

STEEL

PRODUCTION • PROCESSING • DISTRIBUTION • USE

For forty-eight years—IRON TRADE REVIEW

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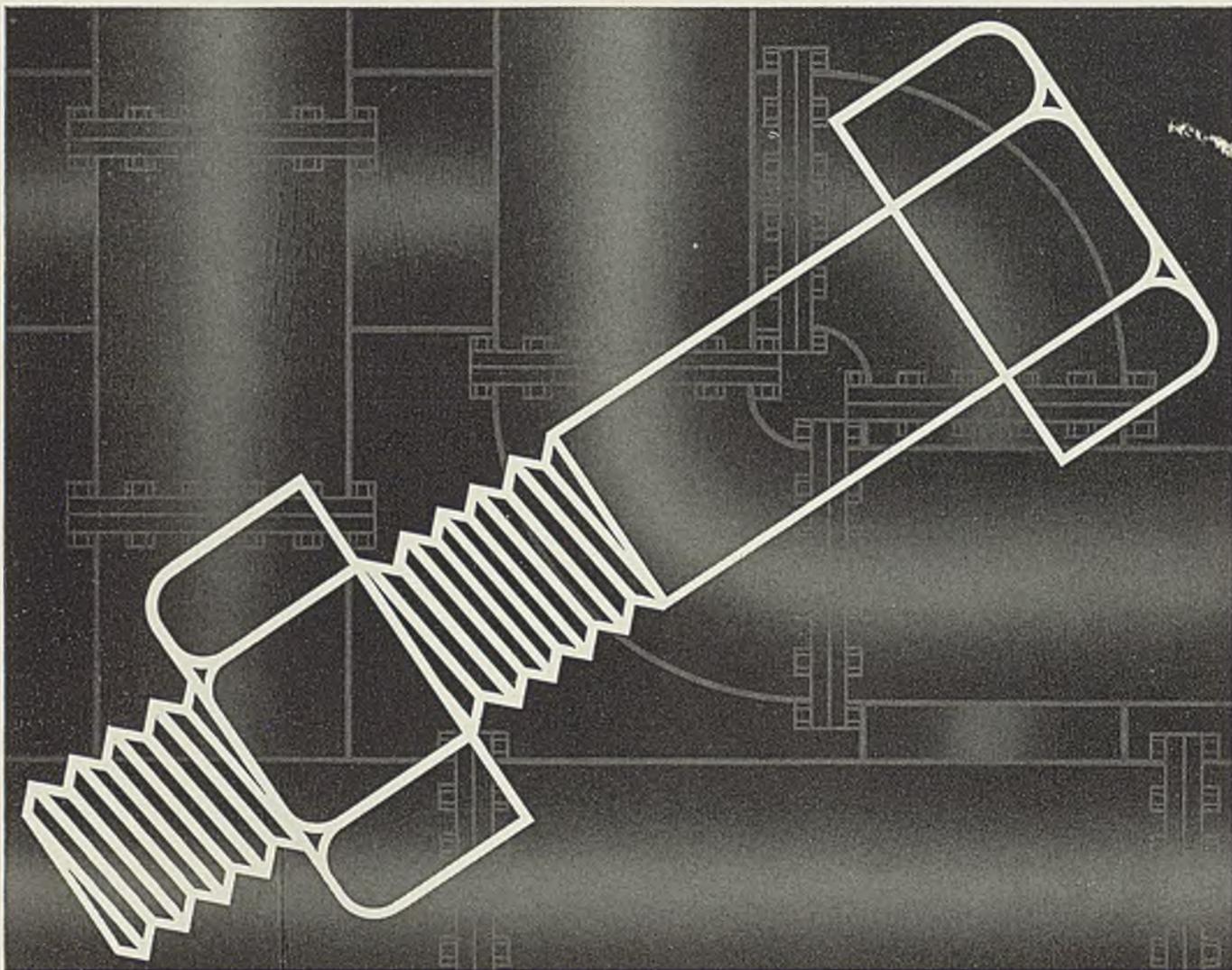
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MOLY

As the Editor Views the News

EVACUATION of Chrysler plants by sit-down strikers has eased the tension of labor relations in motordom, but it does not solve the basic problem involved. Because CIO presumably has a higher ratio of members to the total number of employes in Chrysler plants than in those of General Motors and other automobile companies (p. 29) Mr. Lewis and his lieutenants probably will stage a stern battle to force Walter Chrysler to recognize CIO as the bargaining agency for all Chrysler employes. This would be in accordance with the highly controversial provision for "majority rule" in the Wagner national labor relations act.

The demand of the CIO for a closed shop in Chrysler plants and the majority rule feature of the Wagner act discriminate against employes who do not desire to join unions, or who prefer to belong to unions not at the moment supported by the political party in power. If, in the cause of fair treatment, Mr. Chrysler should reject the CIO demands or if the Supreme Court should declare the act unconstitutional, the basic issue of the labor mess would be thrown into the court of public opinion. In this event, the folly of the President's action in disparaging constitutional authority would be clearly revealed.

Basic Issue Not Settled

A survey by the National Industrial Conference board (p. 20) indicates a definite shortage of skilled craftsmen in the metalworking industries. Of 404 companies reporting, 52.2 per cent stated that they cannot find enough competent men for jobs available; 26.5 per cent indicated a serious scarcity of skilled workmen and 21.4 per cent reported no shortage. A spokesman for a professional union of machinists disputed the findings of the survey, declaring that union lists show 8000 machinists out of work. The union

Men for Jobs; Jobs for Men

list may or may not be correct, nevertheless it is a fact that thousands of classified ads are appearing in the "Help Wanted" columns of newspapers offering jobs to certain types of machinists and machine hands. No one who is familiar with current problems in the majority of metalworking establishments can doubt the existence of a skilled labor scarcity.

Manufacturers confronted with difficulties in finding workmen qualified to fit the jobs that are open cannot depend upon the apprentice system. Excellent as it is for developing an even supply of trained workmen year after year, it is not flexible enough to serve in the present emergency. Therefore a number of employers are adopting the "learner" training system. One machine tool building company, which has employed this system for 21 months (p. 62) has hired 257 "learners" during this period. After 60 days of intensive training under careful supervision the novices are qualified to take their places in the normal production routine. The key to the success of the plan is the care with which the personnel manager selects "learners."

Learner Plan Gains Favor

One of the constant aims of metallurgists is to improve the quality of metals. During the past quarter-century advances in the heat treatment of iron and steel have increased physical properties so much that one is prone to think that further opportunities along this line will be limited. Apparently the opposite is true. New information, coupled with better facilities for transforming the results of research into effective practice in industry, seem to be opening up new avenues of progress. Typical of promising developments are "austempering" (p. 42) a process for imparting some qualities of alloy steel to ordinary carbon steel; the production of ferrous alloys through the use of boride crystals (p. 46); and experimental work (p. 48) in the field of powder metallurgy.

Getting More Out of Steel

E. L. Shaner



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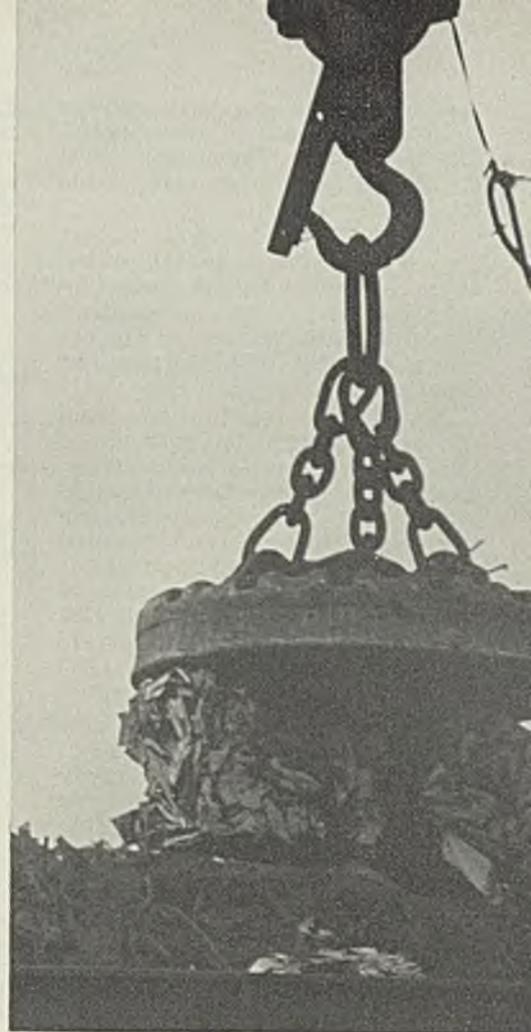
RYERSON

Scrap, Beggar in '32,

Leader in World

Strategy Today

*"Kept Alive by Exports in Depression",
Boom in Shipments and Prices Now
Raises Question of Restriction*



SHOULD the United States restrict exports of steel scrap? This question is assuming major significance in view of unprecedented shipments in recent months and years, mainly to Japan, Italy and United Kingdom — countries which have classed scrap as war material and virtually prohibited its exportation.

Inquiry into this traffic in scrap reveals an amazing increase, from a few thousand tons exported ten years ago to millions of tons today, completely overshadowing this countries' exports of finished steel, affecting not only domestic prices of scrap, but raw materials, and finished steel.

The question of limitation is being considered in the steel industry and in Washington. It is pointed out that some precedent exists for regulation. Early in 1936 congress passed a bill empowering the President to control exports of tin plate scrap, and the secretary of state as chairman of the munitions control board was given authority to issue permits for such exports.

Washington is dabbling in the problem to the extent that Senator Guffey, Pennsylvania, is considering

a bill to place scrap exports on a quota basis. This is said to be favored by a number of steelmakers, but the largest scrap consumers in this country apparently are not committing themselves. During the worst years of the depression, as will be shown, many scrap dealers managed to continue in business only through cultivating export business, while they pointed out the situation which might arise with continued drain of American resources. The belief prevails that the problem may be worked out more satisfactorily within the steel and scrap industries than through arbitrary restriction to be imposed by the government.

Large Tonnage Is Handled

Steel scrap has been growing steadily in importance as a raw material for the steel industry. At the beginning of the century the tonnage handled was insignificant but it has reached close to 30,000,000 tons annually in the United States at present, as the technique of steel-making has advanced.

Exports in 1923 were only 98,298 gross tons. In 1933 the first heavy

increase was shown, followed by further gains in 1934 and 1935. Because of the maritime strike in 1936 a slight decrease was noted, but for 1937 it is estimated total exports will be near 3,000,000 tons provided no action is taken to limit the outflow. In January shipments amounted to 72,849 tons.

Should 1937 exports reach the estimated total they would almost equal the aggregate for the 11 years, 1923-33, inclusive. The annual average for this period is 299,175 gross tons, the estimate for 1937 being ten times this figure. These comparisons indicate the tremendous increase in the outward current of scrap.

Total scrap remelted in the United States in 1935 was 26,415,330 tons, practically evenly divided between so-called home scrap—that produced in steel mills and immediately recycled without going into the market—and material that passed from producer to consumer through the hands of dealers or brokers. The same year scrap exports were 2,107,313 gross tons, 16.12 per cent of the purchased scrap.

By far the greater part of the exports from the United States has

been bought by Japan, Italy and the United Kingdom. In three years, 1934-36, inclusive, Japan took 3,343,828 gross tons, 57 per cent of the total scrap exports.

Italy in the same period bought 896,899 gross tons, 15 per cent of the total, and the United Kingdom 781,581 tons, 13.1 per cent. Thus these three took 5,022,308 tons or 85.1 per cent of the total 5,883,514 gross tons exported.

Institute of Scrap Iron and Steel Inc. has estimated that each ton of steel scrap represents the consumption of 5 tons of raw materials. Using this factor the figures indicate that in the three years considered Japan bought the equivalent of 16,719,140 tons of natural resources of the United States, Italy 4,484,495 tons and the United Kingdom 3,907,905 tons, an aggregate of 25,111,540 gross tons.

In an average year Japan now takes as much iron and steel scrap out of the United States as formerly was exported to all nations in three years. Italy and the United Kingdom each takes approximately as much each year as formerly was exported to all nations in one year.

Exports Are Growing Rapidly

These comparisons indicate the rapid growth of scrap exports from the United States to make up for the deficiencies in these three nations. That much of the steel made from this scrap goes into munitions seems evident.

Reasons why these and other foreign nations buy scrap are many, and are based on their comparative lack of raw materials. The first reason is the inadequate iron and steel scrap supply in their own countries, or, at least, insufficient to meet their ordinary needs and their added armament requirements. Insufficient iron ore, or limited blast furnace

capacity are other reasons for importing scrap. At present restrictions on export of scrap from other countries has shifted practically all this demand to the United States, the only country able to supply the need and which is not regulating the outflow.

Another angle to this is the opportunity it gives other nations to utilize scrap from the United States to manufacture steel products to sell to other countries, including the United States.

That demand for scrap from this country is likely to increase rather

EXPORTS OF IRON AND STEEL SCRAP

	Gross Tons
1936	1,941,031
1935	2,107,313
1934	1,835,170
1933	773,406
1932	227,522
1931	136,125
1930	358,649
1929	557,044
1928	516,148
1927	239,209
1926	130,046
1925	115,247
1924	139,231
1923	98,298

than decrease is indicated in statements by officials of importing countries. A Japanese official is quoted as saying that Japan in 1937 will require about 3,150,000 gross tons of scrap, about half of which will be purchased in the United States. This would mean an increase of about 500,000 tons over 1936 purchases by Japan.

At the same time Japan will need to import 820,000 metric tons of pig iron and 3,500,000 tons of iron ore. But the imported scrap is of greater value, requiring less processing than pig iron or iron ore.

As the world-wide hunger for steel has developed, largely due to heavy

armament programs, restrictions on free movement of scrap have developed practically everywhere except in the United States. The latter has been considered as a great pool, almost inexhaustible, from which all needs can be drawn.

The Japanese government is understood to have exercised strict control over scrap exports, considering this an essential war material. Japan also is placing an import duty on a wide variety of iron and steel products while leaving iron and steel scrap duty free. (See page 33.)

In Great Britain the British Iron and Steel Federation has made an agreement with the National Federation of Scrap Iron and Steel Merchants, (STEEL, March 1, page 24), to regulate and conserve scrap supplies and prices. This agreement is said to include provisions against export of scrap while the present emergency continues.

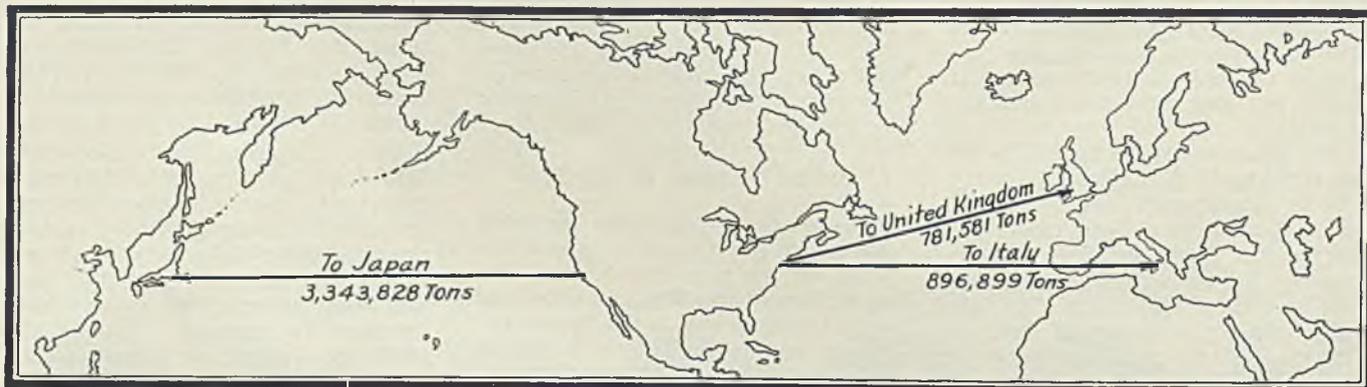
Italy has banned all scrap exports except under license, to prohibit any such movement.

Germany has required an export license for scrap since 1923, applying to various grades. France requires authorization by the ministry of finance, and since Jan. 30, 1937, has imposed an export duty of 20 to 30 francs per 100 kilos. Export permits also are required in Belgium, Czechoslovakia, Poland, Spain, Austria, Finland and Norway. Sweden has a similar requirement covering malleable scrap.

Demand Changes the Picture

Before the heavy demand began, exports were not considered seriously, since the material was drawn almost entirely from areas remote from steelmaking operations. The supply was sufficient for all melters in this country, with surplus for foreign users. Most of the scrap then moved from Gulf and Pacific ports

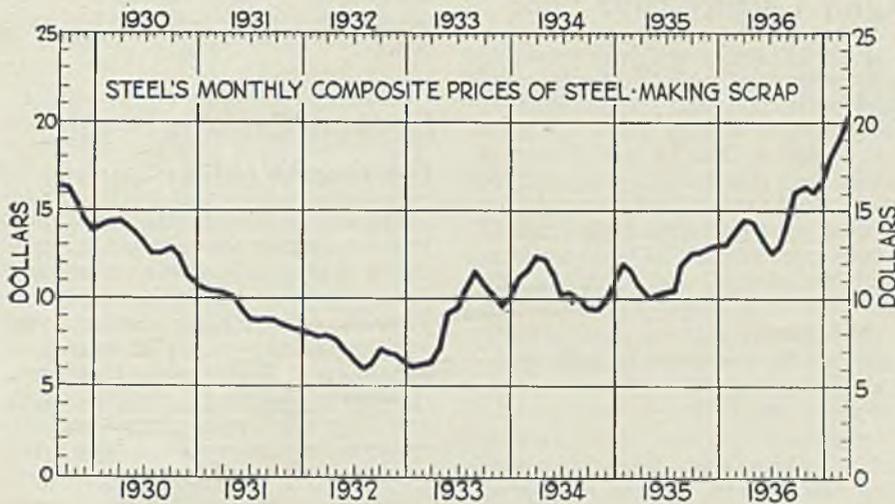
Where Equivalent of 25,000,000 Tons of Raw Materials Went in Three Years



SCRAP shipments to Japan, Italy and United Kingdom in 1934-1936 amounted to 5,022,308 gross tons principally steelmaking grades. Official averages indicate 25,

111,000 tons of raw materials are required to produce this amount of steel. All scrap exports in the three years amounted to 5,883,514 tons

Rise in Scrap Prices Under Stimulus of Foreign Demand



PEAK of steelmaking scrap prices in 1929, as shown by STEEL's composite was \$16.46. Low in 1932 was \$6.06. This month the composite is \$20.73. Some dealers say export business at the bottom of the depression was the only thing that saved them

and some from New England states.

As the draft became heavier prices were bid up until material was attracted from greater distances from tidewater, and export price soon began to affect the price in the domestic market.

In 1929 heavy melting steel scrap was quoted by STEEL at a composite price of \$16. In February this year the average composite price was \$19.19, and at present it is \$21.17 per ton. Much, if not all, this increase is attributed to the steady drain and high bidding by foreign buyers.

Institute of Scrap Iron and Steel Inc. has been aware of the implications in the export of scrap and at its mid-year conference in Detroit, Sept. 9, 1936, President Darwin S. Luntz proposed a joint commission to be named by the institute and the American Iron and Steel institute to study the relation of scrap exports to the domestic market.

"The consumers of scrap should see to it," declared Mr. Luntz, "that a fair price is paid for our commodity at all times, to make it unsound to export scrap. At no time should the price of scrap be permitted to go so low, as it has in recent years, that scrap dealers are compelled to sell for export, in order to cover their costs of operations and meet their payrolls."

Scrap exports kept that industry from bankruptcy during the depression, said Michael V. Bonomo, institute vice president.

He told how his company, in 1932, was forced to accept a foreign offer for a cargo of No. 2 steel at \$4.20 a gross ton because domestic mills were unwilling to buy. He said:

"The logical and natural export of

scrap requires no defense. Exports have saved the business of untold numbers of scrap dealers. The export movement should be utilized to absorb the surplus which we have from time to time and to take up the slack when the domestic demand is dormant. One thing that has been overlooked entirely is the fact that exports have kept the machinery of the scrap industry intact, so that it is now functioning in full swing, to

supply the steel industry with the material which is needed."

The composite price of steelmaking scrap reached its low in July, 1932, at \$6.06 per ton. At that time basic pig iron was \$14, valley, and the steel industry was operating at about 15 per cent.

As a rule steelmaking scrap is quoted at a lower price than steelmaking pig iron and when the former approaches closely to the latter, scrap is considered too costly to be economical. In the March 22 issue of STEEL heavy melting steel at Pittsburgh was quoted \$23.50 and basic pig iron at Neville Island (Pittsburgh) was at exactly the same price. In such circumstances steelmakers normally decrease the proportion of scrap in their open-hearth mixtures and increase the proportion of pig iron, thus lessening demand for scrap and easing the price. However, in the present situation this is not as effective as usual. In the first place the heavy export demand is sufficient to absorb whatever lessened demand results, and at the same time practically all available blast furnaces are active and tonnage of pig iron can not be greatly increased to replace scrap.

In an accompanying table exports by federal customs districts indicates that more than 66 per cent of scrap exports are moving from ports serving scrap-producing territories from which steelmakers in the coastal states draw their supplies.

The 1935 survey of scrap consumption by the United States bureau of

Scrap Amassed on West Coast for Shipment to Japan



WHILE thousands of carloads of scrap cars have been embargoed at eastern points to await ships to transport it to foreign countries, large tonnages also have been amassed at Pacific coast ports. Here at Los Angeles are 4000 tons waiting to be loaded on the steamer CITY OF LOS ANGELES for Japan. On arrival there both ship and scrap will be salvaged and made into new ships, tools and steel products. Wide World photo

mines indicates that domestic scrap melters in these areas in 1935 bought for their own use 5,000,000 tons of scrap. With exports of 1,393,209 tons, it appears that the drain on supplies available to domestic melters was about 27 per cent.

One result of the heavy export and the rapid increase in prices has been a decided effect on prices of finished

UNITED STATES EXPORTS		
	Gross Tons	
	Iron and Steel Scrap	Finished Steel Products
1929	557,044	2,452,282
1930	358,649	1,620,717
1931	136,125	848,690
1932	227,522	378,415
1933	773,406	582,950
1934	1,835,170	996,911
1935	2,107,313	982,909
1936	1,941,031	1,221,663

steel, since scrap is so important a raw material.

An important result of the scrap movement to other countries is shown by an accompanying table of exports of finished steel products and of scrap over the past seven years.

In this table finished steel exports declined steadily while scrap exports increased with equal rapidity. An inference is that from the American scrap other countries manufactured finished steel which they otherwise might have purchased here. This table shows that scrap exports in 1936 were 349 per cent of those in 1929, while exports of finished steel were only 49.8 per cent.

In many respects scrap has come to be the most important factor in the steel industry of the world. Its more immediate availability for conversion, compared with the longer process of mining ore, smelting it to pig iron and refining it to steel, commends it to steelmakers in any case, but more especially to those in countries where natural resources are limited or absent. Conservation is the order of the day and, as has been shown, the attitude of most of the world is to keep scrap at home for domestic melting.

Finds Rearmament Aiding Output in Leading Countries

World industrial production receded during January, according to the current review by National Industrial Conference board. Volume of output declined in the United States, Great Britain, Canada, Germany, and in a number of the South American countries. Slight gains occurred in France, Austria, and the Netherlands.

Despite the slight decline in Great Britain during January, business activity is still maintained at a high

Galvanized Sheets Now Only Quarter 1893 Price

A LOOK backward into prices of galvanized sheets should comfort consumers who feel the present quotation is unduly high. A price list issued in 1893 by Apollo Iron & Steel Co., Pittsburgh, now part of the United States Steel Corp., quotes No. 24 gage galvanized sheets at 14 cents per pound. This compares with the present quotation of 3.80c per pound, Pittsburgh.

This indicates the present price of this grade and gage is little more than one-quarter the price prevailing 44 years ago.

This is a graphic illustration of what improved equipment and practice has done in making steel products cheaper. It is an example of the method that has caused the tremendous growth in the use of steel in replacement of other materials.

rate, especially in industries affected by the extensive rearmament program. Metal trades in leading countries are working at capacity and are having difficulty in expanding output sufficiently to meet new demands.

Building activity is substantially above a year ago, with non-residential construction resulting partly from rearmament, taking the lead.

In France, government purchasing has contributed to the support of heavy industry, and buying in anticipation of higher prices is in evidence.

Brochure Explains Details Of Arc Welding Contest

The James F. Lincoln Arc Welding foundation has issued a brochure giving all details necessary for competing in the foundation's \$200,000 arc welding contest. In addition to the contest's rules and conditions it lists typical machines, structures, buildings, manufactured and fabricated products which contestants may select for subjects for papers. Many subjects are illustrated.

The brochure contains a large chart giving details of the 446 prizes by classifications. In addition to encouraging the use of arc welding the contest is expected to promote steel consumption. A copy of the brochure may be obtained by addressing the foundation, postoffice box 5728, Cleveland.

Italy To Prospect for Minerals in Ethiopia

A government organization, to be known as the East African administration, has been established by

Movie Director Builds All-Steel House in San Fernando Valley



A NUMBER of steel houses of ultra-modern design have recently been built in Southern California. One of the latest of these is this all-steel residence designed by Architect J. Neutra for the motion picture director, Josef von Sternberg, and located in San Fernando valley. The house is notable for the lavish use of steel throughout. The landscaped grounds, planned to offset the severe exterior of the house, feature numerous waterpools to cool the atmosphere

royal decree in Italy to prospect and mine mineral ores in Italian East Africa, according to a report from American Ambassador William Phillips, Rome, to the department of commerce.

Headquarters will be at Addis Ababa and branches will be located in various parts of the country. An Italian-German mining company has been established for the same purpose, with Italy reserving the right to purchase German holdings after five years. The company will prospect principally for coal, iron, copper and lead, it is stated in the ambassador's report.

C. Van H. Engert, Addis Ababa, American minister resident, states that for the present, the German group will furnish some of the technical personnel since a sufficient number of mining engineers is not available in Italy.

Pittsburgh Steel Shipments Expected To Rise 30%

Steel shipments in the tri-state area around Pittsburgh will increase 30 per cent in the second quarter of 1937, and shipments of all commodities will rise 11 per cent, according to estimates of the Allegheny advisory board, composed of 1500 industrial, agricultural and professional men whose activities are directed toward welfare of railroad transportation.

Estimated second-quarter freight car requirements were, 859,100 cars, compared with 779,118 in second quarter last year. Loadings of slag were expected to decrease 11.1 per cent; coke by-products to drop 25 per cent; coke shipments to rise 370 per cent. Small increases were expected in coal shipments. Combined shipments of coal and coke were estimated at 453,176 cars, or nearly half of the region's traffic movement.

Increased business activity was indicated for many products. Loadings of flat glass were expected to rise 26.1 per cent; brick and clay products, 16.6 per cent; electrical goods, 22.3 per cent, and miscellaneous products, 20 per cent.

Hears Own Composition

Charles S. Belsterling, vice president, United States Steel Corp., was guest of honor recently at a concert featuring the world's premier performance of his own musical composition, "March of the Steel Men." The march was played March 19 by the Joliet Township high school band, Joliet, Ill., at its annual concert following a dinner, attended by 40 civic and business leaders.

Steelworkers Vote for \$6; Form New Employees' Group

THE new 40-hour week appeared to be becoming a matter of increasing importance to steelworkers last week. Many expressed dissatisfaction with the March 16 adjustments in pay and hours.

The men in the mills pointed out that as long as business holds up at its present rate, producers probably will continue to pay time and one half for overtime, and there will be little chance to build up inventories.

Their fears center on possible falling off in business later this year, in which event the time and one half for overtime will cease. At 40 hours per week under the new minimum wage of 62½ cents per hour, employees would be earning slightly less than they received prior to March 16.

Employee representatives at the Aliquippa, Pa., plant of the Jones & Laughlin Steel Corp. announced that they will seek a \$6 per day minimum wage, an increase of \$1 per day, as the result of a poll taken among the plant's 13,000 workers.

Employees Will Reorganize

Carnegie-Illinois Steel Corp. representatives announced that they plan to form a new employees' organization.

According to Ralph H. Martin, of Homestead, the Carnegie-Illinois employees' plans call for complete reorganization of the present representation setup.

Representation through the new union will be limited to members to whom cards will be issued on payment of dues of 25 cents a month and an initiation fee of \$1.

The new plan will be submitted to the employees for action soon, it was said, following a meeting at which representatives from all of Carnegie-Illinois' 18 plants in the Pittsburgh-Youngstown district were present, according to Martin. Martin's announcement read:

"Some of the features of the proposed plan provide for:

"A plant executive committee of employe representatives with power to adjust matters not settled by the department representative.

"A central executive committee of employe representatives with power to negotiate with the president of the corporation on problems not settled in the various plants and on all major issues.

"Compulsory arbitration of all matters which cannot be agreed upon by the president and the employe representatives."

A provision of the plan reads: "In order that this organization may be

free and independent of all outside influences, and entirely self-supporting, dues and initiation fees shall be paid by all members of the organization."

SWOC organizers have been capitalizing on their recent gains to the fullest extent. A vigorous drive is under way to line up as many members as possible before May 1, when an initiation fee of \$3 for each new member goes into effect. On March 31 the collection of dues starts at the rate of \$1 per month for men and 50 cents for women. Dues have been suspended since November.

SWOC announced that Allegheny Steel Co., with plants at Brackenridge, Pa., and West Leechburg, had signed an agreement, patterned after the wage and hour agreements made with the United States Steel Corp. subsidiaries. A few temporary sit-down strikes were reported in some departments at Brackenridge and West Leechburg, but signing of the agreement speedily ended these controversies.

The list of steel companies in addition to Allegheny and the five United States Steel subsidiaries which are reported to have made agreements with the SWOC includes:

Blaw-Knox Co. and its subsidiaries, Lewis Foundry & Machine Co., Pittsburgh Rolls Corp., Union Steel Casting Co., National Alloy Steel Co., Braeburn Alloy Steel Co., Hunter Steel Co., Henry Disston Sons Co., Tipton-Woods Co., Havana Metal Wheel Co., Crescent Forge & Shovel Co., Babcock & Wilcox Co., Northwestern Barb Wire Co., Atlantic Foundry Co., Hamilton Steel Co., Molybdenum Corp of America, Reliance Steel & Iron Products Co., Morrow Mfg. Co., Ingram-Richardson Mfg. Co., Pittsburgh Tube Co., Seyler Mfg. Co., Pittsburgh Screw & Bolt Co., Colona division; Treadwell Construction Co., Reed & Prince Mfg. Co., Standard Steel Spring Co.; Buda Co., National Enameling & Stamping Co.

Employees of Tennessee Coal, Iron & Railroad Co., one of the five United States Steel Corp. subsidiaries which completed negotiations with the SWOC March 17, are granted an increase of only 7 cents an hour, instead of the rate of 10 cents an hour established in northern mills.

Following a conference between L. Gerald Firth, president of Firth Sterling Steel Co., Clinton S. Golden, district representative of the SWOC and a committee representing sit-

Newest of Lustrous Steel Trains "Half the Weight"

down strikers of the company's Globe wire division, Mr. Firth announced that the plant would resume production last Wednesday and would re-employ men as necessary in order of seniority and without discrimination. The meeting was held following evacuation of the plant as demanded by the management.

STEEL PRICE ADVANCE LAGS BEHIND INCREASED COSTS

Recent steel price advances actually were less than concurrent increases in production costs, unofficial information at the department of commerce, Washington, indicates. Although for each dollar of wage increase prices were advanced about \$1.30, the rise in cost of scrap and other raw materials is said to more than cancel the difference.

BETHLEHEM DEFINES POLICY ON COLLECTIVE BARGAINING

Out of 60,530 employes in 23 plants of Bethlehem Steel Corp., eligible to vote in a recent election, 58,356, or 96.4 per cent, cast ballots designating the representation plan as their collective bargaining agency, and they elected 462 representatives for the coming year, Bethlehem announced last week.

