Erie Foundry Co., Erie, Pa., saying that volume of business done last year has been better than in some recent years. He believes most of this has been replacement business and that equipment has worn out faster than it has been replaced. He reports business done by his company has been largely export, about four machines being shipped abroad for every one sold in this country, but that export business is about 90 per cent of dollar volume since average size of hammers shipped abroad is larger. About 30 per cent of hammers sold in this country have gone to some government agency.

Large Hammer Made

Outstanding activity of the year has been installation of a 35,000-pound hammer said to be larger and heavier than any steam drop-hammer previously used in this country. In spite of the fact that the number of large steam hammers, those rated at 20,000 pounds or larger, installed in 1939 exceeded the total number of such hammers in use throughout the world at the first of the year, the average size of the steam hammer sold during 1939 decreased to about 7200 pounds from the 15,000-pound figure of 1938. Mr. Reed also notes a growing use of compressed air for hammer operation, although he knows of one large air-operated press which will be changed over shortly to steam.

Commenting on the business situation in heavy forging equipment, F. C. Biggert Jr., vice president, United Engineering & Foundry Co., Pittsburgh, reveals that inquiries for new forging equipment now are coming in after many years of inactivity. It is his opinion that forging equipment, now some 25 years old, built for the large demand fostered by the first World war is

still serving the industry, and that recent demand for high-quality forgings has accentuated the weakness of these old tools, resulting in a quite noticeable increase in replacements.

A trend toward heavier forging equipment is seen by W. W. Criley, general manager, Ajax Mfg. Co., Cleveland, in citing an unprecedented demand for heavier and more powerful upsetting forging machines. The demand not only is for larger standard machines but also for larger special machines, one of which he reports as having an assembled weight of 435,000 pounds.

A novel item in forging equipment, according to Mr. Criley, is a twisting machine for twisting crankshafts of multiple-cylinder, airplane and diesel engines. This machine allows crankshafts to be forged in large steam hammers with all main and eccentric pin bearings in the same plane, thus avoiding use of expensive interlocking dies and excessive draft on impressions. Shafts then are transferred at same heat as forged to the twisting machine, where the angular relation between crank pins is established by twisting the various main bearings.

Press Forging Growing

During the past year, he further states, forging presses of the high-speed, air-clutch operated, rigid-frame type have become even more firmly entrenched as economical, high-production forging tools. Installation of these machines in one plant, is cited by Mr. Criley, where a single press is equaling the output formerly obtained from six steam hammers, three of which had been used for padding and three for finishing. He also points out a broadening of the press forging field from production of characteristic symmetrical forgings to forgings which previously had been unquestionably classified as hammer forgings.

That flow lines of metal are attracting more of the forging user's attention is pointed out by L. E. Ruby, works manager, Riverside Forge & Machine Co. division, Pittsburgh Forgings Co., Jackson, Mich. He also believes die block manufacturers are developing die blocks of better machineability with the same or increased hardness as in the past and that the trend is to more intricate shapes, reduced tolerances, less weight and more srength.

Because of recent developments, a bright outlook for coining and forging machines is seen by R. H. Jones, National Machinery Co., Tiffin, O. These include improved rigidity, ease of operation and control, instantaneous ejection and higher operating speeds. Developments and a widening variety of coining and forging work, states Mr. Jones, have resulted in a marked increase of die life, greater accuracy in parts produced, higher output and lowered maintenance cost. These have contributed in no small measure in placing the modern high-duty forging machine in the front ranks of mass-production tools.

A rapidly broadening field of application for cold forging in making small parts is noted by R. B. Kelly, president, E. J. Manville Machine Co., Waterbury, Conn. Because these parts may be made from wire in coils by heading machines rather than from bar stock in cutting machines, considerable economy is effected in small part manufacture. Reduction of machining necessary decreases scrap metal and usually two or three operations are eliminated in manufacture of the finished part. The increasing combination of type of wire material, including low-carbon, high-carbon and alloy wire, improved header mechanism and the flexibility introduced by annealing between operations have greatly extended the range and kind of work done on these machines.

Progress in Steelmaking

(*Continued from Page* 224)

and the furnace sections to which they should be applied. Recent improvements in bessemer steelmaking suggest tremendous possibilities for the duplex process.

During the year a further increase in use of water-cooled ingot molds both for casting individual ingots and continuous casting of ingots and strip was recorded, comments E. R. Williams, president, Vulcan Mold & Iron Co., Latrobe, Pa. Several continuous casting processes are now in commercial production on nonferrous metals and steel ingots at commercial speeds and quality. Expanded use of continuous casting of steel is anticipated this coming year.

Rounding out of capacity and production facilities, begun in 1939, should be continued in 1940, in the opinion of L. M. Gumm, manager, steel mill and metalworking industry sales, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This may be expected to show up mostly in improvements and additions to the finishing and processing departments, although not confined to these. It may show up as a new billet mill, changes in driving or control equipment, increase in power producing facilities, provisions for handling special grades and finishes of steel, etc. Continued activity also is probable in both arc and induction melting furnaces.

New electrical equipment for hot strip mills was much in the picture in 1939 with one new mill built and several old ones modernized to handle heavier coils, reports L. A. Umansky, industrial department, General Electric Co., Schenectady, N. Y. The trend toward increasing rolling speeds of cold strip mills is requiring larger motors and generator equipment. Refinements include accurate gaging and tension regulation.

Strip finishing departments are acquiring a growing prominence. The electrical equipment for pickling, cleaning and shearing lines is being more closely integrated with mechanical equipment, Mr. Umansky states. Use of photoelectric pinhole detectors for tin plate is gaining prominence. A new regulating system for running strip at constant speed and tension during surface grinding operations has been applied with success.

Furnace Performance Improved

In the past, it has been necessary to compromise with quality due to limitations of furnaces, but today, declares P. M. Offill, vice president, Amsler-Morton Co., Pittsburgh, furnaces are being built that produce exact, uniform results that can be duplicated at will. Automatic control contributes considerably to performance of these furnaces, but design must be fundamentally correct. This modern type of furnace will contribute toward making steel manufacture a precise science.

In 1939, annealing of coiled material in strip, rod or wire form was improved through use of cylindrical bell-type furnaces employing vertical high-temperature alloy radiant tubes and internal atmosphere recirculation. So states J. L. Whitten, sales manager, Lee Wilson Engineering Co., Cleveland. Combustion takes place inside the tubes and products of combustion are excluded from the furnace chamber. Radiant heat is regulated vertically as well as circumferentially from a single control valve. This system lends itself well to dual temperature control, that is, control from tube temperature as well as from charge temperature at times when either should be the dominant factor.

With this furnace, Mr. Whitten explains, was developed high-speed gas recirculation entirely within the work chamber. Fans are effective in reducing heating time under the bell and in improving uniformity of structure in the charge. Develop-

ment of furnace atmosphere use has gone along well with improvement in furnace construction. In wire mills, it is stated, annealing can be accomplished with 60 per cent reduction in cleaning costs as a result of better surface conditions.

Efficient production demands controlled conditions during all stages in operations from blast furnace to finished steel. Controlled conditions, asserts M. J. Bradley, Leeds & Northrup Co., Philadelphia, requires tools for measuring and controlling temperature, pressure, flow combustion, etc. Thus instruments in all departments of the steel industry have become necessities.

In the open-hearth, for example, temperatures of the roof, hot end of checker brick, in the checker flues, before and after the waste heat boiler, are measured. In several shops, temperature of molten steel is measured before the heat is tapped. Furnace pressure is measured, recorded and controlled; fuel supply and combustion air is metered and controlled; and other conditions are measured and controlled. Similar tools for control of operation conditions are used on soaking pits, reheating furnaces, hot billets, forgings, strip passing through mills, etc.

New Instruments Developed

The change in attitude of operators in favor of these working tools has led to improvement in construction, accuracy, reliability and adaptability of the tools or instruments, Mr. Bradley maintains. In fact, many new tools based on fundamental principles have been developed to measure conditions which were beyond scope of available instruments a short time ago.

One of the high spots in this year's steelmaking history is the maintenance of all standard qualities through the tonnage peaks of recent weeks, declares M. J. Conway, fuel engineer, Lukens Steel Co., Coatesville, Pa. While concern for economy has been of foremost importance, mass production and high tonnage have in no way seriously impaired quality, a compliment which can be enjoyed by all steel producers. This shows conclusively that processing steps from the open hearth through the mills are well under control and are not materially affected by switches in raw material proportions.

Heating and steel conditioning have been given full study the past year, Mr. Conway adds. Flame conditioning of alloy steels in place of grinding, stepping up chipping speeds, application of a reasonable amount of automatic control to ordinary heating operations and development of furnace pressure control for reversing regenerative soaking pits—all have contributed to the preparedness to meet increased business without sacrificing quality.

An interesting development, attracting its first general attention in 1939, was a process for producing composite metals by the carbon arc (STEEL, Jan. 30, p. 38). Invented by R. E. Kinkead, consulting engineer welding, Cleveland, the process is carried out by fusing on the surface of an ingot, slab or billet before rolling a layer of the clad material, such as 18-8 stainless steel or chromium. A bond is produced which remains intact during subsequent rolling operations into sheet or strip. Recently a patent for the process was granted, and a large equipment manufacturer licensed to produce the machinery and equipment required in the process.

In commenting on the process, Mr. Kinkead asserts that stainless steel will be made on carbon steel to give a composite comparable in price to the older products. Also, application of the method to making composite metals competitive in the field of tin plate and galvanized appears likely. Speaking of other uses of

welding in the steel industry, he states that further development of billet conditioning is probable and that developments are under way for reducing cropper losses in ingots.

Speaking of progress in steels, W. J. Priestley, vice president, Electro Metallurgical Co., New York, points out that incorporation of small amounts of columbium and titanium in the austenitic chromium-nickel stainless steels has resulted in the ASME boiler code committee approving their use for welded pressure vessels. Another application of stainless made possible by use of columbium or titanium was that of all-welded tank cars. Cold rolled stainless for light construction has been improved in elastic properties by a 400 degrees Fahr. heat treatment.

Presence of molybdenum has been found effective in increasing resistance of 18-8 to localized corrosion or pitting, he continues. Additions of small percentages of silver also are described as beneficial for the same purpose. It has been found advantageous to increase the content of nickel and manganese for better workability in the more complex austenitic stainless steels containing titanium, columbium or molybdenum alone.

Calcium alloys are being used in wrought alloys. Where extreme cleanliness is desired and where fine grain size is not a requisite, calcium-manganese-silicon can be used as a final deoxidizer, Mr. Priestley asserts. It is apparently inert as far as grain refining action is concerned, and is a powerful cleansing agent. Another interesting development in deoxidizers is use of special combined deoxidizing and scavenging alloys and grain refiners. One such alloy, containing silicon, aluminum, vanadium and zirconium, has been found helpful in producing fine grained steel of increased impact strength without formation of harmful segregated inclusions. A special modification of this alloy increases hardenability of engineering steels in addition to controlling grain size and inclusions. Progress has been made in eliminating age hardening in sheet steel.

A recent development in terne plate is of interest. Following development work in continuous coating on long strips, Follansbee Bros. Co., Follansbee, W. Va., has succeeded in combining its experience with cold strip rolling and electrocleaning facilities. With improved, patented methods of annealing, pickling, coating and processing, terne roofing is made in rolls of 50 and 100 feet and longer without seams, states C. H. Manion, the company's chief engineer. A description of the process appeared in STEEL, for Feb. 13, p. 50.

Metal Finishing

(*Continued from Page* 240)

two and three-color finishes—aluminum, gray or black for the substructure, green tint for the body of the bridge and aluminum for highlighting. The effect is quite pleasing, and protective qualities are much better due to improved vehicles.

Dry metal will not rust. Thus a good anticorrosive coating must be moisture-proof and alkali-resistant, says Dr. C. D. Valle, H. Forsberg Co., Cleveland, who adds that the 100 per cent phenolic resin finishes have proved useful under the severe conditions encountered in exterior exposure. Such a coating, formulated essentially from synthetic material, has demonstrated perfect adhesion to all types of metal including steel, brass, copper, aluminum, cadmium-plated ware, chromium-plated material, zinc-galvanized surfaces, tin, etc.

Possibly a most important development in porcelain enamel industry is application of decreased weights to give a thinner finish

capable of withstanding abuse to a much higher degree than thicker coatings, according to D. B. Walters, vice president, Chicago, Vitreous Enamel Product Co., Cicero, Ill. He explains that these lighter weight applications have been made possible through increased covering power or "opacity," which in turn has resulted from work by frit manufacturers. Another development is a practical "one-fire" colored porcelain enamel which permits obtaining the cleanliness and durability of porcelain enamel at minimum cost.

An outstanding development in material has been introduction and widespread use of premilled enamels. Ground to about 80 mesh by the frit producer and supplied in powder form to the enameler, only about half the time is required to grind such powder to standard fineness as necessary for regular enamel frit, advises J. E. Hansen, director of service, Ferro Enamel Corp., Cleveland. This automatically eliminates possibility of mill rooms becoming bottleneck of the enamel plant and increases their capacity as much as 50 per cent.

Domestic Clays Developed

With commencement of hostilities in Europe, Mr. Hansen adds, the enameling industry was faced with a shortage of enameler's grade of clay formerly imported from the Vallendar district of Germany. This stoppage of material was anticipated, and one source of enamels and supply items already has developed a blend of domestic clays to replace Vallendar clay. Other domestic clays are being tried commercially, so no doubt the enameler will have choice of several satisfactory materials in 1940.

Richard H. Turk, executive vice president, Porcelain Enamel & Mfg. Co., Baltimore, emphasizes development of automatic multicarload handling equipment; general adoption of continuous smelting process; a process by which clay is milled to micron fineness.

An interesting development that may change porcelain enamel practice considerably, as pointed out by Lawrence Blazey, secretary, Designers for Industry Inc., Cleveland, is the new process of applying a ground coat to enameling iron and then spraying the enamel finish coat right over it and fusing both in one fire, reducing handling and firing time.

An important installation of porcelain enamel noted by W. H. Brett, secretary, Enamel Products Co., Cleveland, is the recent application of white porcelain steel lining to the Liberty Tubes in Pittsburgh. Other recent installations include a large quantity of elevator cabs for multiple-story housing projects in metropolitan New York.

An important trend is pointed out by George Switzer, industrial designer, New York, who says that there is a new enthusiasm and willingness to do whatever is necessary to find a better finish and that this is not limited to suppliers but manufacturers, executives, workmen and everyone in the industry is included. An interesting new finish for plastics, he adds, is an unusual rich looking satin obtained by sandpapering with a fine paper, a new process now being done on a production basis. The new finish looks and feels like ebony. A new method of protecting aluminum seals the surface, is economical, durable, and so permits use of aluminum in many places where corrosion heretofore prevented.

Richard Rimbach, technical advisor, Standard Steel Spring Co., Coraopolis, Pa., emphasizes the important possibilities of Corronizing, a new metallic pore-free coating developed by that company. This coating exhibits remarkable corrosion resistance in the most severe

Behind the Scenes with STEEL

A Job Well Done

■ Forty-eight thousand pounds of coated paper, cover stock, cardboard, printer's ink, silk thread and glue were trucked into Cleveland's main post office late last Saturday afternoon. A few blocks away in the lake-front Penton building twenty-four worn-out editors, a crew of foot-sore advertising salesmen, dozens of weary printers and a raft of exhausted office helpers piled into overcrowded elevators and headed contentedly toward home. Worries, differences, hard work and late hours were forgotten now, wrapped up and recorded in the best—the most complete—and certainly the most attractive YEARBOOK OF INDUSTRY ever published, now resting heavily in your hands.

Don't Mind Us

■ We've bothered everyone for weeks to get advance forms and have pieced together all 402 pages so we can give you a short and snappy epitome of this elephantine edition, which, as you know, means we'll slice it as thin as possible.

Miles Of Smiles

■ To begin appropriately let's hop 'way up front to that gorgeous five-color lithographed cover sponsored by Timken. The young lady's rosy cheeks and lovely shade of lip rouge are the selection of an expert board of judges who ended up with a very tasty dish. If you would like a life-size copy of the little lady for your office lap tear off the top of your Pontiac and send it collect direct to Canton.