While Philip Murray, SWOC chairman, was threatening to call a strike in Bethlehem's plants, the company issued a statement defining its policy:

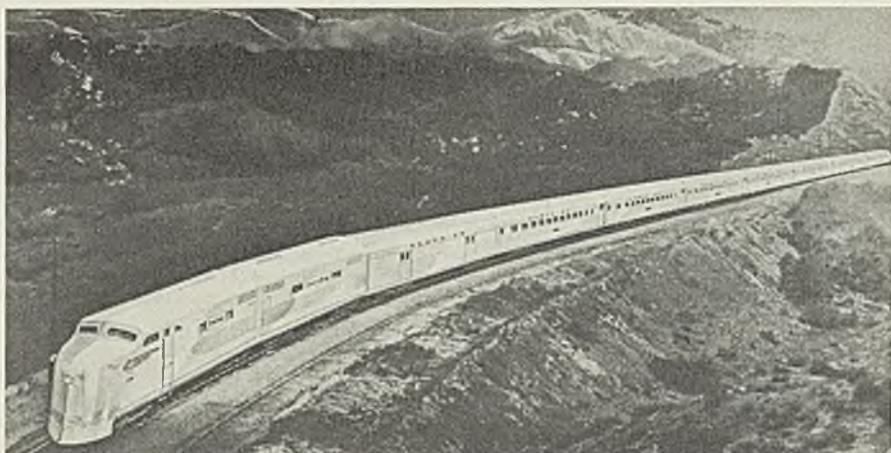
"The managements whenever requested have dealt with the Amalgamated Association of Iron, Steel and Tin Workers, the International Association of Machinists, the Brotherhood of Railway Trainmen, and other labor union groups. The same principle holds good with the Steel Workers Organizing committee, new established agency for steel employes affiliated with the CIO, and negotiations are now going on in some of our plants with the SWOC for those of our employes whom they represent. . . .

"The management has had a consistently open policy on collective bargaining which may be stated as follows: 'The management at any of our plants will meet at mutually convenient times with any persons claiming directly or through any organization to be representatives of any of our employes and we will consider with them any matters of interest to our employes which they may present to us; that is, we will bargain collectively with them.' . . ."

ROXALIN ADOPTS NEW PROFIT-SHARING PLAN

A new plant of sharing profits with their employes has been adopted by Roxalin Flexible Lacquer Co. Inc., Elizabeth, N. J., manufacturers of lacquer and synthetic finishes. One of the features is the presentation of 5000 shares of new Class "B" stock to seven company key men.

Profits will be divided quarterly



THIS gleaming stainless steel train is the new Super Chief which the Santa Fe railroad will place in regular service early in the spring between Chicago and Los Angeles. Built by the Edward G. Budd Mfg. Co., Philadelphia, it embodies newest principles of light-weight construction and will weigh only half as much as the Santa Fe train now in service. It contains nine coaches. The new Super Chief will make the Chicago-Los Angeles run, 2225 miles, in 39 hours, 45 minutes

as follows: Dividends to holders of common stock; dividends to holders of Class B stock; wage dividends to all other workers.

Roxalin has recently purchased an additional plot, 200 x 216 feet adjacent to its plant to lengthen its railroad siding and provide room for further expansion.

SURVEY INDICATES GROWING SCARCITY OF MACHINISTS

The scarcity of highly skilled craftsmen in the metalworking industry is becoming more acute, a survey by the National Industrial Conference board indicates.

The survey covered 404 companies employing 467,200 men. Of these, 52.2 per cent reported they found it is impossible to obtain enough competent workers for jobs; 26.5 per cent indicated a serious scarcity; 21.4 per cent reported no skilled labor shortage. The first group of 211 companies would employ more than 7000 skilled men if they could be found.

In Washington, H. W. Brown, vice president, International Association of Machinists, declared that union lists show 8000 machinists out of work.

BAR IRON MILL WAGES FOR MARCH-APRIL UNCHANGED

Bar iron bi-monthly settlement for March-April period has developed a 2.20 cent card for boiling, 12-inch mills and bar mills; and a 2.30 cent card for the guide and 10-inch mills. This entitles boilers or puddlers to a rate of \$12.80 a ton under wage scale of Amalgamated Association of Iron, Steel and Tin Work-

ers. Card and base rate are unchanged since November-December period last year.

Settlement was made during recent bi-monthly conference between S. C. Leonard of Detroit, secretary-treasurer of the Western Bar Iron association, and wage committee of the Amalgamated association.

Comparisons follow:

	—1937—		—1936—	
	Boll.	Guide	Boll.	Guide
Jan.-Feb.	2.20c	2.30c	2.00c	2.10c
Mar.-Apr.	2.20c	2.30c	2.00c	2.10c
May-June ....	.....	.....	2.00c	2.10c
July-Aug. ....	.....	.....	2.00c	2.10c
Sept.-Oct. ....	.....	.....	2.00c	2.10c
Nov.-Dec. ....	.....	.....	2.20c	2.30c
Yearly ave. . . . .	.....	.....	2.03c	2.13c

METAL TRADES EMPLOYMENT REACHES SEVEN-YEAR PEAK

Metal trades employment in 22 leading centers increased during February to the highest level since early 1930, according to the National Metal Trades association, Chicago. It was the seventh consecutive monthly increase. February index was 98.5 per cent of 1925-1927 average, compared with 96.2 in January and 80 in February, 1936. The depression low was 46.1 in April, 1933. Gains were shown last month in practically all cities.

CONTAINER STRIKE SETTLED

Wilson & Bennett Mfg. Co., 6532 South Menard avenue, Chicago, manufacturer of steel containers, announces that a "sit-down strike" of several days duration has been peacefully settled. The plant is resuming production, according to H. Le Pan, general sales manager.

Armco Work To Cost \$12,260,000

AMERICAN ROLLING MILL CO.'S plan for expansion and improvement calls for an expenditure of \$12,260,000, according to an announcement last week.

This includes building one or more open-hearth furnaces at the Kansas City, Mo., plant of Sheffield Steel Corp., a subsidiary; enlarging open-hearth furnaces at Butler, Pa., and improving furnaces at Middletown, O., resulting in an increase of approximately 250,000 tons over the company's present 2,531,000 tons annual ingot capacity.

Pig iron production at Hamilton, O., will be increased approximately 100,000 tons a year through installation and modernization of the blast furnace now being moved from the inactive plant at Columbus, O.

Approximately \$1,500,000 is earmarked for investment in a rolling mill plant in Australia in participation with the John Lysaght Co. of England, Australia, long a good market for American Rolling Mill products, has closed its ports to imports of sheet iron and steel and at the same time is increasing its requirements through the development of its own automobile industry.

Other items in the program include a new blooming mill in the company's Middletown plant to re-

place the old-steam-driven mill; equipment at Butler for processing an increased production of stainless steel; additional soaking pits at Butler and Middletown; a research laboratory at Middletown; and miscellaneous improvements.

Form Company To Make Steel Mill Equipment

C. E. Fessler, steel mill equipment sales representative of Pittsburgh, and E. R. Tyrrell, formerly chief engineer for McKay Machine Co., Youngstown, O., have organized Fessler Machine Co. to manufacture steel mill equipment in the plant of the former Turner-Fricke Co., Sharon, Pa. An engineering department of eight men has been organized with K. R. Fowler, one of the designers for McKay Machine Co., in charge.

For the last 15 years Mr. Fessler has owned his own firm, Fessler & Co., Pittsburgh, sales representatives for major mill equipment companies. Mr. Tyrrell was chief engineer for McKay Machine Co. for eight years. Prior to that he was plant engineer for Sharon Steel Hoop Co., now Sharon Steel Corp., and before that was associated with Republic Iron & Steel Co., now Republic Steel Corp. Mr. Fessler is president of the new company; Mr. Tyrrell, general manager and secretary-treasurer.

Welding To Cut Battleship Weight

PRACTICALLY all-welded construction will be used in the two new 35,000-ton United States battleships, effecting an approximate 1000-ton weight saving in each, navy officials have disclosed.

Large scale substitution of welded for riveted joints will be made with rivets being used only at joints subjected to extraordinary technique to warships of this size.

Naval constructors pointed out that every pound saved on the keel and hull of a ship of fixed displacement affords that much extra margin for armor, armament and speed. United States battleships are limited to 35,000 tons by the 1936 London naval treaty.

Outer armor plates will be fused into one smooth sheath, giving a streamlined appearance to the hulls. Plans and specifications for battleship No. 55 will be made available this week. One of the ships will be built by a private yard and the other in a navy yard, probably Norfolk, Va.

Contracts for about 6000 tons of steel at total cost of \$629,955 were awarded by the navy department last week (see p. 102).

Tata Steelworks Will Increase Capacity

Tata Iron & Steel Co., Jamshedpur, India, has announced a program of plant extension which will increase its annual ingot capacity to 1,250,000 tons.

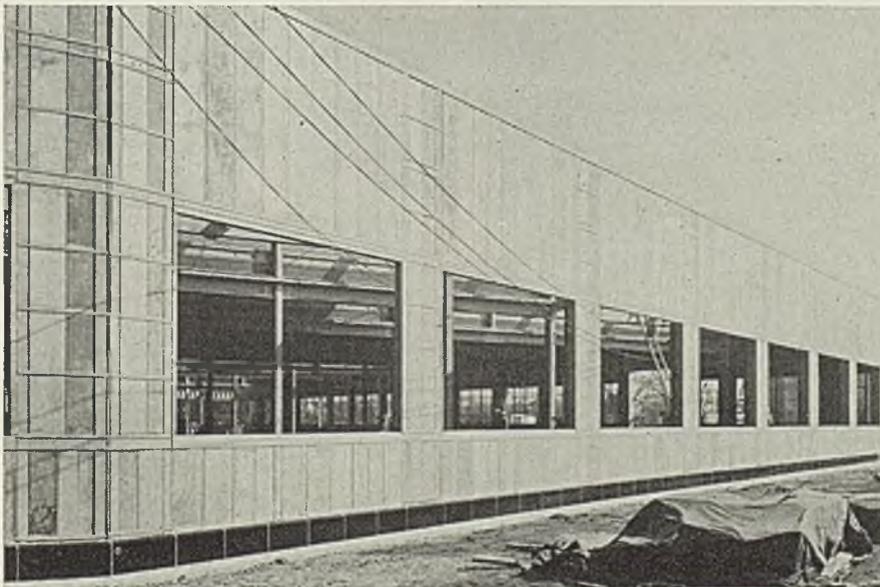
This includes a blast furnace, installation of a structural mill for medium sizes, a strip, hoop and rod mill and addition of a semicontinuous wide strip mill in the sheet department. The company also will build a tube plant in conjunction with Stewarts & Lloyds, of England.

The semicontinuous strip mill will give high production at low cost of operation with a minimum of capital outlay. It will be arranged so that eventually it can be extended.

With the other extensions to rolling mill capacity Tata and its associates will be able to supply about four-fifths of the aggregate demand in India for bars, rails, railroad ties, structural shapes, plates, sheets, tin plate, hoops, tubes, wire rods and wire.

H. A. Brassert & Co., Chicago and London, are consulting engineers. Details of recent merger of Indian steelmaking concerns were given in STEEL, March 1, page 108.

Galvanized Panels Form Base for Walls in Research Laboratory



THIS section of American Rolling Mill Co.'s new research building, Middletown, O., shows a new type of galvanized iron wall panels, base for the exterior wall of porcelain enameled iron, and decorative strips of stainless steel. Glass block will surround steel sash in window areas. Galvanized sections are framed in 4-inch tubular steel. Stainless steel clip strip has been tack welded to panels to support enameled sheets

Financial

NET profit of Jones & Laughlin Steel Corp. and subsidiaries for 1936 was \$4,129,600, compared with a net loss of \$398,716 for 1935, according to the corporation's pamphlet report.

Gross sales amounted to \$94,406,292, against \$63,551,384 in 1935. Steel products sold and shipped in 1936 totaled 1,791,626 tons, in the preceding year 1,182,232 tons. Operations averaged 65 per cent, up from 44 per cent.

Including federal incomes taxes of \$335,000, total taxes paid by the company and subsidiaries amounted to \$3,945,259, or \$1,144,766 more than in 1935. The 1936 taxes include \$519,280 for unemployment insurance under the federal social security act, and taxes under the federal railroad retirement act.

Expenditures for capital improvements and additions completed or in progress Jan. 31, 1936, were \$27,479,605. Unexpended balances on uncompleted authorized construction projects amounted to approximately \$10,500,000.

Expenditures for maintenance and replacements during 1936 were \$12,084,229, compared with \$9,738,575 in 1935.

Floods of January, 1937, caused no appreciable damage to the com-

pany's properties other than some interference with operations at units in Pittsburgh area. Cost of repairing damage caused by floods of March, 1936, amounted to \$956,454.

Total payroll of the company and subsidiaries for 1936 was \$45,559,149, compared with \$32,300,123 in 1935. Average number of employees on payroll was 29,272, or 5028 more than in 1935.

WHEELING STEEL REPORTS \$4,101,857 NET PROFIT

Wheeling Steel Corp. and subsidiaries earned net profit of \$4,101,857 in the year ending Jan. 31, 1937, according to the company's consolidated profit and loss statement. Gross sales totaled \$81,587,874 and gross profit from operations was \$5,505,347. Net profit before provisions for federal income taxes amounted to \$4,428,294. Income tax provision was \$326,437.

Net profit for Wheeling in 1935 was \$3,497,626 before preferred dividends. Gross sales in that year totaled \$66,262,939.

Total expenses and losses resulting from the flood in January, 1937, were estimated to be between \$800,000 and \$950,000.

EARNINGS STATEMENTS

Granite City Steel Co., Granite City, Ill., reports net profit of \$288,

687 for 1936, compared with \$618,358 the preceding year. This equals 75 cents a share on 382,488 shares, against \$2.42 a share on the 24,962 shares in 1935. Net sales for the year were \$10,117,911.

United Engineering & Foundry Co., Pittsburgh, reports net income of \$2,796,072 for 1936, largest in its history. This equals \$3.35 a common share and compares with \$1,631,156 or \$1.92 a share in 1935.

United States Pipe & Foundry Co., Burlington, N. J., reports net profits of \$2,427,867 for 1936 compared to \$1,169,071 in 1935. No provision was made for surtax on undistributed profits.

BLAW-KNOX RE-ELECTS BOARD

As the annual meeting of the Blaw-Knox Co. in Camden, N. J., the board of directors was re-elected and the contract with William P. Witherow, president, as well as its incentive bonus plan, were approved.

Rails 120 Feet Long Installed in England

Steel rails 120 feet long recently were laid in England on the London & Northeastern railway where express trains attain speeds of 90 miles per hour.

The rails, rolled by the Skinninggrove Iron Co., are reported in England to be the longest ever produced in one piece, eclipsing the former record of 90 feet. Standard rail length in the United Kingdom is 60 feet.

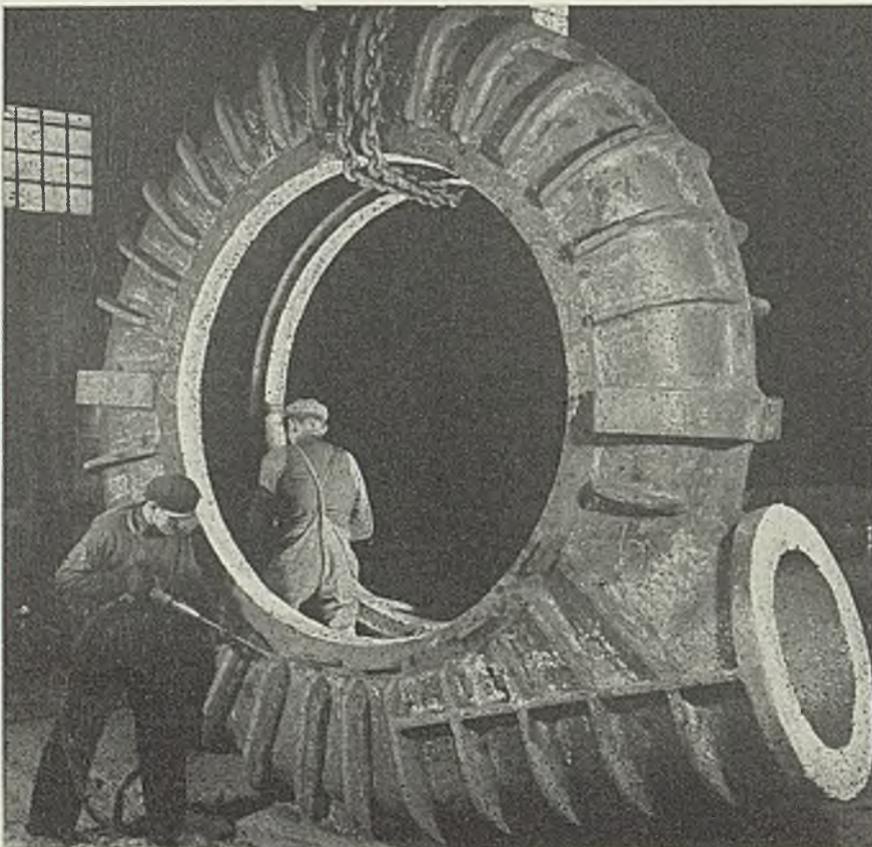
In the United States standard lengths have been welded together while being laid to make continuous rails of much greater length.

Flexibility of the 120-foot rails is illustrated as they bend almost like large rubber hose while being unloaded from flat cars.



WORK on the 100,000,000 cubic yard fill for the Fort Peck dam, Montana, has led to the development of unusual equipment. Giant dredge pumps remove tons of muck from the Missouri river, other pumps suck it through 70,000 feet of 28-inch pipe to the dam fill. Union Steel Casting Co., subsidiary of Blaw-Knox Co., Pittsburgh, is completing an order for 30 steel pump casings, and other items. Each of the casings, illustrated, weighs 34,000 pounds, inside diameter approximately 7 feet, wall thickness 3 1/4 inches, cast in one piece

34,000-Pound Steel Pump Casing Cast in One Piece



Production

THE national steelworks operating rate advanced 1 point last week to 90 per cent, a new peak since August, 1929. In the comparable weeks of 1936 and 1935 the rates were 58½ and 45 per cent, respectively.

Youngstown—Steady at 85 per cent.

Cleveland-Lorain—Off slightly to 80½ per cent, as National Tube Co., Lorain, operated 10 furnaces the first two days of the week and 11 the balance. Corrigan, McKinney division of Republic and Otis Steel Co. held steady at 13 and 8 units respectively.

Detroit—Unchanged at 100 per cent, with all units in production.

Birmingham—Remained at 80 per cent.

Pittsburgh—Up 2 points to 93 per cent. The leading interest started off the week above 95 per cent and was expected to hold close to that level. The leading independent was operating at better than 85 per cent and other mills at comparably high levels.

Wheeling—Unchanged at 97 per cent.

New England—Down 12 points to 85 per cent, two small open hearths being taken off for repairs. Both units will be resumed within two weeks.

Cincinnati—Rose to 80 per cent, a gain of 8 points, with lighting of two more open hearths by Andrews Steel Co., Newport, Ky., and schedule calls for two more this week for a total of six at this plant.

Central eastern seaboard—Unchanged at 58 per cent, with little variation expected over the near future, as output is greatly limited by processing capacity.

Chicago—Increased 1 point to 83½ per cent. On a tonnage basis this represents the heaviest output in history for this period. Mills appear assured of capacity schedules for the balance of this half and additional open hearths are expected to be started during the next several weeks. Blast furnace schedules are steady with 30 of 39 stacks active, and an increase is in prospect next month.

Buffalo—Up 3 points to 90 per cent, with 38 furnaces melting. Many finishing mills are booked to capacity for some time to come.

St. Louis—Stationary at 82 per cent.

Pig Iron Output Up 45.4 Per Cent in 1936

American Iron and Steel institute reports pig iron production in 1936 totaled 30,216,547 gross tons, against

District Steel Rate

	Percentage of Open-Hearth Ingot Capacity Engaged in Leading Districts		Same week	
	Week ended March 27	Change	1936	1935
Pittsburgh ..	93	+ 2	45½	38
Chicago	83½	+ 1	64	46
Eastern Pa...	58	None	38½	28
Youngstown..	85	None	74	52
Wheeling	97	None	73	95
Cleveland ...	80½	- 1½	82	67
Buffalo	90	+ 3	47	35
Birmingham ..	80	None	69	55½
New England..	85	-12	67	51
Detroit	100	None	94	88
Cincinnati ...	80	+ 8	55	†
St. Louis	82	None	†	†
Average....	90	+ 1	58½	45

†Not reported.

20,780,760 tons in 1935. This was an increase of 9,435,787 tons, or 45.4 per cent. Pennsylvania replaced Ohio as leading producer with 9,102,875 tons, against 7,206,655 tons for Ohio. Indiana-Michigan district was third with 4,168,299 tons.

Ferroalloy production last year was 812,640 tons, compared with 591,939 tons in the previous year. The gain was 220,701 tons, or 37.3 per cent.

Pig iron production by classifications follows: Basic, 20,476,921 tons; bessemer and low phosphorus, 5,876,762; foundry, 2,030,991; malleable, 1,717,057; forge or mill, 33,671; white and mottled direct castings, etc., 81,145.

Of ferroalloy production, ferromanganese and spiegel accounted for 395,119 tons; ferrosilicon, 360,490; and ferroalloys 57,021.

Ford Ship Tops To Draw In for Bridges

DISAPPEARING superstructures on Ford Motor Co.'s two new freighters will permit passage under overhead obstacles 15 feet above the water, engineers assert. When the carriers approach a bridge or other obstacle, funnels will lean backward, superstructures will be drawn in like turtles' necks, masts will telescope.

Now under construction at Ford dock yards near River Rouge plant, the carriers will be of all-welded construction, 300-foot length, with a 43-foot beam and 20 foot depth. This is the maximum size vessel that can pass through the New York barge canal.

Two 600-horsepower diesel engines will drive the freighters at 11½ knots and each will carry about 2000 engines and other heavy parts for Ford cars and trucks to eastern assembly plants. They will be launched in June.

Mullins To Acquire Youngstown Pressed Steel

A statement issued by Andrew MacLeod, secretary and treasurer, Mullins Mfg. Co., Salem, O., indicates the Mullins company has closed a deal whereby it will acquire the plant, property and assets of the Youngstown Pressed Steel Co., Warren, O., of which J. M. Hughes is president. The Youngstown company is a wholly-owned subsidiary of the Sharon Steel Corp., Sharon, Pa.

Acquisition of this property, it is said, will greatly increase Mullins' facilities, further diversify its manufactured products and give to it an assured source of steel supply.

This combination will place Mullins in the front rank of companies engaged in automobile stamping, vitreous enameling, and general pressed steel business.

The board of directors of Mullins has approved the transaction, subject to ratification by stockholders at a stockholders' meeting called for April 27.

Plants Still Busy On Dam Equipment

American Bridge Co. at its Ambridge, Pa., plant is fabricating tainter gates for dam No. 21, Quincy, Ill., amounting to approximately 915 tons. At this plant the lift type gates for the Emsworth dam on the Ohio river also are under construction, while the United States engineers are inspecting the operating machinery for the latter dam at York, Pa.

At the Leetsdale plant of Bethlehem Steel Co. roller gates are being built for dam No. 14 at LeClaire, Iowa, amounting to 618 tons. In the plant of the Dravo Corp., Neville Island, Pittsburgh, operating machinery for the locks, valves and penstock is being built for the Tuscaloosa dam, Warrior river, Alabama.

Hunter Steel Co., Neville Island, has contracts for the Peoria dam, approximating 570 tons; and for the LaGrange dam, amounting to 1140 tons, both on the Illinois river. The mitre gates and the operating machinery for both dams were sublet to the J. & J. B. Milholland Co. Hunter Steel also is furnishing all the steel for dam No. 22, Saverton, Mo., approximately 4000 tons.

Hydraulic turbines, two of 60,000 horsepower and one of 5000 horsepower, for the Bonneville dam, Oregon, which are nearing completion at York, Pa., also are being built under supervision of United States engineers.

Men of Industry

FREDERICK ELY WILLIAMSON, president, New York Central railroad, and Chester C. Bolton, who served several years as congressman from the twenty-second district (Cleveland), have been elected directors of the Cleveland-Cliffs Iron Co. Directors re-elected are: William G. Mather, E. B. Greene, T. H. Newberry, G. C. Wade, Crispin Oglebay, Harris Creech and W. R. Burwell.

J. B. Trotman, many years associated with Goulds Pumps Inc., is now located at Connersville, Ind., as manager of the "T" pump division of Roots-Connersville Blower Corp.

James E. Lose, vice president in charge of operations, Carnegie-Illinois Steel Corp., Pittsburgh, was honored March 22 at Clairton, Pa., when one of the company's largest river steamers was given his name.

Otto Miller has resigned as director, Otis Steel Co., Cleveland. All other directors and officers have been re-elected, and Robert C. Schaffner, Chicago, has been named to take Mr. Miller's place.

R. J. Southwell has been appointed sales manager of Andrew C. Campbell division, American Chain & Cable Co. Inc., Bridgeport, Conn., manufacturer of Campbell abrasive cutting and nibbling machines and special machinery.

C. L. Shipley, associated with Champion Rivet Co., for ten years, serving in the operating and sales divisions in Cleveland, has been appointed representative in the Pittsburgh district for the company in the sale of its welding electrodes.

Leonard A. Yoder, formerly sales manager, Yoder Co., Cleveland, has been appointed vice president and assistant manager. John Lucas, assistant sales manager, has become sales manager, succeeding Mr. Yoder.

T. S. Long has been named assistant sales manager of the Warren, O., plant, Taylor-Winfield Corp., Warren. W. H. Marion has been named purchasing agent, and J. D. Anderson has become purchasing agent of the company's Detroit plant.

Michael J. Kist has been appointed manager of sales, Lorain division, Carnegie-Illinois Steel Corp., to succeed Arthur L. George who has retired under the corporation's pension plan. Mr. George had been employed by the company and its predecessors



W. A. Jayme



Michael J. Kist



Arthur L. George

continuously since August, 1895. Mr. Kist began his career with the Lorain Steel Co. in June, 1903, and has been continuously employed by that company and its successor.

W. A. Jayme has been appointed

general superintendent, Wood works, McKeesport, Pa., Carnegie-Illinois Steel Corp. He succeeds the late H. H. Giles. Carl M. Nystrom, acting superintendent for the past six weeks, has been named assistant general superintendent. Both appointments are effective immediately.

Mr. Jayme, a graduate of Massachusetts Institute of Technology in 1921, previously was manager of the alloy division, metallurgical department. He joined Carnegie-Illinois in November, 1935, beginning as contact man of the metallurgical department, and took the position of manager, alloy division, in June, 1936.

Mr. Nystrom, whose schooling included four years of extension work at Carnegie Tech, began as a metallographer for the company in January, 1926. He was appointed foreman of the chrome polishing and inspection department in 1928.

Tris Speaker, former baseball star, has been appointed representative in Cleveland and central Ohio for Rotary Electric Steel Co. (Michigan), Detroit. He will have offices in the Guarantee Title building, Cleveland.

N. C. MacPhee has been appointed metallurgist in charge of electric furnace operations, Liberty Foundry Co., St. Louis. He formerly was associated with Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

H. G. McIlvried, recently brought from the Chicago district by Carnegie-Illinois Steel Corp. as assistant to W. C. Oberg, manager of Pittsburgh district operations, will have charge of constructing the company's Irvin sheet and strip mill. The mill will be built in the Camden district near the present Clairton, Pa., plant.

E. C. Powers, engaged for three years in technical writing for the Lincoln Electric Co., Cleveland, has been appointed assistant secretary, James F. Lincoln Arc Welding Foundation. Prior to starting work with Lincoln Electric, Mr. Powers was employed by the Penton Publishing Co. as an associate editor of *Power Boating* and the former *Marine Review*.

Dr. Ing. Paul Schwarzkopf, well known metallurgist of Reutte, Austria, has been named president, American Cutting Alloys Inc., New York. This completes the reorganization of the company, which now has a mid-western office in Detroit, with J. M. Highducheck as manager, and an eastern office in New York, with George B. Knaepper as manager. Dr. Schwarzkopf, inventor of titanium cemented carbides for cutting of steel at high speeds plans to

spend at least six months of the year in this country to assist in development work, and while here will live in Lewiston, Me., where the company has its manufacturing facilities and laboratory.

Harry A. Schultz, of the United States Steel Corp., New York, has accepted the chairmanship of the steel and iron division, commerce and industry committee, to solicit contributions in industry in New York for the Salvation Army, which during April will seek to raise a minimum of \$600,000 to help the army maintain those of its welfare services and institutions that are not self-supporting.

Bernard E. Sunny, Chicago, and James S. Watson, Indianapolis, have been elected directors, Link-Belt Co., Chicago, to succeed Arthur L. Livermore, deceased, and Austin L. Adams, resigned. Mr. Sunny is a director of many companies, while Mr. Watson is vice president in charge of Link-Belt's Indianapolis plant, having served the company continuously for 44 years. Re-elected directors are: Staunton B. Peck, Chestnut Hill, Pa., and Harris Whitmore Jr., Naugatuck, Conn.

F. E. Fieger has resigned as vice president and director, Jones & Laughlin Steel Corp., Pittsburgh, ending a 20-year association with the corporation. He began with Jones & Laughlin as superintendent of the wire department at the Aliquippa works. The following year he became superintendent of the steelworks department; in 1920 was made assistant general superintendent; in 1923 became general superintendent, Aliquippa works; in 1928, assistant general manager; and in 1929, general manager. In 1935 he was elected vice president, a director and member of the executive committee.

S. S. Marshall Jr. has been elected vice president in charge of operations and a director of Jones & Laughlin, to succeed Mr. Fieger. General manager of operations since January of this year, Mr. Marshall started with the corporation in 1903 in the engineering department. He successively served as master mechanic, assistant general superintendent, general superintendent, assistant general manager of operations, and general manager.

Died:

E P. BURRELL, 66, director of engineering for Warner & Swasey Co., Cleveland, since 1924, in Cleveland, March 21. He was successively designing engineer, works engineer, works manager

Up from Errand Boy, In the American Way



BOLT, Nut and Rivet NEWS, monthly publication of the American Institute of Bolt, Nut and Rivet Manufacturers, in its current issue pays special tribute to J. Edward Welt, vice president, director and sales manager, Atlas Bolt & Screw Co., Cleveland, for accomplishment in his 50 years of business activity. He started as an errand boy in 1887 with the W. H. H. Peck Co., Cleveland, wholesale dealers in mill supplies; joined Atlas company in 1900.

The NEWS lists names of 71 who have contributed exceptionally well to the industry, many of them now gone. About 1890 years of service are represented by 53 men and women who carry on. Oldest in point of service is Mrs. E. M. Foye, president-treasurer, Thomas Smith Co., Worcester, Mass. All in the list have been identified with the industry 25 years or more.

for the company from 1900 to 1924. During his score and a half years with the company he worked on more than 20 great telescopes and domes, including the McDonald observatory and telescope, and the 72-inch reflector of the Astro-Physical Observatory at Victoria,



E. P. Burrell

B. C. He also devoted himself to making better and finer turret lathes. An inventor holding many patents in his field, Mr. Burrell was a member, American Society of Mechanical Engineers and the Cleveland Engineering society.

Horace C. Putnam, 63, president, Kelly Reamer Co., Cleveland, in that city, March 21. He became affiliated with Kelly Reamer in 1918.

John W. Gleeson, 65, president, Thomas E. Gleeson Wire Works, East Newark, N. J., in East Newark, March 18.

Charles F. L'Hommedieu, 93, founder of Charles F. L'Hommedieu & Sons Co., Chicago, in 1898, manufacturer of plating machinery and supplies, in Los Angeles, March 19. He retired 12 years ago.

J. H. Andre, purchasing agent and assistant general manager, Bettendorf Co., Bettendorf, Iowa, while enroute to Chicago, March 24. He had been associated with the company about 30 years.

William E. Evans, 73, who retired one year ago as annealing supervisor for the Thomas Steel Co., Warren, O., in Huntington, W. Va., March 21. He was an authority on the bright steel annealing process.

Erskine M. Maiden Sr., 76, master mechanic who aided in building the bessemer plant of the Republic Steel Corp. at Youngstown, O., in that city, March 21. He retired nine years ago, after 35 years' service with Republic.

James H. Stratton, 75, mechanical engineer, Wellman Engineering Co., Cleveland, in that city, March 19. He was associated with the company for 58 years. He was a member, Cleveland Engineering society and American Society of Mechanical Engineers.

Granger Whitney, 70, formerly manager of blast furnaces in the South and North, at his home in Detroit, March 18. For some years he operated furnaces in South Chicago and LaFollette, Tenn. Moving to Detroit in 1905, he managed blast furnaces for Detroit Iron & Steel Co. until his retirement in 1911.

A. P. Armington, 44, president, Euclid Road Machinery Co., Cleveland, aboard the steamship PRESIDENT ADAMS, March 18, while on a world cruise. The son of George A. Armington, president, Euclid Crane & Hoist Co., parent organization, Mr. Armington was active until 18 months ago when ill health forced him to give up the greater part of his duties.

Meetings

GEARMAKERS SCHEDULE ANNUAL MEETING IN MAY

AMERICAN Gear Manufacturers association announces its twenty-first annual meeting will be held May 24-25 at Galen Hall hotel, Wernersville, Pa. The program will include the president's address, committee reports and eight technical papers. J. C. McQuiston, Penn Lincoln hotel, Wilksburg, Pa., is manager-secretary.

BLAST FURNACE GROUP WILL HOLD ITS THIRD MEETING

Third regular 1937 meeting of the Blast Furnace and Coke Association of the Chicago district will be held at Hotel Shoreland, Chicago, March 30. The program to be presented after a dinner will consist of short discussions on pertinent topics relative to coke plant and blast furnace operation.

MANAGEMENT SOCIETY PLANS ITS PRODUCTION CONFERENCE

Personnel problems, training of skilled men, equipment maintenance,

and similar topics, will be stressed at the eleventh annual conference of the production division, American Management association, to be held in the Palmer House, Chicago, April 21-22.

Papers thus far scheduled are as follows: "Means of Obtaining Better Understanding Between Management and Men," by C. M. White, vice president in charge of operations, Republic Steel Corp., Cleveland; "Measured Day Work," by W. W. Gumphrich, manufacturing engineer, International Business Machines Corp., Endicott, N. Y.; "Accelerating the Training of Skilled Men," by Thomas Turner, general superintendent, Westinghouse Electric & Mfg. Co., Newark, N. J.; and "Control of Equipment Maintenance Costs" by Frederick Oakhill, plant engineer, Bauer & Black division of Kendall Co., Chicago.

STEEL ENGINEERS ARRANGE CONFERENCE IN BUFFALO

Spring engineering conference of the Association of Iron and Steel Engineers will be held April 28-29, Hotel Statler, Buffalo. One of the features of the meeting will be an inspection of the new continuous

hot and cold strip mills of the Bethlehem Steel Co. Brent Wiley, 1010 Empire building, Pittsburgh, is the association's managing director.

STEEL CONSTRUCTORS SET ANNUAL MEETING IN OCTOBER

Fifteenth annual convention of the American Institute of Steel Construction Inc. will be held Oct. 27-29, at the Greenbrier hotel, White Sulphur Springs, W. Va. Clyde G. Conley, president, Mount Vernon Bridge Co., Mount Vernon, O., is president of the institute, and V. G. Iden, 200 Madison avenue, New York, is secretary.

MILWAUKEE PURCHASING AGENTS SCHEDULE SHOW

Milwaukee Association of Purchasing Agents is sponsoring its third industrial products exhibit April 6-7 at Hotel Schroeder, Milwaukee. The show is planned for operating executives from all sections of Wisconsin, upper Michigan and northern Illinois.

BRITISH INSTITUTES ADOPT PLAN OF CO-OPERATION

Councils of the British Iron and Steel institute and British Institute of Metals announce that a plan of co-operation has been effected between the two organizations. Members of each institute can become members of the other without formalities other than application. Dues for joint membership are at a lower rate than those prevailing for separate membership. Entrance fees also are reduced.

The plan follows one recently completed by the two British institutes with the American Institute of Mining and Metallurgical Engineers whereby members, associates and student members of the British societies may become junior foreign affiliates of the American society. The arrangement is reciprocal.

Receive Bessemer Gold Medals of British Institute

BRITISH Iron and Steel institute has named two recipients of Bessemer gold medals for 1937, as announced briefly in STEEL, March 22, p. 23. Presentation will be made at the annual meeting of the institute in London, April 29-30.

Col. N. T. Belaiew, one of the medallists, has during the past 25 years published many important papers on metallurgy, these dealing mainly with the structure and metallography of steel. He has studied the manufacture and uses of Damascene steel and related the results to production of present-day high-grade steels, particularly high-speed steel. For distinguished military service in the World war, he holds several medals. Colonel Belaiew now lives in Paris where in 1931 he started research in the newly equipped laboratory of the Welding institute.

Aloyse Meyer, Luxemburg, the other medallist, heads Societe Anonyme ARBED, second largest steel company in Europe. Honorary vice president of the British institute, since 1928 he has been president of the Entente Internationale de l'Acier. He was active in the introduction of the Thomas-Gilchrist process of steel manufacture into the Luxemburg-Lorraine district, a process which revolutionized steel-making on the Continent. Since the war, Monsieur Meyer has introduced modern American blast furnace practice in works under his control.



N. T. Belaiew



Aloyse Meyer

Si-Lux Co. Acquires Ohio Chemical Products Firm

Si-Lux Co., Investment building, Pittsburgh, industrial chemicals, through the purchase of entire outstanding capital stock has acquired ownership of J. H. R. Products Co., Willoughby, O., producer of barium and other industrial chemicals.

Albert Pavlik, head of Si-Lux, has assumed the presidency of the Ohio corporation. He states the purchase was made primarily to provide additional facilities for manufacturing Bar-Flux, but the company intends to continue production of other barium compounds. The name of J. H. R. Products Co. will be changed to Si-Lux Corp., and the plant enlarged.

M. J. Rentschler, manager of J. H. R. Products Co. since its formation, will continue in a similar capacity.

Activities of Steel Users and Makers

SUTTON ENGINEERING CO., Pittsburgh, maker of rolling mill machinery, is building straightening machines for the following: Babcock & Wilcox Tube Co., Beaver Falls, Pa.; Clayton Mark & Co., Chicago; Columbia Tool Steel Co., Chicago Heights, Ill.; Globe Steel Tubes Co., Milwaukee; Ohio Seamless Tube Co., Shelby, O.; Bundy Tubing Co., Detroit; Pennsylvania Tube Co., Bridgeport, Pa.; Titan Metal Mfg. Co., Bellefonte, Pa.; Tube Reducing Corp., Stamford, Conn.; Wheeling Steel Corp., Wheeling, W. Va.

Pacific Iron & Steel Co. Ltd. has removed its Los Angeles offices to 11633 South Alameda street.

Cooper-Bessemer Corp., Mt. Vernon, O., has opened its Mt. Vernon foundry for the manufacture of Meehanite metal.

Vollrath Co., Sheboygan, Wis., producer of steel enameled ware, recently added to its products a line of stainless steel kitchen utensils.

Cincinnati Milling Machine Co., Cincinnati, has recently acquired the Blackburn Foundry Co., Cincinnati, for manufacturing Meehanite metal.

Cleveland Crane & Engineering Co., Cleveland Tramrail division, Wickliffe, O., recently acquired the tramrail division of Osborn Mfg. Co., Cleveland.

Puffer-Hubbard Mfg. Co., Minneapolis, has redesigned its line of display cases for grocers, butchers and other food retailers. A number of important changes have been made for efficiency and appearance.

Monarch Machine Tool Co., Sidney, O., recently let a contract for an addition to its machining division, which will provide about 18,000 square feet of additional floor space. It is expected the building will be ready April 1, and at that time \$100,000 worth of new machine tool equipment will be installed.

Wheelco Instruments Co. has moved its offices and manufacturing facilities to larger and more modern quarters at 1929 South Halsted street, Chicago. The company manufactures controllers, pyrometers, limit cut-outs, combustion safety devices, diesel instruments and the like.

Offices of all Hillman enterprises in Pittsburgh, including Hillman Coal & Coke Co., Pittsburgh Coke & Iron Co., Pittsburgh Steel Co., Na-

tional Supply Co., Spang, Chalfant & Co., World Metals Inc., and B. G. Sistrone & Co., will be consolidated in the Grant building, Pittsburgh, by May 1. The last four firms are already in the new quarters.

Moore Plow & Implement Co., Greenville, Mich., has added many new chilled plow repair items, and now manufactures nearly 1000 such repair items, accounting for about 75 per cent of the company's business. The company also produces various types of chilled plows, cultivators and other agricultural implements.

White Mfg. Co., Elkhart, Ind., is now producing front end attachments for wheeled type industrial tractors heretofore produced by Trackson Co., Milwaukee, and known by the trade name Trackson-Lessmann. This transfer of manufacture and sales applies only to the apparatus for use on tractors equipped with wheels and pneumatic tires.

F. J. Stokes Machine Co., Philadelphia, has acquired from Standard Machinery Co., Mystic, Conn., exclusive rights to manufacture and sell toggle type preforming presses developed by the latter company and hereafter to be known as Stokes-Standard presses. These presses are built for exerting pressures up to 80 tons required for

certain molding compounds and for forming preforms up to 4 inches in diameter and with a 4-inch die fill.

Miles Machinery Co., Saginaw, Mich., has moved into its new, fire-proof, daylight construction plant, designed and built especially for rebuilding used machine tools. The plant is 51 x 320 feet with side bay 68 x 160 feet and is equipped with three overhead cranes, with depressed railway and truck entrances and other economical handling means. Modern machine tools have been installed.

Tecumseh Products Co., Tecumseh, Mich., has started production of a new V-type, 4-cylinder compressor for applications requiring a $\frac{1}{2}$, $\frac{3}{4}$ or 1-horsepower motor for high suction pressure, room cooling applications. It is designed for use with any refrigerant. The company also has made plant changes so that all assembly work is done in glass enclosed assembly rooms to which only dust free air is admitted.

Buick division, General Motors Corp., Flint, Mich., has completed erection of a 3-story structure, 220 x 240 feet, the first of the new buildings in its construction program. This building houses the personnel, employment, master mechanics, metallurgical, and works engineering departments. The building is air conditioned and contains a modern 15-room factory hospital.

Not a Game, but a Time-Saver in Relocating Machines



RELOCATION of machinery in the Cadillac-LaSalle plant, Detroit, to concentrate production on the ground floor, where four others formerly were occupied was facilitated through use of a toy workshop. Here engineers cut small-scale shapes of machine tools, and using twine and cardboard strips, made a miniature replica of the factory floor plan. They were thus able to establish the best location for each machine merely by moving the templets; and report a saving of 90 per cent in time for doing the job

BULLARD

Type "D" MULT · AU · MATICS

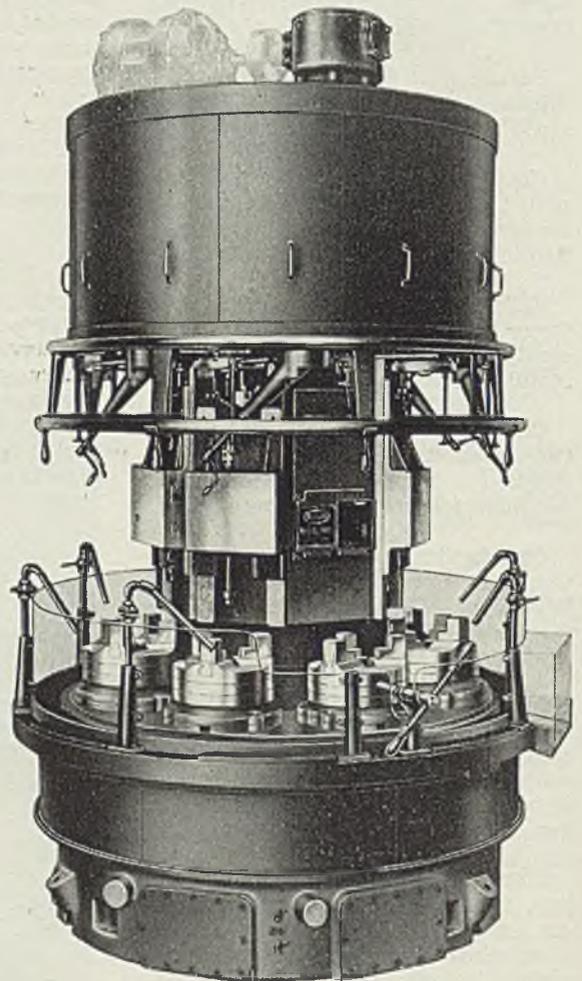
● Manufacturing Economy is the first step in Profit Increase.

● This Economy in machine tools is only obtained by those manufacturing units which provide in their design and construction features of Versatility, Reliability, Productivity, and Efficiency.

● Bullard Mult-Au-Matics have for years been accepted manufacturing units because of these inherent features.

● Today, operating facts and savings are proving that Mult-Au-Matics are Sound, Profitable Investments on jobs requiring Boring, Turning, Facing, Drilling, Reaming, Threading, and a host of other standard and special operations.

● In one instance, on Rear Axle Driving Gears of hot rolled steel, the Mult-Au-Matic time per piece is 1 minute and 39 seconds. Savings in this instance warranted the use of the Mult-Au-Matic. This is only one of many cases. If others can profit, so can you.



Type "D" Machine Sizes

8 inch—6 Spindles
8 inch—8 Spindles
12 inch—6 Spindles
12 inch—8 Spindles
16 inch—6 Spindles
16 inch—8 Spindles

The Bullard Company

Bridgport · Conn ·



MIRRORS OF MOTORDOM

OFFICE workers in the downtown district were wondering last Tuesday whether they were in Moscow or Detroit following instructions from police to vacate and lock offices by 4 p. m. and to stay off the streets for the rest of the afternoon.

The occasion was a demonstration march by the UAW for the purpose of protesting against police evictions of sitdown strikers in a number of small shops and stores.

In these evictions, practically all accomplished with no resistance, more than one union organizer with a criminal record was found directing the strike. Homer Martin, UAW president, in condoning the tactics of such an element, certainly picked up no public favor for his crowd.

A well organized effort was made to turn out as many union members in the demonstration as possible. Notices were posted near automobile plants announcing the assembly. An airplane with an amplifier cruised over the plants in the morning with a union organizer urging the men below to join the mass meeting.

Thousands Jam Streets

Martin promised to turn out 175,000 men in the demonstration, set for 5:45 p. m. By 4 p. m. streets in the vicinity of Cadillac Square were jammed by thousands of curious citizens who wanted to discover what the affair was all about. Nearly 1500 police and special deputies were stationed around the sector. These extensive preparations by authorities seemed to inflict a bad case of jitters and many were wondering just exactly what was in prospect.

Shortly the march started, the unionists appearing in a long column five abreast, carrying flags and hastily painted signs, singing, booing and cheering. Signs included "Pickert (police commissioner) Must Go," "GM Today—Ford Tomorrow," "Murphy Are You On Our Side?"

Organizers in sound trucks spurred

on the singing and shouting until the crowd was assembled to hear brief addresses by leaders of the UAW.

To this observer the crowd appeared to number about 15,000, perhaps another 15,000 watching the proceedings from curbs, doorways and other vantage points. Most of those in the demonstration appeared young, with a fair sprinkling of negroes, large numbers of women and some children.

By dusk the crowd had dispersed and white wings were busy cleaning up rubbish. No heads were cracked, no violence of any sort was reported. The "revolution" was over.

MEANWHILE, Governor Murphy was busy attempting to untangle the Chrysler strike. Daily negotiations between company representatives and the UAW were getting nowhere, and the tieup was spreading throughout a large number of suppliers in this district, throwing additional hundreds out of work. Locally, the situation was worse than that occasioned by the General Motors shutdown, because the Chrysler plants are concentrated in this vicinity, whereas the General Motors plants are scattered more widely.

After a brief meeting of Walter P. Chrysler, Lewis Murphy and their aids in Lansing, an agreement was reached, and Thursday morning the 6000 sit-down strikers in Chrysler plants began evacuating the property. Mr. Chrysler was firm in refusing to proceed with negotiations before the men moved out and it is believed Governor Murphy persuaded Lewis to accede to this wish without a great deal of trouble. It appears now that Chrysler production will be resumed shortly.

No shortage has yet developed in the rumor crop concerning union activities. One report is being circulated to the effect John Lewis is only a "front" for the CIO movement and the real power behind this is

William Z. Foster, old-time IWW leader. This would give a very definite red tinge to the organization, a fact which may be given further credence by a recent speech delivered by an army officer in Cleveland, purporting to show he had evidence revealing the labor movement to have been planned and directed by Moscow, as an outgrowth of a conference held in this country in 1921, when he claimed the groundwork for the movement was laid.

Link this up with statements made by William F. Green in a recent interview concerning Lewis and you may have something more than mere talk. Mr. Green pointed out that Lewis was originally aligned with "rightist" thinkers such as Coolidge and Harding, but for some inexplicable reason, possibly a burning desire to lead a labor party into the White House in 1940, renounced his original belief and joined forces with radical elements.

Apparently no efforts are being made to work out a solution of the Hudson strike which started at the same time the difficulty at Chrysler plants arose. The UAW demands sole bargaining power which the Hudson management refused to allow, but negotiations broke down and no plans have been announced for their resumption, each party to the dispute waiting action by the other.

Dealers Well Stocked

One explanation offered is that Hudson dealers are now well stocked with cars and there is no need to make any hurried effort to resume production. With \$12,000,000 in reserve the company probably can well afford to wait until workmen are prepared to resume their jobs.

Settlement of the Chrysler strike was being watched with eagle eyes by more than one company here last week. If the agreement which Chrysler and Lewis were working out should represent any major concessions to Chrysler union members, it may touch off some more "powder kegs" in the automotive labor field.



MIRRORS OF MOTORDOM

Even some of the General Motors' divisions were experiencing their troubles, although not seriously enough to affect production figures. For example, it is reported on good authority one assembly line workman at Pontiac "sat down" over some grievance the other day and caused a 40-minute tieup of the entire line until the matter was adjusted to his satisfaction.

A brief disturbance in the Cadillac pressed metal department in which 300 operators stopped work for an hour was settled quickly.

Reports of labor troubles at the Ford plant are numerous but are practically impossible to check, the general feeling being that Ford, through his superior police department, is well equipped to forestall extensive tieups. How far the UAW has been able to bore into Ford workmen is anyone's guess. Harkening back to the time of the General Motors' strike, it is recalled a group of some 25 attempted to stage a sitdown in the Lincoln plant.

The foreman of the division talked to headquarters for instructions and was told to keep the line going as best he could for the moment. Shortly a platoon from the Rouge plant arrived on the scene and escorted the sitdowners to the pay office. A later check into the records of these men showed them to have been recently hired and all from outside the state—men obviously planted by the union to start a disturbance.

INQUIRIES are coming out for machinery to be used in the proposed new central tool and die shop planned by Ford. They include a number of heavy tools such as boring mills, 30-inch slotters and similar equipment, leading some observers to believe Ford is solving the problem of high costs in local die shops by setting up his own equipment to handle the work. This is not to infer local die shops are going begging for business, but increases in labor costs have boosted overall costs appreciably in comparison with some out-of-town shops.

The large list of machine tools on which Chrysler has been taking bids for installation in its Canadian plant to machine Dodge and Plymouth engines is close to being awarded. Although the Chrysler

Automobile Production

Passenger Cars and Trucks—United States and Canada
By Department of Commerce

	1935	1936	1937
Jan.....	300,335	377,306	399,426
Feb.....	350,346	300,874	*352,750
March....	447,894	438,992	.....
April.....	477,059	527,726	.....
May.....	381,809	480,571	.....
June.....	372,085	469,355	.....
July.....	345,297	451,474	.....
Aug.....	245,075	275,951	.....
Sept.....	92,728	139,785	.....
Oct.....	280,316	229,989	.....
Nov.....	408,550	405,702	.....
Dec.....	418,317	519,132	.....
Year.....	4,119,811	4,616,857	.....

*Estimated.

Calculated by Cram's Reports

Week ended:	
Feb. 27.....	111,915
March 6.....	126,975
March 13.....	101,684
March 20.....	99,013
March 27.....	101,805

management has had its hands full lately, it is believed the high tariff on automobile parts made in America for use in Canada probably will force Chrysler to speed up the new plant and equipment for this engine work in Canada, from the competitive standpoint if nothing else.

Offices of the Chrysler division in Canada are said to resemble a machine tool convention these days, so numerous are the representatives figuring on various parts of this expansion program.

SITDOWNS notwithstanding, auto assemblies continue to roll along at a merry clip, close to the 100,000 per week mark prevailing since the latter part of February. Total for the week stood at 101,805, up a notch from the previous week. General Motors currently is accounting for well over half the cars being turned out, and last week moved up to 54,020. Ford likewise stepped up a little, to 34,800.

It appears now total assemblies for March will approximate 488,000, making a grand total for the first quarter of almost a million and a quarter, well ahead of the total for similar periods in the last two years. April likely will see a further advance in production and although

usually the peak month of the year, may surrender these honors to May in view of strike delays.

THICKNESS gage operating on the electrical resistance principle is being used by Studebaker to obtain an accurate check of lacquer thickness on bodies . . . Hudson-Terraplane shipments in 1936 increased almost 22 per cent over 1935 . . . Willys-Overland in Toledo has been experiencing difficulty in getting delivery of stampings and small parts, and has been compelled to curtail production somewhat . . . Al Rick-enbacker has started his annual swing through the East and middle west in the interest of the twenty-fifth running of the Memorial day race at Indianapolis . . . Another entrant into the ever-increasing family of station wagons is the new ¾-ton model introduced by Hudson . . . Chevrolet traffic department says the total amount of material moved by it in a year, if figured on a ton basis, would fill nearly 80 per cent of all the box cars owned by the railroads of the country . . . Demand for radio installations has more than doubled among Oldsmobile buyers since the introduction of 1937 models.

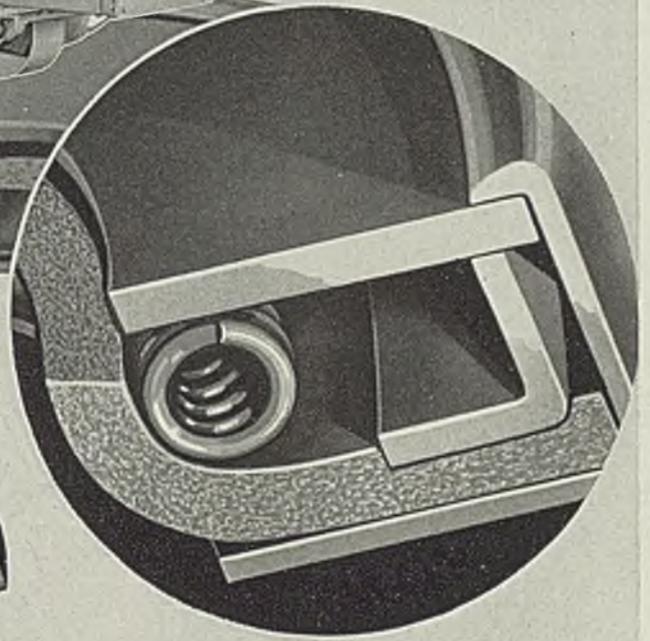
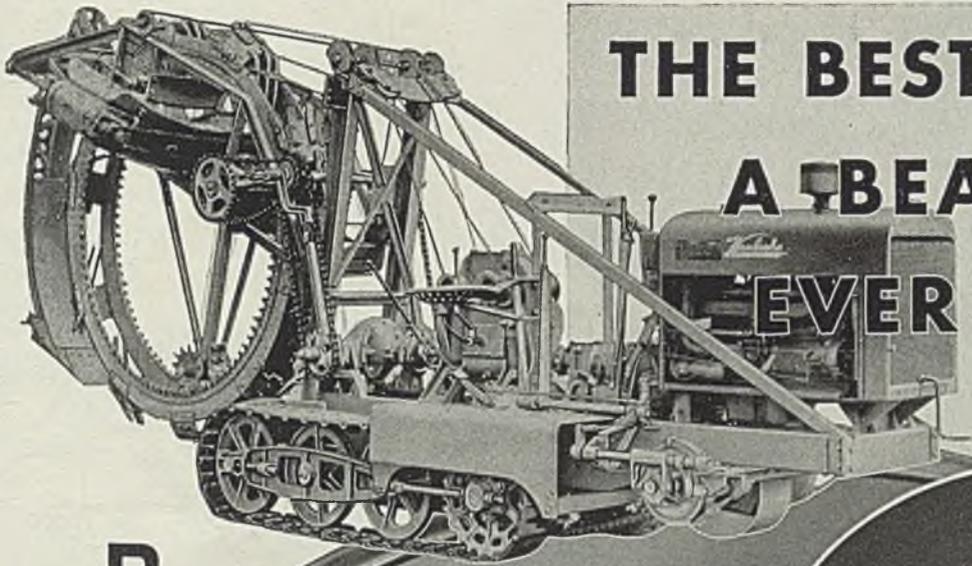
As predicted in this department several weeks ago, Great Lakes Steel Corp. has announced plans for additional coke oven capacity here, to supply fuel requirements of a new blast furnace; 130 ovens in two batteries are involved . . . Plymouth has announced a new convertible coupe with several innovations including different type of insulation and defroster vents . . . Sears, Roebuck & Co. has entered the deluxe house trailer field, with trailers to be built by Hurd Lock & Mfg. Co.

Great Lakes Awards Coke Plant to Semet-Solvay

Great Lakes Steel Corp., Detroit, has awarded a contract for a 130 oven by-product plant to Semet-Solvay Co., one of the wholly-owned subsidiaries of Allied Chemical & Dye Corp. Two batteries of Semet-Solvay vertical flue combination ovens will be constructed on Zug island in the Detroit river. The by-product plant will include a benzol refining unit. The program also provides for equipment for unloading coal from boats, and coal storage.

Design of the coke ovens provides for heating with blast furnace gas, releasing the coke oven gas to the steel mills. The coke oven gas will be piped through a large gas line to the mills at Ecorse, some three miles distant.

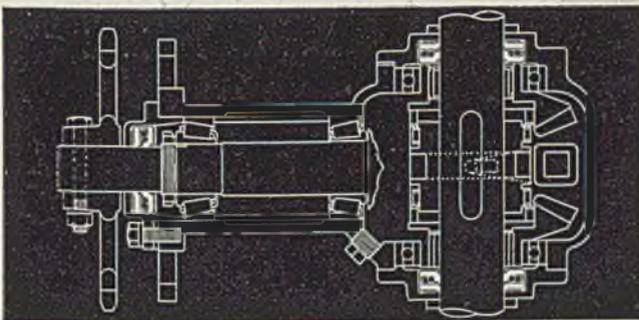
THE BEST FRIEND A BEARING EVER HAD



PRIOR to the adoption of Chicago Rawhide "Perfect" Oil Seals it was not practicable to use anti-friction bearings in the Conveyor Reverse Transmission of these Buckeye Ditchers. The attack of moisture and grit from the excavation was sufficiently severe to ruin such a bearing in less than a week's service.

Since Chicago Rawhide "Perfect" Oil Retainers were adopted, more than a year and a half ago, there has been no difficulty in maintaining ball and roller bearings in this mechanism. Investigation of ditchers so equipped after a year and a half of continuous service shows the bearings to be in perfect condition with housing lubricant completely free of any foreign matter.

If you have a critical bearing problem, ask Chicago Rawhide engineers to offer suggestions.



BUCKEYE TRACTION DITCHER COMPANY
Conveyor Reverse Transmission equipped
with "Perfect" Dual C Oil Retainers.

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When you visit New York City or travel over the new Triborough Bridge or its tributary highways, stop in and see our new mill in the center of New York City's greatest single road building project and on the new East River Drive.

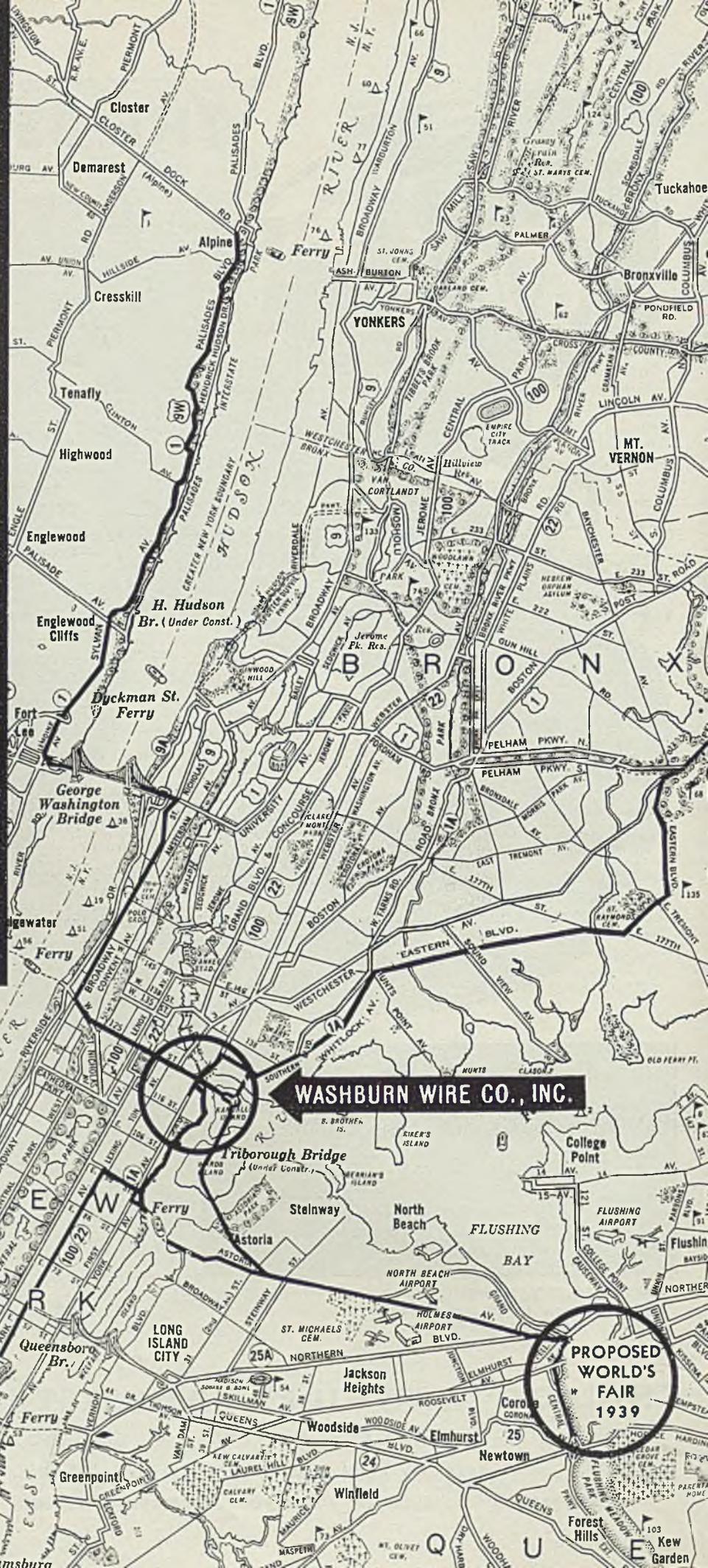
There are many surprising moments in store for you as you go through our new plant. See the longest "Tramrail" in the East which picks up and conveys material from our own pier through to final operations... See wire drawn by careful and gradual reductions to exacting specifications... See modern heat-treating equipment in action... See scientific tests for pipes, seams, laps, flexibility, carbon content and uniformity... See long-experienced wire craftsmen conducting their inherited methods of testing wire for temper, roundness, even spacing and freedom from cast in coils. More intricate and interesting things to see than in a museum of science. The latchstring is always out and you are welcome at any time.

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WINDOWS OF WASHINGTON

WASHINGTON

THE collusive steel bids inquiry by the department of justice is at a practical standstill, it was admitted by Attorney General Cummings last week.

This is due, it is said, not to the fact that the information could not be obtained but to the "unsettled status of the law and the defects of the Sherman antitrust law as it now stands."

In other words, it appears that the field and other work has been completed by the department on this steel survey, but the department does not have enough information to go into court and make a case. This is much along the lines of statements made by John Dickinson, who until recently was assistant attorney general in charge of this work.

Antitrust Laws Outmoded

In connection with this steel investigation the attorney general is said to be of the opinion that the antitrust laws have been devitalized by judicial interpretations and the question is, he said, how this can be cured by legislation and that "runs into industrial control." He is of the opinion that the lawmakers cannot write wage and hour legislation very well without running into the antitrust laws. "It is a very difficult problem," he said, "and if anyone can give me an answer I will be very much obliged." Referring further to the antitrust laws Mr. Cummings said they are "certainly in need of some form of reformation."