Some Highspots

■ And now if you can tear yourself away, let's trot along up the page numbers through a collection of the best industrial advertising we've ever seen. It's hard to resist a nod of recognition to Bethlehem's simple dignity, and to Roebling's mickanic, Bill Smith. The spread by J. & L. is simply beautiful, to say nothing of that swell pair of huskies Blaw-Knox introduces. There are dozens of others worth more than just a mention, but, my gosh, we have to get a few plugs in for that new editorial index on the baby pink paper stock. To find things in STEEL's Yearbook now, is just like rolling daintily off a fresh cut Yule log. Whip into the pink section and spot your page. It will give you anything but the Rose Bowl winner.

Real Meat

■ And so at long last we get to the editor's review of this issue which you may find a bit more intelligent than this drivel. But then, of course, he's too modest to come out flat footed and brag about such things as the swell articles on the shape of things to come, or the excellent reviews of the major steel consuming industries. We're not beyond saying they're the tops, and so are the technical reviews, the Business Trend charts, the market summaries and the whole shootin' match. As Plymouth Locomotive says "Seeing is Believing" and we want you to take time to see every page of this book. The tonic will be just as stimulating as that snappy looking ad by Lee Springs.

Happy New Year

■ So strike a match on the Norton grinding wheel, light up a Xmas stogie and go through page by page until you come to Lee Wilson's *Smooth Sailing* on the inside back cover. We hope your New Year will be just as peaceful and that all of your good resolutions and best wishes come to pass. And don't wear yourself out so on Saturday night that you can't even get organized for New Year's eve. These double-jointed week-ends are bad.

SHRDLU

applications. Thus it has an almost unlimited field of application in structural work on sucker rods for oil wells, and similar conditions of exposure or corrosion. Shop tests show Corronized steel sheets can be drawn and welded without impairing their corrosion resistance. For other details, see STEEL, Oct. 23, 1939, page 42. Several large steel companies soon will produce products made from Corronized rolled steel sheet and strip, according to an announcement.

Alfons Bach, designer, New York, mentions increasing acceptance of stainless steel in kitchen and home furnishing work, and points to the use of steel furniture and steel sections or prefabricated panels in small dwellings as having important possibilities. Much of this expansion in use of steel has been due to the attractive finishes available, he adds.

John Vassos, designer, Norwalk, Conn., regards removing the metallic sound from steel furniture as an important advance made possible by rubber mountings. He regards the lack of color as a disadvantage which shortly will be overcome by development of inherent, permanent color in steel, either through electroplating or oxidation. The radio industry already has developed oxidized and lacquered finishes for bezels which have been enthusiastically received.

New Flame Processes

Flame dehydrating and descaling has experienced remarkable development, according to G. V. Slottman, acting manager, applied engineering department, Air Reduction Sales Co., New York. Many fabricators of structural sections now favor this method of cleaning steel prior to painting. The Linde Air Products Co., New York, states this method is much faster than comparative cleaning methods. Steel foundries, for example, have found castings can be descaled in as little as one-fifth the time required for chipping.

An interesting development pointed out by American Chemical Paint Co., Ambler, Pa., is application of the spray-granodine protective coating without heating. Previously employed only in a heated solution, this new development is important to finishers of refrigerator cabinets, sheet metal parts of automobiles, washing machines and similar items as use of unheated solution effects substantial savings in steam and makes possible economies in use of chemicals employed. This company also reports greatly extended use of the thermoil-granodine coating to prevent wear on surfaces experiencing friction such as cam-

shafts, valve tappets, piston rings, and the like.

Speaking of wear resistance, W. H. Spencer, manager foundry division, Wilkening Mfg. Co., Philadelphia, says a surface treatment of cast iron for wear resistance, particularly for resistance to scuffing has proved valuable. Phosphates, sulphides or oxides formed on the surface of the iron are major methods. A recent development has been production of an improved oxide coating made possible by giving the surface an acid treatment after its formation during heating. New coating reduces wear over a longer period of time due to its improved adherence to the metal.

Important new automatic finishing machines have been developed, states F. P. Romanoff, Apollo Metal Works, Chicago. He mentions a new automatic buffing machine; a new coloring composition using aluminum powder with silica; production of ductile prefinished coatings on steel, copper and brass which can be fabricated so no openings will be encountered at angled and drawn areas.

Operate Automatically

B. C. Gardner, DeVilbiss Co., Toledo, O., also includes development of automatic machines as one of the advances this year. He says greater manufacturing activity, faster production schedules and necessity for lower production costs are responsible for increasing demand for automatic finishing and coating machines. Many unusual machines have now been developed for high-speed product finishing. Other trends include continued adaptation of spray equipment to changes in finishing materials, development and extensive use of water wash and other types of modern exhaust equipment to handle more adequately vapor and residue of newer finishing materials and faster finishing processes.

Automatic finishing equipment has been applied to clock cases, pencil barrels, lipstick holders, can tops, lithographed sheets, steel pipe, barrels, battery cases, floor and wall tile, flashlight shells, electric motors, generators, air silencers, camera spools, bottle tops, metal cans and many other items, according to H. S. Willson, Paasche Airbrush Co., Chicago. Another interesting development, he adds, is application of flock, a suede-like finish made of wool, cotton, rayon or silk. This is proving popular on metal novelties. It also is being used in airplanes for sound deadening.

Specifications for red lead paint are changing from the usual linseed oil type of vehicle to the glyceryl phthalate type, a synthetic with decidedly superior drying qualities, says Benjamin Joachim, president, Joachim Research Laboratories Inc., Brooklyn, N. Y. Introduction of dehydrated castor oil has improved the quality of white baking finishes and brought them within an economical range, particularly in view of the present high prices of China wood oil.

J. F. Barnes, Barnes & Reinecke, industrial designers, Chicago, states that although a number of manufacturers have sought some finish to replace wrinkle lacquer to obtain freedom from dust and a more pleasant touch, they find that there is nothing satisfactorily able to provide the good coverage, hiding power and durability of the wrinkle finish. He believes there is a real market for a smooth finish that will give all the advantages of wrinkle as to price, durability and coverage.

A new development in the field of plating on zinc is a method of electrodepositing a black coating containing nickel and molybdenum, reports H. A. Nelson, assistant to general manager, technical department, New Jersey Zinc Co., Palmerton, Pa. He adds that some progress has been made toward estab-

lishment of standard specifications for plated coatings on zinc. A new transfer method for producing woodgrain finishes on zinc without baking also is attracting attention, specially in the automotive industry.

Increased use and acceptance of highly oxidized red lead is shown by the fact that federal and A. S. T. M. specifications have been changed to include the 97 per cent grade in addition to 85 and 95 per cent grades, advises C. H. Rose, National Lead Co. research laboratories, New York.

Many new developments in prefinished sheet and strip mark 1939, according to C. C. Struever, general manager, American Nickeloid Co., Peru, Ill., who says that two new grades of steel-base materials were introduced in February, 1939: American Bonded B and C grade nickel steel and chrome steel sheets and coils with a utility grade base metal. Both new types are available in sheets up to 160 inches and longer, in widths up to 24 inches. Long coils up to 2000 pounds can be produced.

Probably most important in prefinished metals was recent introduction of prefinished nickel plated and chromium-plated aluminum sheet, said to be the first commercially acceptable plated aluminum. The bond is guaranteed against peeling, lifting or chipping.

The material can be soldered successfully with ordinary 50-50 solder and regular cut acid, a feature that makes it usable where aluminum alone is impractical. Both these new metals will withstand temperatures up to 750 degrees Fahr. without surface discoloration or excessive warping.

The aluminum with nickel and chromium finishes is available in sheets up to 36 x 96 inches in a full range of tempers and in gages from 0.010 to 0.064-inch. A choice of bright or satin finishes — striped, crimped or corrugated patterns — adapt the new prefinished metals to many uses and designs. They can be bent, stamped or moderately drawn without damage to the permanently-bonded coatings.

Fabricating methods and design of products to obtain advantages of use of prefinished metals also experienced important advances.

Joining and Welding

(*Continued from Page* 212)

cating, designing, qualifying and bidding on welded structures, have become much more standardized. A large number of qualified welding operators and availability of improved equipment and electrodes have had a beneficial effect. Important developments contributing to reduced costs include use of press-brakes to keep welds to a minimum, alternating-current welding with positioning fixtures and large-diameter heavily coated electrodes of the concave fillet type, application of work-efficiency methods to expedite deliveries, liberal use of grinding and shot-blasting.

S. M. Humphrey, of Taylor-Winfield, believes development of the new process of welding aluminum using an energy storage system will help eliminate instantaneous demands on power systems found in conventional welders; will permit higher quality, more uniform welding of heat-treated aluminum alloys than at present; may have considerable bearing on future use of resistance welding in aircraft. Another important development is the Vasco process of percussion welding, consisting of a condenser charged to high voltage and discharged across a gap between the two parts to be welded. Resultant arc produces the required heating of parts for the weld, permits butt welds to be made in hitherto unweldable combinations of materials. For example, copper may be butt-welded to stainless steel. In fact, almost any conceivable combination of metals may be welded satisfactorily by this method.

C. L. Hibert, Consolidated Air-

craft Corp., San Diego, Calif., says spot welding of aluminum alloys is gradually becoming a production process, at least one manufacturer already attempting a complete welded airplane. Other manufacturers are expanding spot welding from unstressed parts to primary structures. A new development originating in Paris and introduced here this past year is a new spot welder machine employing an inductive discharge and using a three-way rectifier for the direct current charge. High peak loads are eliminated because the energy is stored over a period of time. Another novel feature of this equipment is a compression and recompression cycle of electrode pressure.

J. B. Johnson, chief of materials laboratory, materiel division, War department, Air Corps, Wright Field, Dayton, O., also believes introduction of spot welders utilizing stored energy and the variable-pressure cycle an important development. This combination produces spot welds in aluminum alloys with improved tensile strength Another development is small-diameter electrodes which permit welding extremely thin sheet with minimum distortion of the joined surfaces.

J. H. Deppeler, chief engineer, Metal & Thermit Corp., New York, points to increasing use of automatic welding machines with the type of head which allows use of coated electrodes by slitting this coating. In 1940 this should result in the further increase of flat welding and use of much narrower gaps, he believes.

Coating A Problem

Increasing use of various types of coated metals requires development of welding techniques and materials for efficient welded structures. A new method of welding galvanized iron by use of tin-coated electrodes and the carbon arc has been announced and no doubt will be extended during the coming year, states A. R. Eckberg, superintendent, engineering and maintenance department, Eastman Kodak Co., Rochester, N. Y. The possibility of using nickel or nickel-chromium electrodes on some plated metals, such as Corronized sheet, remains to be developed.

Use of welding and cutting in many new fields has seen development of new types of mechanical cutting machines to meet these new requirements, says G. V. Slottman, acting manager, applied engineering department, Air Reduction Sales Co., New York. Cutting ranges have been increased and additional torches added so as many as eight cuts can be made simultaneously. Preparation of beveled surfaces for subsequent arc or gas

welding has been speeded up by using three torches on the machine, thus properly preparing the edge in one pass. Machining U-grooves when preparing heavy plates for welding has been an expensive operation until recently. However, this now can be done with oxy-acetylene torch at low cost.

Greatly increased speed of oxy-acetylene welding equipment is noted by The Linde Air Products Co., New York. A spectacular example, is a recent increase in speed of tube welding of 300 per cent. It is now possible to weld continuous tubing of 20-gage material at 50 feet per minute. A few years ago, 15 feet per minute was considered good. Mechanization of the oxyacetylene process has been extended to many other fields, including welding of steel containers, aluminum beer barrels and mechanical bronze welding using a vapor flux. This last is applicable not only to steel but also to nonferrous metals, such as Everdur and copper, at speeds from 6 feet per minute on 20-gage material to 3 feet per minute on 11-gage. Mechanical welding at more than 10 feet per minute has been done successfully in material as thin as 28-gage.

Standards Developed

In the field of fastenings, W. C. Stewart, technical advisor, American Institute of Bolt, Nut and Rivet Manufacturers, Cleveland, reports important progress in research and standardization. The bolt, nut and rivet industry produces about a half-million different standard parts which must be substantially identical as made by different manufacturers, a complicated standardization problem. A committee is sponsoring an investigation of effects of errors and elasticity on strength of screw threads at Massachusetts Institute of Technology. Another project is the study of shearing strength of derrick bolts in co-operation with American Petroleum institute.

A. M. Jones, general sales manager, Buffalo Bolt Co., North Tonawanda, N. Y., lists the following as important points of progress made in 1939: Better metallurgical control of steel and various processes used in making bolt and nut products, improved heat-treating facilities to obtain maximum physical properties in bolts with minimum decarburization, better design and greater accuracy in making tools, more efficient machinery for bolt and nut manufacture, closer inspection to insure meeting present rigid requirements.

H. Mayoh, American Screw Co., Providence, R. I., notes greatly increased demand and broader acceptance by diversified industries of Phillips-type screws and bolts. This type is now available in wood

screws, machine screws, stove bolts and various types of hardened self-tapping sheet-metal screws including one with a shake-proof thread cutting. There appears to be a growing market for sheet metal screws, especially in the plastics field.

W. G. Uhler, sales manager, Cleveland Cap Screw Co., Cleveland, regards 1939 as an important milepost in advancement of cold-heading practice. Use of new cold-heading equipment permits work heretofore impossible. Products made by new heading methods are definitely superior in accuracy, grain structure and tensile strength.

The past year saw developments in connection with the Perma-Grip method of joining sheets to framework, says Ernest Schaefer, Schaefer Permagrip Enterprises, Cleveland. It is now possible to construct automotive-type bodies entirely of metal using Perma-Grip fasteners and using the steel sheets as structural elements.

Designs for structural steel frames with shop connections that are welded have been developed during the past year in which all-steel connections may be "rivet-bolted" by the erector, reports H. W. Cram, sales manager, Dardelet Threadlock Corp., New York. Use of welding in many instances has increased opportunities for Dardelet rivet-bolt.

Now Maintain Tightness

C. C. Washer, vice president, Philadelphia Steel & Wire Corp., Philadelphia, believes engineers today are giving much more thought to maintaining tightness in bolted assemblies than heretofore. Several bulletins have been issued by the spring washer industry on the subject of maintaining tightness in bolted structures. Dealing with the causes of bolt looseness and its cure, this has been a valuable addition to available literature.

Morgan R. Kavanagh, general manager, Oliver Iron & Steel Corp., Pittsburgh, notes threadrolling has practically supplanted cutting on diameters and lengths suited to this process. He also reports much progress made by use of microscopic examination in elimination of laps and bad thread form. A recent development in fastenings is the rivet-bolt and drive-grip bolt used where either objectionable noise or inaccessibility makes straight riveting inadvisable. Made with both soft and case-hardened knurls which bite into the hole, this type of bolt prevents turning of the bolt while the nut is being run up.

Advances in portable hand-driven tools—especially in electric screw drivers and such — permit greater speed in assembly with increased accuracy, declares N. C. Hurley, Jr.

vice president, Independent Pneumatic Tool Co., Chicago, who adds that methods are being developed so even the screw can be picked up and placed in the hole mechanically. Thus the operator never even touches the screw, nut or bolt as the case may be.

Pierre Champion, president, Champion Rivet Co., Cleveland, mentions cold riveting is being investigated by such authorities in this country as bureau of public roads, American Institute of Steel Construction and others. He notes an interesting development in welding of armor plate. While little is known at the present time concerning welding of armor plate, he believes it will be done successfully.

An interesting development in riveting is described by L. A. Ward, consulting engineer, Tomkins-Johnson Co., Jackson, Mich. It involves punching the hole, placing the rivet and forming the head without removing the work from the machine. This is done automatically, one arrangement using the rivet itself as the punch to form the hole.

Multiple hydraulic piercing of holes in relatively heavy plate is a new development having many advantages, points out Otto J. Maha, vice president, Hannifin Mfg. Co., Chicago. Multiple punching eliminates constant inspection of spacing and location of holes. By use of small, compact hydraulic piercing units mounted on framework to fit the work at hand, holes can be punched simultaneously from various angles without interference with one another due to small size of the punching units. A typical job is the multiple punching of heavy plates for automobile chassis side rail including several angles and curves, all done in 4 seconds. Such a machine can easily be rearranged to suit design changes from year to year without costly changeover.