The house committee on appropriations has just made public testimony given before that committee during the course of the discussion on appropriations for the department of justice by John Dickinson, formerly in charge of the antitrust division, having jurisdiction over the collusive steel bidding investigation.

"We have had seven men at work ever since last summer," said Dickinson in his testimony to the committee, "on the request that was transmitted to us by the President

to investigate identical bidding. You gentlemen may remember that the newspapers in the middle of the summer carried stories about the identical bids that were being received by a large number of government departments and the President transmitted the report of the federal trade commission on the steel industry to us and requested that we obtain information from the departments about the instances of identical bidding with which they were familiar."

Dickinson told the committee further that "an enormous mass of material was delivered to us. We concentrated largely on the steel side of it and drew up plans of investigation for the bureau. The bureau conducted more than 200 interviews throughout the country with various people engaged in the steel business and has been making reports to us, to be further analyzed and to have suggestions sent back to the bureau.

"We feel," continued Dickinson, "that in the present status of the antitrust laws it is extremely difficult to discover conduct which, under the decisions, will bring a case of the ordinary type squarely under the laws.

Twilight Zone in Bidding

"Business men have gotten sufficiently awakened to what the laws mean so that they do not do things which the law clearly prohibits, and in consequence the question of whether a breach of the law has occurred often turns on what you might call the background and surroundings of business conduct. A great many things that on the surface may look like violations of the law may turn out not to be such in the light of decisions."

The assistant attorney general told the committee that "the Supreme Court in the steel trust case and the International Harvester case 17 or 18 years ago, laid down rules to the effect that for one concern to follow the price of another con-

cern does not necessarily mean a violation of the law. And there have grown up in a good many of these industries practices which enable one concern to take its cue as to prices from other concerns, without any clear and definite violation of the law unless a good many other factors and circumstances can be established. So that we have to conduct these rather long investigations often without getting down to anything that clearly establishes a breach of the law."

STRIKE FACTORS BRING PROPOSALS FOR CONTROL

A resolution passed here last week in connection with sit down strikers, shows in no uncertain terms what the board of directors of the United States chamber of commerce thinks about the situation, as follows:

"No form of bargaining which includes, as a preliminary or as any other incident, the forcible seizure and occupation of property by 'sit down strikers' is consistent with the principles to which the chamber of commerce is committed in upholding the rights of workers. Exclusion by such means of other workers from their right and opportunity to work is a most serious aggravation of these acts of lawlessness.

"The right to strike, so long as it does not endanger the public interest or impose upon others intolerable hardship, is fundamental. The right to the possession of property by its owners, free of trespasses, is equally fundamental.

"It is the manifest obligation of government to protect all of these rights, by every lawful means, in the interest not only of the employer and of the employe but of the public, as well.

"We call upon our members to lend every possible support, and encouragement to all government officials, everywhere, in performing their sworn obligation to preserve law and order."

There is considerable adverse comment on the sit down strike from

various government officials and members of congress are wondering how long it will be before the President gets into the situation.

Congress is being urged by the National Association of Manufacturers to enact legislation that will curb costly labor disputes. The proposed legislation would empower the President in labor disputes involving interstate commerce, to appoint a special commission of impartial persons.

This commission would make a complete investigation and make its findings public. Provision would be made that the report would have to be made public within 90 days after the President had appointed a commission and during that period neither employer nor employe could act by calling a strike or creating a lockout. None of the leaders of either house of congress were disposed to discuss the matter last week. In view of the fact that there is considerable labor legislation before congress adjourns to come direct from the administration it does not seem probable that such a suggestion will be taken seriously, at least at this time.

The proposal was made public by C. M. Chester, chairman of the board of the association, who disclosed that it had the approval of the board and was based on months of study of the situation. In recent months there has been growing talk of an official plan for permitting the President wider latitude in handling labor controversies. Under the proposed legislation as described by Mr. Chester the ultimate effect would be to "mobilize public opinion in order to avoid disastrous strikes when they threaten the security of the whole nation."

SEEK APPROPRIATION FOR INDUSTRIAL ECONOMICS

In the department of commerce appropriation bill before Congress \$125,000 has been allowed for establishment of a new division of industrial economics within the department. The budget bureau had allowed \$300,000 for this item but the understanding is that commerce officials are glad to start with the smaller appropriation.

Secretary of Commerce Roper, discussing this new division at an executive session of the house appropriations committee, said that "the proposed division would be a highly desirable addition to the equipment of the department to assist industry and trade in the same general way that the bureau of agricultural economics assists agriculture and the bureau of labor statistics assists labor.

"The business depression," the secretary continued, "has unmistakably demonstrated the necessity for two basic lines of research by the gov-

ernment; first, an adequate diagnosis of the causes of business depressions so that government policies designed to combat them may be carefully formulated with all the facts on hand; second, a complete analysis of our business structure in the fields of production, distribution, and durable goods industries to provide essential facts for formulation of intelligent policies by private industry, looking to elimination of uneconomic practices due largely to lack of adequate information. Certainly our experience of the last four years indicates urgent need for basic work of this character, as a safeguard against adverse developments in the future."

In a pending appropriation bill \$265,000 is being asked for administration of the Walsh-Healey act by the department of labor.

It may be recalled that this law was passed during the closing hours of the last Congress and while the authorization was given for the law the time was too short to make an appropriation. During the past year the labor department has been borrowing personnel from various of its own divisions and persons from other government departments.

Under the proposed appropriation of \$265,000 an elaborate set-up is provided, so that in the future this will be just another division of government for which money will have to be spent. When these divisions once get started they rarely ever are stopped.

JAPAN SUSPENDS TARIFF ON PIG IRON AND SCRAP

Because of the present rearmament program in Japan the iron and steel situation there is causing much interest. In this connection the department of commerce last week received a cablegram from Commercial Attache Williams, at Tokyo, informing the department that in view of the changes in Japanese government policies regarding budget and abandonment of revenue measures that the iron and steel market has been adversely affected, which has caused a decline of 30 per cent in prices. He states, however, that the undertone of the market is fairly firm.

"In view of the apprehension of the shortage of supply," the cable says further, "the government has decided to suspend import duties on pig iron and scrap for two years, until June, 1939. It is expected that a bill will be presented to the Diet at an early date providing for restoration of the former duties whenever it is considered necessary."

Williams states further that iron and steel imports in January fell 45 per cent from the December imports, the decrease being attributed to various measures curtailing exports in view of the shortage of the domestic

supply. Domestic production of iron and steel showed a substantial increase in January," the cable states.

WANTS GOVERNMENT TO BUILD ALL NAVAL VESSELS

Another effort was made in the senate last week during the discussion of the navy appropriation bill by Senator Bone, Washington, for an amendment to provide for construction of naval vessels in United States navy yards only, entirely eliminating such construction in private shipyards.

The senator has made several such efforts and he now has a bill pending in committee dealing with the same subject. His amendment, which was as follows, was voted down:

"That no part of the moneys appropriated or made available in this act shall be used for the construction of any naval vessel not heretofore let to contract, by a private contractor or contractors; nor shall any of the moneys appropriated or made available be used for the manufacture, by a private contractor or contractors, of the main engines, ordnance, and armament for such vessels, the term 'manufacture' to mean the making of castings and forgings (both roughing and finishing) the parts, assembling, and installing."

AMERICAN WIRE RODS GAIN TOEHOLD IN GREECE

With the expiration of the European rod cartel agreement Dec. 31, Greece became an open market for wire rod imports, it is pointed out in a report received in the bureau of foreign and domestic commerce from American Commercial Attache K. L. Rankin, Athens.

Certain difficulties arising from hesitancy of various suppliers to sell wire rods to Greek importers, owing to reported uncertainty of payment through the respective clearing accounts and the fact that Germany claimed inability to sell at the price fixed under the cartel agreement, caused the Greek government to authorize importation of 500 metric tons of wire rods from the United States at \$55.15 per ton, c.i.f. Piraeus, when Polish wire rods were being currently offered at about \$45.

The Greek government apparently did not wish to establish a precedent in its barter arrangements with Poland and authorized importation of the American product.

It appears that Greek importers hope to cover requirements eventually by imports from Germany at not more than £9 (approximately \$45) per ton. They also hope to conclude an agreement with the European wire rod cartel, when and if renewed, whereby they may purchase wire rods at about £9 per long ton, c.i.f. Piraeus, as in 1935.

Industry Can Not Escape International Entanglements

A FEW days ago in the British House of Commons, Arthur Henderson, labor member, asked Chancellor of the Exchequer Chamberlain whether he was aware that the prices of iron and steel and nonferrous metals were still rising "as the result of the government rearmament program and manipulations of speculators" and whether he was taking measures to halt this upward tendency.

The Chancellor replied by assuring his questioner that the government was watching the price situation carefully and stating that undue emphasis was being placed upon the effect of the rearmament program upon prices. He pointed out that armament is only one factor in the increasing demand for ferrous and nonferrous metals. The major influence in the rise of prices, he inferred, is not armament nor speculation but the rapid advance toward economic recovery in most of the industrial nations of the world.

This question and answer in the British parliament is interesting to Americans because similar queries are being raised on this side of the Atlantic. Mr. Henderson's apparently innocent question carried certain political implications. As a laborite, he would be pleased to be able to put the blame for higher prices upon the government. Chancellor Chamberlain's response likewise was tinged with political flavor. Even if he knew that government policy was a big factor in the price situation, it would not be prudent to admit it.

Requirements of Politics Prevent Administration Spokesmen from Airing Economic Problems Frankly

Sooner or later the government administration in Washington will be put on the spot in regard to rising prices in this country. For political reasons, government spokesmen will attempt to evade giving any explanation that will reflect adversely upon the administration's policies. It is a good guess that efforts will be made to blame industry for increasing prices, the Supreme Court for blocking administration-sponsored legislation, or the armament programs of foreign countries for encouraging speculation and thereby stimulating price advances. There is little likelihood that any responsible administration spokesman will admit the truth, which is that government policy is by far the most important factor in the present price situation.

In this discussion, however, we are concerned primarily with the international aspects of inflationary tendencies. It must be admitted that the race for military preparedness abroad has affected the prices of certain commodities in the United States. The effect upon quotations of nonferrous metals has been pronounced; upon prices of iron and steel products it has been slight.

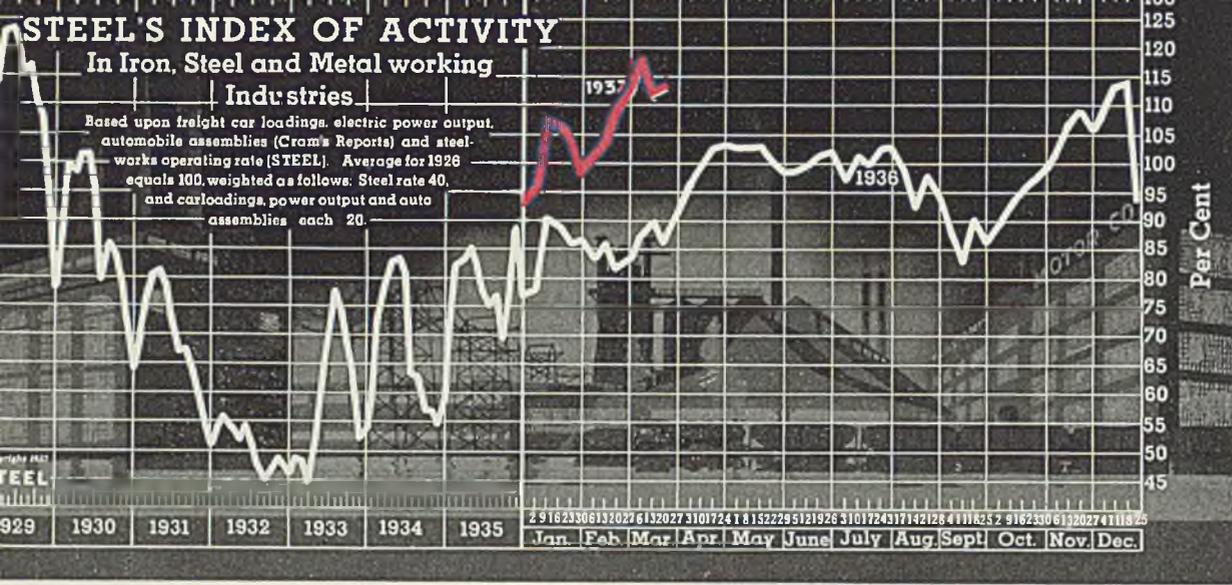
Nevertheless, American industry cannot escape the inevitable conclusion that sooner or later the international hunger for iron, steel and nonferrous products will involve this country in delicate problems of national policy. In spite of the predominating attitude of isolation and of strict neutrality which rules congress, the realities of supply and demand in the world economic situation are bound to make this nation an active participant in international affairs.

Move To Place Embargo on Scrap Exports Shows Difficulty of Divorcing Economics from Politics

In order to envision the problems which will confront our industries, we need not look beyond the limits of the present international situation in iron and steel scrap. For several years, Japan, Italy and England have been purchasing steelmaking scrap from American exporters in unprecedented volume. This drain upon domestic supplies has caused considerable discussion among dealers and large purchasers of scrap. The former declare, with full justification, that in the acute days of the depression export sales saved dealers from bankruptcy—at a time when domestic buyers were virtually out of the market. On the other hand, users of scrap claim that continued heavy exports not only threaten a shortage for home consumption but also tend to keep domestic prices at unduly high levels.

The upshot of this controversy is that zealots of neutrality and isolation in congress and scrap users who feel the need of conserving supplies at home may find a common meeting ground in legislation calculated to restrict or control the exports of scrap. If it were possible to confine the issue to the immediate question of what is desirable from the standpoint of the economic needs of the iron, steel and metalworking industries, dealers and users of scrap probably could agree among themselves as to the proper solution.

But the political complications are such that it is questionable whether solution of the problem can be confined to meritorious economic considerations. For this reason, it seems desirable that industry should approach the issue with caution. It will do well to look out for political boomerangs.



The

STEEL'S index of activity gained 0.4 points to 113.1 in the week ending March 20:

Week ending	1937	1936	1935	1934	1933	1932	1931	1930
Feb. 6.....	100.8	83.8	82.7	70.7	48.7	56.0	74.9	100.8
Feb. 13.....	101.9	82.8	82.4	72.4	48.3	55.5	75.4	100.9
Feb. 20.....	108.8	81.8	80.5	75.5	46.0	54.5	76.0	97.7
Feb. 27.....	112.8	83.4	81.1	76.8	47.4	55.1	75.8	99.7
March 6.....	117.9	87.7	82.0	78.6	43.4	54.1	79.2	98.3
March 13.....	112.7†	89.7	84.0	79.9	42.7	54.8	80.6	97.5
March 20.....	113.1*	86.0	84.0	79.7	44.6	54.4	81.3	98.1

*Preliminary. †Revised.

March Issued Full Quota Of Problems for Industry

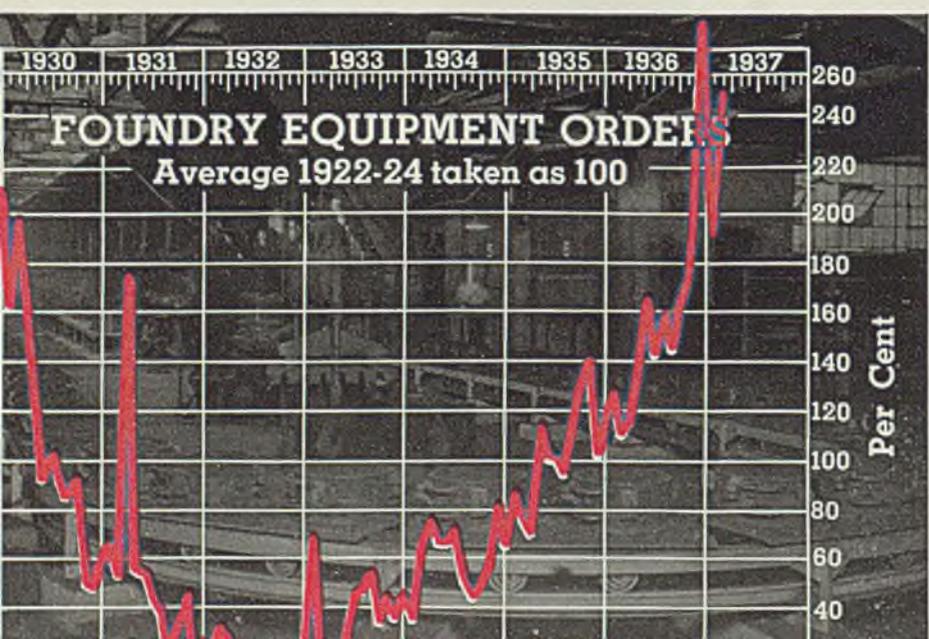
SELDOM has a single month witnessed as many important events weighted with far-reaching implications for industry as March of 1937. Within the span of the 31 days ending next Wednesday, several long-smoldering developments burst into flame with dramatic suddenness. Many years will pass before the effect of these happenings upon business will wear off.

Most important among the developments of the month were (1) general realization of the seriousness of the President's Supreme Court attack, (2) recogni-

tion of CIO by United States Steel and the swift-moving spread of sit-down strikes in Detroit, (3) the state of near-anarchy attending the labor situation in motordom and (4) the awakening to the fact that wage increases and shortening of the work week forced by public opinion, coupled with the influence of foreign armament programs, presents a serious threat of inflation.

All of these domestic factors are symptoms of a revolution which is unique in American industrial development. The attempt to settle economic problems by direct political action is disconcerting. Especially alarming is the disposition of public officials to permit problems affecting the public interest to be decided by irresponsible minorities which flout the orderly processes of law.

These danger signs cause public apprehension as



	Per Cent			
	1937	1936	1935	1934
Jan.....	190.9	127.0	76.6	37.2
Feb.....	249.5	110.4	75.7	65.8
March.....	115.0	69.4	75.4	75.4
April.....	134.0	113.2	67.9	66.5
May.....	165.4	100.7	70.4	50.7
June.....	141.4	100.2	43.1	46.4
July.....	159.6	94.0	55.3	80.4
Aug.....	144.8	113.0	66.9	66.9
Sept.....	161.0	128.5	46.4	46.4
Oct.....	173.8	140.0	55.3	55.3
Nov.....	200.4	100.4	80.4	80.4
Dec.....	283.3	118.1	66.9	66.9

BUSINESS TREND

to the ability of the federal government to guide the economic forces which it has recklessly permitted to get into the hands of uncontrollable minorities. This is the outstanding threat to business.

Notwithstanding the sobering happenings of March, the record of industrial activity for the month is en-

Where Business Stands

Monthly Averages, 1936 = 100

	Feb., 1937	Jan., 1937	Feb., 1936
Steel Ingot Output	122.6	121.1	78.8
Pig Iron Output	128.7	123.9	75.6
Freight Movement	100.1	95.6	90.4
Building Construction		98.0	61.1
Automobile Production	91.7	103.9	79.1
Wholesale Prices	111.3	110.3	99.3

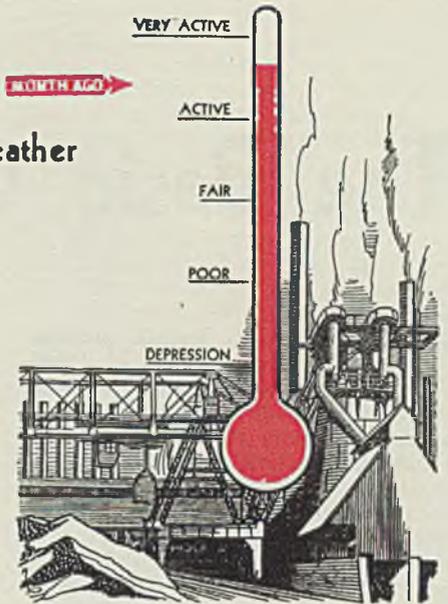
couraging. STEEL's index of activity compares favorably with that for six of the 12 months of 1929.

This is all the more remarkable in that except in the

Industrial Weather

TREND:

Upward



first week of March, 1937, automobile output was seriously affected by strikes. Steelworks operations ranged between 86 and 90 per cent of capacity—by far the best sustained rate in the recovery period. Freight car loadings were rising steadily to the highest point since 1931. Electric power output was running consistently at above the 2,200,000,000 kilowatt-hour figure weekly.

Commodity prices continued their upward trend, with some erratic fluctuations in the quotations of sensitive metals.

The Barometer of Business

Industrial Indicators

	Feb., 1937	Jan., 1937	Feb., 1936
Pig iron output (Daily average, tons)	107,857	103,863	63,411
Machine Tool Index	207.7	201.7	107.1
Finished Steel Shipments	1,133,724	1,149,918	676,315
Ingot output (Daily average, tons)	184,361	182,181	118,577
Dodge Bldg., awards in 37 states (sq. ft.)		33,470,000	20,856,700
Automobile output	*352,750	399,426	304,232
Coal output, tons	41,740,000	40,940,000	41,290,000
Business failures; number	721	811	856
Business failures; liabilities	\$9,771,000	\$8,661,000	\$14,089,000
Cement production, Bbls.		6,633,000	3,454,000
Cotton consumption bales	664,000	678,100	517,000
Car loadings (weekly av.)	694,564	663,377	627,024

*Estimated.

Financial Indicators

	Feb., 1937	Jan., 1937	Feb., 1936
25 Industrial stocks	\$232.09	\$235.41	\$198.47
25 Rail stocks	\$44.68	\$43.56	\$38.67
40 Bonds	\$89.45	\$90.31	\$87.95
Bank clearings (000 omit.)		\$27,226,000	\$20,923,647
Commercial paper rate (N. Y., per cent)	%	%	%
*Commercial loans (000 omitted)	\$8,649,000	\$8,943,000	\$7,959,000
Fed. Reserve ratio, per cent	80.4	80.4	78.2
Railroad earnings	†\$38,436,679	\$70,519,601	\$35,728,532
Stock sales, N. Y. stock exchange	50,255,060	58,675,976	60,871,262
Bond sales, par value	\$285,187,800	\$343,532,400	\$373,004,100

*Leading member banks Federal Reserve System.
†January, December and January respectively.

Commodity Prices

	Feb., 1937	Jan., 1937	Feb., 1936
Exports	\$221,550,000	\$182,630,000	
Imports	\$240,396,000	\$192,821,000	
Gold exports		\$11,000	\$23,637,000
Gold imports	\$121,336,000	\$7,002,000	

Foreign Trade

	Feb., 1937	Jan., 1937	Feb., 1936
STEEL's composite average of 25 iron and steel prices	\$36.74	\$36.55	\$33.48
Bradstreet's Index	\$11.23	\$11.13	\$10.02
Wheat, cash (bushel)	\$1.52	\$1.49	\$1.15
Corn, cash (bushel)	\$1.24	\$1.26	83c
Petroleum, crude (Bbl.)		\$1.08	\$1.08

The Basic Open Hearth Process-I

THE basic open hearth process for the manufacture of steel may be thought of as a process that has evolved from a series of developments rather than from a single invention. Although steel-making was known to the ancients, the crucible method of melting steel was first patented by Huntsman in the middle of the eighteenth century in England; consequently by the middle of the nineteenth century there was nothing novel about steel melting in Europe nor in this country. An 1860 industrial map of England and Continental Europe, where most of the steel making processes were developed, and likewise in this country where these processes were rapidly being adopted due to the westward growth of railroads and industry and demands of our Civil war, would have revealed numerous crucible steel plants, wrought or puddle iron mills, blast furnaces, forge shops, rolling mills, and some bessemer plants. The acid bessemer process was rapidly being adopted in this country where the majority of ores were much lower in phosphorus than in England. Yet none of the steel of commerce, at this time, was made by the open hearth process.

Origin of Open Hearth Process

Strange as it may seem the fundamental construction of the open hearth furnace was conceived after it had been applied to glass melting by Sir Francis William Siemens. Sir William Siemens, as he is known to the metallurgical profession, was a graduate of the Polytechnical school at Magdeburg, completing his scientific studies at Göttingen university in Germany. In 1846 when he was 23 years old he invented an air pump and five years later a water meter. Siemens was a typical engineer and scientist who was interested in all new developments and was attracted particularly to the theories on heat and heating and read many of the current papers by such physicists of his time as Joule, Carnot and Mayer. As early as 1848 he was interested in fuel economy and carried out a series of experiments of waste heat in steam engines and in 1852 delivered a paper before the British Institute of Civil Engineers on "The Conversion of Heat into

Origin, Early History and Present Day Practice and Equipment are Discussed

BY H. I. GEIGER

Mechanical Effect." His theories were applied to the construction of a regenerative steam engine and this engine proved so successful in the saving of fuel that quite a number were built of 5 to 40 horsepower and put in service in England, Germany and France. As a result of its success he was asked to deliver a paper on this engine before the Royal Institute in 1856, the same year that Henry Bessemer took out

a patent on his pneumatic method of steelmaking. Thus it may be seen that Siemens was a recognized scientist before his name became associated with the regenerative furnace for steel melting.

In 1857 Siemens' attention was directed to greater fuel economy in glass works. Up to this time most of the glass melting furnaces were heated by fuel beds which were a part of the furnace. He discovered that by separating the gas producer from the regenerators he got better results and after four years effort in 1861 at Birmingham, England, the regenerative principle with a separate gasifier was put into successful operation and patented. On June 20 of the following year, Siemens' friend, the scientist Michael Faraday, delivered his last lecture before the Royal institute, the subject of his paper being the "Siemens Regenerative Furnace Which Was In Operation at the Birmingham Glass Works." Faraday described the regenerative system as consisting of three parts: The gas producer and mains, the regenerators located under the furnace, and the heated chamber or furnace proper in which combustion was accomplished.

Regenerative Crucible Furnace

Immediately there was a demand from the crucible steel makers to apply the Siemens regenerative furnace to melting of crucible steel. Instead of using the open coke fire, they could place the crucibles in the combustion chamber, the third part

HEREWITH is presented Part 1 of an article presenting a broad, general picture of our most important steel making process, that involving the basic open hearth furnace. It is intended not to raise any controversial points but to convey the high points of the process and its development to those interested in steel, and particularly to steel consumers. This part deals largely with the historical background. Subsequent installments will describe the present day open hearth furnace, the making of a heat of basic open hearth steel and will contain notes on existing practice. A notable feature of Part 3 will be a complete log of a basic open hearth heat

of the furnace as described by Faraday, where the charges could be readily melted. Siemens adapted the furnace to crucible melting, as shown in Fig. 1, and found that he could melt a ton of crucible steel with one-sixth the fuel it took under the old method. Naturally, most of the crucible steel plants of England were anxious to adopt this new heating method and by 1868 Siemens stated that his engineering drawing office could not keep pace with the demand for working drawings of his regenerators for glass works, zinc plants, iron puddling shops and crucible steel plants. During the year 1868 he designed and installed his regenerative furnaces in the Maukbridge Steel & Iron Works, the Hayanse & Associated Works, the Llansamlet Zinc Works, near Swansea and four large plate glass works of the Marie L'Oignies, Floreffe, Aniche and Jeumont companies.

First Open Hearth Rails

During the period from 1861 when he patented his regenerative furnace to 1868, Siemens was trying to put another of his ideas into practice. This idea was first conveyed to an Abraham Darby of a crucible steel melting plant at Ebbw Vale and consisted simply in that instead of melting the steel in crucibles placed in the combustion chamber of his furnace, the crucible charge was to be placed directly on the hearth, melted and refined and then tapped out of the hearth into a ladle. Nothing was done about this idea during that year, but in 1862 to 1865 Siemens tried to interest a number of the crucible steel makers to try out his idea in some of the furnaces he had built for them for crucible melting. Prejudices of the workers and the operating difficulties he encountered led him to build his own experimental furnace in 1865. The hearth of this furnace still adhered to the crucible pot melting type of hearth and proved to be quite unsuccessful as a steel producer and in 1867 he erected a furnace which was near to the true open hearth type of today. This furnace was capable of melting a 2400-pound charge of steel every six hours on an acid (silica) lined hearth bottom. In the same year, Siemens sent samples of his open hearth steel to the Paris exhibit. A number of railroad representatives visited Siemens and some immediately adopted it for rails in place of the cast iron rails commonly used. The first experimental open hearth steel rails were cast into ingots at the Siemens plant and rolled by Sir John Brown & Co., at Sheffield. These rails processed so successfully that it led to the formation of the Landore-Siemens Steel Co.

In 1868 Sir William Siemens pat-

ented his pig and ore process for making open hearth steel. This process was very clearly described by James Riley, manager of the Steel Co. of Scotland, who later was to become better known through his pioneer work with nickel steel. In a paper which he read before the British Iron and Steel institute in 1889, the pig-ore process, as Riley described it, was defined as consisting of placing sand cast pig iron over the bottom and around the hearth. It was then melted down, this operation taking about four hours. When melted, clean, hand-picked ore was added to the molten pig iron in large amounts, resulting in a violent evolution of gas, due to uniting of the oxygen of the ore with the carbon of the pig iron, rapidly burning the carbon out of the pig iron to a content low enough to fall in the steel range. After the evolution of gas had subsided and the metal became quiet, ferromanganese and spiegeleisen were added to the molten metal in the hearth and the steel was tapped into a ladle and poured into ingots.

Developments in France

However, priority of the steel melting practice in an open hearth was claimed by the Martin brothers of the Sireuil Steel Co. of Sireuil, France. The popularity with which the Siemens regenerator was received in England spread to France and on April 17, 1863, Sir William Siemens' engineers completed the installation of the first regenerative furnace at the Sireuil Steel Co. Emil Martin and his brother, of that company, immediately conceived of the idea of melting steel directly on the hearth of their regenerative furnace instead of in crucibles. After many experiments the Martin brothers discovered that they could melt mixtures of pig iron and steel scrap together in the hearth and obtain various grades of

steel from soft to hard depending on the amount of pig iron charged with the steel scrap. No ore was used in their process. They took out a patent on these processes Aug. 15, 1865, thus gaining priority over Siemens by patenting their pig-scrap process prior to his pig-ore process. The pig-scrap process is the process commonly used today in production of open hearth steel. To Siemens is credited the design of the regenerative type of open hearth furnace, and to the Martin brothers is given the credit for the melting of steel directly in the hearth instead of placing it in crucibles. The process is known today as the Siemens-Martin process.

Early Commercial Development

In the year 1869 the new process was carried out on a fairly large scale considering the size of plants and other factors. In England the Landore-Siemens steel plant was tapping about 75 tons per week. The Yorkshire Steel & Iron Co., the Bolton Steel & Iron Co., and the London & North-Western Railway Co.'s steel plants were all tapping Siemens-Martin steel. On the Continent, Messrs. Verdie & Cie., Messrs. DeWendle & Cie., the Sireuil Steel Co., F. Krupp & Co. of Essen, and Chevalier Stummer of Vienna had also taken up its production and by 1870 open hearth steel was on its way to take its place beside the crucible and bessemer processes of steelmaking.

In America in the years 1869-1870 S. J. Wellman made the first open hearth steel in this country at South Boston, Mass., in the plant of the Bay State Iron Works. This furnace was acid (silica) lined and had a capacity of 5 tons and was of the Siemens regenerative type with the separate gas producer. This furnace proved to be a commercial success and to a fair measure a metallurgical success. Many awk-

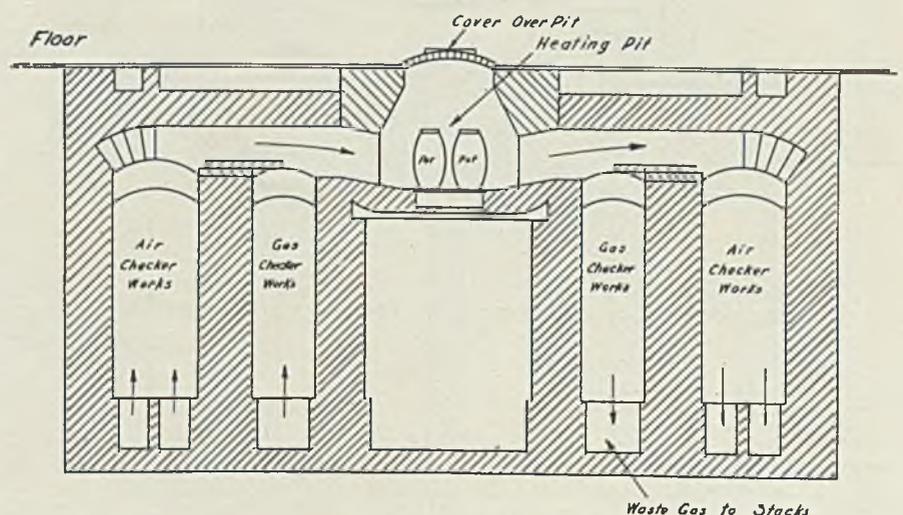


Fig. 1—Siemens' regenerative crucible melting furnace of 1865

ward details of operation had to be worked out. For instance, after the steel was melted and tapped, no ladle was used in pouring the molten steel into molds. The metal was tapped from the furnace through a forehearth and directly into molds which were set on a steam engine driven turntable. As each mold was filled by the metal stream from the forehearth, the table was turned so that the next empty mold could receive the metal, and this sequence followed until the contents of the furnace were drained. At this plant no deoxidation was carried out in the furnace, but in the molds. Only 35 per cent ferromanganese was used, being made at the plant by reducing black oxide of manganese with charcoal and lime in crucibles, and to the reduced manganese was added spiegeleisen in proportions so that the resultant alloy contained about 35 per cent manganese. This was poured into the molds together with the molten steel, the manganese deoxidizing the metal in the molds to produce a malleable product. One of the greatest problems of this furnace was prevention of the burning of the roof.

Limitations of Acid Process

Each new open hearth furnace built in the following few years presented special problems. The newly organized Landore-Siemens Steel Co., built a 7-ton open hearth furnace in 1873, shown in Fig. 2, with a specially designed roof which was depressed sufficiently to give direction to the flame as it entered the furnace at the end. The problem was to direct the flame over the molten metal surface. Up to that time no thought was given to building gas ports or burners at each end of the furnace hearth which would direct the flame towards the

bath of metal. This furnace, although it had no ports, was a first step towards the principle of flame direction. Needless to say the roof burned out rapidly in this furnace and because of its low construction was easily damaged during the charging, which was all done by hand.

Besides roof trouble and difficulty in obtaining proper direction of the flame, another recognized shortcoming of the acid open hearth process of the 1870's was the limits of the raw materials which could be used. It must be borne in mind that the acid pig-scrap process of that period, as it is today, was purely a melting operation which depended principally on the oxidation of the scrap in the melting down of the scrap and pig iron charge. The heavier scrap of less bulk was preferred to facilitate charging and to minimize the amount of oxidation in melting. One of the greatest objections to the acid process of the seventies was its non-dephosphorizing and non-desulphurizing nature. None of the phosphorous or sulphur could be removed from the molten metal because of the acid nature of the slag, hence only the lower phosphorous and sulphur steel scrap and pig iron could be used.

Early Acid Steel Practice

The furnaces of the seventies were, as already pointed out, small affairs holding from 5 to 10 tons and all were hand charged. The furnaces were sand lined. Various proportions of pig iron to steel scrap were charged depending on whether a high, medium, or low carbon heat of steel was wanted. This charge was melted and the impurities such as silicon, carbon and manganese in the steel and pig were oxidized to form a slag with

the sand. This slag collected at the top of the molten bath, was glassy in nature and chemically was a double silicate of manganese and iron. This slag was not capable of transferring oxygen from the flame to the metal. After the charge had become completely molten, any iron oxides which remained in the metal from the melting down operation continued to react with the carbon and bubbles of carbon monoxide and carbon dioxide continued to rise from the metal and break through the glassy slag removing carbon.

As the stock of oxygen in the metal decreased from this reaction the gas evolution or "boil" decreased and the furnace operator poured a small amount of the metal in a test box, cooled it and broke it. By the nature of the fracture he could tell whether the carbon had dropped enough to meet the specifications of the steel he was trying to make. If the carbon was too high a small amount of oxygen was added to the molten bath in the form of clean lump ore. The "boil" was revived again and carbon continued to burn out of the metal in the form of carbon monoxide gas until once more the boil ceased and a fracture test was taken. If the carbon was right for the tapping, the furnace man would order additions of deoxidizers to be made to the molten metal. This was necessary as a small amount of residual oxygen remained in the steel and had to be removed before casting so as to produce a sound casting or a sound ingot and to render it malleable in the forging or rolling operation. Manganese was used at that time for a deoxidizer and was added in the form of spiegeleisen or 35 per cent ferromanganese. After the deoxidation, the heat of steel was tapped from the furnace into a ladle and poured.

Oxidation and Deoxidation

One of the outstanding advantages of the acid process was its low oxygen content as compared with highly oxidizing bessemer process. The lower the oxygen content, the more malleable would be the metal and the less duty would be required of the deoxidizer. The process of deoxidation with manganese was fairly well understood at this stage of the development of steelmaking. As early as 1804 David Mushet learned of the value of pyralusite, MnO_2 , additions to crucible steel. In 1839 Sir Joshia Heath took out a patent on a similar process and later Robert Mushet, a descendant of David Mushet showed Bessemer that the addition of spiegeleisen, 20 per cent Mn, to bessemer iron removed oxygen and rendered it malleable. The process already described for the production of 35

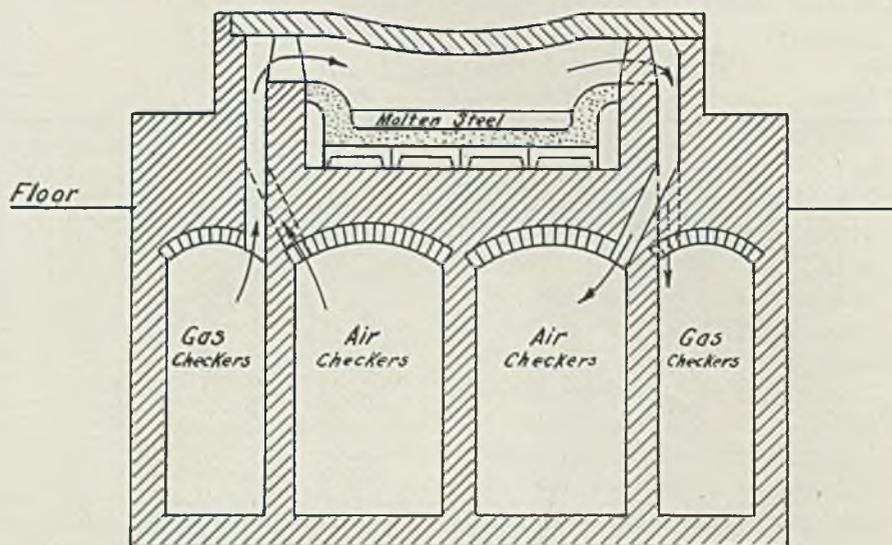


FIG. 2—This 6-ton Landore-Siemens regenerative furnace was built in 1873

per cent ferromanganese in crucibles under the Bay State iron practice was the Henderson process and used exclusively in Europe from 1863 through 1869 after which its production was changed to Siemens acid open hearth. In 1875 M. Pourcel of the Terre Noir Steel Co. of France, not satisfied with the 35 per cent manganese alloy or with spiegeleisen as a deoxidizer, after some experiments succeeded in making an 80 per cent ferromanganese in the blast furnace. This alloy immediately replaced the 35 per cent type and is used today.

Discovery of Basic Lining

The steel makers of the seventies, having rendered their steel fairly malleable by deoxidation, did not fail to recognize that even if the steel were properly deoxidized, an excess sulphur content would cause the steel to crack up badly in rolling or forging, which property they described as "hot short." It frequently offset the good done by deoxidation. They also found that when the phosphorous was too high the steel had a tendency to be brittle at room temperature; this condition was described as "cold short." When it is borne in mind that the English blast furnaces tapped pig iron with a 1.50 to 2.25 per cent phosphorous content, one can readily appreciate the difficulties of the steel makers of that time in view of the fact that our present day standards hold phosphorous to a 0.045 maximum in basic practice and aim at 0.090 to 0.110 in the acid bessemer for good results and 0.050 in the acid open hearth. It was evident that a process had to be developed which would remove this objectionable element along with sulphur, and the other elements, manganese, silicon and carbon.

As the regenerative furnace construction originated with the needs of the glass melting industry for greater fuel economy, and the idea of melting of a steel and pig charge on an open hearth was borrowed from the crucible process to increase output at lower costs, likewise true to form, the basic lining of the open hearth was borrowed from the bessemer process. For a number of years, I. Lowthian Bell, one of the foremost metallurgists of Europe of that period, had been trying to lower phosphorous in the blast furnace. Likewise a host of other metallurgists of Bell's time such as Karston, Hargreaves, Evans, Wall, Warner, Troost, Englehardt and a dozen others had tried to lower the phosphorous in steel, but this was left to a young man by the name of Sidney Gilchrist Thomas.

Young Thomas had been educated in the classics and in a pre-medical course at Dulwich college near

London and on the death of his father entered government service. He continued his studies evenings at Vacher's laboratory in London, choosing metallurgy. He also took courses in this subject under the famous Dr. Percy at the Royal School of Mines. As laboratory projects young Thomas was attracted to the unsolved problems of metallurgy. The one which engaged his interest was his problem of phosphorous in the acid bessemer process. He reasoned that since phosphorous formed phosphoric acid in the steel process, that it would need a basic slag to absorb it or neutralize it and "fix" it in the slag after it became oxidized in the metal. The acid slag would not. All Thomas needed, then, was a basic material to line the vessel and a basic material to form the slag. A basic slag would also absorb sulphur. In London at college he experimented with a miniature converter, but could not get sufficient pressure for his blows. He then decided to devote all of his time to his experiments. Consequently he wrote his cousin, P. C. Gilchrist, a chemist at the Baenavon Steel Co., of his idea and soon joined the cousin at the steel

company where together they carried on a series of experiments for a year and a half with a miniature 8-pound converter lined with such basic materials as lime, magnesia, and dolomite.

In these experiments they reduced the phosphorous 25 to 95 per cent. The results of their experiments were conveyed to the Baenavon company who let them line a small converter for further tests. These tests were successful and in the spring of 1879 Sidney G. Thomas, at the age of 29, presented the results of their experiments before the British Iron and Steel institute. In their work they were able to reduce the phosphorous in their basic lined bessemer from 1.50 to 2.00 per cent in the pig iron down to 0.08 and 0.10 per cent with a 3 minute afterblow. (In the basic bessemer process which is confined to Europe where the ores are high in phosphorous, an afterblow is necessary. After the carbon has been burned out and the bright carbon flame disappears, the vessel is not turned down as in the acid practice, but instead the blower continues to force air through the vessel and a phosphorescent blue

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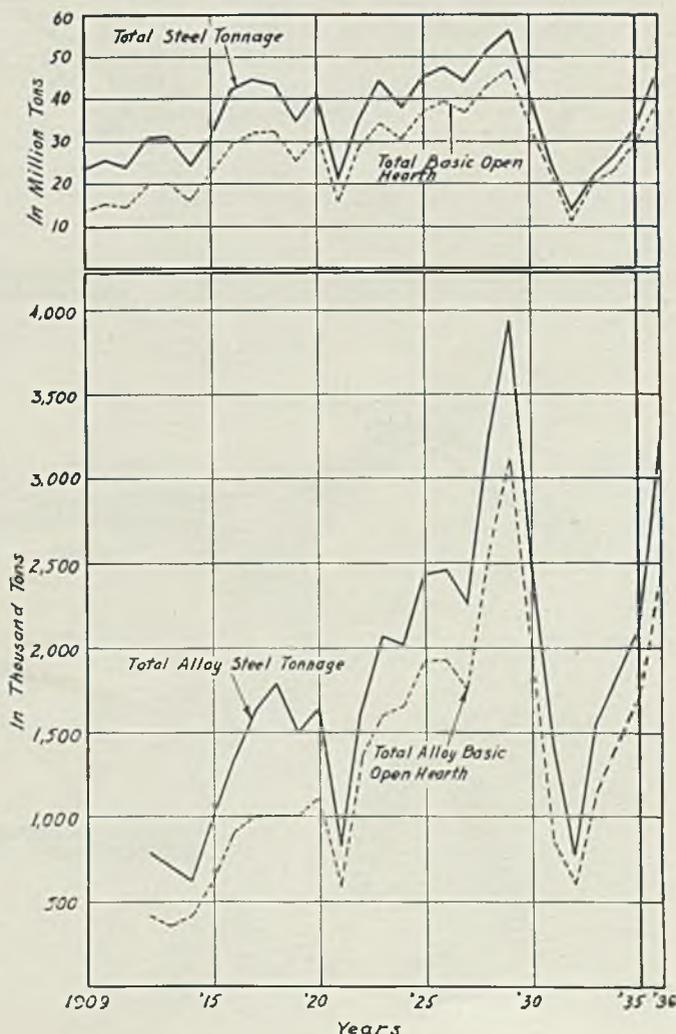


Fig. 3—Tonnage growth of alloy steel ingots and castings produced by basic open hearth process

Heat Treatment of Steel by Direct Transformation From Austenite

BY E. S. DAVENPORT
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THE heat treating process known as "austempering" consists essentially of heating steel to an appropriate temperature above the critical range to render it austenitic and then, instead of cooling it to room temperature in one of the conventional cooling media, the steel is rapidly transferred to a hot quenching bath maintained at some

predetermined, constant temperature below the critical range but above about 300 degrees Fahr.; the steel is held at this temperature for a predetermined time to insure the

FIG. 1—Carbon steel wire 0.180-¹ inch in diameter with 0.74 per cent carbon and 0.37 per cent manganese; heat treated to hardness shown and tested under comparable conditions

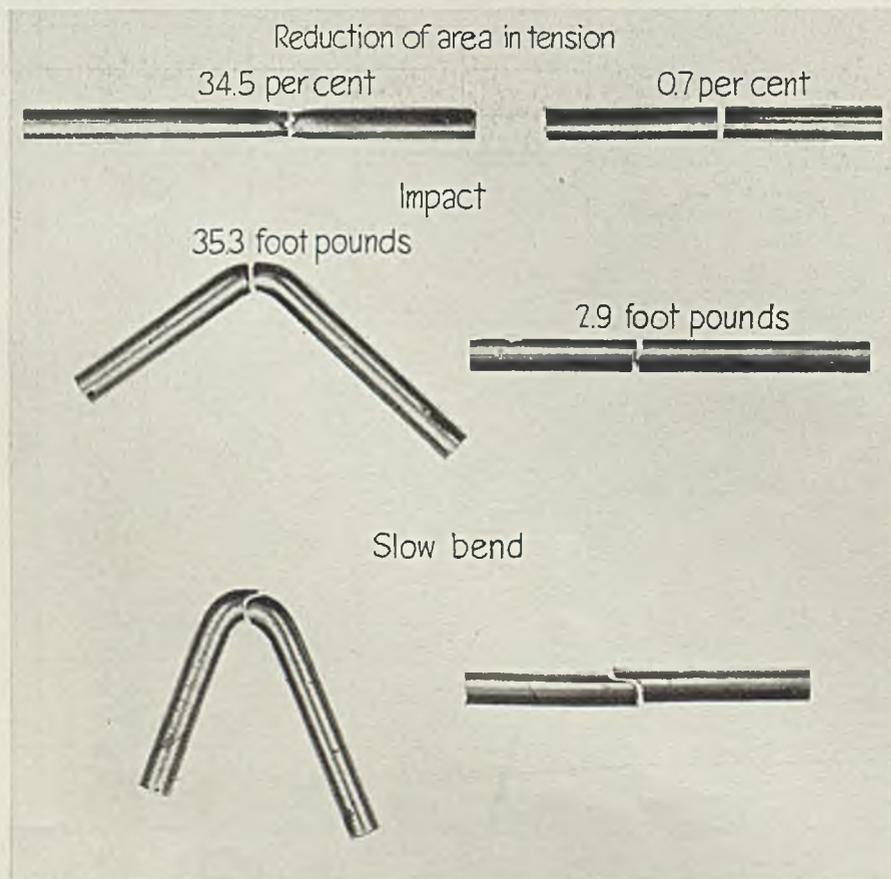
complete direct transformation of the austenite to the final product, after which the material may be cooled to atmospheric temperature in any convenient manner.

The process is an outgrowth of systematic study of the rate of austenite transformation at constant temperatures below the critical range; these investigations led to the S-shaped time-temperature curve¹. The process is covered by American² and foreign patents. The more technical aspects of the subject have been described elsewhere³, and need not be dwelt upon at length here.

Principle of this treatment is to cool the steel to an appropriate subcritical temperature level so rapidly it is still in the austenitic condition when it reaches that level, and to hold it there long enough to insure direct and complete transformation to the structure characteristic of the particular temperature. This process of direct transformation, when carried out at a level within the appropriate range, develops attractive mechanical properties coupled with relatively high hardness; the steel is at no time in the fully hardened martensitic state.

It should be understood clearly that austempering is *not* a method

Hardness: Rockwell C 50
Austempered Quenched and tempered



¹ The Process and Result of Austenite Transformation at Constant Temperature," *Metals and Alloys*, vol. 8, no. 1, p. 22; January, 1937.

² United States Patent 1,924,099; E. C. Bain and E. S. Davenport; Aug. 29, 1933.

³ Transformation of Austenite at Constant Subcritical Temperatures," by E. S. Davenport and E. C. Bain, *Transactions of the American Institute of Mining and Metallurgical Engineers, Iron and Steel Division*, 1930; pp. 117-154.

⁴ "Microscopic Cracks in Hardened Steel, Their Effects and Elimination," by E. S. Davenport, E. L. Roff and E. C. Bain, *Transactions of the American Society for Metals*, 1934; vol. XXII, p. 289.

of hardening steel by quenching it from a low-temperature bath in such a manner as to cause it to transform to fully hard martensite which must be tempered in a subsequent operation. The essence of the process lies in the fact the steel is maintained at a constant subcritical temperature for a *predetermined* period, long enough to permit the transformation to complete itself before the steel cools to temperatures at which fully hard martensite would be the product of the reaction. In other words, the steel is caused to go *directly* from austenite to some particular desired structure instead of through the intermediate stage of hard, highly stressed, martensite, with the disadvantages which this step entails.

Selection of the proper time-temperature conditions for the sojourn of the steel in the austempering bath is based upon a knowledge of the transformation rate characteristics of the particular steel being treated. While steels may be classified in a general way as to transformation rate characteristics, nothing short of actual trial or experimentation will serve to develop the necessary information for correct austempering schedules for a given steel, heat treated under a given set of conditions. In practice, bath temperatures in the range 300-800 degrees Fahr. are employed most frequently; this is the range of temperature over which the transformation proceeds relatively slowly as compared to temperatures either immediately higher or lower, at least in so far as plain carbon and low-alloy steels are concerned.

Material of Bath Unimportant

In general, the lower the bath temperature the higher the strength and hardness and the lower the ductility of the treated steel. Likewise, the lower the bath temperature the longer the time necessary to complete the transformation, although there may be certain exceptions to this general rule.

Attention is called to the fact the material used for the austempering bath plays no part in the process other than that of a heat-abstracting medium. Any substance which does not combine chemical with the steel and is capable of being maintained as a liquid at the desired temperature will serve the purpose. Baths consisting of molten salt or molten metal have been found satisfactory; in general, molten metal has a somewhat higher heat abstracting power than molten salt but the latter is often more economical and convenient, particularly in large-scale operations.

One convenient method of evaluating the merits of austempering is to compare the properties of a given steel at some particular hardness

Hardness: Rockwell C 50

Austempered

Quenched and tempered

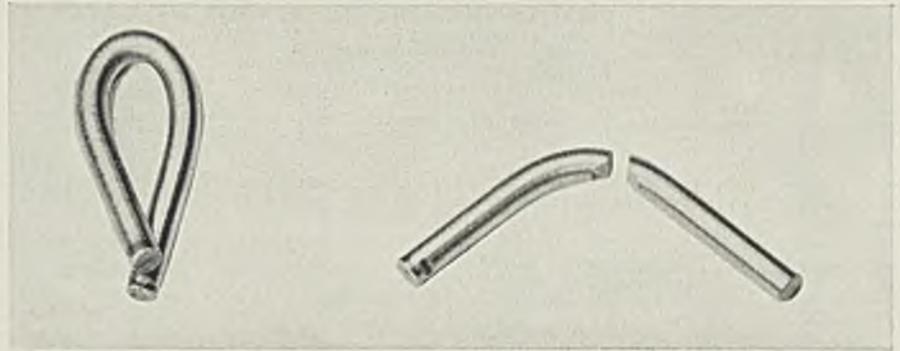


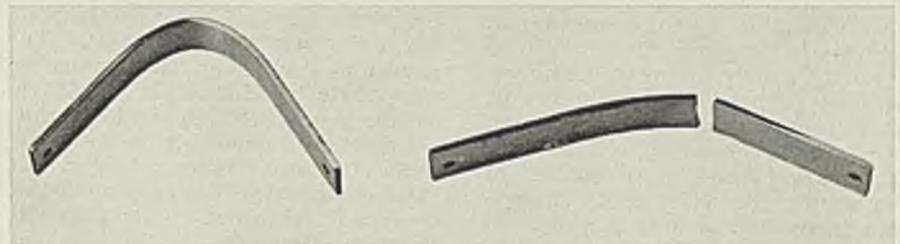
FIG. 2 (above)—Carbon steel wire 0.180-inch in diameter with 0.78 per cent carbon and 0.58 per cent manganese; heat treated to hardness indicated and bent under comparable conditions

FIG. 3 (below)—Flat steel strip 0.063-inch thick with 0.76 per cent carbon and 0.75 per cent manganese; heat treated to hardness shown and bent under comparable conditions

Hardness: Rockwell C 55

Austempered

Quenched and tempered



level as developed by this method and by the conventional quench and temper method. A comparison of the tensile, impact, bend and other mechanical properties, as developed by the two methods at a common hardness of, say, Rockwell C 50 (brinell 495), serves to show what the austempering treatment can contribute in the way of improved properties. Any property could be selected as the "common denominator" for such a comparison; hard-

ness is usually selected because of its ease and convenience of determination and because of the non-destructive nature of the test.

A large number of such comparisons have been made covering a hardness range from about Rockwell C 40 (brinell 375) to about Rockwell C 60 (brinell 627), most of them having been made on plain carbon steels ranging in carbon content from about 0.60 to about 1.10 per cent. A few low-alloy steels have been in-

Hardness: Rockwell C 58

Austempered

Quenched and tempered

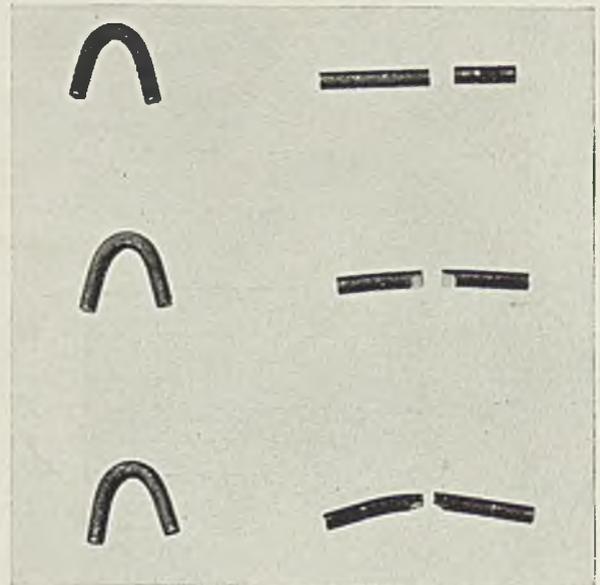


FIG. 4—Carbon steel wire 0.103-inch in diameter with 1.01 per cent carbon and 0.39 per cent manganese; heat treated to hardness shown and bent under comparable conditions

Table I

Typical Comparisons of Properties Developed in Several Steels

Analysis of steel, per cent			Type of specimen tested	Hardness at which comparison was made		Quenched and tempered	Austempered
C	Mn	Si		Rockwell C	Brinell	Reduction of area in tension, per cent	
0.78	0.58	0.15	0.180-inch round wire	50	495	26.1	46.4
0.74	0.37	0.15		50	495	0.7	34.5
0.74	0.37	0.15		41	388	42.7	54.2
0.78	0.58	0.15	0.180-inch round wire	50	495	Impact strength (un-notched specimens), foot-lbs.	
0.74	0.37	0.15		50	495	14.0	36.6
0.74	0.37	0.15		41	388	3.4	35.3
						34.5	50.1
0.93	0.73	0.21	0.200-inch round, polished longitudinally	50-51	495	Endurance limit in rotating beam fatigue test (R. B. Moore type), lbs. per sq. in.	
						108,000	136,000

vestigated, but this particular field will require further investigation before systematic comparisons can be made.

Austempering Raises Ductility

In general, austempering results in an improvement in toughness and ductility over what can be obtained on the same steel under comparable heat treatment by the conventional quench and temper method. This superiority shows up most strikingly in such properties as reduction of area in tension, resistance to impact, resistance to shattering, resistance to fatigue, and ductility as revealed in the simple free bend test. Elongation in tension is only slightly improved, whereas ultimate strength and yield strength may be either slightly lowered or slightly raised.

Typical examples given in Tables I and II show what austempering accomplishes by way of achieving unusual combinations of properties such as high toughness or ductility or resilience coupled with relatively high hardness. Fig. 1 illustrates the difference in properties developed by the two methods of treatment in a steel containing 0.74 carbon, 0.37 manganese and 0.15 per cent silicon when treated to a hardness of Rockwell C 50 (brinell 495).

A simple free bend test is a ready

means of demonstrating the toughness and ductility of austempered steel as shown in Figs. 2, 3, and 4 illustrating the results of such bend test comparisons performed on typical plain carbon steels at three different hardness levels; namely, Rockwell C 50 (brinell 495), C 55 (brinell 555) and C 58 (brinell 578).

Another interesting example of properties obtainable by austempering is shown in Figs. 5a and 5b. The shovel was austempered to a hardness of Rockwell C 55 (brinell 555); at this relatively high hardness the shovel was capable of being bent without failure as shown in Fig. 5a.

Upon removal of the bending force the shovel returned to its original shape as shown in Fig. 5b, with no indication of permanent deformation from the bending operation.

Limitations of the Process

Hardness Range—In most of the carbon steels studied so far there seems to be a particular range of hardness, varying somewhat with different steels, in which the superiority of the austempered product over the quenched and tempered product is most pronounced. This region of marked improvement has been found in most cases to be within the hardness range Rockwell C 40 to C 60 (brinell 375 to 627), although

this does not imply there is no improvement outside of this range.

Sections Must Be Thin

Effect of Mass—The thickness of section which can be treated successfully by austempering is limited fairly definitely, at least with plain carbon steels. The process is limited to sections which can be cooled with sufficient rapidity to prevent transformation to soft pearlite during the quench to the austempering bath temperature. If the thickness is too great, heat cannot be withdrawn from the steel rapidly enough to cool it through the temperature range of rapid transformation in the vicinity of 900-1200 degrees Fahr. without undergoing transformation; if transformation does occur at these higher temperatures during cooling, the steel is no longer austenitic when it reaches the bath temperature, and the whole purpose of the operation is defeated since there is no austenite left to undergo transformation to the desired structure.

Experience indicates the upper limit of thickness of carbon steel which may be successfully austempered probably lies somewhere between ¼ and ⅜ inch; this limit will vary with several factors, notably the dissolved alloy content and the austenite grain size of the material;

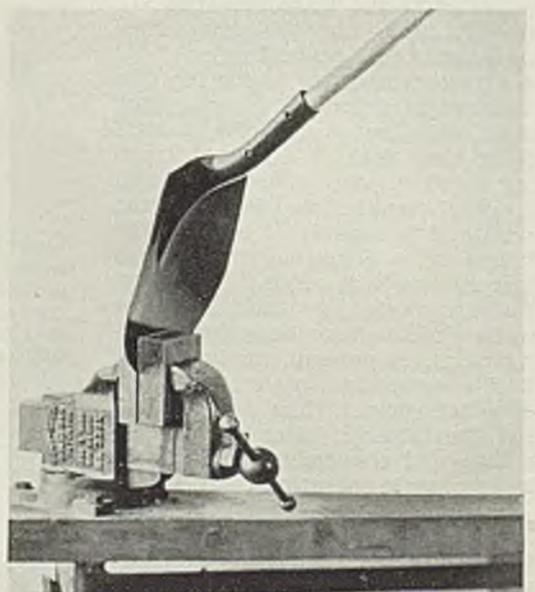


FIG. 5a (left)—Plain carbon steel shovel, austempered to a hardness of Rockwell C 55 (brinell 555), capable of being bent as shown without failure. Fig. 5b (right) — The same shovel, after removal of bending force, returns to original shape with no permanent deformation

in general, as the dissolved alloy content or the austenite grain size of the steel increases, the transformation is retarded, and consequently sections of greater thickness may be successfully austempered. Similar limitations apply, in principle, to any heat treatment which involves a quenching operation from above the critical range.

Time Required for Alloy Steels—The action of alloying elements in retarding the transformation to a marked extent in the range of austempering temperatures often necessitates impracticably long holding periods in the austempering bath to assure substantial completion of the transformation in alloy steels. In extreme instances several days, or even weeks, may be required at certain temperatures and this, of course, eliminates such steels from consideration as suitable for treatment by austempering on a commercial scale. Even with carbon steels the time required for completion of the transformation at austempering temperatures may be too long to permit the use of continuous process equipment, and some form of batch or semibatch type equipment is indicated, at least so far as the liquid bath portion of the apparatus is concerned.

In summary, austempering is a method of producing in carbon steel, high hardness coupled with a high degree of toughness and ductility. Viewed from a somewhat different angle, it is, in effect, a method of developing in carbon steel what might be termed "alloy steel properties" and in some cases actually developing better properties than those ordinarily obtainable with the more costly alloy steel. The question of whether a corresponding improvement may be expected in the properties of low-alloy steels by austempering still remains to be answered; preliminary indications are to the effect some improvement may be expected, but whether it will prove to be as marked as that found in carbon steels remains for future work and experience to disclose.

High-Strength Steels in Constructional Uses

Symposium on High-Strength Constructional Metals, 126 pages, 6 x 9 inches; published by American Society for Testing Materials, Philadelphia; supplied by STEEL, Cleveland, for \$1.25 in heavy paper and \$1.50 in cloth, plus 15 cents for postage; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This symposium comprises five extensive technical papers and discussion presented at the 1936 A.S.T.M. regional meeting. The papers cover the chemical and

Table II

Comparison of Properties Developed in Single Steel

Test specimen was a 0.180-inch round wire containing 0.85 carbon, 0.42 manganese and 0.18 per cent silicon

Property measured	Quenched and tempered	Austempered
Rockwell C hardness	50	50
Brinell hardness	495	495
Yield strength (0.1 per cent set), lbs. per sq. in.	224,700	210,900
Max. strength, lbs. per sq. in.	261,100	256,700
Elongation in 2 inches, per cent	4.7	6.2
Reduction of area, per cent	28.3	44.8
Impact strength (un-notched 0.180-inch rounds)	20.4	40.2

physical properties and manufacturing and fabricating properties of metals and alloys applied for various constructional applications, including buildings, ships, automobile bodies, airplane wings, tanks and other uses.

Latest information is presented on carbon and low-alloy steels, corrosion-resisting steels, alloys of copper, nickel, aluminum and magnesium. Many charts and data tables are included.

Presents Spring Handbook

A new volume entitled "The Art and Science of Spring Making" has been issued by Barnes-Gibson-Raymond division of Associated Spring Corp., Detroit, and Ann Arbor, Mich. It is an 88-page, profusely illustrated handbook which is intended to represent a complete treatise of modern spring engineering. It treats of springs in language that is not too technical and which is of equal interest both to practical production men and engineers. It is intended to assist in the solution of spring selection and design problems and numerous problems in design actually are worked out for easier understanding. Subject matter of the

book is indexed and conveniently grouped for reference. Those identified with the use of purchase of springs may obtain a copy of the new book by addressing the company.

Issues Standard Index

American Society for Testing Materials, 260 South Broad street, Philadelphia, has issued an index to its A.S.T.M. standards and tentative standards as of Jan. 1, 1937. The 513 standards and 284 tentative standards are indexed under appropriate key words according to the materials of subjects to which they apply. Also included is a list of serial designations in continuous numeric sequence.

K Monel High in Tensile

Hy-Carbo Steel Co., Lowell, Mass., custom drawer of high carbon steel wire, recently has drawn some K monel metal wire. This material when reduced from 3/16-inch rod to 0.040-inch wire showed tensile strength of 180,000 pounds per square inch. After heat treatment the wire showed tensile strength of 200,000 pounds.