Die Casting

(*Continued from Page* 242)

sulting engineer, Forest Hills, N. Y., notes this fact as contributing to full-time operations now being enjoyed by most commercial die casters.

Castings suppliers also are equipping their plants with more conveyor equipment to speed handling of castings through machining and plating operations, says Mr. Chase. In some plants slab zinc is melted, alloyed, cast, the castings machined, plated and packed for shipment all in the space of about 2 hours. Safety of machine operators likewise is being given more detailed attention, one plant having equipped all casting machines with mirrors permitting the operator to see all interior parts of the die when it is opened, while remaining at the end of the machine where controls are located. This, of course, also entails automatic ejection and conveyor equipment to move the casting from the machine.

Dependable alloys and better casting methods have gone hand in hand in making possible the casting of larger pieces and thinner sections, in the opinion of Marc Stern, superintendent, die cast division, AC Spark Plug division, General Motors Corp., Flint, Mich. Citing competition between die castings and plastics, Mr. Stern notes that unusual effects have been achieved in automotive instrument panels by combining the two.

Less than two years after introduction of the first zinc alloy die cast lawnmower, six other mower manufacturers have instituted the use of die castings in current models. This represents an interesting departure in a field where manufacturing tradition is particularly strong, notes R. E. Kellers, market development division, New Jersey Zinc Co., New York. He also cites another field where die castings have made an important foothold,

the oil burner industry where five years ago die castings were unheard of while today every prominent producer uses some castings for decorative or functional purposes.

D. L. Colwell, Paragon Die Casting Co., Chicago, observes the encouraging results of the business upturn last fall which meant two or even three-shift operations for many. He also confirms the trend toward use of the cold-chamber type of machine for casting aluminum, which permits positive alloy control; and finally sounds a warning to zinc die casting producers against dangers of contamination resulting from use of secondary alloy which is appearing here and there.

Control of impurities in present-day zinc alloys, now available in purity of the order of 99.99 per cent plus, impresses B. Sandell, metallurgist, Stewart Die Casting division, Stewart-Warner Corp., Chicago, as a leading factor in expanding use of these alloys. Improvements in application of metallic protective plates, together with the many new developments in organic finishes, and finally the increasing use of die castings in conjunctiin with plastics are other favorable trends.

Employing Higher Pressures

Classifying his comments under the headings of equipment, methods, alloys and dies, A. D. Weigolt, Precision Castings Co., Cleveland, points to the definite trend toward higher pressure hydraulic machines with an eye toward obtaining structurally a more solid and uniform casting and finish; use of more efficient means of handling, often involving specially constructed trays and conveyors, machine trimming and the like; stricter maintenance of alloy standards; and more extensive use of heat treated alloy steels for the construction of dies to cast zinc.

Formerly, he states, annealed blocks were used and heat treating delayed until after production of sample lots of castings. New procedure is to use steel heat treated to hardness in the range of 240-360 brinell, so that when the die is completed it is ready for production runs. This does away with some of the unpredictable changes which take place in the die during heat treatment, often necessitating reworking at additional expense. Naturally steel companies must be accorded credit for development of alloy steels which can be machined in the heat treated condition.

Research being conducted by the New Jersey Zinc Co. to evaluate the usefulness of various materials for zinc casting dies may lead to some important recommendations when completed, in the opinion of B. W. Gonser, Battelle Memorial Institute, Columbus, O. He foresees

the eventual development of dies which will resist fatigue cracking due to sudden temperature change stresses, thus making available many of the borderline alloys, such as aluminum bronze, high-tin bronze and some copper-nickel-zinc analyses, in die cast form.

Mr. Gonser mentions the recent development of an alloy containing 83 per cent copper, 10 zinc, 5 silicon, 1 manganese and 1 aluminum, which has a melting range of 1513-1566 degrees Fahr., or as low as the lowest melting brass in use. As die cast, this alloy shows tensile strength of about 110,000 pounds per square inch, yield strength of 84,000 pounds per square inch, brinell hardness of 182 and elongation of 3.5 per cent in 2 inches. Castings as produced are bright and clean, requiring no further surface finishing. The alloy is used commercially for making die castings of unusual strength.

Chief deterrent to the more general use of the brass die casting process continues to be the inability to obtain die steels which will resist the high heats involved, concludes W. W. Sieg, general manager, Titan Metal Mfg. Co., Bellefonte, Pa. He sees as the most important advance in brass die casting during the past year the production of parts involving deep core work and thin walled sections.

F. W. McIntyre, vice president and general manager, Reed-Prentice Corp., Worcester, Mass., declares that his company has been concentrating on improvement of the high-pressure type of machine for producing aluminum, brass and magnesium castings by the positive-plunger or cold chamber method. Production of the older type of machine which used air pressure to force metal into the die practically has been discontinued. Higher pressures under which metal is injected and the increasing size of parts cast have made it necessary as well to increase locking pressures. Another advance cited by Mr. McIntyre is the standardizing of machines so that it is possible to convert readily from the ladle type as used for brass and light alloy, to an automatic zinc machine of conventional form. Some additional parts are necessary, of course, for the conversion.

Die Steels Are Improved

A die steel which has proved satisfactory for brass die casting is mentioned by M. K. Smith, metallurgist, Latrobe Electric Steel Co., Latrobe, Pa. A tungsten tool steel, it has the following analysis: Carbon, 0.30; silicon, 0.45; manganese, 0.35; tungsten, 9.00; chromium, 3.25; and vanadium 0.45 per cent. When heat treated to 400 brinell, this steel has given uniform results in die casting of brass.

Three types of die steels are supplied to die casters, one for the low melting point alloys such as zinc, tin and lead; one for intermediate metals, primarily aluminum but some magnesium; and the high melting point alloys such as brass. N. I. Stotz, Universal-Cyclops Steel Corp., Titusville, Pa., points out that the fields of the first two classifications sometimes overlap, but in general inexpensive die steels of the intermediate carbon type, with either manganese, chrome or vanadium individually or in combination, are used in the first classification. As mentioned previously, there is a tendency toward use of bars in a state of intermediate hardness rather than annealed. Since modern tool efficiency will permit machining much harder materials than heretofore, Mr. Stotz suggests this trend will continue, studies already being under way on the effect of lead in these compositions, permitting machinability possibly up to 300 brinell.

In the intermediate metal field, the industry has standardized fairly well on steel which is essentially 0.35 carbon, 5 chrome and 1 per cent mo-

lybdenum. Mr. Stotz points out that fully 80 per cent of aluminum die castings are made in dies of this composition.

Best results in the brass die casting field seem to be with low-carbon semihigh-speed steels with 10-12 per cent tungsten, but such steels are accompanied by certain drawbacks including difficult machinability, damage to surface from excessively high hardening heats, distortion, and the like. The ultimate brass casting die, Mr. Stotz suggests, may even be a nonferrous material, although many of the stainless steel analyses have yet to be investigated.

Further comment on die steels emanates from Floyd Rose, vice president, Vanadium-Alloys Steel Co., Pittsburgh. He cites the availability of a die steel for casting of aluminum alloy at approximately half the cost of former steels, which makes it economical for zinc-base metal casting as well. Typical analysis shows 0.33 carbon, 0.90 silicon, 0.30 manganese, 4.75 chromium, 1.20 tungsten and 1.40 per cent molybdenum.

With increased pressures used in die casting, some difficulties have been experienced from amalgamation or penetration of die surfaces by the metal being cast. This can be overcome, notes Mr. Rose, by nitriding the die surfaces after the impressions are polished. Conventional nitriding treatments are used at 1000 degrees Fahr.

Casting

(*Continued from Page* 246)

certain other details are regarded as trade secrets so that a specification-writing body lacks much published information which would be of use. And in this connection, confusion arises due to the improper use of statistical data as a basis for specification making. Everyone recognizes no commercial material can be made to conform rigidly to an exact specification; some tolerance must be permitted and this tolerance is a function of the manufacturing process and the precision of its control . . . If the material is to be an article of commerce, then it is necessary that the specified value represent a figure which always will be exceeded in good operating practice. How far the specified value must be below the average then is a question to be determined by the possible precision of control, without prohibitive cost which the plant can exercise."

Similar considerations are pertinent to the problem of quick annealing of malleable iron. Dr. Schwartz points out that, contrary to some opinion, annealing cost does not go down as annealing time is decreased and unless a consumer actually is willing to pay more money for a saving in time the reduction of annealing time to the lowest possible limits will not be attractive economically.

He concludes with the suggestion that "in view of the fact almost every metallurgical variable affects the annealing of malleable iron, it must be borne in mind that if one must run close to the minimum of annealing time, all these variables must be kept close to optimum conditions. Occasionally, optimum conditions are not the most economical conditions and furthermore accurate supervision also involves additional expense. The fact that optimum annealing time may represent far from optimum physical properties is another factor. Except in special cases, therefore, it is not to the interest of the user or producer of malleable iron to strive for the fastest annealing, but only for the elimination of unnecessary waste of time."

Enrique Touceda, consulting engineer, Malleable Founders' society, Albany, N. Y., sees as high spots of the past year the increase in installation of batch and continuous annealing ovens with controlled at-

mosphere, experiments in the direction of special products providing enhanced wear resistance, and the institution of an eight-week training course in metallurgy and metallography for key men in foundry operating forces, under joint sponsorship of the society and the Rensselaer Polytechnic institute, Troy, N. Y. Mr. Touceda further mentions the availability from a number of malleable foundries of a product which consistently and uniformly averages around 64,000 pounds per square inch ultimate strength; 49,000 pounds per square inch yield point, 20 per cent elongation, with no decrease in machining or properties over "ordinary" malleables.

Never more than during 1939 has the malleable iron industry stressed the importance of an average high standard of quality of product, pungently observes F. O. Parker, sales manager, Acme Steel & Malleable Iron Works, Buffalo, and president, Malleable Founders' society, at the same time paying tribute to the valuable assistance accorded shop men attending the previously mentioned training courses at Rensselaer. Important results also are expected during the present year from activities of the technical council formed by the Malleable Founders' society.

Composite molding, a new development on patterns used for high-production operations, has been found a practical and economical procedure at the Saginaw Malleable Iron division of General Motors Corp., Saginaw, Mich., according to W. H. Doerfner, general manager. He explains how groups of castings, which together make up different assemblies, such as differential or steering gear, are made in one mold. Example of one group is the differential carrier, gear case and bearing caps. Advantages include leveling off peaks of daily tonnage by a more uniform average production, decrease of pattern cost per unit produced, reduction of number and cost of pattern changes, lowering of the number of readjustment periods invariably taking place when patterns are changed, and much improved continuity of operations gained by annealing and processing work in closer ratio to shipments.

Market Education Needed

As president of the Gray Iron Founders' society, C. J. Miller, president, Fremont Foundry Co., Fremont, O., points to the increasing recognition by his industry of the fact that safety and health campaigns and equipment in the smaller foundry not only improve public and industrial relations but also yield actual profit on the investment therein. Mr. Miller also senses heightened interest in sound estimating, costing and pricing systems. He sees as the weakest point in the industry the lack of market education, or a failure on the part of users to appreciate fully what low-cost high-quality gray iron can accomplish for them.

Better control of melting processes, increasing use of automatic blast control equipment, improved mechanical charging methods, wider use of mixing ladles and further adoption of covered insulated ladles for transporting hot metal are some of the year's highlights in metal production departments of gray iron foundries, as seen by G. P. Phillips, International Harvester Co., Chicago. In molding and coremaking departments further development and application of mechanical equipment includes special molding machines for definite classes of castings, control of properties of molding sands with emphasis on use of so-called all-purpose synthetic sands and wider application of coreblowing, especially on heavy production repetitive jobs.

Mr. Phillips also notes increasing use of copper in alloy gray iron, and the development of ferroalloys containing carbide-forming elements

and economical graphitizing elements. Hot quenching of relatively thin sectioned castings, flame hardening of parts of relatively heavy sectioned castings and induction heating and quenching for high surface hardness are significant achievements in the field of heat treatment of castings.

Nickel continues a basic fundamental ingredient in alloying cast iron, a number of new examples being reported in the review, "*Nickel in* 1939," prepared by the development and research department, International Nickel Co. Inc., New York. Small additions, together with chromium or molybdenum, raise tensile strengths and wear resistance appreciably, as in truck and airplane brake drums where three-fold increase in life is reported. Nickel and a small amount of molybdenum are used in an iron showing 80,000 pounds per square inch tensile strength, ideally suited for hydraulic cylinders in power dams, rolls for ferrous and nonferrous rolling mills. Low-cost hard balls for ore grinding operations have been produced of iron containing nickel, chromium and manganese in small amounts, while liners for ore grinding ball mills have shown excellent service when made of an iron containing 4½ per cent nickel.

Promotes Better Understanding

National, regional and local activities of the American Foundrymen's association have furnished invaluable aid in promoting better understanding of technical problems. A.F.A. President H. S. Washburn, president, Plainville Casting Co., Plainville, Conn., believes that these meetings and conferences have "carried to the individual foundries in all sections of the country the practical application of laboratory developments, enabling producers of castings to meet the challenge for products suited to modern demands."

Better business, and incidentally better profits, impress W. L. Seelbach, secretary-treasurer, Forest City Foundries Co., Cleveland, as the big news of 1939, in view of the fact improved profits have permitted foundries to bring production equipment up to standard and to purchase additional equipment.

Engineers are expecting more and more from gray cast iron, declares H. W. Johnson, engineer, Greenlee Foundry Co., Chicago, and these engineers, as they become more familiar with high-test irons and alloying elements producing unusual properties, are important factors in extending the use of gray iron generally.

In lieu of reviewing the year's developments foundrywise, J. W. Bolton, chief metallurgist, Lunkenheimer Co., Cincinnati, suggests four current research projects he considers of particular interest and significance to foundrymen. They include the work of project 18 of the A.S.T.M.-A.S.M.E. joint research committee on the effects of temperature on the properties of metals, covering the influences of both austenitic and ferritic grain coarsening and refinement, with particular reference to creep properties; also the work of this committee on project 23, a fundamental research covering copper-base and nickel-base alloys, cast and wrought, in the temperature range 200-1000 degrees Fahr. Third is the extension of work of the United States Steel Corp. research laboratories on time-temperature or S-curves, a project of recognized fundamental importance. Fourth, Mr. Bolton calls attention to a useful paper presented before the A.F.A. recently on the effects of time on the graphitization reaction.

Looking for some single characteristic of the nonferrous foundry industry, N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo, concludes it is the recognition and

satisfaction of "urgent need for replenishing its equipment and making repairs to and replacement of equipment which has served faithfully but has now reached the point where changes are imperative." The process of rejuvenation in nonferrous foundries appears in full swing, with a concomitant appreciation of the added values of informed personnel and adequate metallurgical and chemical control.

Behavior of sand in the mold or in the core at elevated temperatures continues to be studied more vigorously by foundrymen, reflects Harry W. Dietert, Harry W. Dietert Co., Detroit. To improve refractoriness of mold and core, sand with high sintering temperature is being favored and precautions are taken to keep sand clean. Volume change under temperature is being controlled in part by material selection, and in part by blending the sand and controlling the degree of ramming. Hot strength of sand, as measured by the dilatometer, is increased when the green strength, clay content, mold hardness and percentage of fines are increased.

From his vantage point as president of the Foundry Equipment Manufacturers' association, P. J. Potter, vice president, Pangborn Corp., Hagerstown, Md., discerns two major developments crystallizing in the past year. One is the determination of foundry operators to make their plants safe places in which to work, both from accident and dust standpoints. A second is the rapid mechanization of all foundry operations—sand preparation, cupola charging, coremaking, molding and cleaning of castings. Various units for doing this work are being built in smaller sizes and at prices within reach of smaller foundries. Spurs to mechanization of foundries include lack of trained foundry help, wage and hour law, and the unrelenting insistence of buyers for a better and more uniform product.

W. R. Bean, vice president, foundry equipment department, Whiting Corp., Harvey, Ill., mentions the perfection of a wet gas washer and dust collector applicable to all sizes of cupolas as a noteworthy advance in equipment circles during the year. He notes that duplexing is gaining in popularity as a means of providing different grades of iron from a primary mixture, and adds that designs are in preparation for small capacity fuel-fired furnaces to meet growing needs in this field.

Bessemer Is Gaining Favor

Water jacketing of cupolas to permit longer periods of operation with less change in diameter and area in the melting zone has had measurable success and will show further benefits as designs are perfected, Mr. Bean declares, and he further echoes Mr. Melmoth's previously mentioned prophecy regarding more favorable consideration of the side-blow bessemer converter for steel foundries, because of low investment cost, low standby expense and flexibility of operation.

Better mixing of sand in the water stream and perfection of an improved "gun" have assisted in furthering the "hydroblast" cleaning of large castings in both steel and gray iron. Barrel cleaning of this type now is being perfected, according to Mr. Bean.

"In the malleable foundry field," he concludes, "mechanized molding has seen real progress during 1939, bringing with it duplexing of metal as the only logical means of providing continuous supply of metal within the carbon range required for high-quality malleable iron. There is at present no single melting unit which will provide continuous output of metal below the practicable low limit of carbon of the cupola, or the approximate range 2.50-2.70 per cent. Much work is being done to provide a melting unit to meet this world need."

Steelworks Expansion

(*Continued from Page 254*)

YOUNGSTOWN SHEET & TUBE CO.

Completed

Campbell Works: Boring and tapping equipment.

Struthers Works: Hydraulic spray equipment for merchant mills. Five wire drawing machines. Equipment for making ⅜ and ¼-inch standard pipe.

Indiana Harbor Works: Pump house. Two 800-pound boilers. Turbo generator. New ingot car and slab pushers and pilers. Billet storage yard. New shear line, continuous cleaning line, one 2-pit battery and one 4-battery annealing box furnaces at tin plate mill. Hot strip mill with full complement of buildings, three coilers and equipment for handling cut-to-length material. Shear lines, trimming lines and processing equipment for coils or cut material. Continuous picklers.

Underway

Brier Hill Works: Fuel oil storage plant, dolomite machine, 30 ingot mold cars, and hot top equipment at open-hearth. One 20-foot circular soaking pit.

Campbell Works: Gasoline-electric locomotive for handling bin cars at blast furnaces. For the open hearth, 50 ingot cars and equipment for handling hot-blown metal from the bessemer department. Relocation of power lines at No. 12 substation. Coiling equipment for No. 1 skelp mill. Pipe straightener.

Indiana Harbor Works: Combustion reversal and roof temperature controllers on three open hearths. Edger and coiling equipment at skelp mills. Three re-squaring shears at hot strip mill. Plate counting machine at tin mill.

WHEELING STEEL CORP.

Completed

Steubenville Works: Replaced and modernized benzol refining, sulphate drying and gas cleaning equipment and river coal piers at coke department. No. 1 blast furnace relined. Installation of four galvanizing lines to replace the galvanizing department abandoned at Portsmouth works.

Yorkville Works: Modernized one drying oven at lithographing department.

Beech Bottom Works: Installed two electrically-heated annealing furnaces.

Benwood Works: Replaced old blooming mill and two rows of soaking pits.

Portsmouth Works: Wire-fabric welding machine added.

Underway

Steubenville Works: 60-inch hot strip mill widened to 64 inches, its speed increased and coilers replaced. At the cold strip mill, one 3-stand tandem mill widened, the 3-stand tandem mill changed to a 4-stand 54-inch unit and its speed increased, and a 2-high skin pass mill replaced with a 4-stand unit. Four lines of galvanizing machines being installed.

Yorkville Works: Single stand skin pass mill being converted to a twin-stand unit. Modernizing two electrolytic cleaning lines.

Beech Bottom Works: Adding two electrically-heated annealing furnaces.

Benwood Works: Additional coilers on skelp mill. Replacing old buttweld mills with a continuous welding unit for making pipe from ½-inch to 3 inches diameter.

Portsmouth Works: Modernizing two open-hearth furnaces and one row of soaking pits.

Marine Department: One twin-screw diesel-powered towboat and 14 steel barges.

REPUBLIC STEEL CORP.

Completed or Underway

Youngstown: Cold mill for sizing and straightening pipe, continuous buttweld pipe mill, enlarging three open hearths, additional pipe galvanizing equipment, skelp trimmers, pipe cutting and threading units, light oil recovery plant, continuous buttweld mill and skelp coiling equipment under contract, additional pipe processing equipment.

Warren: Coil welding equipment, radiant tube annealing furnace, descaling pump, scale breaker and roll grinder for strip division; enlarged blast furnace; electro-cleaning and cutting lines at tin mills; dolomite machine; DX gas plant; pin hole detectors and classifiers in tin lines.

Central Alloy: Buildings, cold mills and auxiliary equipment for stainless steel; one 25 and one 50-ton electric furnace, two diesel locomotives, grinders and polishers, two modern sheet galvanizing units, equipment for grit cleaning of sheets, centerless grinders for bar stock, galvannealed equipment, additional annealing capacity.

Cleveland: Sintering plant enlarged, 156-inch resquaring plate shear, open-hearth control and meters, scrap drop extension, mold cars and ingot buggies, blooming mill tables improved, two charging machines, two diesel locomotives, open-hearth capacity increased, coil welders, 66-inch slitting line at strip mill, stripper crane, stretcher leveler, additions to cutting line.

Buffalo: Relined two blast furnace stoves and changed to 2-pass units, two diesel locomotives, new pumps, increased open-hearth capacity.

Chicago: Increased electro-galvanizing capacity at wire mill.

Birmingham: Installed mechanical cutting and loading equipment at coal mines, and added blowing capacity at blast furnaces.

Gulfsteel: Additional equipment to manufacture galvanized roofing, modern fuel oil supply system for open hearth,

plate mill rebuilt to roll wider stock, new hot and cold bolt and nut manufacturing division at Gadsden, facilities for making copper clad steel plates, plant for making road wire mesh for Truscon division, plate mill reheating furnace.

Steel & Tubes: Tube shaping equipment and printing machine for showing lengths.

Union Drawn: Screw machine equipment, moved Ideal Foundry to Newton Falls, O. from Beaver Falls, Pa.

Bolt & Nut: Installed additional boltmakers.

Berger Mfg.: Modernizing finishing assembly department, equipment for making kitchen cabinets.

Niles Steel Products: New building and machinery for making containers.

Truscon: Modernized stationery and printing department, equipment for making additional window products and bar joists, flash and platform manufacturing department improved.

Adirondacks: New ore concentration plant at Port Henry, N. Y.

BETHLEHEM STEEL CO.

Completed

Bethlehem: 5-story addition to main office building; one 7-inch upsetting type forging machine; addition to drop forge building.

Steelton: 4000-horsepower boiler plant and steam lines; two heating and one annealing furnace at forge shop; improvements and additions at wire rope division, Williamsport, Pa.

Maryland, Steel Division: Three benzol washers; blast furnace turboblower; addition to 12-inch skelp mill for making skelp for continuous buttweld mill; new annealing and finishing facilities at cold reducing tin mills; new Bethanizing unit and storage space for wire products.

Maryland, Shipyard: New light metal shop; two 25-ton cranes; additional machine tools.

Lackawanna: Additional finishing facilities at sheet and strip mill.

S. San Francisco: New building for 9-inch bar mill.

Los Angeles: Extension to warehouse for Eastern products.

General: New warehouse at Houston, Tex.

Underway

Bethlehem: Five narrow-gage diesel-electric locomotives; one 50-ton diesel locomotive crane.

Steelton: Addition to wire rope mill at Williamsport, Pa., 425 x 80 feet.

Lebanon: One 3000-kilowatt turbine and additional boiler.

Maryland, Steel Division: Two continuous buttweld mills including building additions, furnaces and equipment; new 4-story general office building; new metallurgical and chemical laboratory; 4-hole soaking pit at slabbing mill; equipment for making cold reduced galvanized roofing and similar sheets; two 40-ton and one 50-ton diesel locomotive cranes; additional annealing and finishing equipment line at cold reduced tin mills.

Maryland, Shipyard: Improvements and additions to two shipyard ways; extension to machine shop including additional machine tools.

Lackawanna: Welfare building for No. 2 open-hearth shop; one 17-ton ore unloader.

Cambria: Coal mixing and pulverizing plant at coke ovens; extension to warehouse for storage of fence.

JONES & LAUGHLIN STEEL CORP.

Completed

Pittsburgh Works: No. 1 open-hearth shop rebuilt and modernized. Twelve batch annealing furnaces installed and the speed of cold reducing and temper-pass mills increased at strip mill division. Four diesel locomotives replaced older equipment.

Shannopin Coal Co.: Coal cutting and loading machines have been installed.

Underway

Aliquippa Works: Additional annealing and cold finishing equipment at tin mills. Two steam locomotives to replace older units.

Pittsburgh Works: Rebuilding and enlarging one blast furnace. Rebuilding three batteries of by-product coke ovens.

Vesta Coal Co.: Twenty-four barges to replace older bottoms.

Interstate Iron Co.: Addition to ore washing plant.

LACLEDE STEEL CO.

Completed

Alton Works: One 150-ton open-hearth furnace and one 150-ton ladle crane. Increased wire drawing capacity and tube welding and finishing equipment. Boiler room improved. Pickling capacity enlarged.

Madison Works: Capacity of welded joist department increased.

Underway

Alton Works: Further increase in wire drawing capacity. Modernization of blooming mill and tables. New physical and chemical laboratory.

Madison Works: Modernization of boiler plant.

INLAND STEEL CO.

Completed

Indiana Harbor: No. 1 blast furnace rebuilt. Five 150-ton open hearths completed. One galvanizing and two tin pots installed. Sundry finishing equipment in strip mills.

Underway

Indiana Harbor: Addition to soaking pits serving 46-inch bloomer. Storage building for merchant mills.

MISCELLANEOUS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.: Principal improvements for 1939 approximate $522,000 at the Allegheny division and $167,000 at the Ludlum division, including a 22-inch reversing Steckel mill at West Leechburg plant, converting hammers from air to steam and enlarging wire department at Dunkirk plant, improving processing and finishing facilities at Watervliet plant, and new warehouses at Detroit and Chicago.

Harrisburg Steel Corp., Harrisburg, Pa.: Installed stress relieving furnace for seamless high-pressure cylinders.

American Chain & Cable Co., Bridgeport, Conn.: New plant at Houston, Tex., for manufacturing wire rope and warehousing.

Empire Sheet & Tin Plate Co., Mansfield, O.: Two electric annealing furnaces installed.

Conners Steel Co., Birmingham, Ala.: Completed electric steel plant, capacity 30,000 tons annually. The 6-ton electric furnace is the first in the Birmingham district for producing carbon and alloy steel billets.

Central Iron & Steel Co., Harrisburg, Pa.: One 65-inch lifting magnet, one 400-ampere welding machine, one metalizing spray unit, one 5-ton overhead crane with runway 150 feet long and span of 44 feet, three locker rooms and two storage buildings.

United Engineering & Foundry Co., Pittsburgh: Mills built for nonferrous rolling include a 1-stand 4-high breakdown and a 1-stand 4-high cold finishing for the Ansonia works, a 1-stand 4-high cold finishing each for the Kenosha works, and the Waterbury works of the American Brass Co. Those underway include a 4-high nonreversing cold mill for the Chase Brass & Copper Co., Cleveland, and a 4-high cold sheet mill for the Dow Chemical Co., Midland, Mich. Mills installed and underway for ferrous rolling are included in the accompanying tables.

Worcester Pressed Steel Co., Worcester, Mass.: Press shop addition 90 x 80 feet completed. New modern finishing equipment being installed.

Otis Steel Co., Cleveland: Four annealing furnaces, welding line, automatic-type soaking pit and one 10-ton gasoline locomotive added.

McLouth Steel Corp., Detroit: One box annealing cover and two bases.

Detroit Seamless Steel Tubes Co., Detroit: One annealing furnace with capacity of 2 tons per hour.

Braeburn Alloy Steel Corp., Braeburn, Pa.: New steel shear blade building, saw and lathe.

Lewis-Mathes Co., E. St. Louis, Ill.: One piercing mill to make up to 6-inch diameter copper tubes.

Rotary Electric Steel Co., Detroit: One 30-ton electric furnace installed.

Woodward Iron Co., Woodward, Ala.: Relined and air-conditioned one blast furnace. Installed an ore crusher. Work of air-conditioning another stack is underway.

Arthur G. McKee & Co., Cleveland: Completed two 500-ton stacks for Appleby-Frodingham Steel Co., Scunthorpe, England; two 120-ton tilting open hearths for the Dominion Steel & Coal Corp. Ltd., Sydney, N. S.; remodeled No. 1 stack of the Inland Steel Co., Indiana Harbor, Ind. increasing the hearth from 18 to 20 feet; installed nested tile checker in five stoves at various blast furnace plants as well as new and remodeled McKee distributors.

Baker & Co., Newark, N. J.: One 16 x 16-inch, 2-high mill with combined pinion stand and drive for rolling a wide variety of nonferrous metals.

Colorado Fuel & Iron Corp., Denver: Facilities and equipment for manufacturing welded mesh being installed.

The Midvale Co., Philadelphia: One boiler, compressor, machine tools, two treating and forge furnaces and extension to press plant completed. Improvements underway include addition to press and treatment plants, five heat treating furnaces, oil quenching equipment and machine tools.

Superior Steel Corp., Pittsburgh: One stand of cold rolls for strip production for 1940 completion, as well as miscellaneous equipment.

Rustless Iron & Steel Corp., Baltimore: Contemplating the installation of a 16-ton electric furnace to increase annual melting capacity to 53,000 tons.

Freyn Engineering Co., Chicago: Through British associates, Ashmore, Benson, Pease & Co. Ltd., completed construction of the first of two 500-ton stacks at Colvilles, Ltd., Glasgow, Scotland. No. 2 stack under construction.

Granite City Steel Co., Granite City, Ill.: Added three radiant tube annealing furnaces.

Vulcan Detinning Co., Pittsburgh: Plant under construction to house new equipment designed to increase efficiency of chemical detinning process.

American Rolling Mill Co., Middletown, O.: Replaced steam-driven blooming mill with modern slabbing mill. Hot strip mill revamped and widened.

William B. Pollock Co., Youngstown, O.: Plate work for remodeling three stacks of the Inland Steel Co., the American Rolling Mill Co. and the Republic Steel Corp.

Monarch Steel Co., Indianapolis: Storage building, pickling unit, power house, and large building for housing new cold drawn mill under construction.

Lewis Foundry & Machine, Pittsburgh: Mills built or under construction include one 60-inch 3-high breakdown, France. Two 52-inch 2-high breakdown, Tata Iron & Steel Co., India. One 60-inch 3-high breakdown, Sweden. One 5-stand 2-high aluminum foil mill, Cochran Foil Co., Louisville, Ky. One 44-inch 3-high breakdown, Algoma Steel Co., Canada. One 12-inch 2-high cold mill, Dow Chemical Co., Midland, Mich.

Pittsburgh Coke & Iron Co., Neville Island, Pa.: An expansion program estimated to involve $1,000,000 will be undertaken in 1940. A large portion of this expenditure will be spent for the installation of facilities used for the manufacture of ingot molds.

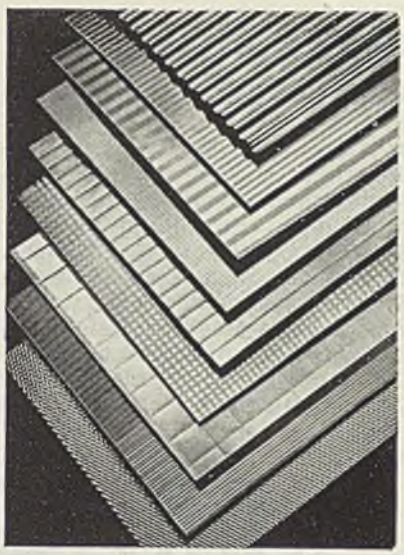
Prefinished Bonded Sheets Withstand Draws

■ Prefinished bonded metals of two new kinds, nickel aluminum and chromium aluminum, have been developed by American Nickeloid Co., Peru, Ill. These are said to combine beauty, tarnish-resistant qualities and durability of nickel and chromium with extreme lightness, strength and workability of aluminum.