Keeps Cool with Stainless

SCIENTIFICALLY cooled butter chips for fastidious eaters are made available by this new stainless steel cooler, a product of Lansing Os-gard Co., Cleveland. Chips are placed in two layers on each tray, so designed that the bottom tip of the tray is just deep enough in the ice and water to keep the butter at 38-42 degrees Fahr. Conductivity of the metal does the rest. Note racks for dishes, drain cock and compartment for forks. Stainless steel is of the Enduro type, supplied by Republic Steel Corp., Cleveland



New Ferrous Alloys Obtained By Use of Boride Crystals

WHEN Colmonoy Inc., Los Nietos, Calif., about five years ago first introduced the metallic boride mixture containing a previously unknown metallic boride crystal, it was thought to be of particular value for the formation of a wear and corrosion protective overlay. Later these crystals were alloyed with certain base metals and offered to industry in the form of welding rods for the formation of welded surface overlays. Subsequent research over the past three years has proved that these crystals may be used in producing alloy irons and steel with valuable properties. The crystalline mixture may be added to low carbon steel or common cast iron in various proportions, or, alloyed with nickel as a carrier, it may be utilized as an alloying element.

Alloyed With Low Carbon Steel

As an example of the properties of these new, easily made alloys, 10 per cent metallic boride mixture and 90 per cent low carbon steel in the form of boiler punchings, by weight, produce a metal which has a hardness of 63 to 65 on the Rockwell C scale as cast but which may be annealed to machinable softness and then rehardened to any desired hardness up to and including that of its cast state. These properties are not unusual inasmuch as many steels may be so hardened. Where this new alloy does differ, however, is in the annealing and hardening procedure. With this alloy it is the temperature reached and not the method of cooling which determines the degree of hardness. The hardness increases as the temperature to which it is heated is increased until the maximum of 2140 degrees Fahr. has

BY MILES C. SMITH

been reached; whenever the temperature reading corresponds with the degree of hardness desired on the hardness curve, it is necessary only to withdraw the metal from the furnace and allow it to cool in the at-



Photomicrograph at 400 magnifications of the nickel and metallic boride crystal alloy, showing regular, close grained structure and the presence of the well distributed indestructible crystals. These are the white ones

mosphere. No water or oil quench is necessary nor will an oil or water quench affect the hardness one way or another. As easily may be understood, this particular alloy does not change its shape nor is it easily damaged during its heat treatment.

Should this same crystalline mixture be alloyed with pure cast iron

the resultant metal is close grained, hard and relatively brittle. One component of the mixture, one of the three metallic borides comprising it, has such a high melting point that it does not lose its identity in any of the alloying procedures regardless of the temperature to which the metal may be heated or superheated. Neither is it oxidized. The crystals, microscopic in size, permeate the mass as in an emulsion and contribute desirable physical properties to it. In this cast iron alloy, for example, identically the same metal cannot be produced without the indestructible borides as with it. That is, if the two so-called low borides are alloyed with cast iron the resultant alloy is hard and close grained but not so hard or so close grained as the alloy made of the mixture of the three borides. Too, the 2-boride alloy is only a fraction as efficient as the 3-boride alloy in resisting corrosion and abrasion.

Nickel-Boride Alloys

Much already has been said about this relatively new metallic boride mixture and its influence on certain base metals. Nickel, for example, when alloyed with the crystals in the approximate proportions of 25 per cent crystals and 75 per cent pure electrolytic nickel, acquires a hardness of 56 to 58 on the Rockwell C scale and extraordinary resistance to sulphuric, hydrochloric and acetic acids as well as alkali corrosion. The crystals have a like effect on other base metals. Chief concern at this time, however, is the use of these crystals and their alloys for easy alloying that may be done by practically anyone. The chief asset of such alloys, aside from the ease with which they may be formed, is the fact that they do not depend upon a delicate metallurgical balance for their properties and may be remelted again without destroying their properties.

Table 1 shows the essential physical properties of the basic alloys obtained by adding certain percentages of the crystalline mixture to cast

Table I

Physical Properties of Basic Alloys Formed by Adding Crystalline Metallic Boride Mixture to Cast Iron, Mild Steel and Tungsten Bearing Steel

Alloy	Hardness Rockwell C	Tensile Strength, lbs. per sq. in.	Compression Strength, lbs. per sq. in.	Coefficient Thermal Expansion	Density	Solidification Temperature Thickening	Fahr. Solid
No. 2, 87 per cent cast iron and 13 crystals	62-63	Brittle	Brittle	0.00000934	7.55	2055	1990
No. 3, 19 per cent tungsten, 62 steel and 19 crystals	63-65	47,047	235,890	0.00000506	8.26	2142	2135
No. 6, 75 per cent pure nickel and 25 crystals	56-58	25,633	192,529	0.00000859	7.80	1990	1801
90 per cent mild steel, 10 per cent crystals, as cast	63	50,219	490,960	.....	7.58	2375	2152
90 per cent mild steel, 10 per cent crystals, annealed	33	102,508	508,475	.....	.....	.....	.....
90 per cent mild steel, 10 per cent crystals, hardened	62	107,068	440,437	.....	.....	.....	.....

iron, mild steel and tungsten bearing steel. A comparison of the average physicals of the alloys formed with the crystalline mixture and the average physicals of the several base metals reveals the effect of the added borides. Table 2 shows the losses in weight for these alloys after exposure to corrosion.

Relative abrasion factors are not so easily determined as resistance to abrasion depends on conditions which may be present in one application and not in another. While frictional coefficients and abrasive coefficients may be determined for one metal against another or one metal against a nonmetal it is entirely out of the question to say that any metal has such and such an abrasive coefficient in any and all instances. Insofar as the writer has been able to determine after some 20 years of study, no comparative figures for abrasion resistance are dependable.

Useful Nickel-Boride Alloys

Some highly useful alloys are being made by using as an alloying element the No. 6 alloy listed in Table 1, which contains pure nickel and metallic boride crystals. Base metals now being used with the No. 6 metal include cast iron, mild steel and copper. Inasmuch as No. 6 has a relatively low melting point it combines easily with the base metals mentioned. Table 3 sets forth some of the interesting properties of various alloys thus obtained. This table must be read with a mental reservation that hardness and brittleness often go hand in hand. While the table does illustrate to some extent the inconsistency of physical properties and the fact that curves and not straight lines must be depended upon for quantity proportions to obtain a desired quality, it does give a hint as to an easy method of alloying. By this method there is no danger from superheating and elimination of constituents by oxidation. If the base metal and the No. 6 mixture will alloy at all, they will intermingle when both are fluid and form the desired metal, providing all impurities are kept out. An example of a mixture which will not alloy satisfactorily by this method is a mixture of mild steel and less than 25 per cent No. 6.

None of these simple alloys may be rolled, forged or drawn but all of them may be cast into shapes with no special provision, in the majority of cases, for excessive shrinkage or possible distortion as the metal solidifies. All borides seem to have a beneficial effect on steel or iron and tend to sponsor close grained crystallization, but this new metallic boride crystalline mixture has outstanding properties of this character. Regardless of how hot the metal may have been heated during the alloying or remelting it

Table II

Losses in Weight of Basic Crystalline Metallic Boride Alloys During Corrosion Tests

Corrosive Agents	Temperature Degrees Fahr.	Hours of Exposure	Alloys as defined in Table 1			
			No. 2	No. 3	No. 6	90 per cent steel, 10 per cent crystals
Sulphuric acid 1 part and water 4 parts	70	100	13.98	.....	0.05	13.98
Sulphuric acid 1 part and water 4 parts	220	1	3.25	.....	0.82	21.88
Hydrochloric acid 1 part, water 1 part	70	100	9.55	.....	0.14	9.20
Nitric acid 1 part, water 2 parts	70	100	2.98	.....	4.22	0.13
Acetic acid 1 part, water 1 part	70	100	0.40	.....	0.30	0.006

solidifies to a dense, minute grained metal.

A good example of this fact is reflected in alloying pure electrolytic copper with No. 6 metal. One per cent of the No. 6 in copper eliminates the porosity often found in cast copper and changes the physical properties, producing a yield point of 18,930, ultimate strength of 27,110 pounds, elongation of 28.5 per cent and reduction of area of 47.5 per cent. Pure copper with 10 per cent No. 6 develops a yield point of 37,000 and ultimate strength of 43,000, with a very dense structure, but the elongation is reduced to 3.5 and the reduction of area to 8.4 per cent.

High Strength Magnets Are Produced in New Plant

Commercial production of special high strength magnetic alloys such as alni, alnico and the like has been begun by Taylor-Wharton Iron & Steel Co., High Bridge, N. J., in a new building just erected for this purpose. The new plant was designed as a result of studies covering the production of these alloys on a small scale for sometime past. Included are full provisions for quality control, heat treatment and testing. These permit production of castings to meet strict mechanical and electrical specifications, solid throughout, free from surface de-

fects and uniform in structure and properties. Magnetic testing equipment of latest type permits a rigorous production test routine on the entire output of the new magnets. The company states that magnet designs hitherto difficult or impossible to cast successfully now may be produced, thus giving wide scope to designers of instruments and other electrical equipment.

Fireproof Gasoline Tank Is Placed in Production

American Safety Tank Co., Dwight building, Kansas City, Mo., has developed and placed in production a new gasoline tank for use on trucks and other motor vehicles. Approved by Underwriter's Laboratories, Chicago, it is designed so as to be fireproof, spillproof, crash resistant and non-explosive. It is made with dished and flanged pressure heads of 12-gage steel; these are swedged into and electrically welded to the body which also is of 12-gage steel. The steel used is pickled and oiled. Patented placement of fill and feed pipes prevents leakage of gasoline in case of upset. In combination, a patented air control system, a ball check in the cap and a fusible alloy plug in the cap which melts and acts as a pressure release before rupture of the tank can occur, effectually prevent leakage or seepage of the gasoline.

Table III

Some Properties of Alloys Obtained by Mixing Various Base Metals with No. 6 Metal Listed in Table 1

Description of alloy	Hardness Rockwell scale	Corrosion resistance: Copper losses are shown in milligrams per square inch of exposed surfaces; all other figures show per cent of weight loss				
		Sulphuric acid 1 to 4		Hydrochloric acid 1 to 1		Nitric acid 1 to 2
		Cold 100 hrs.	175 deg. F. 100 hrs.	Cold 100 hrs.	175 deg. F. 1 hour	Cold 100 hrs.
No. 6 metal	58 C	0.05	0.82	0.14	.....	4.22
Mild steel	.....	57.69	31.72	27.00	20.45	10,000+
Mild steel and 25 per cent No. 6	6 C	0.53	0.51	6.15	5.22	8.60
Cast iron	50 C	33.51	4.33	63.65	18.82	997.00
Cast iron and 5 per cent No. 6	56 C	65.91	12.60	100.96	21.65	2185.00
Cast iron and 15 per cent No. 6	29 C	1.07	2.90	18.35	13.16	29.30
Cast iron and 25 per cent No. 6	28 C	0.32	0.54	3.80	8.43	37.00
Copper	29 B	2.20	.....	28.30	.....	.....
Copper and 10 per cent No. 6	50 B	1.69	.....	40.70	.....	.....

Powder Metallurgy Presents Broad Field for Experimental Development

MANUFACTURE of tungsten and molybdenum has been responsible for the developments in the field of powder metallurgy, according to G. J. Comstock, assistant manager of research and development, Handy & Harman Co., New York, in an address given before the February meeting of the New York chapter, American Society for Metals.

In the opinion of Mr. Comstock, since tungsten and molybdenum must be pressed and sintered in powdered form before being drawn into wire, a study of these metals has brought about many developments in the field of powder metallurgy. Today some six million pounds of these rarer metals are being produced annually in this country.

In general, powder metallurgy consists of metal products which are manufactured by mixing, pressing and sintering a metal or a number of metals in powdered form. Mr. Comstock said one of the most important aspects of powder metallurgy was that the final product could show physical properties like the original metals themselves or could be a composite of them. As an example he mentioned a sintered alloy of tungsten and copper which possessed a relatively high conductivity due to the copper but which was refractory at high temperatures due to the tungsten. Sintered

tungsten carbides mixed with binders such as cobalt also retain the extreme hardness of the refractory carbides. The speaker said other metals sintered in common practice today included alloys of silicon and nickel and mixtures of copper and graphite.

In sintered powders, adhesion of the two metals may take place or diffusion may go so far as to alloy the two constituents. One of the unexplained phenomena, according to the speaker was a new process of coating steel with silver. In this case there is no visible alloying of the two metals but the silver does adhere to the steel in a manner which is not well understood. The only suggestion that Mr. Comstock could give regarding the nature of this adhesion was that there might be some lattice distortion of the atomic spacing.

Bonds between metals may be formed in various ways according to Charles Hardy, president, Charles Hardy Inc., New York. A bimetal of silver on copper is made by formation of a eutectic layer between the two metals. A nickel coating on steel forms because an alloy layer between the two sheets is produced.

Metals may be considered powdered when they will pass a 100 mesh screen. Metals passing a 325 mesh sieve will have a maximum particle size of about 43 microns in diameter but many powders are pro-

duced commercially today with a particle size of $\frac{1}{2}$ to 1 micron.

There are several ways of producing metal powders. Aluminum and tin may be powdered by a spraying process. The usual methods are (1) reduction of oxide; (2) chemical precipitation; (3) electrolysis in the presence of an inhibitor to prevent a uniform metallic deposition. Mr. Hardy interposed at this point and said that an important factor in powder metallurgy was that the shape of the particle could be controlled to some extent. For example, chemical precipitation methods tend to produce a spherical particle whereas electrolytic methods give a dendrite or irregular shape. Reduction processes, according to Dr. S. L. Hoyt, metallurgist, A. O. Smith Corp., New York, tend to produce porosity in metal powders; as, for example, the reduction of tungsten metal from its oxide.

To determine the size and shape of metallic powders is not an easy task. Volumetric measurements of a known weight are used for comparisons of samples with different particle sizes. Comparisons can also be made on the rate of settling of a definite weight of powder from a suspension in some solution. Tungsten powder can be mixed with powdered copper and heated to the melting point of copper. Samples can then be polished and etched to show not only particle size but to some extent particle shape.

Milling Operations Important

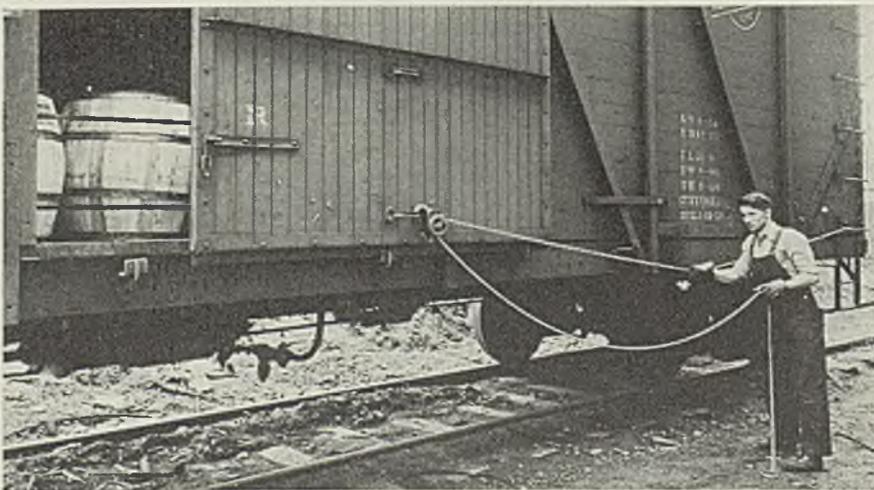
Milling operations in ball mills are also quite important as to the time factor. Silver and graphite can not be mixed in a ball mill as the coating of individual particles of silver with carbon prevent adhesion of the silver particles during subsequent sintering.

Mr. Comstock stated all metallic powders are coated with an oxide film but it was added that many powders had been obtained notably aluminum and tin, where the oxygen ran less than 0.3 per cent.

Among the difficult metals to sinter is chromium, due probably to its poor heat conductivity. There has been little success also with beryllium powder as it oxidizes readily and also forms carbides easily.

Mr. Comstock thought one of the future developments in powdered metallurgy might be the manufacture of tool steel or high speed steel parts as there are many hard alloy compositions suitable for tools but which can not be forged. A recent development mentioned by Mr. Hardy is the coating of individual particles of metals with a second metal, as for example, molybdenum powder coated with silver which is available commercially today. Other compositions are lead powder coated with copper and tungsten powder coated with copper.

It's a One Man Job



USING this opener for freight car doors makes a workman a one-man gang, according to the Signode Steel Strapping Co., Chicago, makers of the device. Using an arrangement of chain and pulleys as shown, one man can open or close the bulky doors of box cars, with a resulting savings in labor over the gang method of handling this operation

STARTING . . . STOPPING . . . ALL DAY LONG— Vanadium Steel Stands the Gaff in Twin Coach Transmission Shafts



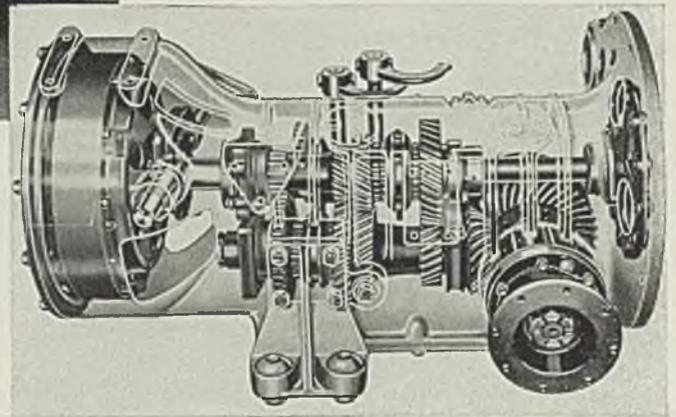
The Twin Coach bus is a familiar vehicle in almost every city and town throughout the country.

Quick starts with heavy loads . . . stops at lights . . . pulling up at corners to receive and discharge passengers . . . getting under way quickly while the light is still green . . . bus service is tough on transmissions.

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"Back-bone" of transmission assembly used in Twin Coach buses is the chromium-vanadium steel main transmission shaft.



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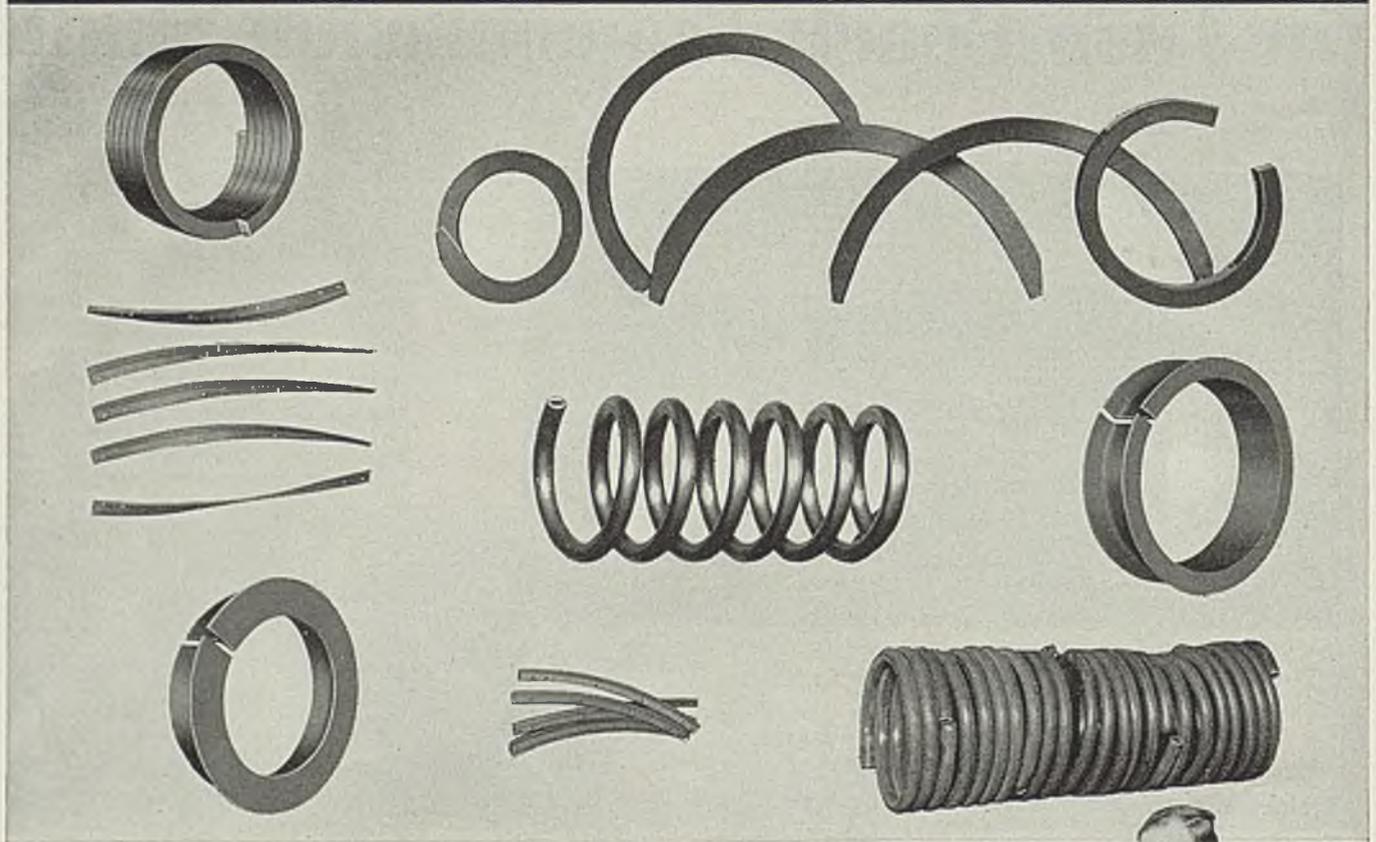
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are used by steel makers in the
production of high-quality steels.

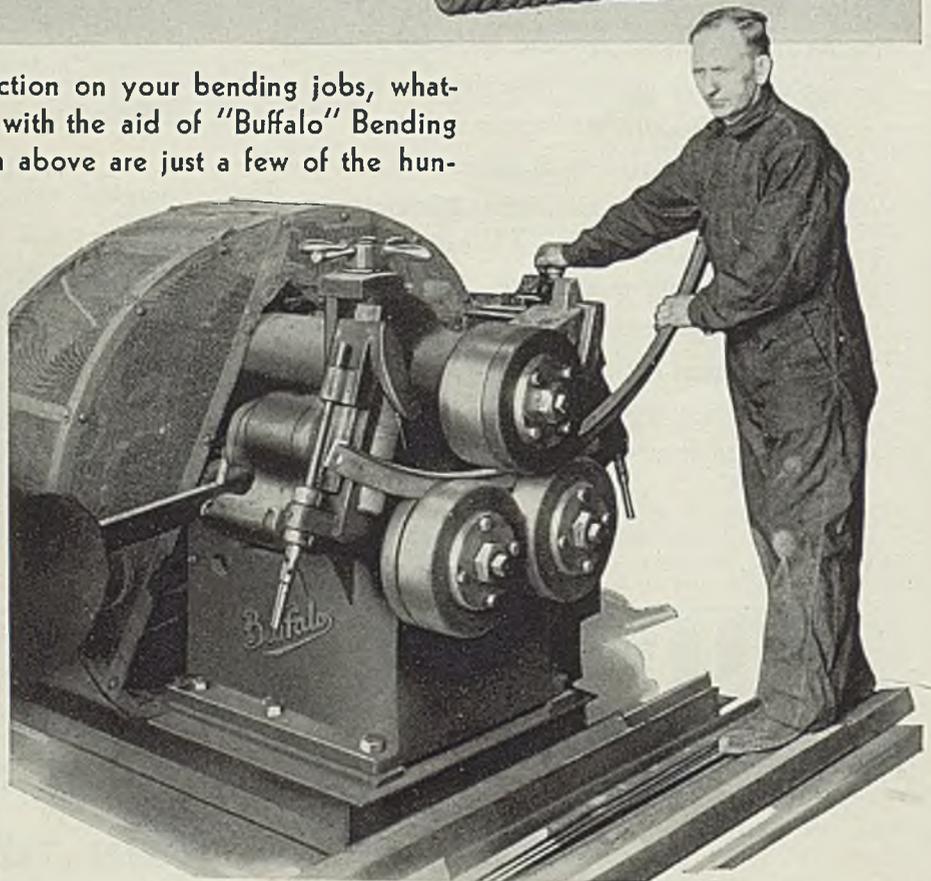
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MATERIALS HANDLING



Novel Transfer System Is Employed To Speed Production and Assembly Work

A MOST ingenious system of crane transfers features the materials handling equipment installed recently in the new plant of the American Blower Corp., Detroit. This system involves the use of four units, two of them being standard overhead electric traveling cranes, which are kept busy doing heavy lifting work up and down the main bays of the building, and the other two are special traveling cranes which travel at right angles to the main bays and do the actual transfer work.

By means of this unique arrangement, heavy machinery and other units in process of fabrication can be lifted by the crane in one of the main bays, transported to the end of the runway and at that point transferred, crane and all, to the adjoining bay, where the load is deposited at the proper point for the next production operation.

Runway Extensions Provided

Suspended from the bottom of each transfer crane is a section of runway, which, when locked in position, serves as a projected track and carrier for the entire bay crane and its load. These transfer cranes are each of 25-ton capacity. Traveling along their runway at the extreme end of the building, they can be locked into position at the exact point where the suspended carrier runway is in alignment with the main bay crane runway. With the alignment accomplished, main bay runway end-stops are raised, permitting the bay crane to move onto the transfer crane runway. The main bay crane and its load are then moved to another bay and transferred to its runway.

The main bay cranes are 5-ton and 10-ton capacity units and operate on runways which are 364 feet

long. The length of travel of the transfer units is 120 feet. To take additional advantage of this system, depressed railroad tracks, running below and parallel with the transfer crane runways, facilitate loading and unloading of freight cars. The accompanying illustration shows one of the main bay cranes supported by one of the 25-ton transfer cranes and unloading a freight car spotted on tracks beneath the transfer crane runway.

The entire installation is the re-

sult of collaboration between plant engineers of the American Blower Corp. and the consulting engineers, Albert Kahn Inc., Detroit. By extending the length of the transfer crane runway, the system can be applied to as many bays as may be desired.

♦ ♦ ♦

Carries Equipment to Job In Special Auto Trailer

FITTED out with special compartments for carrying a full complement of tools and accessories, as well as a load of rail, carriers and other parts, a special streamlined automobile trailer has been constructed by Mechanical Handling Systems Inc., Detroit, for use in



◆
THIS 25-ton capacity transfer crane, in addition to its main work of transporting the two smaller bay cranes from one bay to another, also supports the bay cranes while they load and unload freight cars spotted on depressed tracks. Photo courtesy Harnischfeger Corp., Milwaukee
◆

MATERIALS HANDLING



to a coiler. In the accompanying illustration, this coiler is shown directly over the operator's left shoulder.

As the strip is coiled, automatic discharge drops the finished coil onto a troughed roller conveyor unit, which acts as a loading station for a coil upender. The coil then travels on roller conveyor from the upender to an electric, au-

transport duty between its plant and points of installation of its conveyors. The new unit was built by the company's trailer division and is expected to prove an efficient aid to service and erection crews.

The company's trailer division manufactures automobile drive-away trailers and has recently redesigned the line for streamlined effect and has effected improvements in methods of manufacture. Among these is use of a new type of rivet which can be both driven and clinched from the outer side of the trailer body. Economy in floor space in the assembly department has been effected by placing all welding machines in line on a mezzanine gallery. Cables from the machines have been run down from the gallery and beneath the floor to various points of use.

◆
SHOWN here is equipment for coiling aluminum strip, upending the coil and transferring it to a conveyor which serves as a coiling table. Photo courtesy Mathews Conveyor Co. Ellwood City, Pa.



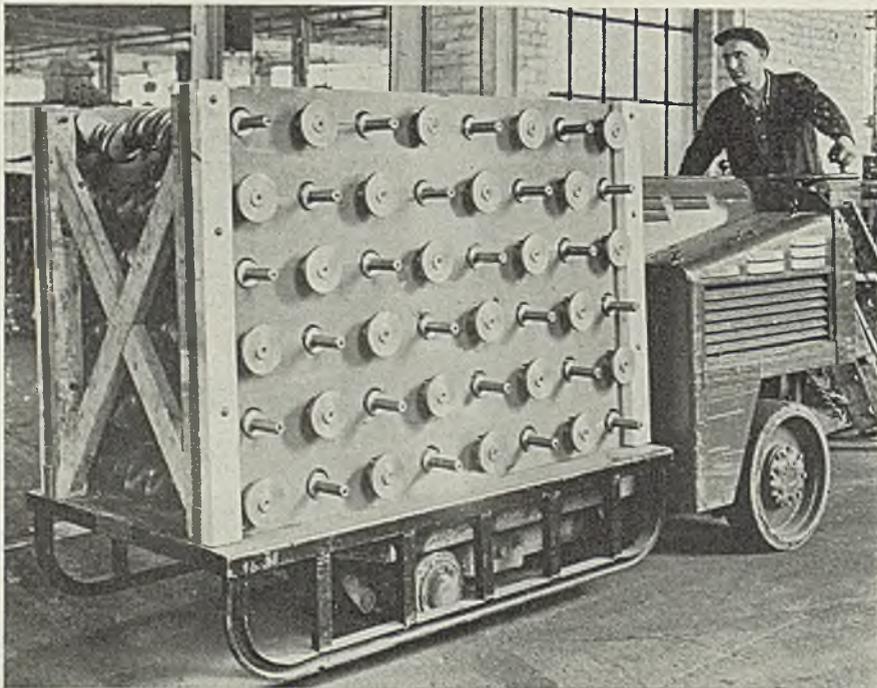
Strip Aluminum Handled By Roller Conveyors

MATERIALS handling methods similar in general principles to those employed in steel and other heavy industries are now becoming more common in other branches of the metalworking industries. A re-

cent installation for handling hot strip aluminum include some interesting features of application. A line of roller conveyors leads from the rolling mill, conveying the strip

tomatically-operated electric hoist which elevates it and discharges in turn to a conveyor which acts as a cooling table, and which also provides temporary storage. From the latter point, coils travel on conveyors to the finishing department,

(Please turn to Page 73)



◆
BY USING this special type of wood storage rack and welded steel skid platform, Ohio Crankshaft Co., Cleveland, finds it possible to expedite shipment of machined and heat treated crankshafts to an automobile plant in Detroit, and to avoid possibility of contact between shafts which might mar their machined surfaces. The rack is dismantled quickly when the 48 shafts are to be removed. Gasoline-powered lift truck permits speedy movement of the shafts from the plant to the shipping platform where the load and truck are raised by hydraulic elevator and the former is placed on a motor truck. Photo courtesy Elwell-Parker Electric Co., Cleveland

1877
Year



DO YOU KNOW...

A half century ago Jeffrey originated and patented certain fundamental chain designs. From these were manufactured the first all steel drive and conveyor chains with rollers turning on thimbles locked in the side bars and with pins articulating in the thimbles. For this original invention the U. S. Patent Office on November 29, 1887, granted Patent No. 373,983 on "Chain and Chain-Making" . . . to Joseph Andrew Jeffrey, founder of the Jeffrey Manufacturing Company.

These chains, which Jeffrey expressively names the STEEL THIMBLE ROLLER type . . . STR for short . . . have survived the tremendous changes in power transmission and conveying ideas of industry during the past 50 years. Maximum strength and minimum weight, with renewable parts make their use a real economy.

When you have need for such chains . . . call on Jeffrey, their originator.

The **Jeffrey Mfg. Co.**
Columbus, Ohio
Sales Offices in Principal Cities

Reproduced below
Steel Thimble
Chain for which the
original patent was y

UNITED STATES PATENT OFFICE

JOSEPH A. JEFFREY, OF COLUMBUS, OHIO,

CHAIN AND CHAIN-MAKING.

SPECIFICATION forming part of Letters Patent No. 373,983, dated November 29, 1887.

Application filed August 22, 1872. Serial No. 287,542. 125a, mod.