The materials consist of a surface of chromium or nickel bonded by an electrolytic process to an aluminum base metal. They can be soldered with ordinary 50-50 solder and regular cut-acid. The chromium or nickel surface does not peel, lift or chip, and these bonded metals will withstand temperatures of 500 to 750 degrees Fahr. without discoloration of surface and excessive warping. The fact that base as well as surface is a white metal is distinct practical advantage.

Both types are easily workable during manufacturing processes, and are highly resistant to corrosion, rust or tarnishing. They can be bent, stamped or moderately drawn without damage to the permanently bonded coatings.

Metals are all white, and are available in sheets in sizes up to 36 x 96 inches in a full range of tempers, and in thicknesses from 0.010 to 0.064-inch. A choice of bright or satin finish and striped, crimped or corrugated patterns is expected to adapt the two new prefinished metals to many uses and designs. Illustration shows some of the patterns available in these metals.



Prefinished sheets of aluminum coated with nickel or chromium have been developed for forming and stamping to a variety of patterns

New Alloy Steel Machined At 450 Brinell

■ A new H. T. M. alloy steel developed by Joseph T. Ryerson & Son Inc., Sixteenth and Rockwell streets, Chicago, is machineable under ordinary shop conditions after being hardened to more than 450 brinell. This new steel is a chromium-nickel-molybdenum alloy, analysis carbon 0.35 to 0.45, minimum manganese 0.50, minimum nickel 2.0, chromium 0.90 and minimum molybdenum 0.40 per cent. Alloying elements are balanced to develop a high degree of hardness with either oil quench or air cooling.

This steel is claimed to be suitable for applications where a high-tensile, high-hardness and deep-hardening alloy is desired and where uniformity of hardness from surface to center is desirable.

With suitable heat treatment, sizes as large as 10-inch rounds can be made to show uniform hardness throughout entire cross section. Parts such as cams, rollers and gears can be rough machined, heat treated to desired hardness, then finish machined. This avoids grinding and danger of distortion due to heat treatment.

The steel, states the producer, is particularly resistant to impact and shock at subzero temperatures and is suitable for bolts at high temperatures. Tests indicate that at 1000 degrees Fahr. it will show 100,000 pounds per square inch tensile strength, 85,000 pounds yield point, 25 per cent elongation in 2 inches and 79 per cent reduction of area.

This alloy, already heat treated, is available under name of Nikrome "M" and has these minimum physical properties: Tensile strength, 110,000 pounds per square inch: yield point, 90,000 pounds per square inch; elongation, 16 per cent in two inches; reduction of area, 47 per cent; brinell hardness, 240-265.

Heating By Solar Radiation Tested

■ AN EXPERIMENTAL house to trap the sun's heat falling on roof and store it in the basement for future use is ready for research at Massachusetts Institute of Technology, Cambridge, Mass.

Purpose of the investigation is to study various uses of solar heat, including winter house heating, summer air conditioning and power generation.

Although several types of energy collectors, or "heat traps," are to be tried in the research program, attention first will be given to a shallow box-like heat collecting device placed on roof. Top of box has several covers of glass interspaced with dead air regions to allow sunlight to pass but trap heat. Bottom of box is a thin sheet of metal painted black to absorb the utmost amount of solar energy. Firmly fixed to its under side is a series of small thin-walled metal tubes heated by contact with sheet and which in turn heat water circulated through them. Beneath box is a layer of mineral wool to prevent escape of heat in that direction.

After water has been warmed in heat collector, it passes through insulated pipes to the storage tank in basement. Tank evens out fluctuations in heat collected from sun and is so thoroughly insulated that it is expected to lose little heat over long periods of time. Depending on size of tank, water can be kept hot from a few weeks to half a year. To use heat in storage tank for heating purposes, a system of forced air circulation passes air through ducts on hot side of tank. Air also can be passed

through coils of a refrigeration system to be installed later, which, operating on an absorption principle, will utilize sunlight as its heat source.

Research also will be devoted to paints on collecting devices and to determining the most effective number of glass plates over collector and best angle of roof slope to meet requirements of various heaters.

New Braking Control For Crane Hoists

■ A dynamic braking control for alternating-current crane hoists developed by Electric Controller & Mfg. Co., 2700 East Seventy-ninth street, Cleveland, eliminates mechanical load brake on crane and is operated entirely by alternating-current power. It may be used with any standard wound-rotor hoist motor as no conversion units or additional collector bars are required and may be installed on existing cranes.

Advantages are claimed to be power saving, elimination of mechanical load brake upkeep and faster lowering speeds. Control permits very short, accurate inching movements of any load within crane capacity. Overhauling loads can produce speeds 50 per cent above synchronous motor speed and return power to line by driving motor as a generator on all points except creeping speed points.

Longmuir Manual on Cast Iron Pipe Making

■ *Cast Iron Pipe*, by Percy Longmuir; cloth, 104 pages, 5 x 7½ inches; published by J. B. Lippincott Co., supplied by STEEL, Cleveland, for $2.50.

One of a series of industrial text books issued in Great Britain this volume covers briefly the principal features connected with the manufacture and properties of cast iron pipe, with special reference to centrifugal casting. The text is supplemented by 53 illustrations including four micrographs. Material is presented under seven chapter headings: Vertically cast pipe; metal spun cast iron pipe; sand spun cast iron pipe; special castings; joints for cast iron pipe; metallurgical control; properties of cast iron pipe. The book closes with two pages of references and an index.

Special-Service Alloys

■ Two new alloys have been developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. "Kovar", for making electrical connection into vacuum tubes, is a good conductor of electricity, has approximately the coefficient of expansion of glass and fuses readily with glass to form a seal capable of maintaining a high vacuum. It contains 29 per cent nickel, 17 per cent cobalt, 0.2 per cent manganese and 53.8 per cent iron.

"K-42-B", for high-temperature service in steam turbine blades, is capable of withstanding 2912 degrees Fahr., and is stronger at 1100 degrees Fahr., than ordinary carbon-steel at room temperature. It contains 46 per cent nickel 25 per cent cobalt, 10 per cent ferrotitanium and 19 per cent chromium.

Floor Resurfacer

■ A new pre-mixed floor resurfacing material, "Rock-Tred," developed by Rock-Tred Co. Inc., 629 West Washington street, Chicago, provides a wearing surface throughout its entire thickness and bonds permanently to concrete, metal, rigid wood flooring or asphalt mastic floor. This material is dustless, noiseless, sparkless and, according to manufacturer, will resist heat, fire and acid.

The material can be spread from ½-inch in thickness to a feather edge, and will sustain any load that

the subfloor can hold. Chipping, mixing, sand or cement are not required. Resurfacing material cures in from 8 to 12 hours and is claimed to get harder with age and use. Though the top surface attains the hardness of concrete, the gum-like under structure gives floor a lasting resilience, according to reports from users.

This floor resurfacer is further said to be self-repairing as slight surface abrasions are smoothed out by use.

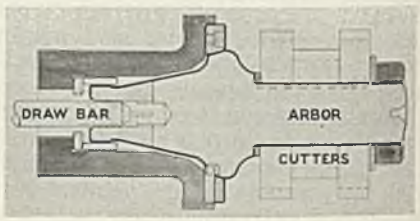
Simplified Practice

■ The division of simplified practice of the national bureau of standards announces simplified practice recommendation R51-29, die-head chasers (for self-opening and adjustable die-heads), has been reaffirmed without change by the standing committee of the industry. This recommendation covers sizes and number of threads per inch for stock die-head chasers. Copies of the recommendation may be obtained for 10 cents each from the superintendent of documents, government printing office, Washington.

Cutter Arbor Embodies Collet Principle

■ The basic principle in any successful arbor is that it must seat firmly and run true. Second, it should be driven in a simple and practical way. Third, it should be mounted so that sizes can be changed with the minimum cost. Fourth, extreme accuracies should not be required in the manufacture, but at the same time accuracy in mounting the arbor must be held.

In the recently patented Hall standard arbor, illustrated herewith, these ends have been attained thus. The shank has a narrow taper at its large diameter. This taper forms "front seat" for arbor. Although taper should be held reasonably close as to angle, it does not need to be an exact fit to hardened and ground locating plate, which only locates this end of the arbor for concentricity. Back end of arbor is straight, and is a slide fit in a hardened, replaceable bushing. The diameter of this straight section can have a reasonable tolerance inasmuch as it is split in four sections. These sections expand to a tight fit on the same principle as a collet —through the wedging effect of the angle of the threads on the draw bar. Overall length of the shank, as well as location endwise of course can vary to some degree without ill effect.



Worn parts are easily replaced in this type of arbor, restoring original accuracy of setup

When this arbor is pulled back by draw bar, the split straight section becomes a tight fit in its bushing, and at same time front taper section is firmly seated, making it impossible for arbor to rock or run out.

Arbor is positively "key driven" from front or locating plate. One or more keys of any length can be used, these matching key ways in the back of its tapered diameter.

In some cases it is desirable to use smaller arbors on certain classes of work. This is accomplished at

a small cost as use of a smaller size arbor entails only the installation of a smaller size front plate. Thus the design can be accommodated to any size of arbor which may be selected within range of machine.

A.S.T.M. Methods of Analyzing Metals

■ *A.S.T.M. Methods of Chemical Analysis of Metals;* 250 pages, 6 x 9 inches; published by American Society for Testing Materials, Philadelphia; supplied by STEEL, Cleveland, for $2 in paper, $2.50 in blue cloth.

This is the second edition of the society's handbook and gives latest approved analytical procedures for ferrous and nonferrous metals and spectrochemical analysis, as issued by the society. Four extensive standards cover ferrous metals, twelve apply to nonferrous metals and alloys and three are spectrochemical methods. Ferrous metals covered include steel, cast iron, open-hearth iron, wrought iron and ferroalloys.

Nonferrous metals include aluminum and its alloys, copper, brass and bronze, lead, tin, antimony, silver solders, nickel, zinc and metallic materials for electrical heating. Spectrochemical methods relate to high grade pig lead, determination of lead, iron and cadmium in zinc and minor constituents in zinc alloy die castings.

Enameling Clay

■ An enameling clay "Pemco Micronized clay type M-7," claimed to be equal to German Vallendar clay, has been developed by Porcelain Enamel & Mfg. Co., Eastern and Pemco avenues, Baltimore.

The clay is mined in North America and is refined by the micronizer process in which the unrefined clay enters a cylindrical chamber at a speed of over 700 miles an hour and bombards itself. This bombardment results in the explosion of the clay particles and their reduction to an average grain size of 3 microns. The speed of the clay causes the impurities to be thrown out and the resultant clay is so fine, the manufacturers state, that it could pass through a 2500 mesh screen if such were available.

Colors Steel Black

■ A low-temperature steel coloring process known as Du-Lite Process "290" developed by Du-Lite Chemical Co., Middletown, Conn., is said to produce a deep, heavy black color on tool, high-speed and plain cold-rolled malleable steel, cast iron, tin and carburized parts. This process is claimed to be a chemical reaction and not a deposit. It will not rub off, harden, embrittle or draw, and does not add to any dimension. No dirt or film is deposited in threads or other surfaces. Finish adheres well and can be used as a metal primer for enamel, lacquer or paint. A highly polished piece when treated becomes as lustrous as black plastic; unfinished surfaces become dull.

Process works at a variation of 10 to 15 degrees Fahr. without affecting color. Bath does not break down or weaken in operation. Analysis and consequent addition of activating salts are not required.

Caulking Compound

■ A prepared synthetic plastic material, Firmex sealing compound, developed by Firmex Plastic Co., 104 Nineteenth street, Brooklyn, N. Y., is claimed to be waterproof, not to shrink, crack or crumble and not to be affected by vibration, heat, cold, or severe weather conditions.

Uses include sealing joints and seams between skylights, ventilators, etc. It also is suited for repairing roof leaks and for sealing joints subject to expansion and contraction. Natural gray and other colors are available.

Construction and Enterprise

Michigan

ADRIAN, MICH,—Kreighoff Co., Detroit, has been awarded contract for two additions to the foundry here of Magnesium Fabricators Inc., a division of Bohn Aluminum & Brass Corp., Detroit. Stuchell and Buckheit, Detroit, architects.

DETROIT—W. O. Barnes Co. Inc., 1297 Terminal, will erect an addition to its factory building on Terminal avenue. Giffels & Vallet Inc., L. Rossetti, 1000 Marquette building, Detroit, associated architects.

DETROIT—Godin Tool & Die Inc., 2210 Twelfth street, has been incorporated with $20,000 capital to manufacture die and tool machinery; Arthur F. Godin, 8150 Outer drive.

GRAND HAVEN, MICH. — Osterink Construction Co., Grand Rapids, Mich., is low on general contract for construction of a factory building here for the Hatton Leather Co. Robinson, Campau and Crowe, Grand Rapids, Mich., architects.

ST. CLAIR, MICH.—John Kantzler & Son, St. Clair, have been awarded contract for construction of a substation here for the Detroit Edison Co.

ST. LOUIS, MICH.—Leslie M. Lowery, Midland, Mich., has been named architect to prepare plans for construction of a $30,000 creamery plant here for the St. Louis Co-Operative Creamery.

Pennsylvania

BEAVER FALLS, PA.—Borough of Beaver Falls, W. H. Anderson, secretary, is having preliminary plans made for erection of incinerator building. Carlisle & Sharrer, 507 Martin building, Pittsburgh, architects.

Ohio

MARBLEHEAD, O.—Village, Anthony Turinsky, mayor, is having plans prepared for waterworks. Rollin F. MacDowell, Chester-Twelfth building, Cleveland, consulting engineer, and C. H. Shively, Kinney building, Fremont, O., associate architect.

RAWSON, O.—Village, Jacob C. Romick, mayor; H. R. Hartman, clerk, plans waterworks system, and will take bids Jan. 5 on (1) drill well; (2) elevated tank, 75,000-gallon capacity; (3) deep well turbine pump; (4) pipe and fittings; (5) miscellaneous materials. Russell Mason, Findlay, O., consulting engineer. Estimated cost $60,000. Cash or certified check of 5 per cent to accompany bid.

Maryland

BALTIMORE—City council has passed $2,500,000 sewer loan proposed by Mayor Jackson.

District of Columbia

WASHINGTON—Bureau of supplies and accounts, navy department, will take bids until 10 a. m., Jan. 5, schedule 96, one motor-driven automatic screw machine, delivery Alameda, Calif.; schedule 98, one motor-driven, omniversal horizontal milling machine, delivery, Alameda, Calif.; schedule 125, one motor-driven, 12-inch high speed shaper, delivery Alameda; schedule 126, three motor-driven high-speed hack saws, delivery Alameda; schedule 127, motor-driven, variable speed buffing and polishing machines, delivery Alameda; schedule 131, one motor-driven shearing machine, delivery Alameda; schedule 132, motor-driven, 9-inch screw cutting, back-geared lathes, delivery Alameda; schedule 146, steel packing case strapping; schedule 202, 200 double-tier steel clothing lockers; schedule 227, one motor-driven bending roll, delivery Sewall's point, Va.; schedule 231, four precision type bench lathes, with complete underneath motor drive, delivery Newport, R. I.; until Jan. 9, schedule 203, one motor-driven honing machine, delivery San Diego, Calif.; schedule 211, one motor-driven radial drill, delivery Mare Island, Calif.; schedule 212, brass and steel bolts and nuts; schedule 215, steel rivets and washers; schedule 221, one motor-driven power squaring shear; schedule 225, one motor-driven horizontal spline milling machinery, delivery Newport, R. I.; schedule 232, 17,600 pounds of corrosion-resisting steel sheets, delivery Mare Island, Calif.; schedule 233, one motor-driven, upright drilling and tapping machine, delivery Philadelphia; schedule 236, one motor-driven high speed, radial drill press, delivery Philadelphia; schedule 239, submersible portable pumps, complete, and with spare parts; schedule 240, one hand feed, air-powered, worm driven portable milling machine, delivery Philadelphia; schedule 246, fuel oil tank drain pumps, with motors and controllers; spare parts; special tools and wrenches, delivery Boston and Charleston, S. C.; schedule 257, vacuum and fuel pumps.

North Carolina

BOONVILLE, N. C.—City, Harvey Gentry, mayor, is considering installation of water and sewer system.

HICKORY, N. C.—City voted $50,000 water and sewer bonds.

KINSTON, N. C.—City has been authorized to issue $300,000 bonds for improvements to power plant and waterworks system.

MARSHALL, N. C. — French Broad Electric Membership Corp., recently organized, has applied to REA for loan of $300,000 to construct rural electric lines.

SILER CITY, N. C.—Town, W. O. Mann, treasurer, will take bids Jan. 5 for furnishing materials and equipment for construction of sewage treatment plant, including clarifiers for two settling tanks, mechanical equipment for removing sand and sludge from grit chambers, 50 gallons-per-minute secondary sewage pump, cast iron pipe and fittings, gate valves, etc. Linberg Engineers Inc., Burlington, N. C., engineers.

South Carolina

ABBEVILLE, S. C.—City has received additional grant of $40,000 from PWA for Rocky River hydroelectric project, to be used in construction of transmission lines.

SPARTANBURG, S. C.—City, W. W. Griffin, chairman of public works commission, plans waterworks improvements; has $63,012 WPA allotment.

Mississippi

BILOXI, MISS.—City plans application to Mississippi industrial commission for permission to hold an election on $75,000 bonds for establishment of a ceramics plant.

Tennessee

PARIS, TENN.—City, J. Sweeney, superintendent, care of board of public utilities, will take bids soon for 109 miles of rural electric lines. Cost $105,000. RFA allotment has been approved.

Louisiana

THIBODAUX, LA.—Town, Charles E. Delas, mayor, takes bids Jan. 23 for waterworks improvements. Plans and specifications available after Jan. 5. J. B. McCrary Co. Inc., engineer, Atlanta, Ga.

Virginia

BOWLING GREEN, VA. — Virginia Electric Co-operative has been authorized to negotiate loan of $79,000 to build 72 miles of additional electric lines.

PRINCE GEORGE, VA.—Prince George Electric Co-operative has been granted permission to borrow $135,000 to build approximately 141 miles of electric lines.

WAYNESBORO, VA.—J. V. Webb, Ferrum, Va., will be resident manager in charge of operations of veneer plant to be erected on five-acre tract of land west of here. Estimated cost $50,000.

Missouri

ST. LOUIS—Joseph L. Muren, 3939 Fillmore street, has contract for construction of machine shop for John Ramming Machine Co., 308 South First street. Estimated cost $30,000.

Texas

DALLAS, TEX.—City, James W. Aston, city manager, will install $36,000 sewer system in Lagow, near Terry.

SEYMOUR, TEX.—City, Tom E. Craddock, mayor, has plans in progress for electric lines, costing $160,000, and generating plant, $40,000. H. G. Gieb & Co., architect and engineer, 1109 Mercantile building, Dallas, Tex.

SILSBEE, TEX.—City has made application to WPA for funds to construct waterworks and sewer systems, including 100,000-gallon elevated steel tank and tower, 250 gallon-per-minute pumps, etc. Cost $212,000. Koch & Fowler, engineers, Great National Life building, Dallas, Tex.

Pacific Coast

MERRILL, OREG.—Plans are being drawn and bids will be taken soon for proposed municipal pump and pumping equipment.

PENDLETON, OREG. — Pendleton Grain Growers Inc. plans construction in January of a $25,000 elevator. Equipment includes 400-foot conveyor system for loading grain on river barges.

PORTLAND, OREG. — George H. Buckler Co. has contract to build a $50,000 pier, 100 x 150 feet, with corrugated iron shed, machine shop and offices for Albers Bros. Milling Co.

GOLDENDALE, WASH. — Klickitan P. U. district has been allotted $142,000 federal funds for construction of 40 miles of power lines near Glenwood. Plans are being prepared.

RITZVILLE, WASH.—Columbia Engineering Co., Wenatchee, Wash., has been named project engineer for the Big Bend Electric Co-operative, planning 280 miles of transmission lines.

SEATTLE—Union Wines Inc., 204 First avenue, South, has acquired building at Renton, Wash., and will make alterations and install distillery and other plant equipment.

SEATTLE—G. B. & S. Mill Inc. has been organized with $10,000 capital by D. W. Gates and associates, 525 Insurance building, to manufacture ore grinding mills.

Canada

NORTH VANCOUVER, B. C.—Pacific Salvage Co. will build two new ship berths, each 400 feet long, and accessory buildings, to cost $50,000.

NORTH VANCOUVER, B. C.—Wallace Shipbuilding & Dry Dock Co., 355 Burrard street, will build addition to plant at foot of Lonsdale avenue, to include new berths and accessories building, estimated to cost $75,000.

HUMBERSTONE, ONT.—Robin Hood Mills Ltd., 300 St. Sacrament street, Montreal, has awarded contract to Carter-Halls-Aldinger Co. Ltd., 419 Cherry street, Toronto, for construction of grain elevator and flour mill here to cost $1,000,000. C. D. Howe & Co. Ltd., 712 Public Utilities building, Port Arthur, Ont., engineer.

KITCHENER, ONT.—B. F. Goodrich Rubber Co. of Canada Ltd. will build $85,000 plant addition here. G. W. Swan is general manager.

NEW TORONTO, ONT. — Anaconda American Brass Ltd. has awarded contract to Carter-Halls-Aldinger Co. Ltd., 419 Cherry street, Toronto, for erection of plant addition, 100 x 200 feet. Dominion Bridge Co. Ltd., 1139 Shaw street, Toronto, has steel contract.

PORT ARTHUR, ONT.—Canada Creosoting Co., controlled by Dominion Tar & Chemical Co., Toronto, Ont., plans erection of plant here or at Fort William, Ont., to cost $150,000.

SOUTH PORCUPINE, ONT.—Faymar Porcupine Gold Mines has awarded contract to Canadian Comstock Co. Ltd., 80 King street, West, Toronto, for mill and mining plant here to cost $325,000. Burlington Steel Co., Hamilton, Ont., has steel contract.

TORONTO, ONT.—Graham Nail & Wire Products Ltd., 35 Fraser avenue, will build addition to plant here. B. Leon, Terminal Warehouse building, Toronto, is engineer.

ARVIDA, QUE.—Aluminum Co. of Canada Ltd., 1010 St. Catharine street, West, Montreal, has begun excavation work on plant addition here to cost $150,000. Other contracts to be let immediately.

LAUZON, QUE.—J. M. Somerville, secretary, Dominion department of public works, Ottawa, is receiving bids for construction of keel block units and other additions to Champlain Dry Docks here.

MONTREAL, QUE.—Two main buildings housing plate shop and carpenter shop of Montreal Dry Dock Co., recently sustained severe damages by fire.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

ABRASIVES (Blast Cleaning)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

ABRASIVES (Polishing)
Abrasive Co., Taconey & Fraley Sts., Philadelphia, Pa.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ABRASIVES (Wire Cleaning)
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

ACETYLENE
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

ACID-PROOF LININGS
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

ACIDS (Pickling)
American Chemical Paint Co., Box 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

AIR COMPRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

ALKALI CLEANING COMPOUNDS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

ALLOYS—See FERROALLOYS

ANGLE IRON BENDERS
Excelsior Tool & Machine Co., Ridge and Jefferson Avenues, East St. Louis, Ill.

ANGLES, CHANNELS—See BEAMS, CHANNELS, ANGLES

ANNEALING BOXES—See BOXES (Annealing)

ANVILS
Swedish-American Steel Corp., 427 Kent Ave., Brooklyn, N. Y.

ARCHES AND WALLS
Standard Arch Co., Frostburg, Md.

ARCHES (Suspended)
Standard Arch Co., Frostburg, Md.

AXLES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BABBITT METAL
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BAGS (Cotton)
Ames Bag Machinery Co., 1991 E. 66th St., Cleveland, O.

BALING PRESSES
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BALL TRANSFERS
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

BALLS (Brass or Bronze)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Strom Steel Ball Co., 1850 So. 54th Ave., Cicero, Ill.

BALLS (Special Alloy Metals)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel) (*Also Stainless)
*Strom Steel Ball Co., 1850 So. 54th Ave., Cicero, Ill.

BAND SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.

BANDS—See HOOPS AND BANDS

BANDS (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BAR BENDERS
Kardong Bros. Inc., 346 Buchanan St., Minneapolis, Minn.

BAR DRAWER AND STRAIGHTENING MACHINES
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

BARGES (Steel)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Maryland Dry Dock Co., Baltimore, Md.
Treadwell Construction Co., Midland, Pa.

BARRELS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

BARS (Alloy)
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Midvale Co., The Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BARS (Brass, Bronze or Copper)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BARS (Concrete Reinforcing)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Northwest Steel Rolling Mills, Inc., 4315 Ninth Ave., Seattle, Wash.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Iron)—See IRON (Bar)

BARS (Reinforcing)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.

BARS (Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BASKETS (Dipping—Hard Rubber)
American Hard Rubber Co., 11 Mercer St., New York City.

BASKETS (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

BATTERIES (Storage)
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.

BEAMS, CHANNELS, ANGLES, ETC. (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BEARINGS (Ball)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BEARINGS (Brass, Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The 344-60 W. 6th Ave., Tarentum, Pa.

BEARINGS (Journal)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Needle)
Torrington Co., The, Torrington, Conn.

BEARINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

BEARINGS (Quill)
Bantam Bearings Corp., South Bend, Ind.

BEARINGS (Radial)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St., and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roll Neck)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller Tapered)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Rolling Mill)
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Self-Aligning Roller)
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

BEARINGS (Thrust)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELLS (Furnace)
Pittsburgh Steel Foundry Corp., Glassport, Pa.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

BENDING AND STRAIGHTENING MACHINES
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Alliance Machine Co., The, Alliance, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Kane & Roach, Inc., Niagara & Shonnard Sts., Syracuse, N. Y.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

BENZOL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Northwest Steel Rolling Mills, Inc., 4315 Ninth St., Seattle, Wash.
Republic Steel Corp., Dept. ST, Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jones and Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BINS (Storage)
Petroleum Iron Works Co., Sharon, Pa.

BLAST FURNACE CLEANING (Gas)
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

BLOWERS
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

BLOWPIPES (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

BLOWPIPES (Hand and Stand)
American Gas Furnace Co., Elizabeth, N. J.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BOARDS (Hammer)—See HAMMER BOARDS

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Oil Well Supply Co., Dallas, Texas.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

BOLT AND NUT MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Landis Machine Co., Inc., Waynesboro, Pa.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Tracks)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Scranton, Pa.

BORING MACHINES (Precision)
Heald Machine Co., Worcester, Mass.
Reed-Prentice Corp., Worcester, Mass.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Treadwell Construction Co., Midland, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Treadwell Construction Co., Midland, Pa.

BRAKE LININGS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Hydraulic)
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

BRAZING EQUIPMENT
American Gas Furnace Co., Elizabeth, N. J.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.

BRICK (Ladle)
Freeport Brick Co., Freeport, Pa.
Globe Brick Co., The, E. Liverpool, O.

BRICK (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Inland Fire Brick Co., 3101 Berea Rd., Cleveland, O.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., Sharon, Pa.
Youngstown Steel Tank Co., Oak St. and Andrews Ave., Youngstown, O.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

BRUSHES (Industrial)
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Broslus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Tate-Jones & Co., Inc., Leetsdale, Pa.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.

BUSHINGS (Oilless)
Rhoades, R. W., Metalline Co., 50 Third St., Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.

CARBURIZERS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTINGS (Acid Resisting)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Mechanite Metal Corp., 311 Ross St., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Electro-Alloys Co., The, Elyria, O.
National-Erie Corp., Erie, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
Reliance Steel Casting Co., 2818 Smallman St., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Brass, Pressure)
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Controlled Grain Structure)
Sorbo Mat Process Co., 1004 Market St., St. Louis, Mo.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cascade Foundry Co., W. 19th and Plum Sts., Erie, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cheney, S., & Son, Manlius, N. Y.
Columbia Steel Co., San Francisco, Calif.
Detroit Gray Iron Foundry Co., Foot of Iron St., Detroit, Mich.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Urick Foundry Co., Cherry St., Erie, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Electro-Alloys Co., The, Elyria, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Ohio Malleable Iron Co., Columbus, O.
Peoria Malleable Castings Co., Peoria, Ill.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel)
(*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Erie Forge Co., W. 15th and Cascade Sts., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
Reliance Steel Casting Co., 2818 Smallman St., Pittsburgh, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdry Co., Heriel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

CASTINGS (Wear Resisting)
Meehanite Metal Corp., 311 Ross St., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Baldwin Duckworth Div. of Chain Belt Co., 326 Plainfield St., Springfield, Mass.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

CHAIN (Roller)
Baldwin Duckworth Div., of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Peoria Malleable Castings Co., Peoria, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIRS (Steel)
Harter Corp., The, Sturgis, Mich.

CHAPLETS (Foundry)
Cheney, S., & Son, Manlius, N. Y.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 115-117 E. Carson St., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANING SPECIALTIES
American Chemical Paint Co., Box 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Twin Disc Clutch Co., 1379 Racine Ave., Racine, Wis.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.

CLUTCHES (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., Pittsburgh, Pa.
Koppers Coal Co., 100 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., 100 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

COILS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, 100 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Combustion)—See COMBUSTION CONTROLS

CONTROLLERS (Electric)
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Oven)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

WHERE-TO-BUY

COPPERING COMPOUND
American Chemical Paint Co., Box 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Scranton, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 401 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
American Flexible Coupling Co., 18th and Pittsburgh Ave., Erie, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Poole Fdy. & Mach. Co. Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Erie Forge Co., W. 15th and Cascade Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon, O.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co.,
2086 W. 110th St., Cleveland, O.

CUTTERS (Keyseating)
Davis Keyseater Co., 397 Exchange St., Rochester, N. Y.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co.,
Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co.,
1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
American Shear Knife Co.,
3rd & Ann Sts., Homestead, Pa.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.,
Standard Steel Works Co.,
Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Bronze Die Casting Co.,
Franklin St. at Ohio River, Pittsburgh, Pa.
Titan Metal Mfg. Co.,
Bellefonte, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Reed-Prentice Corp., Worcester, Mass.

DIES (Cast)
Detroit Alloy Steel Co.,
Foot of Iron St., Detroit, Mich.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Federal Fabricating & Steel Corp., Mineral Ridge, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co.,
115-117 E. Carson St.,
Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES

Basic Dolomite, Inc.,
Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Thomas Machine Mfg. Co.,
Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Cincinnati Bickford Tool Co., Oakley Sta., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Thomas Machine Mfg. Co.,
Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co.,
11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The,
2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co.,
P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co.,
P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co.,
Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co.,
4 English St., Westfield, N. Y.

DRUMS (Magnetic)
Dings Magnetic Separator Co.,
663 Smith St., Milwaukee, Wis.

DRUMS (Steel)
Petroleum Iron Works Co.,
Sharon, Pa.
Pressed Steel Tank Co.,
1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Peabody Engineering Corp.,
580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp.,
1016 W. 9th St.,
Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp.,
551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The,
19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co.,
Milwaukee, Wis.
Electric Controller & Mfg. Co.,
2698 E. 79th St., Cleveland, O.
General Electric Co.,
Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co.,
310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co.,
2422 Euclid Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Pollock, Wm. B., Co., The,
101 Andrews Ave.,
Youngstown, O.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Aetna-Standard Engineering Co., The, Youngstown, O.
Brassert, H. A., & Co.,
310 So. Michigan Ave.,
Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B.,
134 E. 47th St., New York City.
Loftus Engineering Corp.,
509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co.,
2422 Euclid Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Semet-Solvay Engineering Corp.,
40 Rector St., New York City.

ENGINES (Diesel)
Cooper-Bessemer Corp.,
Mt. Vernon, O.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave.,
Chicago, Ill.
Ingersoll-Rand Co.,
11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co.,
Pittsburgh, Pa.

FANS (Crane Cab)
Trufio Fan Co., Harmony, Pa.

FANS (Exhaust Ventilating)
Sturtevant, B. F., Co.
Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

FANS (Portable)
Perkins, B. F., & Son, Inc.,
Holyoke, Mass.
Trufio Fan Co., Harmony, Pa.
Wagner Electric Corp.,
6400 Plymouth Ave.,
St. Louis, Mo.

FANS (Wall)
Trufio Fan Co.,
Harmony, Pa.