To all whom it may concern:
Be it known that I, JOSEPH A. JEFFREY, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Chains and Chain-Making, of which the following is a specification, reference being had therein to the accompanying drawings.
Figure 1 is a face view of a strip of steel, wrought iron, or other suitable metal, from which may be cut side bars adapted for my improved chain. Fig. 2 is an edge view of Fig. 1. Fig. 3 is a view of one of the finished side bars. Fig. 4 is a section of Fig. 3. Fig. 5 is an edge view of Fig. 3. Fig. 6 is a plan view of two of the bars in position. Fig. 7 is a side view of a tube from which can be cut thimbles or tubular end bars. Fig. 8 shows a thimble ready for insertion. Fig. 9 is a view of a link after the parts have been assembled. Fig. 10 is a

After these thimbles are inserted in the side bars they are fastened in the thimbles by riveting or by any other method of fastening. At the opposite ends of the side bars are provided with notches or key-seats, and there may be a corresponding notch or key-seat at the end of the thimble. This means a rigidity of the link. At the opposite ends of the side bars are provided with notches or key-seats, and there may be a corresponding notch or key-seat at the end of the thimble. This means a rigidity of the link. At the opposite ends of the side bars are provided with notches or key-seats, and there may be a corresponding notch or key-seat at the end of the thimble. This means a rigidity of the link.



SURFACE TREATMENT AND FINISHING OF METALS

Difficult Metal Cleaning Problems Solved by British Manufacturers

IT IS inevitable during the process of manufacturing even the simplest metal articles that the surface should become contaminated with grease. The removal of this grease is essential before any finishing process can be applied. For such processes as plating, painting or porcelain enameling, the degree of cleanliness required is of a very high order and the problem of economic production of this cleanliness is one of paramount importance.

The lubricants in common use in industry almost invariably consist of organic liquids, such as hydrocarbon oils of animal, vegetable or mineral origin. Some of these oils have been subjected to chemical treatment, such as sulphonation, and may contain inorganic material added to produce certain desired properties in the oil.

Two Methods Are Outstanding

Many methods of degreasing and cleaning metal have been developed and are in common use, but for metal to be finished with paint, lacquer or vitreous enamel, two are outstanding and will be discussed here. First is the utilization of the detergent action of alkalis and soaps. In this case, the articles are immersed or sprayed with a water solution of the detergent agent and the grease is removed by emulsification or saponification, or both. The second is the removal of grease by solvents, particularly with chlorinated hydrocarbons in vapor degreasers.

The use of these two methods and the limitations imposed on each is probably best illustrated by describing the cleaning problems of several manufacturers whose products are finished with porcelain enamel. At a meeting of the Institute of Vitreous Enamellers held

in London in February several interesting facts were brought to light concerning both methods.

One manufacturer described a difficulty he experienced with streaking on a certain type of sheet. This sheet had a microscopically roughened surface which increased the adherence of the finish. Erratic results were obtained when vapor degreasing alone was used to clean this particular type of sheet. Upon examining the cleaned sheets

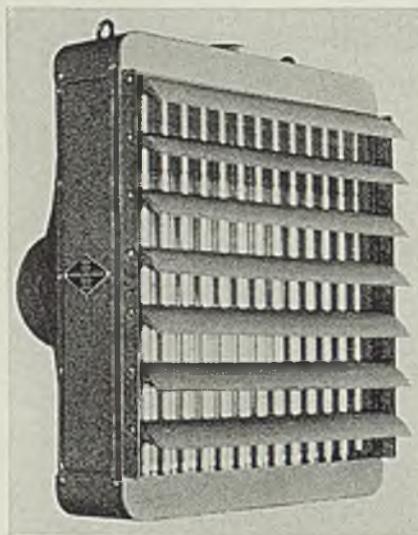
under a microscope it was found that the drawing compound had penetrated into the metal, so that after the vapor degreasing had been completed there was still a slight trace of oil left in the pores. In further experiments it was found that if the sheets were immersed in the boiling solvent before vapor degreasing, all the grease was removed and there was no residual trichlorethylene remaining in the pores of the sheet. Subsequent production tests revealed an almost total elimination of rejects from this cause.

Soaps Are Hard to Remove

The problem of the type of drawing lubricants to be used was introduced when another manufacturer who used a soap lubricant described his difficulty. Trichlorethylene which functions only as a solvent would not remove the soap and the only method by which it could be removed was by means of caustic cleaner. This particular manufacturer found the soap was readily removed in a boiling alkaline solution. However, cleaning was not complete since the evaporating solution left a thin film of grease on the sheet. Subsequent use of a vapor degreaser removed this film completely and this practice was adopted as standard.

Proponents of alkali cleaners then entered into the discussion and described their methods. Caustic soda, they claimed, was undoubtedly the most powerful saponifying agent for converting vegetable fats, greases and oils into soaps. However, it was admitted to be a poor emulsifier, and therefore could not by itself remove mineral oils and greases since they can not be saponified. This could be overcome by adding a soap either as such or as a resin, which in contact with a hot solution of caustic soda would be converted to a sodium resinate and act in a manner similar to soap. A further disadvantage of caustic soda alone was in its poor rinsing qualities, which created a tendency for caustic soda to pass through the

Heaters Finished in Colors



UNIT heaters finished with an attractive baked crackle finish are now offered in a wide range of colors. These colors, which include brown, ivory, silver, blue and others, will permit the purchase from stock of heaters which harmonize with the furnishings of offices, stores, restaurants and other places where appearance is a factor. Photo courtesy Ilg Electric Ventilating Co., Chicago

rinse and into the pickling bath which would cause excessive losses of acid. To overcome this difficulty it was found necessary to introduce such agents as sodium silicate and trisodium phosphate in the correct proportions with caustic soda. A combination of the products mentioned, it was said, would give an alkaline mixture of generally satisfactory degreasing properties.

This prompted another manufacturer to state that he did not regard trichlorethylene and alkaline cleaners as competitive, but preferred to regard them, when used in combination, as a 100 per cent cleaning procedure. His procedure was to use the trichlorethylene cleaner followed by an alkaline cleaner, the reverse of the instance noted above. It was his experience that the increase in cost was more than compensated for by the reduction in rejects due to dirt, oil and grease.

Graphite Difficult to Remove

This same manufacturer encountered difficulty in removing graphite from castings which had passed through the machine shop. On these castings the graphite had become more firmly bonded to the metal because of the oil used in the shop. The only manner in which he had been able to deal with the problem satisfactorily was to use first a trichlorethylene degreaser, then an alkaline wash, followed by a rinse and acid pickle.

He had also to deal with some metal which had been treated with a rust preventing compound consisting of approximately 30 per cent petroleum jelly and 70 per cent petroleum spirit. Petroleum jelly was difficult to remove, and even trichlorethylene would not remove it completely, there being streaks across the metal after treatment. If the metal was allowed to stand for two or three days after cleaning, rusting would occur in places where the metal was perfectly clean but there was no rusting where the very fine concentration of grease had remained on the metal.

In the course of some experiments, carried out by this manufacturer, three pieces of metal were allowed to stand for three days after treatment. The first, which had been treated with trichlorethylene alone, was in a bad condition; the second, which had been cleaned with trichlorethylene and an alkaline cleaner, was in an even worse condition; and the third, which had been treated with only the alkaline cleaner, was the only one which had not rusted. This was taken as proof that with first a trichlorethylene degreasing operation, followed by an alkaline cleaner, the metal was clean—hence rusting took place uniformly. Using only trichlorethylene, all the grease would not be

removed, and there was partial rusting. The result with alkaline cleaner alone proved the presence of a uniform distribution of grease film over the entire surface which acted as a rust preventive.

Another reason was given for the use of an alkaline cleaner following the trichlorethylene degreaser which appears paradoxical. One manufacturer found the trichlorethylene degreaser produced a grease-free metal surface which would not wet out. A subsequent alkaline bath treatment corrected this difficulty.

Some manufacturers were experiencing trouble with trichlorethylene vapors escaping into the plant and drifting to the finishing rooms where they came in contact with the gas burners of the baking ovens. The vapors would then decompose forming hydrochloric acid which had a detrimental effect upon the finishes, particularly the synthetic enamels. Upon investigation, however, it was found that the escape was caused either by faulty equipment or because operators were pushing the work through too fast and disturbing the vapor to such an extent that it was lifted out of the degreaser mechanically. Use of trichlorethylene by workmen who were under the impression it could be used for dry cleaning caused evaporation difficulties in many cases.

The manufacturers attending this

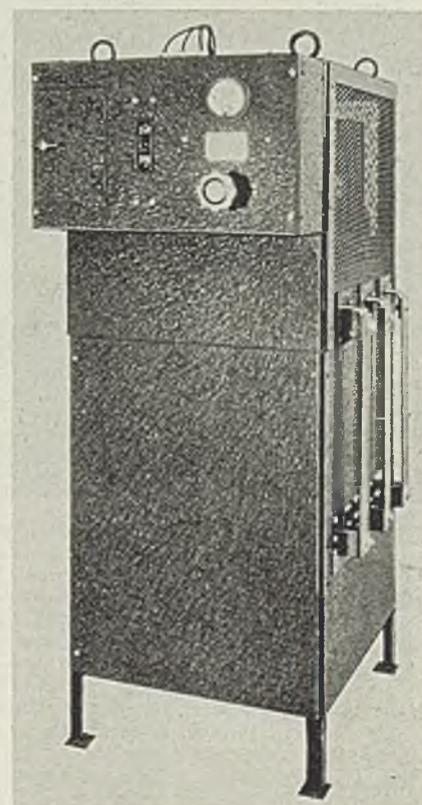
meeting were almost entirely in agreement in the opinion that both vapor degreasing and alkaline cleaning should be used together to obtain entirely grease-free metal surfaces. They were not in agreement, however, on the order in which the two methods should be used. Since the full operating conditions of each plant could not be covered there is no way of judging the means by which each manufacturer solved the problems mentioned above. However, it is hoped the description of these problems and their solutions will suggest a course of action to those who are having similar troubles in their plants.

Clear Lacquer Resists Thinners, Acids, Alkalies

Interesting claims are made for a clear lacquer manufactured by the Watson-Standard Co., Pittsburgh. This lacquer, known as No. 20 All-Resistant Clear Coating is said to resist common acids and alkalies as well as lacquer thinner, turpentine and other solvents. It is said to be non-toxic, odorless and tasteless and can be used for the interior of steel food containers. Acids such as acetic and citric are said to have no effect on this coating. The lacquer has been used successfully in some cases as an aluminum vehicle.

Rectifier Provides New Source of Direct Current

COPPER oxide plate type rectifiers provide a new means of converting alternating current into direct current for use in the electroplating industry. Rectifier units, of the type illustrated here, are manufactured by Hanson-Van Winkle-Munning Co., Matawan, N. J. in connection with Westinghouse Electric & Mfg. Co. Each unit consists of power transformers, a small fan for air circulation, the rectifier unit and necessary control equipment. De-ion circuit breakers serve both as a switch and protection against overloads and short circuits. Numerous sizes are offered providing a wide range of current supply. When installed where they will be free from excessive humidity, dirt and fumes, it is said the equipment will give years of trouble-free service. Freedom from moving parts, except for small ventilating fan, keeps maintenance costs at a minimum. Additional features of this equipment include a high overall efficiency and high power factor





WELDING, ETC.

BY ROBERT E. KINKEAD

What Is New in Welding

DEVELOPMENT of a single-electrode spot welder for light-gage metals by a Cleveland company will be welcomed by home builders who want to use steel as a construction material. The sheet metal to be welded in the new process carries the welding current. When the pressure on the single electrode reaches a predetermined amount, the welding current flows for a predetermined length of time. Radius of operation from the ground connection on the sheet may be as much as 6 feet under favorable conditions. . . .

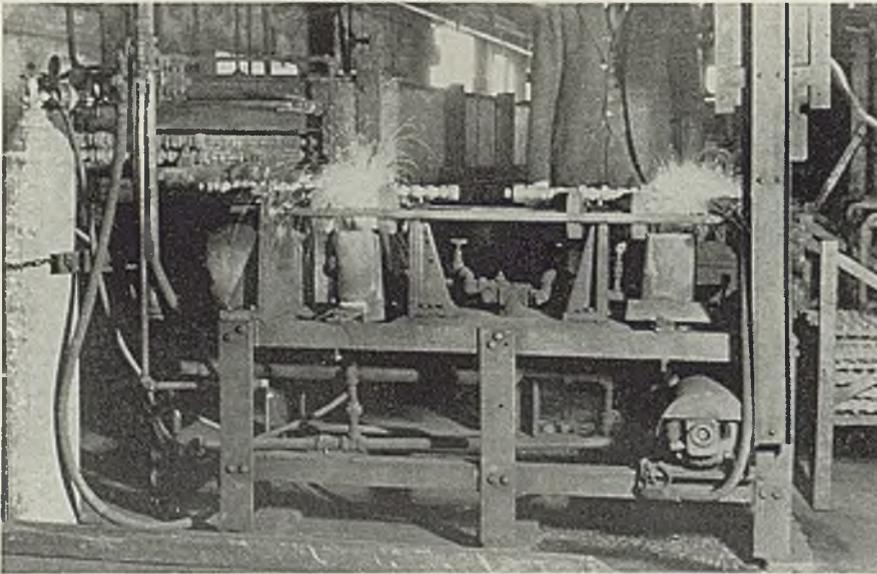
Steel mill engineers forecast widespread use of machine driven scarfing torches for skinning billets. This represents the second step from the manually operated scarfing torch which uses high-pressure oxygen in large volume and removes

IN this column, the author, well-known consulting engineer in welding, is given wide latitude in presenting his views. They do not necessarily coincide with those of the editors of STEEL.

several hundred pounds of metal per hour. It is conceivable a multiplicity of such scarfing torches might be used with machine drive not only to remove a large amount of metal per hour, but also to leave a plane surface similar to a fairly good machined surface. . . .

Stack cutting has reached a high state of development in one railroad shop for cutting small parts for freight cars. Ten to 15 plates are stacked and held by hydraulic jacks so the edges are cut clean. Use of templates and several machine

Localized Annealing by Torch



PROCESSING of camshafts at the plant of Buick Motor Co., Flint, Mich., involves several interesting procedures. Shafts are of S.A.E. 1020 steel, received in rough forged condition. They are rough turned and then copper plated to avoid carburization between cams and on the oil pump gear blank, the copper being machined from the cams and bearings. Packed in pipe containers the shafts are carburized at 1700 degrees Fahr. for 18-20 hours and cooled in the containers. Reheated to 1430 degrees Fahr. and quenched in brine, the gear blank then is annealed to permit cutting the teeth. This is done as shown above, by playing flames from city gas torches on the blanks while the shafts are rotated slowly in a special fixture. Jets of water are sprayed on adjacent cams to prevent softening. Blanks are heated to 1300-1400 degrees Fahr. The entire shaft finally is drawn at 375 degrees Fahr. to prevent grinding checks, and it is then straightened, ground and the gear teeth cut

driven flame cutters give large production per man hour. . . .

Electric welding from one side of 90 feet of 1-inch plate per man hour is a recent development which may have applications in the building of merchant vessels. The welds are made under a protective slag and are strong and ductile. . . .

* * *

Danger of Abuse

THE President would have us believe what he wishes to do to the supreme court will permit the government to raise the economic status of the miserable tenant farmer of the south, the laborer of the north, the prairie farmer of the west—a most admirable and desirable end. Mr. Roosevelt is not the first president who chafed at supreme court decisions. He proposes no fundamental change of government; only an expedient to circumvent authority of the court.

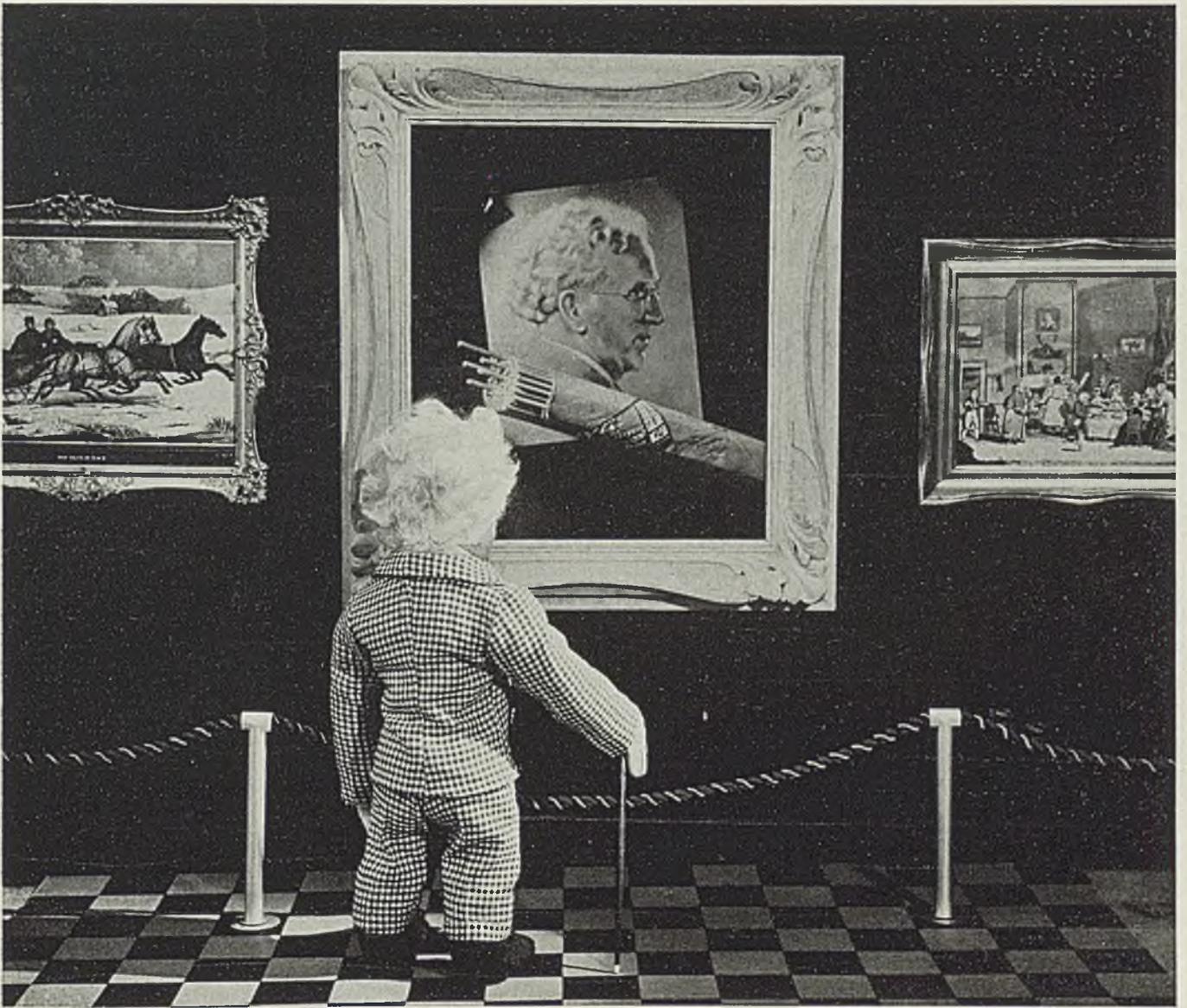
Most people who are well-to-do will oppose any change, and the people who expect to be benefited will approve, not on any intellectual grounds but from perfectly legitimate reasons of what they regard as self interest. Intellectual grounds for political convictions are extremely rare. Intellect is used as a tool to find justification.

Our own thought is that Mr. Roosevelt's plans will not accomplish in the long run anything near what he hopes and that the expedient involves danger of abuse in case he is succeeded by a president of less conscience. But we have no violent convictions in the matter. After all, the country has in President Roosevelt an able and competent executive. If he gets what he wants, he will certainly do the best he can in the interest of all the people.

* * *

Influencing People

A YOUNG engineer in charge of a welding department in northern Ohio is applying Dale Carnegie's principles of how to influence people and make friends to the handling of a group of about 15 welding operators. Up to the present time the experiment has been entirely successful. The men are satisfied and they work willingly. The young engineer has been able to convince the men whenever he has failed to get them what they want the difficulty was due to denial of the request by some higher official. He has not yet come to the point in his career of handling men at which he is confronted with the necessity of saying "no" on his own responsibility and making the men like it. Unfortunately, however, such situations do arise.



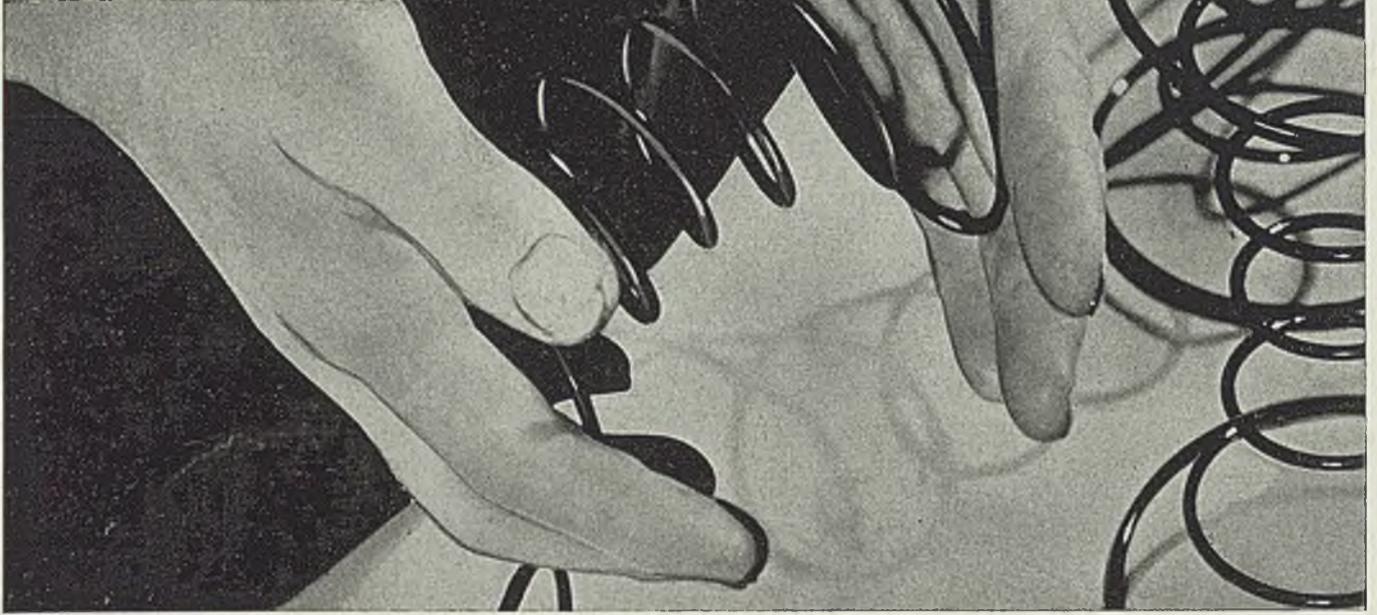
Whitey Sez:

"Works of a master, whether art or electrodes, can captivate a gallery only on the merits of knowing how. Arc-Welding Electrodes by MAURATH are 'Rembrandts' in their respective fields."

MAURATH, INC., CLEVELAND
BUILDER OF BETTER WELDING ELECTRODES IN ALL ANALYSES

CHEMICALLY

there are five elements other than iron to consider in the usual wires of industry...carbon, manganese, phosphorus, sulphur and silicon. Here we briefly discuss manganese. Other advertisements discuss other elements.



MANGANESE IN WIRE *usually saves you money*

3RD in a series of advertisements designed to help you make a better selection of wire for maximum value per unit of cost.

Manganese in small quantities makes steel tough... and steel that is to be used

for wire purposes must be tough!

The amount of manganese may vary, depending upon the application, from .15 to 1.20%. Low carbon steel, for example, usually contains from .30 to .60% except in special cases where unusual properties in the finished product are desired.

If you are using cold drawn high carbon wire for such spring purposes as cushion springs or bed springs, only the scientifically correct

proportion of manganese and carbon will give you the high strength and stiffness... combined with ductility... that you insist upon. For tempered wire products and tempered springs, a lower manganese is desired.

Steel producing experts can obtain remarkable properties in both cold drawn wire and oil tempered wire by using the *proper amount* of manganese. Call on the experts in Wickwire Spencer's Research Laboratories. Their services are yours for the asking.



WICKWIRE SPENCER STEEL COMPANY
New York City, Buffalo, Chicago, Worcester, Pacific Coast
Headquarters: San Francisco. Warehouses: Los Angeles,
Seattle, Portland. Export Sales Department: New York City.

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Dent Spacer Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wickwire technical man on your wire problems, however large or small.

WISSCO WIRE

by Wickwire Spencer

POWER DRIVES



Lubrication While "Running-In" Demands Extreme Care and Supervision

AT THE "running-in" period lubrication is of special importance and requires most careful supervision. The machine tool repair department in one plant runs-in all machine tools taken into the shop whenever the bearings are replaced before returning to the production department. Before this practice was adopted many bearings had been damaged or ruined by not receiving proper care and supervision when immediately put into production at full speed.

Some recent tests made on lubricants for crank cases by the research department of the Institution of Automobile Engineers of Great Britain indicate advantages of colloidal graphited crankcase oil during the running-in period. During the test, two new engines were run and left standing during alternate 15-minute periods. In addition, during the running time, each engine was turned over at 1000 revolutions per minute at light load for 5 minutes and at 2000 revolutions per minute and a medium load for the remaining 10 minutes.

Graphite Saves Wear

These alternate running and rest periods were repeated 30 times and the piston rings then measured. It was found, according to this statement, that the wear of the engine lubricated with plain oil was 50 per cent greater than in the engine using oil containing Acheson's "dag" brand colloidal graphite.

The tests were continued for a further 150 cycles and measurements again taken. The curves of wear which were plotted as a result of the test showed a clear difference between the two lubricants—the engine with the colloidal-graphited oil showing constantly

about one-half the wear as when lubricated with plain oil. Piston ring rather than cylinder bore wear was recorded for it can be more simply and accurately measured. The actual method adopted was to weigh the rings and to check the results by analysis of the metal in the crankcase oil.

Colloidal graphite, naturally, does not replace the properties of a good plain oil. What it does is to "take the strain" of lubrication when bearing conditions are most severe. That it can supplement the properties of an oil in this way, especially during running-in, seems to be proved by the tests.

Sometimes Belt Slip Helps

SOMETIMES the ability of a belt to slip under sudden excessive load demands permits satisfactory operation under especially severe peak load requirements. Such was the case in the drive to a mixing mill.

For a few seconds after one of the ingredients was added the load shot up 100 per cent, then dropped to about 50 per cent and rapidly tapered down to full load. The overload characteristics of the motor handled this short overload without difficulty as such conditions occurred frequently.

The belt used on the drive slipped during the peak and so had a short life. In an endeavor to correct this, a no-slip belt was installed. This resulted in trouble. The belt pulled without slipping but the overload shot up still higher, dangerously high for the feeder lines in this particular case. Also, the overload pulled the equipment out of line.

One obvious solution was to

change the type of drive using a larger motor and different, more positive connection. But in this case a larger motor would require extensive changes in power supply and power rate as the plant was at the demand limit on incoming lines. A consulting engineer suggested using a cheap, rebuilt belting and let it slip on the overload; also, to feed half of this ingredient at a time, thus decreasing the overload. The result has been very satisfactory operation.

The mistake in this case had been to assume that slippage was detrimental, whereas the ability to slip was all that permitted the drive to operate under the load conditions.

◆ ◆ ◆
Oversize bearings are a wise precaution for overhanging gears or pulleys.

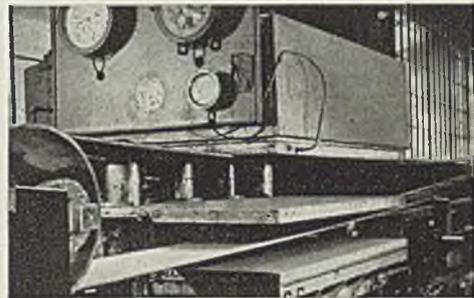
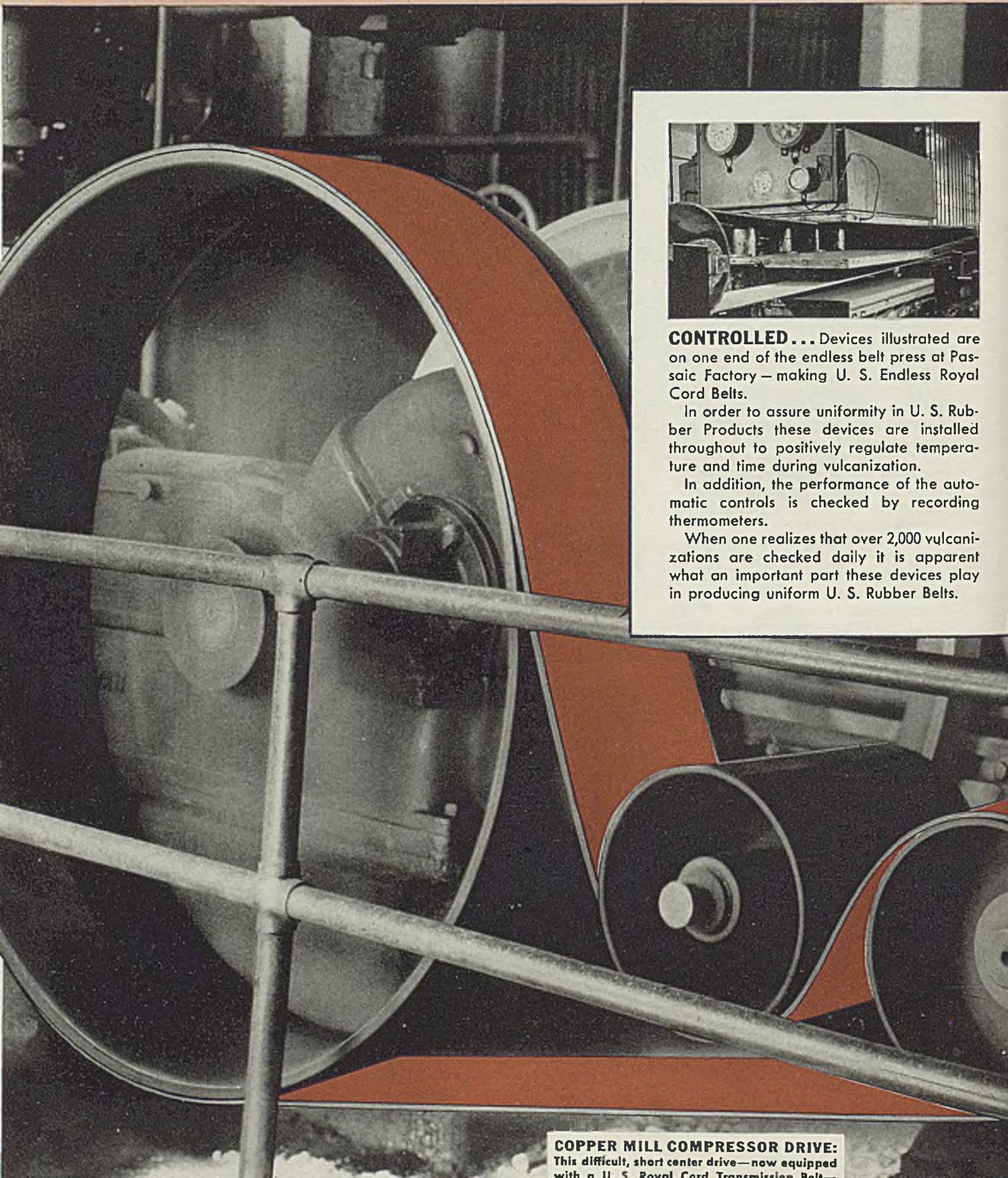
◆ ◆ ◆
Lineshafts mounted on light interior brick walls sometimes give slightly with excessive belt tension, thus throwing the shaft out of alignment.

◆ ◆ ◆
Checking the fuse to see that a unit of incorrect rating has not been installed is an important part of all periodic checking of motors and starting equipment.

◆ ◆ ◆
Have you ever purchased new equipment and found later that a duplicate spare, which could have been used without waiting, was tucked away in a corner? Such wastes may be prevented by proper storage and records of spare equipment on hand.

◆ ◆ ◆
How long has it been since the meters and other testing equipment has been checked for accuracy? An accidental fall, which was not reported, may injure the delicate instruments so as to give entirely misleading results. Once a year is not too often to have delicate instruments checked and adjusted in a testing laboratory.

When you're belting a tough



CONTROLLED . . . Devices illustrated are on one end of the endless belt press at Passaic Factory — making U. S. Endless Royal Cord Belts.

In order to assure uniformity in U. S. Rubber Products these devices are installed throughout to positively regulate temperature and time during vulcanization.

In addition, the performance of the automatic controls is checked by recording thermometers.

When one realizes that over 2,000 vulcanizations are checked daily it is apparent what an important part these devices play in producing uniform U. S. Rubber Belts.

COPPER MILL COMPRESSOR DRIVE:

This difficult, short center drive—now equipped with a U. S. Royal Cord Transmission Belt—

drive call on U·S·RUBBER

U. S. Rubber Transmission Belts Give Service Beyond Price and Specifications

What is the best way to buy a belt? By Price? By Specifications?...*Specifications* are important: whether duck or cord, flexibility, quality of friction, number of plies, must be known in relation to specific horsepower, load, speed, tension, and size of pulleys. *Price* is important, for you want the most belt service for the least money.

But the *best* way to judge belt value is by *performance*... performance that

goes *beyond* price and specifications. The performance value of U. S. Rubber Transmission Belts is not built only upon specifications, it is not written solely in terms of price. U. S. Rubber Transmission Belts give Service Beyond Price and Specifications because every belt has built into it *extra* capacity for hard work and long useful life.

When you're belting a tough drive—call on U. S. Rubber.



IDEA BOOK FREE!
Get your copy of the valuable new U. S. Transmission Belt Album. Numerous "on the spot" photographs show U. S. Transmission Belts operating tough drives in many different industries. Shows, also, U. S. Belts in the making. Write for it today.



United States Rubber Company

"Learner" Training System Produces Machine Operatives in Sixty Days

WHEN industrial employers canvass their own need for skilled men among the large numbers of unemployed who should be available for work, the question of how to convert an unskilled man into useful service always presents itself.

Industry has no greater problem than to provide itself with men equipped to do its work. If we look at that job in the light of past experience, when four to five years of apprentice training or long service at the bench were the only ways by which men could acquire skill, the situation seems hopeless. None of us knows what lies three or four years ahead. We do know that there are orders on the books which cannot be filled unless we find someone to work an extra shift. The business is here and while it has to wait its turn every day's delay is money out of pocket for the manufacturer.

Intensive Training Used

There is one way around the situation. Unable to await the gradual development of skill by apprentices in training in our established school at The Warner & Swasey Co., we have been filling our immediate needs by intensive work with unskilled men of known adaptability to mechanical work. Sixty days in training under careful supervision and our "learners" are fairly ready to take their places in the normal production routine. True they are not men of all around skill but they do their designated jobs with all the care and accuracy that is required.

Altogether, 257 men have entered our employ as "learners" since establishment of this system 21 months ago. With an organization numbering about 1050 shop employes, we have set 100 as the maximum number of learners for our plant and feel ourselves able to maintain a high productive rating so long as we do not exceed that number.

The secret of the whole system, however, lies in the care with which the personnel manager selects his

BY CHARLES J. STILWELL
Vice Pres., Warner & Swasey
Co., Cleveland

learners. Let an applicant for a mechanic's job sit down across the table from you and if you know the routine operations of a good machine shop you can size him up quite quickly. A few well chosen questions, properly timed in the initial interview, will show up any bluff on technical experience, and if the candidate makes no pretense of training but has confidence in his ability to work with tools, his first few hours at the bench will prove him right or wrong.

The "picking," to be sure, is growing thin as most skilled men, as well as semi-skilled, are back at work. Indicative of this is the fact that one day quite recently our own employment manager interviewed 127 applicants responding to an ad for learners. He hired only six.

Spotted throughout the plant at the machines to which they appear best suited and where there is a need for men, the learners are started at 52½ cents an hour. As a rule they reach low average efficiency within



Charles J. Stilwell

a period of 60 days, qualifying for a raise to 57 cents an hour. If they are good enough to justify advancement to this rate, they are assured of a job with us. From that point on, as part and parcel of the Warner & Swasey organization, each employe who entered via the learner route becomes the object of still deeper interest on the part of foremen. Though no effort is made to have him replace the all around skilled mechanic, he gathers broader knowledge with each passing month and acquires a general usefulness which enables him to function at many points throughout the plant.

Foremen were a trifle wary when we launched our learner training but their attitude has changed completely, as is evidenced by the fact that they now hate to see men whom they trained transferred from their own department. They are completely sold on the idea.

Augments Regular Training

One great advantage of this training method lies in the fact that it applies to men of advanced or middle age, as well as to the youngster who has never had a job but shows the innate qualities that make for speed and accuracy in shop work. With the shortage of men that now confronts us, any man who has the qualities which fit him for the job finds a place among our learners.

This procedure in no sense supplants the company's apprentice training program. Temporarily discontinued when the depression put an end to almost all machine tool buying, the course was re-established two years ago. We have been adding to the number regularly and now have 33 enrolled. But the first to complete apprenticeship under this re-established course will not graduate until 1939. After a half century of apprentice training, we know that four full years are required to produce a good, all around mechanic, qualified not only for the shop but for those posts of real responsibility which are the training

ground for production, sales, and engineering executives. The penalty for interruption of our apprentice training is being felt today in a shortage of men qualified to serve as minor executives. We recognize that there is no way to make new foremen or inspectors until the products of our current training are available. With posts waiting to be filled in cost accounting, standards and production departments, we must rely upon the same source to fulfill our needs.

If anything has made the necessity for close co-ordination of public education and industrial training apparent, it has been the present crisis in industry. With all the funds that have been spent in the name of trade training, a negligible portion has been devoted to purposes attuned to the needs of industry. This has not been the fault of educators alone, for industry has left the schools in the dark about their needs. It is up to industry to set standards of training for the schools and to insist that those in charge of trade and high school education understand the ways and needs of industry.

The school is the place for men of the future to learn the proper approach to problems and how to think them out. Industry's role is to define the problems and to insist that those in charge of education know the answers. If we go that far to help ourselves, the business of training men for work within our plants will be a relatively simple one.

Announce Program of Open Hearth Meeting in Alabama

A comprehensive program has been arranged for the national open hearth conference and meeting of blast furnace and raw materials committee of the American Institute of Mining and Metallurgical Engineers April 7-9. As announced in Steel, March 22, page 21, this joint meeting is to be held at the Tutwiler hotel, Birmingham, Ala.

Major details of the program are as follows:

Wednesday, April 7

MORNING

Open Hearth

Refractories and Furnace Construction
Informal discussion of designated topics.
Blast Furnace and Raw Materials

Raw Materials

- "Concentration of Lake Superior Ore," by T. B. Counselman.
- "Ore Mining on Red Mountain," by T. C. DeSollar.
- "Brown Ores of Russellville District," by E. F. Burchard.
- "Washing of Brown Ore," by Charles Morgan.

AFTERNOON

Joint Session of Open Hearth and Blast Furnace Groups

- "Summary of Data on Oxides and Tem-

peratures of Pig Iron," by Prof. T. L. Joseph.

Informal discussion of designated topics.

EVENING

Smoker at Birmingham Athletic club.
Open Hearth and Blast Furnace groups guests of Southeast section of American Institute of Mining and Metallurgical Engineers.

Thursday, April 8

MORNING

Open Hearth

Quality and Metallurgical Problems
Informal discussion of designated topics.
Blast Furnace and Raw Materials

Blast Furnaces

- "Trend of Southern Pig Iron Business," by W. E. Curran.
- "Advantages and Practice in Production of Low Silicon Pig Iron," by G. M. Harris.
- "Raw Coal in Blast Furnaces," by W. T. Allan, Scotland.
- "Blast Furnace Practice in France," by F. Clerf, France.

AFTERNOON

Open Hearth

General Practice

Informal discussion of designated topics.
Blast Furnace and Raw Materials

Products

- "Centrifugal Pipe from Southern Iron," by J. T. MacKenzie.
- "Utilization of Blast Furnace Slag," by J. R. Cudworth and J. C. Mead.
- "Dry Granulated Slag in the United States and Germany," by E. E. Brosius.
- "Use of Slag in the Manufacture of Glass," by C. A. Basore.

EVENING

Dinner of Open Hearth and Blast Furnace groups.

Friday, April 9

MORNING

Plant visitation to Tennessee Coal, Iron & Railroad Co.

British Steel Institute Announces Meeting Papers

British Iron and Steel institute has announced the program for its annual meeting to be held at the Institution of Civil Engineers, London, April 29-30. In addition to a considerable number of technical papers, the program will include a business session, medal awards, the president's address and the annual dinner.

Technical papers for the annual meeting are as follows:

Thursday, April 29

MORNING

"Seventh Report on Heterogeneity of Steel Ingots," a report of the joint committee of the Iron and Steel Institute and British Iron and Steel Federation to the Iron and Steel Industrial Research Council.

AFTERNOON

- "Influence of the Mean Stress of the Cycle on the Resistance of Metals to Corrosion-Fatigue," by H. J. Gough and D. G. Sopwith.
- "Effect of Protective Coatings on the Corrosion-Fatigue Resistance of Steel," by D. G. Sopwith and H. J. Gough.
- "Some Experiments on the Influence of Silicon, Phosphorus and Manganese on Nitrogen-Hardening Cast Iron," by J. E. Hurst.

Friday, April 30

MORNING

"Work of the Coke Research Commit-

tees of the Iron and Steel Industrial Research Council," by E. C. Evans and J. M. Riddison.

- "A Practical Trial of Roofing Sheets of Copper Steels and Other Materials," by Sir Robert Hadfield and S. A. Main.
- "Thickness of Oxide Films on Iron," by H. A. Miley.
- "Effect of Phosphorus on Mechanical and Corrosion-Resisting Properties of Low-Carbon and Low-Alloy Structural Steels," by J. A. Jones.
- "Method for Testing Resistance of Stainless Steels to Local Corrosive Attack," by Sven Brenner.

AFTERNOON

- "An Investigation of the Iron-Carbon Constitutional Diagram. Part I—Preliminary Survey of the Delta Region," by F. Adcock.
- "Allotropy of Iron," by H. Esser.
- "Alloys of Iron Research. Part XII—Note on the Beta_m Transformation in Manganese-Rich Iron-Manganese Alloys," by Marie L. V. Gayler and C. Wainwright.
- "Some Properties of Commercial Steel Sheets Containing Copper, Chromium and Phosphorus," by S. C. Britton.

The autumn meeting of the institute will be held in Middlesbrough, Sept. 14-17.

Reviews Recent Progress Made with Alloy Steels

The more interesting phases of the year's progress in the manufacture, selection and utilization of alloy steels were reviewed in an address which H. J. French, in charge of alloy steel and iron development, International Nickel Co. Inc., New York, presented before the March meetings of the Columbus, Dayton and Cincinnati chapters of the American Society for Metals.

The widening of the field of welded construction as the result of rapid advancement in the art of joining alloy steels has been reflected in increased use of these superior steels, the speaker stated. High-strength, semicorrosion-resistant steels with moderately improved properties have been developed and are available at comparatively low cost.

Use of nickel as a ferrite strengthener has effected an improvement of the fatigue-tensile ratio of normalized steels, asserted Mr. French. He also referred to the importance of retained austenite in influencing the impact strength of gear materials.

Improve Steel Storage Unit

Electrical spot welding is used in fabrication of a new desk-high storage cabinet just announced by the All-Steel Equip Co., Aurora, Ill. Legs are made of heavier steel than the case and are formed so as to give the strength of square tubing. A steel pocket is welded to the inside of the door, and a die cast chromium plated handle is standard equipment.

Foundrymen's Association Announces Program for Milwaukee Convention

ALL phases of foundry management, operation and development are included in the program for the forty-first annual convention of the American Foundrymen's association in Milwaukee, May 3-7. A broad array of technical papers and committee reports have been scheduled. Simultaneous with the convention, the association will hold in the Milwaukee Auditorium the largest foundry show in recent years.

Probably the most important series of sessions of the program are the six pertaining to foundry management problems. Speakers will cover such subjects as safety methods, occupational disease laws, job evaluation, foundry costs, and foreman and apprentice training.

Comprehensive Hygiene Program

This year's program of the safety and hygiene section is the most comprehensive yet arranged. Not only will employe safety be discussed in papers dealing with foot, leg, head and eye protection, but the effect of equipment maintenance on safety and general good housekeeping will be considered.

That the gray iron industry has been active in studying cast iron and methods of improving its quality is shown by the fact that this division will require four sessions for its program. Metallurgical and melting developments are to be stressed in 14 papers. The cast iron shop course of three sessions will provide instruction in practical fundamentals of cupola operation, core-making, gating and risering.

The steel division is scheduling four meetings, one a roundtable luncheon conference. Numerous committee reports will be presented. Melting developments, annealing cycles, sand control, physical tests of heat treated and fully annealed malleable iron and shrinkage

studies are subjects for two malleable sessions. A roundtable conference will deal with the newer annealing methods.

Increased attention to sand control is emphasized in the program. In addition to the shop control course and report of the sand research committee, the nonferrous and steel divisions each will devote a special session to a study of sand problems. Rapidly increasing importance of refractory insulating materials in furnace construction is evidenced by a session on this subject.

Three papers during the week's program are being contributed by representatives of European countries, one being the annual exchange paper of the Institute of British Foundrymen. The annual business meeting will be held on the afternoon of May 6 and the annual dinner will be served that evening.

The detailed tentative program for convention sessions is as follows:

Monday, May 3

MORNING

Plant visitation.

AFTERNOON

Opening Session

Address of welcome.

Address of president, by J. L. Wick Jr., president, Falcon Bronze Co., Youngstown, O.

Cast Iron Shop Course

Session 1—"Cupola Construction and Operation."

"Capacity of Cupola Basins," by J. A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala.

Sand Shop Course

Session 1.

EVENING

Dinner meeting of engineering school instructors.

Tuesday, May 4

MORNING

Sand Shop Course

Session 2—"Synthetic Sands."

Gray Cast Iron

"Ferrite, Its Occurrence and Control in

Gray Cast Iron," by Richard Bancroft, Perfect Circle Co., Newcastle, Ind., and A. H. Dierker, Ohio State university, Columbus, O.

"Effect of Coke Size on Cupola Melting," by J. A. Bowers and J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

"Pressure Castings," by H. H. Judson, Goulds Pumps Inc., Seneca Falls, N. Y.

Report of committee on fluidity testing, by W. H. Spencer, Sealed Power Corp., Muskegon, Mich.

Steel Castings

"Designing for Steel Castings," by R. A. Bull, consulting engineer, Chicago.

Report of committee on methods for producing steel for castings, by F. A. Melmoth, Detroit Steel Castings Co., Detroit.

"Specifications for Steel Castings," by E. W. Campion, Bonney-Floyd Co., Columbus, O.

"Studies on Solidification and Contraction in Steel Castings—V," by C. W. Briggs and R. E. Gezelius, naval research laboratory, Washington.

Report of committee on coupon tests, by J. M. Sampson, General Electric Co., Schenectady, N. Y.

Management—Job Evaluation

"Job Evaluation for Rate Setting," by Bertram Miller, General Electric Co., Erie, Pa.

"Time-Motion Study and Job Standardization," by H. C. Robson, Link-Belt Co., Chicago.

NOON

Gray iron division luncheon.

AFTERNOON

Gray Cast Iron

"Graphitization and Inclusions," by J. W. Bolton, Lunkenheimer Co., Cincinnati.

"Hardenability of Cast Iron," by D. W. Murphy and W. P. Wood, University of Michigan, Ann Arbor, Mich.

"Cast Iron for Nitriding," by J. E. Hurst, Staffs, England.

Steel Castings

Report of committee on radiography and steel castings.

Report of committee on developments in heat treatment of steel castings.

Malleable Cast Iron

Report of committee on shrinkage in malleable cast iron.

"Physical Tests of Heat Treated and Fully Annealed Malleable Irons," by R. Schneidewind and A. W. White, University of Michigan, Ann Arbor, Mich.

Cast Iron Shop Course

Session 2—"Cupola Operation and Carbon Control."

EVENING

Stag dinner and entertainment. Foundry Equipment Manufacturers' association, American Foundrymen's association and Milwaukee chapter, American Foundrymen's association.

Wednesday, May 5

MORNING

Management—Apprentice Training

"Apprentice Training for Foundries," by M. P. Miller, Lynchburg Foundry Co., Lynchburg, Va.

"Apprentice Training Plan of Caterpillar Tractor Co.," by K. P. Crowell, Caterpillar Tractor Co., Peoria, Ill.

"Apprentice Training as Viewed by a Graduate Apprentice," by C. F. Haertel, Falk Corp., Milwaukee.

Sand Research

"Durability of Foundry Sands," by C. E. Schubert, University of Illinois, Urbana, Ill.

"Control of Core Hardness," by H. W. Dietert, H. W. Dietert Co., Detroit.

Report of committee on sand research.

Malleable Founding

"Selection of Annealing Cycles and Furnaces for Annealing Malleable Cast Iron," by A. F. Landa, Central Scientific Institute for Machine Production, Moscow, U.S.S.R.

"Sand Control in a Malleable Foundry," by E. Zirzow, National Malleable & Steel Castings Co., Cleveland.

"Developments in Melting Malleable Cast Iron," by W. R. Bean, Whiting Corp., Harvey, Ill.

NOON

Malleable division luncheon and roundtable discussion. Topic—"Newer Annealing Methods."

Steel division luncheon and roundtable discussion. Topic—"Survey of Report of Iron and Steel Institute Committee on Steel Castings Research," by C. W. Briggs, naval research laboratory, Washington.

AFTERNOON

Management—Foundry Costs

"Malleable Foundry Cost Methods," by R. E. Belt, Malleable Founders' society, Cleveland.

"Steel Foundry Cost Methods."

"Steel Iron Foundry Cost Methods," by W. J. Grede, Liberty Foundry Co., Milwaukee.

"Nonferrous Foundry Cost Methods," by J. L. Wick Jr., Falcon Bronze Co., Youngstown, O.

Gray Cast Iron

"Wear Testing," by P. S. Lane, American Hammered Piston Ring Division, Koppers Co., Baltimore.

"Microstructure and Physical Properties of Cast Iron," by A. L. Boegehold, General Motors Corp., Detroit, and V. A. Crosby, Climax Molybdenum Co., Detroit.

"An Improved Method of Making Test Bars," by A. I. Krynlitsky and C. M. Saeger Jr., national bureau of standards, Washington.

Cast Iron Shop Course

Session 3—"Core Making."

EVENING

Management—Safety Methods— Good Housekeeping

"Foot and Leg Protection," by M. W. Dundore, Beloit Iron Works, Beloit, Wis.

"Head and Eye Protection," by J. Holzbog, Chain Belt Co., Milwaukee.

"A Consideration of Human Silicosis," by Dr. Norbert Enzer, Mount Sinai hospital, Milwaukee.

"Good Housekeeping," by Dr. E. G. Meiter, Employers Mutual Liability Insurance Co., Milwaukee.

"Safety as Affected by Maintenance," by James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.

Thursday, May 6

MORNING

Steel Founding

"Cement as a Bonding Material," by C. A. Menzel, Portland Cement association, Chicago.

"Sand Control as Related to Steel Casting Production," by Charles Fuerst, Falk Corp., Milwaukee.

Report of committee on steel foundry sands, by R. E. Aptekar, American Brake Shoe & Foundry Co., New York.

Nonferrous Foundry Practice

"Practical Applications of Sand Control in Nonferrous Foundries," by A. C. Arbogast, Northern Indiana Brass Co., Elkhart, Ind.

"Some Fundamentals in Nonferrous Sand Control," by G. K. Eggleston, Detroit Lubricator Co., Detroit.

"A Study of Nonferrous Sands," by H. W. Dietert, H. W. Dietert Co., Detroit. Annual business meeting of nonferrous division.

Management—Occupational Disease Laws

"Occupational Disease Laws," by O. E. Mount, American Steel Foundries, Chicago.

"Industrial Codes and Their Applications," by J. R. Allan, International Harvester Co., Chicago.

NOON

Nonferrous division luncheon and roundtable discussion.

AFTERNOON

Management—Foreman and Apprentice Training

"Foreman Training," by A. D. Lynch, Hammond Brass Works, Hammond, Ind.

Conference on apprentice training.

Refractories

"Insulating Refractory Brick — Their Properties and Application," by A. V. Leun, Bethlehem Steel Co., Bethlehem, Pa.

"Insulating Refractories," by G. A. Bole, Ohio State university, Columbus, O.

"Use of Firestone for Cupola Linings," by Harry Raynor, Chrysler Corp., Detroit. Report of work of joint committee on foundry refractories, by E. J. Carmody, National Superior Co., Springfield, O.

Annual Business Meeting

Election of officers.
Committee reports.

Cast Iron Shop Course

Session 4—"Gating and Riserling."

EVENING

Annual dinner of American Foundrymen's association.

Friday, May 7

MORNING

Gray Cast Iron

"Some Steel Works Castings," by J. Roxburgh, Davy Bros. Ltd., Sheffield, England. Exchange paper of Institute of British Foundrymen.

"Heavy-Section High-Strength Irons," by V. A. Crosby and E. R. Young, Climax Molybdenum Co., Detroit.

"High-Strength Cupola Iron Practice," by R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee.

"Titanium in Cast Iron," by E. R. Starkweather, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

Nonferrous Practice

"Casting 30 Per Cent Cupro-Nickel," by T. E. Kihlgren, International Nickel Co. Inc., Bayonne, N. J.

"X-Ray as an Aid in Production of Aluminum Castings," by George Stoll, Bendix Corp., South Bend, Ind.

"Problems in Bronze," by H. J. Roast, Canadian Bronze Co. Ltd., Montreal, Canada.

Report of committee on analysis of defects, by H. M. St. John, Detroit Lubricator Co., Detroit.

Report of committee on recommended practices, by H. J. Rowe, Aluminum Co. of America, Cleveland.

AFTERNOON

Plant visitations.

British Institute of Metals Broadens Its Activities as Membership Gains

BUSINESS recovery of the British metals industry was reflected in the twenty-ninth general meeting of the Institute of Metals held in London, March 10-11. Evidence of this was a membership increase and satisfactory progress in establishing an endowment fund.

G. Shaw Scott, institute secretary, reported an increase in membership for the first time since 1931, the total membership at the end of 1936 being almost 2100.

President W. R. Barclay, Mond Nickel Co. Ltd., London, announced that £13,887 of a £20,000 endowment fund had thus far been subscribed by nonferrous metal-working industries. Income of the fund will be used to increase existing facilities for publication of the *Journal* and improving and developing service to members.

New officers of the institute, in addition to President Barclay, include Eng. Vice Admiral Sir Robert B. Dixon, London, and Lieut. Col. R. M. P. Preston, Rio Tinto Co. Ltd., London, vice presidents; W. T. Griffiths, Mond Nickel Co. Ltd., London, Stanley Robson, National Smelting Co. Ltd., Bristol, A. J. G. Smout, Birmingham, and Dr. D. Stockdale, Cambridge, members of council.

Revealing that the American Institute of Mining and Metallurgical

Engineers had invited the Institute of Metals to hold a meeting in the United States in 1938, preferably in October, President Barclay stated that the council of institute had decided to accept. A similar invitation had been extended to the British Iron and Steel institute. It was recalled that a similar proposal for a joint meeting had been made to the two British organizations in 1932, but the plan was canceled because of economic circumstances prevailing at that time.

As a result of negotiations carried out during the past year, a program of closer co-operation between the Institute of Metals and Iron and Steel institute has been worked out, the main feature of which is joint membership in the two organizations at a reduced rate. A similar arrangement already had been effected between the two British institutes and the American Institute of Mining and Metallurgical Engineers. The purpose of such arrangements is gradually to strengthen the ties existing between the societies.

The May lecture of Institute of Metals will be delivered in London, May 5, by Prof. Aurada. "Flow of Metals" will be the subject. The autumn meeting of the institute will be held in Sheffield, Sept. 6-10, and negotiations have been started for

holding the 1939 autumn meeting in Glasgow.

Technical sessions opened with a paper by Dr. Marie L. V. Gayler, scientific officer, department of metallurgy, National Physical Laboratory, Teddington, on "The Theory of Age-Hardening". The author advanced a general theory of age-hardening based on data relating mainly to the age-hardening of alloys of the duralumin type and of beryllium-copper and silver-copper alloys.

Age-hardening takes place by two processes: (1) Diffusion; and (2) precipitation, the second overlapping the first. Both processes take place within wide temperature limits which are peculiar to every alloy system, that is, the "temperature range". The limits of the range are indeterminate, but approximations can be obtained for all practical purposes. If the temperature of aging be close to the lower limit, both stages of the aging will take place excessively slowly; if the temperature of aging be close to the upper limit, the first stage will proceed so rapidly that its effect will not be detected.

Each of the two processes is characterized by changes in physical properties which will present maxima, or minima, depending on the aging temperature, the characteristics of the first being gradually replaced by those of the second. Softening which occurs when an alloy is aged at a higher temperature, after being previously aged at a lower temperature, is now believed explained in the light of the new theory.

Metal Spraying Discussed

A paper on "Metal Spraying: Processes and Some Characteristics of the Deposits", was presented by E. C. Rollason, assistant lecturer, department of metallurgy, the University, Birmingham. The author described spraying pistols which use wire, powder and molten metal, discussed the nature of the sprayed deposit and described a number of corrosion tests, using intermittent salt-spray, made on zinc and aluminum deposits and on painted zinc coats. Tests also were made with three types of pistol on aluminum deposits and on painted zinc coats. Tests also were made with three types of pistol on aluminized surfaces. Heat treated nickel-chromium-iron coatings were found to have good resistance to oxidation at elevated temperatures.

In his conclusions, the author stated that each of the three types of spray equipment has characteristic advantages which will allow all to survive competition and become useful tools. Owing to low costs, the powder process, undoubtedly will prove successful in spraying

large surfaces with zinc, especially when the coat subsequently is painted. The type of pistol also offers possibilities for spraying brittle metals and alloys of high melting point which could not be drawn into wire, although deposits of the higher melting point metals which were examined did not prove to be wholly satisfactory.

The molten metal instrument can produce thick coatings of the low melting point metals at a reasonable price, and should prove useful to the galvanizer doing contract work, especially as the metal in ingot form is used and neither acetylene nor oxygen is required. The wire pistol, on the other hand, probably will hold the field in building up thick deposits on worn articles and also for producing heat-resisting surfaces. Even in the production of zinc coating, where the cost is higher than in the case of the other processes, the wire pistol offers advantages in the spraying of internal work.

Tests Zinc Coatings

Dr. T. P. Hoar, Cambridge, said that he had conducted tests in the laboratory and outside tests on aluminum and zinc coatings. Laboratory tests showed that a saline solution of zinc gave a good coating, but it corroded rapidly, while an aluminum coating was more resistant. In tests in water, aluminum was not sufficiently protective but zinc gave good results. Atmospheric tests were made with three kinds of aluminum, and after 6 years it was found that the base metal showed no rusting, and even scratched portions remained in good condition. When paint was applied, it retained its adhesive properties. The speaker emphasized, however, that the various applications of metal spraying must be studied, and that the proper coating and method of application adopted for each particular case.

W. E. Ballard, Birmingham, asserted that with a zinc coating, a zinc oxide base paint is best. Referring to the author's statement on aluminized surfaces for resisting oxidation, he expressed the opinion that special aluminum alloys give better results than unalloyed metal. He said also the aluminum coating was superior for resisting atmospheric corrosion. Referring to spraying of brass, Mr. Ballard pointed out that under certain conditions brass can be sprayed with a wire pistol without losing zinc. Another speaker mentioned that red iron oxide paint had been used over zinc coatings without ill effects, but that lead base paints usually are unsuitable.

Dr. L. Northcott, research department, Woolwich, contributed a paper on the "Effect of Cast Struc-

ture on the Rolling Properties of Zinc". The research was initiated to investigate the difficulties encountered in the first stages of breaking down chill-cast ingots. These investigations showed that the crystals of zinc, which belong to the hexagonal system, are weaker along certain planes than along others. In columnar form, zinc crystals are for this reason weak at right angles to the direction of growth.

Cracking of ingots of pure zinc when cold-rolled under ordinary conditions thus is due to the properties of the crystals themselves and not to grain boundary effects. The effect is intensified greatly by the powerful tendency of zinc to form large columnar crystals, since in an ingot of rectangular section the columnar crystals developed from one mold face have their direction of weakness in the same planes. Cold rolling of pure cast zinc is possible under certain controlled conditions, but the method is not likely to be applicable to commercial work.

A paper by Prof. R. S. Hutton, professor of metallurgy, Cambridge university, and Dr. Richard Seligman, managing director, Aluminum Plant & Vessel Co. Ltd., London, reported on an investigation made on Gilbert's aluminum statue of "Eros" in Piccadilly Circus, London. This statue is free from serious corrosion after 38 years' exposure, and it was found that it is made of unalloyed aluminum.

Aluminum Resists Corrosion

It is not possible to state whether the metal used in 1893 was produced by the old chemical or new electrolytic process, but results of analyses of specified examples of old aluminum are reported in the paper. Prof. Hutton, just returned from America, mentioned that a certain part of a statue of Washington also was found to be made of aluminum and has been exposed to atmospheric conditions for about 30 years without showing much wear.

"Resistance of some special bronzes to fatigue and corrosion-fatigue was discussed in a paper by Dr. H. J. Gough, superintendent, and D. G. Sopwith, scientific officer, engineering department, National Physical Laboratory, Teddington. Fatigue and corrosion-fatigue tests on four types of special bronzes were carried out to ascertain suitability of these materials for special aircraft purposes. The materials tested were: Phosphor-bronze; aluminum-bronze (10 per cent aluminum); beryllium-bronze (2.25 per cent beryllium); and Superston 189 bronzes.

Results showed that corrosion-fatigue resistance of the bronzes compare favorably with stainless.

Electroplaters Convene in London

For International Conference

THE first International Electrodeposition Conference was held in London on March 3 and 4, under the auspices of the Electrodepositors' Technical society. This society, formed in 1925, has been associated since its inception with the Faraday society. It has acted as the technical body in Great Britain for the dissemination of scientific knowledge on all matters relating to electrodeposition. The society includes within its scope electrochemistry and electrometallurgy, with special reference to electroplating, electrotyping; the preparation, coloring and polishing of metals, and the corrosion and protection of metals by electrodeposition and other coating processes.

The conference was held at British Industries House, with E. A. Ollard, of Metal Reflectors Ltd., Slough, Buckinghamshire, president of the society, in the chair. Among the countries represented, either by personal representatives or by the presentation of papers, were: Czechoslovakia, France, Germany, Great Britain, Holland, Italy, the United States, and the U. S. S. R. A number of authors of papers presented by foreign associations were present in person.

In the absence of George B. Hogaboom, president of the American Electroplaters' society, who was unable to attend owing to illness, the United States was represented by Walter R. Meyer, electrochemist, General Electric Co., Bridgeport, Conn., who at the opening session, conveyed greetings from the American society and extended an invitation to attend an international convention in America in 1939.

Gives Progress of Electrochemistry

The conference was opened by Lord Melchett, director of Imperial Chemical Industries Ltd., who, in his speech, made reference to the activities of the Electrodepositors' Technical society since its inception, and to the developments of electrodeposition work in Great Britain. Referring to the importance of research work, as conducted by laboratories of technical societies and of private firms, he stressed the difference between work conducted for genuine research of an original character and the necessary routine work conducted from day to day for control purposes in works laboratories. He expressed the wish that the discussion arising from this first international conference would be

conducive to the further development of this very important branch of industry.

Four full sessions were devoted to the presentation of papers. The first session, in the afternoon of Wednesday, March 3, comprised six papers dealing with electrodeposition practice in various countries. The following papers were presented and discussed: "French Nickel Plating Practice," by M. Ballay, Chef du Service des Recherches, Centre d'Information du Nickel, Paris; "British Electroplating Practice," by E. J. Dobbs, director and chief chemist, W. Canning & Co. Ltd., Birmingham; "American Electroplating Practice," by George B. Hogaboom; "Zinc and Cadmium Plating in the U. S. S. R.," by N. A. Isgarischev; "Modern Electroplating Machinery," by Dr. John Kronsbein, technical director, Brightside Plating Co., Birmingham; "German Electroplating Practice," by Dr. Richard Springer.

International Differences Noted

A general digest of these papers was first given by W. T. Griffiths, director of metallurgical research, Mond Nickel Co. Ltd.; each author present then gave a summary of his paper. From the digest, as well as from the general discussion that followed the presentation of the papers, it was apparent that practice in the various countries differed mainly in points of detail. It was interesting to note that Germany, owing to lack of sufficient raw materials, has developed the electrodeposition of nickel