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc.,
Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co.,
Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co.,
Bethlehem, Pa.
Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Columbia Steel Co.,
San Francisco, Calif.
Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.
Pittsburgh Steel Co.,
1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co.,
Brown-Marx Bldg.,
Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp.,
30 E. 42nd St., New York City.
International Nickel Co., Inc., The,
67 Wall St., New York City.
Ohio Ferro-Alloys Corp.,
Citizens Bldg., Canton, O.
Sloss-Sheffield Steel & Iron Co.,
Birmingham, Ala.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp.,
Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co.,
Bethlehem, Pa.
Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.
Ohio Ferro-Alloys Corp.,
Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.
Tennessee Products Corp.,
Nashville, Tenn.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.
Tennessee Products Corp.,
Nashville, Tenn.

FERROSILICON
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp.,
Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co.,
Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp.,
22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
Kidde, Walter, & Co.,
140 Cedar St., New York City.

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Forged Steel)
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLOORING (Monolithic)
Johns-Manville Corp.,
22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co.,
Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Columbia Steel Co.,
San Francisco, Calif.
Dravo Corp. (Machinery Div.),
300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co.,
38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp.,
Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc.
16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St.,
Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc.,
Sharpsburg Branch,
Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp.,
1016 W. 9th St.,
Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Samuel, Frank, & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co.,
Box 310, Ambler, Pa.

WHERE-TO-BUY

FLUXES (Soldering, Welding and Tinning)
Anti-Borax Compound Co., Inc., Fort Wayne, Ind.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

FORGING ROLLS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Hollow Bored)
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Erie Forge Co., W. 15th and Cascade Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co.,
Erie Forge Co., W. 15th and Cascade Sts., Erie, Pa.
San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., 16th St., and 5th Ave., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.,
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp. Pittsburgh-Chicago.

FURNACE BOTTOMS
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

FURNACES (Brazing)
American Gas Furnace Co. Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp. P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Gas or Oil)
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Tate-Jones & Co., Inc., Leetsdale, Pa.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.

FURNACES (Laboratory)—Con.
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.

FURNACES (Open Hearth)
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 134 E. 47th St., New York City.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Harter Corp., The, Sturgis, Mich.

GAGE BLOCKS
Dearborn Gage Co., 22037 Beech St., Detroit, Mich.

GAGES
Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS SCRUBBERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)
American Hard Rubber Co., 11 Mercer St., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City

GAUGES (Draft)
Peabody Engineering Corp., 580 Fifth Ave., New York City.

GAUGES (Indicating and Recording)
General Electric Co., Schenectady, N. Y.

GEAR BLANKS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GEARS (Spur, Bevel, Miter)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3280 E. 80th St., Cleveland, O.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GOGGLES (Cleanser)
Lenco Laboratories, Inc., The, 623 Bondi Bldg., Galesburg, Ill.

GRABS — FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

GRAPPLES (Scrap Handling)
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDERS (Pedestal, High Speed)
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.

GRINDERS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

GRINDERS (Precision Thread)
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

GRINDING WHEELS
Abrasive Co., Taconey & Fraley Sts. Philadelphia, Pa.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segment)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
National-Erie Corp., Erie, Pa.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HACK SAWS
Armstrong-Blum Mfg. Co., 5737 Bloomingdale Ave., Chicago, Ill.
Simonds Saw & Steel Co., Fitchburg, Mass.

HAMMER BOARDS (Drop)
Detroit Drop Hammer Board Co., 3824 Grand River Ave., Detroit, Mich.

HAMMERS (Chipping, Riveting, Calking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Power)
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The Alliance, O.

HANGERS
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HARDWARE SPECIALTIES
Peoria Malleable Castings Co., Peoria, Ill.

HEADING MACHINERY
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland, O.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

HEATERS (Air)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.

HEATERS (Oven)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard-Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Ingersoll-Rand Co., 11 Broadway, New York City.

HOOKS (Chain)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOOPS AND BANDS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

HOOPS (Welded Wire)
Keystone Steel & Wire Co., Peoria, Ill.

HOSE (Flexible Metallic)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

HOSE (Rubber)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Treadwell Construction Co., Midland, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

INDICATORS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

INGOT METALS
Roessing Bronze Co., Butler Plank Rd., Etna, Pittsburgh, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Co., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Box 310, Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INJECTORS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Inland Fire Brick Co., 3101 Berea Rd., Cleveland, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON (Swedish)
Swedish-American Steel Corp., 427 Kent Ave., Brooklyn, N. Y.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JETS (Steam, for Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

KEYS (Machine)
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYSEATERS
Davis Keyseater Co., 397 Exchange St., Rochester, N. Y.

KILNS (Rotary Sintering)
Smidth, F. L., & Co., 225 Broadway, New York City.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Flying)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LACQUERS
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

LADLES
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Treadwell Construction Co., Midland, Pa.

LAMPS (Filaments)
General Electric Co., Nela Park, Cleveland, O.

LAMPS (Mercury Vapor)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LAMPS (Neon Glow)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHE DOGS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

LATHES
LeBlond, R. K., Machine Tool Co., 2694 Madison Rd., Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.
Reed-Prentice Corp., Worcester, Mass.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret) (Automatic Vertical)
Bullard Company, the, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEAD WORK
Dietzel Lead Burning Co., Coraopolis, Pa.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Cooper-Bessemer Corp., Mt. Vernon, O.
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Switching and Transfer)
Cooper-Bessemer Corp., Mt. Vernon, O.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Treadwell Construction Co., Midland, Pa.

MACHINERY (Second Hand)
Emerman, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Broslus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Kane & Roach, Inc., Niagara and Saonnard Sts., Syracuse, N. Y.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Shuster, F. B., Co., The, New Haven, Conn.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

MACHINES (Die Casting—Injection Molding)
Reed-Prentice Corp., Worcester, Mass.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

MARKING DEVICES
Cunningham, M. E., Co., 115-117 E. Carson St., Pittsburgh, Pa.
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL FINISHES
American Nickeloid Co., 1310 Second St., Peru, Ill.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Reed-Prentice Corp., Worcester, Mass.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

NAILS
(*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

WHERE-TO-BUY

NOZZLES (Descaling)
Aldrich Pump Co., The, Allentown, Pa.

NUTS
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (CUTTING)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Paint)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OILS (Rust Preventive)
American Chemical Paint Co., Box 310, Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

OVENS (Conveyor or Truck Type)
Ross, J. O., Engineering Corp., 350 Madison Ave., New York City.

OVENS (Core and Mold)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

PACKING (Asbestos or Rubber)
Garlock Packing Co., The, Palmyra, N. Y.
Goodyear Tire & Rubber Co., Akron, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, Palmyra, N. Y.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Box 310, Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Industrial)
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Marking)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Box 310, Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Rust Preventive)

American Chemical Paint Co., Box 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Stick Form)

Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

PENSTOCKS

Treadwell Construction Co., Midland, Pa.

PERFORATED METAL

Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS

Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUND

American Chemical Paint Co., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT

International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS

American Hard Rubber Co., 11 Mercer St., New York City.
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON

Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

PIG IRON (Charcoal)

Tennessee Products Corp., Nashville, Tenn.

PILING (Iron and Steel)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)

Wood Preserving Corp., The, 100 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES

SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)

Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper—Rubber or Rubber Lined)

American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Brass, Bronze, Copper)

American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)

Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Square and Rectangular)

Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Welded Steel)

Treadwell Construction Co., Midland, Pa.

PIPE BALLS

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING

Crane Co., 836 So. Michigan Ave., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE FITTINGS

American Hard Rubber Co., 11 Mercer St., New York City.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)

Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

PIPE STRAIGHTENING MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS

Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

PIPING (Air and Gas)

Youngstown Steel Tank Co., Oak St. and Andrews Ave., Youngstown, O.

PIPING CONTRACTORS

Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

PISTON RINGS

American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.

PISTON RODS

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS

Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)

*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)

*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)

Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLES (Tubular Steel)

National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)

Medart Co., The, 3520 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)

Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)

Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

POTS (Lead)

Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

POTS (Melting)

Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POTS (Slag and Cinder)

Pittsburgh Steel Foundry Corp., Glassport, Pa.

PRECIPITATORS (Cottrell Electric)

Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

WHERE-TO-BUY

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

PRESSES (Bending)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Forging)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Denison Engineering Co., The, 118 Chestnut St., Columbus, O.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
West Tire Setter Co., 397 Exchange St., Rochester, N. Y.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Shell and Projectile Banding)
West Tire Setter Co., 397 Exchange St., Rochester, N. Y.

PRESSES (Stamping)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bdlg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

PUMPS (Boiler Feed)
Aldrich Pump Co., The, Allentown, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Aldrich Pump Co., The, Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Hydraulic)
Aldrich Pump Co., The, Allentown, Pa.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)
Aldrich Pump Co., The, Allentown, Pa.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry Co., E. Chicago, Ind.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (Light and Accessories)
Buckeye Rolling Mill Co., Wheeling, W. Va.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Hyman-Michaels Co., 122 S. Michigan Ave., Chicago, Ill.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Buckeye Rolling Mill Co., Wheeling, W. Va.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Emerson, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

RECEIVERS
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Climax Fire Brick Co., Climax, (Clarion Co.), Pa.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Freeport Brick Co., Freeport, Pa.
Globe Brick Co., The, E. Liverpool, O.
Inland Fire Brick Co., 3101 Berea Rd., Cleveland, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Standard Arch Co., Frostburg, Md.
W. Virginia Fire Clay Mfg. Co., Diamond Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Inland Fire Brick Co., 3101 Berea Rd., Cleveland, O.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Oiling)
American Spiral Spring & Mfg. Co., 5540 Harrison St., Pittsburgh, Pa.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

RINGS (Weldless)
(*Also Stainless)
*Midvale Co., The Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS
(*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., The, Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.

RODS (Piston)
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes)
(*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Titan Metal Mfg Co., Bellefonte, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., The, Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

ROLL FORMING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Kane & Roach, Inc., Niagara and Shonnard Sts., Syracuse, N. Y.

ROLLER LEVELERS (Backed-up)
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

ROLLERS (Rubber)
Goodyear Tire & Rubber Co., Akron, O.

ROLLING DOORS & SHUTTERS—See DOORS AND SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Aetna Standard Engineering Co., The, Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry Co., First National Bank Bldg.,
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ROLLS (Sand and Chilled)
Aetna-Standard Engineering Co., The, Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machines)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa

WHERE-TO-BUY

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts,, Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

RUST PREVENTIVES
American Chemical Paint Co., Box 310, Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 1100 Koppers Bldg., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Box 310, Ambler, Pa.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES
Lenco Laboratories, Inc., The, 623 Bondi Bldg., Galesburg, Ill.
Kimball Safety Products Co., 7314 Wade Park Ave., Cleveland, O.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

SAND (Annealing Box Sealing)
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

SAND (Molding)
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

SAND (Silica)
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

SAND (Slag Pocket)
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

SANDBLAST ABRASIVES
Industrial Silica Corp., 602 Stambaugh Bldg., Youngstown, O.

SAND CONDITIONING AND PREPARING MACHINERY
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWING MACHINES (Hot and Cold)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Armstrong-Blum Mfg. Co., 5737 Bloomingdale Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks Morse & Co., Dept. 96. 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The Bridgeport. Conn.

SCALES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

SCALING TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCHOOLS
International Correspondence Schools, Scranton, Pa.

SCRAP BALING PRESSES—See BALING PRESSES

SCRAP (Iron and Steel)
Hyman-Michaels Co., 122 S. Michigan Ave., Chicago, Ill.

SCREENS AND SIEVES
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Progressive Mfg. Co., The Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Windsor, Vt.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., The, Torrington, Conn.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Progressive Mfg. Co., The, Torrington, Conn.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Thread-Cutting)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SEPARATORS (Sand)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAKERS
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Brass, Bronze, Nickel Silver)
Titan Metal Mfg. Co., Bellefonte, Pa.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Wapakoneta Machine Co., The, Wapakoneta, O.

SHEARS
Aetna-Standard Engineering Co., The, Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEARS, ROTARY (Slitting, Beveling, Circling, Flanging)
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEET LIFTERS AND CARRIERS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
*International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

WHERE-TO-BUY

SHEETS (Electrical)—Con.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jessop Steel Co., 584 Green St., Washington, Pa.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHOT (Copper)
Roessing Bronze Co., Butler Plank Rd., Etna, Pittsburgh, Pa.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co., 3280 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLES
Leard, Wm., Co., Inc., 16th St., and 5th Ave., New Brighton, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
American Spiral Spring & Mfg. Co., 5840 Harrison St., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Lansing Stamping Co., Lansing, Mich.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill.
Sheet Metal Specialty Co., Pittsburgh, Pa.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

STAMPINGS (Blanking)
Federal Fabricating & Steel Corp., Mineral Ridge, O.
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.

STAMPS (Steel)
Cunningham, M. E., Co., 115-117 E. Carson St., Pittsburgh, Pa.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Chrome Cobalt)
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Crucible Steel Company of America, 405 Lexington Ave.,
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Ziv Steel & Wire Co., 2945 W. Harrison St., Chicago, Ill.

STEEL (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa. New York City.
Crucible Steel Company of America, 405 Lexington Ave.,

STEEL (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago. New York City.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick Ct., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

WHERE-TO-BUY

STEEL (High Tensile, Low Alloy)—Con.

Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST. Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled)

(*Also Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 1980 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River. New York City. Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural)

***(Also Stainless)**

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Treadwell Construction Co., Midland, Pa.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT

Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Treadwell Construction Co., Midland, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Steel Tank Co., Oak St. and Andrews Ave., Youngstown, O.

STELLITE

Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS

Babcock & Wilcox Co., The, 19 Rector St., New York City.

STOPPERS (Cinder Notch)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)

Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Kane & Roach, Inc., Niagara and Shonnard Sts., Syracuse, N. Y.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

SWAGING MACHINES

Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

SULPHURIC ACID

Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SWITCHES (Electric)

Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

TACHOMETERS

Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS

Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.

TANKS (Pickling)

American Hard Rubber Co., 11 Mercer St., New York City.
Fleming Tank Co., Inc., 31st St. and Penn Ave., Pittsburgh, Pa.
Goodyear Tire & Rubber Co., Akron, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
Nukem Products Corp., 70 Niagara St., Buffalo, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)

American Gas Furnace Co., Elizabeth, N. J.

TANKS (Storage, Pressure, Riveted, Welded)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Steel Tank Co., Oak St. and Andrews Ave., Youngstown, O.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)

American Hard Rubber Co. 11 Mercer St., New York City.
Dietzel Lead Burning Co., Coraopolis, Pa.
Fleming Tank Co., Inc., 31st St. and Penn Ave., Pittsburgh, Pa.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TANKS AND TOWERS

Treadwell Construction Co., Midland, Pa.

TANTALUM CARBIDE

Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.

TAPS AND DIES

Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

TERMINALS (Locking)

Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

THERMOMETERS

Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS

Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Washington Tin Plate Co., Washington, Pa.
Weirton Steel Co., Weirton W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM

Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Chain Pipe)

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOL BITS (High Speed)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.

TOOL HOLDERS

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)

Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tantalum Carbide)

Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.

TOOLS (Tipped, Carbide)

McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)

Air Reduction Sales Co., 60 E. 42nd St, New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

TORCHES AND BURNERS (Air—Gas)

American Gas Furnace Co., Elizabeth, N. J.

TOWBOATS

Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)

Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TRACK ACCESSORIES

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)

Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRAMRAILS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRANSFORMERS

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

TRANSMISSIONS—VARIABLE SPEED

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)

Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)

Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.,) 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Electric Industrial)

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Elwell-Parker Electric Co., The 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)

Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)

Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)

Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.

WHERE-TO-BUY

TRUCKS (Lift)

Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT

Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE MILL MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE REDUCTION

Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE WELDING MACHINES

Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

TUBES (Boiler)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)

American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBING (Cold Drawn Seamless Steel)

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBING (Copper, Brass, Aluminum)

Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Shenango-Penn Mold Co., Dover, O.

TUBING (Phosphor Bronze)

American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Seamless Flexible Metal)

American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Welded Steel)

Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUMBLING BARRELS (Coke Testing)

Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TUNGSTEN CARBIDE (Tools and Dies)

Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TUYERES

Climax Fire Brick Co., Climax, (Clarion Co.), Pa.

TWIST DRILLS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS

Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVES (Blast Furnace)

Bailey, Wm, M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Broslus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa

VALVES (Brass, Iron and Steel)

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Check)

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Control—Air and Hydraulic)

Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

VALVES (Electrically Operated)

Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.

VALVES (Gas and Air Reversing)

Blaw-Knox Co., Blawnox, Pa.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

VALVES (Gate)
Bartlett-Hayward Div , Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

VALVES (Gate—Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

VALVES (Globe)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Hunt, C. B., & Son, Salem, O.
Wood, R. D., 400 Chestnut St., Philadelphia, Pa.

VALVES (Hydraulic De-Scaling)
Hunt, C. B., & Son, Salem, O.

VALVES (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

VALVES (Needle)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Steam and Water)
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

VISES (Bench)
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

WALKWAYS—See FLOORING—STEEL

WASHERS (Gas)
McKee, Arthur G., Co., 2422 Euclid Ave., Cleveland, O.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Peoria Malleable Castings Co., Peoria, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O,
National Lock Washer Co., The, Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHERS (Spring)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WELDED STEEL CONSTRUCTION
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

WELDERS (Electric—Arc, Spot, Seam, Flash, Butt, Automatic Projection, Hydromatic, Etc.)
Federal Machine & Welder Co., Dana St., Warren, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-647.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

WELDING COMPOUNDS
Anti-Borax Compound Co., Inc., Fort Wayne, Ind.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
General Welding & Equipment Co., 268 Northampton St., Boston, Mass.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
American Agile Corp., 5806 Hough Ave., Cleveland, O.
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Bronze)
Titan Metal Mfg. Co., Bellefonte, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS OR WIRE
Air Reduction Sales Co., 60 East 42nd St., New York City.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Champion Rivet Co., The, Harvard Ave. at E. 108th St. Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-648.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Brass)
Titan Metal Mfg. Co., Bellefonte, Pa.

WIRE (Cold Drawn)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Round, Flat, Square, Special Shapes)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE (Stapling)
Keystone Steel & Wire Co., Peoria, Ill.

WIRE (Threaded)
Progressive Mfg. Co., Torrington, Conn.

WHERE-TO-BUY

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Anaconda Wire & Cable Co., 25 Broadway, New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE BUGGIES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

WIRE CLOTH
Cyclone Fence Co., Waukegan, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City,

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., Bridgeport, Conn.

WIRE FORMS, SHAPES AND SPECIALTIES
American Spiral Spring & Mfg. Co., 5540 Harrison St., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Fifth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MILL EQUIPMENT
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)
American Cable Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE ROPE SLINGS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Shuster, F. B., Co., The, New Haven, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.
Williams, J. H., & Co., 225 Lafayette St., Buffalo, N. Y.

WRENCHES (Drop Forged)
Roebling's, John A., Sons Co., Trenton, N. J.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

ZINC (Rolled Sheets, Strips, Coils)
New Jersey Zinc Co., 160 Front St., New York City.

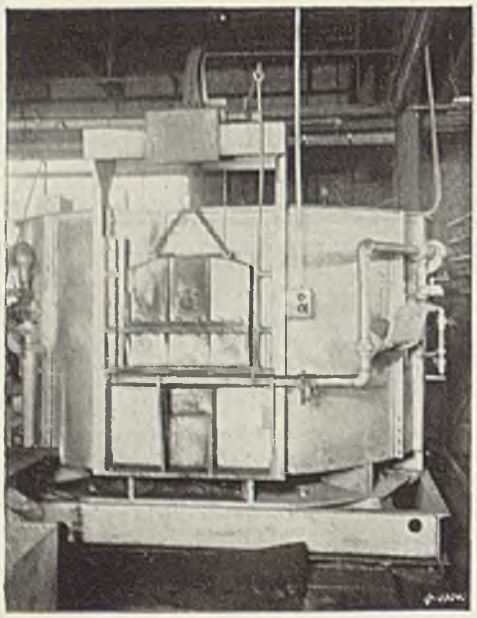
ZINC SLABS (High Grade)
St. Joseph Lead Co., 250 Park Ave., New York City.

ZINC SLABS (Spelter)
New Jersey Zinc Co., 160 Front St., New York City.

ZIRCONIUM METAL AND ALLOYS
Electro Metallurgical Sales Co., 30 E. 42nd St., New York City.

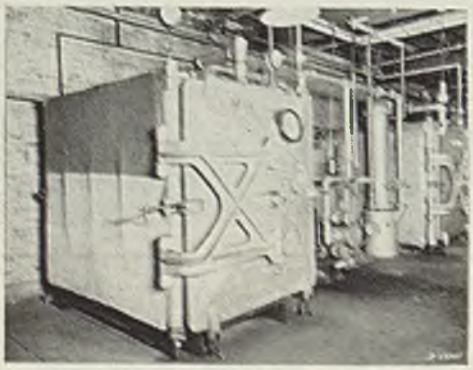
HEAT TREATING EQUIPMENT

(At the Former GENERAL HOUSEHOLD UTILITIES CO. PLANT)
Makers of Grunow Refrigerators and Grunow Radios
Your immediate inquiries will be given prompt attention



Mahr Rotary Gas Fired Furnace

1—6'6" diameter Mahr Ring Type Rotary Gas Fired Heat Treating Furnace, 1675 deg. F. Equipped with Exite hearth plate and with provision for filling both outside and inside sand seals. With Lewellen motor drive with Minneapolis-Honeywell Type M-20-4 motor driven Butterfly valve, 10 oz. Mahr blower and motor with McKee Proportional Mixer. Complete Leeds & Northrup recording equipment.



Devine Dehydrating Unit

Models A-461 and A-449. Complete with shelves and recorders, with 1—Devine Vacuum Pump, with 3 H.P. 3-60-220-1160 motor.

Also Available

1—Mott Continuous Rotary Sand Blast Type SG—with Cullman Dr.

1—Mott Sand Blast Type 25—26" x 29" cabinet.

1—Mott Dust Arrester 6' wide x 7' high, No. 60 Type CS.

1—Pangborn Sand Blast Tumbler Type, Type G.F. No. 2.

1—Blakeslee Metal Washer 22" w. x 21" h., x 22' l., complete.

1—Blakeslee Metal Washer 22" w. x 22" h. x 12' l.

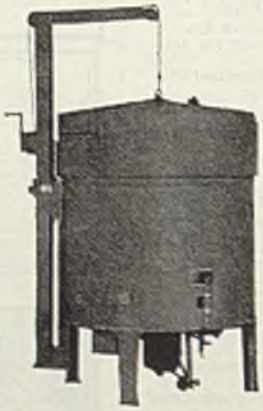
1—8 Station Thomson Gibb Multiple Flash Production Welder 336 amp. 60 cy., 440 volt.

4—50 KVA Thomson Gibb Refrigerator Cabinet Clamping Spot Welders.

2—Gas fired lead furnaces.

2—Electric oil quenching tanks.

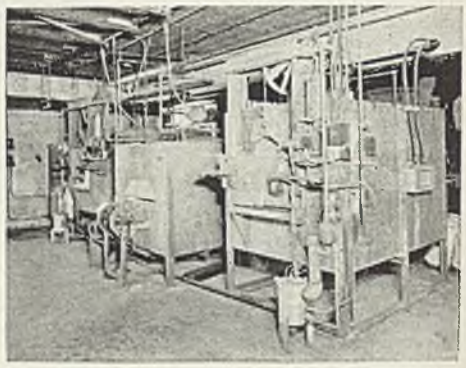
2—Air Filters, piping and tank.



Leeds & Northrup Homo Furnaces.
Hevi Dty. 1842 Vert. Retort Furnaces.
40 K.W. G.E. Brazing Furnace.
5 Pot Hevi Duty Tinning Furnace.
Miscellaneous Other Furnaces.

No. 166A American Gas Furnace "Shaker Type." Opening 13" w. x 3" h. x 8' long. Equipped with a Reeves motor drive; 1—Spencer Turbo Compressor with 2—Minn.-Honeywell type V-20-4 motor operated gas and air control valves.

THIS FURNACE IS IN EXCELLENT CONDITION.



EF Electric Hardening Furnaces

Manufactured by Electric Furnace Co. 2—50 KW Batch type Brazing Furnace Equipments. Operate to 1750 deg. F. Effective heating chamber length 4'6". Heating chamber width 2'4". Lined with 15" semi-refractories and insulated brick. Complete with all electrical equipment.

1—Gas fired chain conveyor type preheating furnace, operates to 900 deg. F. Effective heating chamber length 6'0". Inside width of chamber 3'0". Equipped with:

1—L. & N. indicating controller.

1—Minn.-Honeywell 2 position control valve.

1—Chrome alumel thermocouple.

1—Victor Acme motor operated blower.

1—Combustion type generator equipment for providing "Elfurno" gas for 2 batch brazing furnaces.

EF Gas Fired Hardening Furnace

E-F Furnace Co. gas fired chain belt conveyor draw furnace with Reeves motor drive oil quench tank and conveyor complete with: Pyrometer equipment, quenching equipment, blower.

Louis E. Emerman & Company

1761 ELSTON AVE. CHICAGO, ILL.

CLASSIFIED

Employment Service

SALARIED POSITIONS
$2,500 to $25,000

This thoroughly organized advertising service of 30 years' recognized standing and reputation, carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 110 Delward Bldg., Buffalo, N. Y.

MEN—SALARIED POSITIONS—WOMEN
$2,500 to $15,000

Our confidential system promotes you for high salaried positions—moderate cost. Write for testimonials and valuable information No. F-1.

EXECUTIVE'S PROMOTION SERVICE
Washington, D. C.

Help Wanted

SHEET METAL SHOP FOREMAN

by refrigerator and refrigerated case manufacturer. Experience in these lines not essential.

Press brake and welding light gauge metals important.

GLOEKLER MFG. CO.
P. O. Box 1390, Erie, Pa.

Positions Wanted

STEEL EXECUTIVE—ADMINISTRATIVE

Formerly assistant to president, comptroller. Broad knowledge of steel business. Legal, financial and security experience. Graduate engineer.

Desires management position with industrial company.

Address Box 116, STEEL, Penton Bldg., Cleveland.

Accounts Wanted

MANUFACTURERS REPRESENTATIVE calling on industrial plants in Wisconsin, wants line of machine shop replacement parts, tools, supplies or equipment. Address Box 119, STEEL, Penton Bldg., Cleveland.

A SUCCESSFUL, WELL ESTABLISHED manufacturers' agency, with a business and technical background and with wide acquaintance, offers office administration, sales power and warehousing to established manufacturer desiring representation in southern half of Ohio and adjacent territory. Let us be your Cincinnati branch. Address Box 113, STEEL, Penton Bldg., Cleveland.

Castings

OHIO

THE WEST STEEL CASTING CO., Cleveland. Fully equipped for any production problem. Two 1½ ton Elec. Furnaces. Makers of high grade light steel castings, also alloy castings subject to wear or high heat.

PENNSYLVANIA

NORTH WALES MACHINE CO., INC., North Wales. Grey Iron, Nickel, Chrome, Molybdenum Alloys, Semi-steel. Superior quality machine and hand molded sand blast and tumbled.

Opportunities

LANGUAGES • TRANSLATIONS

Accurate Translations: Technical, Commercial, and Advertising Matter. 15 years' experience. Reasonable rates. Send us your next job, whether letter or catalogue; or submit for quotation.

****If you wish to learn Spanish, French, German, or any other language, consult us for expert guidance.*

LANGUAGE SERVICE CENTER
Lewis Bertrand, Director
18 East 41st Street, New York. LExington 2-8838

FOR RENT

completely equipped

STRUCTURAL STEEL PLANT

in central Philadelphia

WILKINSON & FOYLE, Agents.
1201 Chestnut St., Phila.

Bids Wanted

Federal Works Agency, Public Buildings Administration, Washington, D. C., Dec. 14, 1939.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Standard Time, Jan. 18, 1940, for construction of the U. S. P. O. at Fenton, Mich. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished, in the discretion of the Commissioner, to builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Commissioner of Public Buildings, Federal Works Agency.

Wanted

Wanted . . .
PORTABLE SPOT WELDING GUN

with complete equipment including transformer lines, etc.

Give description, price and complete specifications. Interested in buying immediately.

GLOEKLER MFG. CO.
P. O. Box 1390, Erie, Pa.

WANT SMALL SAND BLAST TUMBLING barrel in good condition.
AMERICAN METAL TREATING CO.,
1035 E. 62nd St., Cleveland O.

Contract Work Wanted

NEW ENGLAND FACTORY WITH WELL equipped machine shop capable of high class production work, also sheet metal department equipped to fabricate stainless steel, copper or mild steel products can handle outside work equivalent to one thousand man hours per month. Address Box 112, STEEL, Penton Bldg., Cleveland.

Equipment For Sale

ALL MACHINES FOR QUICK SHIPMENT

LATHES

24"x20' Lodge & Shipley Selective Head for motor drive, Q.C.G., T.A. Serial No. 27,023. In excellent condition.

18"x8' L. & S. cone drive (bowl head) Q.C.G., Cullman Motor Drive. Very good.

RADIAL DRILLS

6' American Universal, Gear Box at base in rear for M.D. Serial No. 35,875. Good shape.

6' Reed-Prentice, Plain, Gear box, single pulley or motor drive. Serial No. 5700. In excellent condition.

PLANERS

72"x72"x16' Cincinnati Double Housing, 4 Heads, 35 H.P. motor 230 V., D.C. 400/800 Rev. Good condition.

60"x60"x10' Liberty Double Housing Tool & Die Shop Planer 1 rail and 1 side Head. Box bed and box table, V-belt motor drive 3/60/220.

Practically good as new.

SHAPER

28" American, B. G. Crank, 4-speed Gear Box, Motor 3/60. Rebuilt. Ready to ship.

TESTING MACHINE

100,000 lb. Riehle, Universal, with motor 1/60/110-220 volts. Excellent condition.

PRESSES

No. 6 Bliss, Double Crank, Tie-Rod frame, 6" stroke, bed 42"x34", with Marquette Cushions. Wt. 24,000 lbs. Belt driven. Excellent condition.

No. 59¼ Toledo, Single Crank, Tie-Rod frame, 8" stroke, bed 40"x40", ram pressure 440-Tons. Wt. 80,800 lbs. Belt driven. Good condition.

UNISHEARS

B-36 Stanley, 36" throat, cap. ¼", 2 HP. Motor 3/60/220 volts. Weight 5500 lbs.

O-36 Stanley, 36" throat, cap. 14 ga., ¼ HP. Motor of 3/60/220 V. Wt. 725 lbs.

Both Machines like new

MARR-GALBREATH MACHINERY COMPANY
53 Water St. Pittsburgh, Pa.

Rails—"1 Ton or 1000"

NEW RAILS—5000 tons—All Sections—All Sizes.
RELAYING RAILS—25,000 tons—All Sections—All Sizes, practically as good as New.
ACCESSORIES—Every Track Accessory carried in stock—Angle and Splice Bars, Bolts, Nuts, Frogs, Switches, Tie Plates.
Buy from One Source—Save Time and Money
'Phone, Write, or Wire

L. B. FOSTER COMPANY, Inc.
PITTSBURGH NEW YORK CHICAGO

ADVERTISING INDEX

ADVERTISING INDEX

As Your Production Climbs New Peaks—

Are your Drilling Machines EARNING MAXIMUM PROFITS?

Customers Say . . . "CLE-FORGE High Speed Drills Produce Most Holes per Grind, Most Grinds per Drill"

YOU MAKE large capital investments in drilling equipment to insure low-cost, accurate production of holes. Have you thought enough about *continuing* those low costs by correct selection of Drills and Reamers?

Cle-Forge High-Speed Drills and Peerless High-Speed Reamers *make your machines earn faster*. Countless tests under equal competition show "Clevelands'" outstanding superiority in number of *holes* per grind, number of *grinds* per tool.

Drilling 3/16" oil holes in steel bolts, Cle-Forge increases useful drill life 240%. Making 3 cuts in bronze bushings to 1 1/16" total depth, each Cle-Forge multiplies former drill production by more than 700 times. "Cleveland" Adjustable Reamers reduce former cost of $5.91 per 100 holes in hard metal to 18c per 100 under identical conditions.

Long-experienced "Cleveland" Engineers will gladly help you to determine whether Cle-Forge High-Speed Drills can make your multiple machines earn more. Address as below or consult your regular source of supply.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 654 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU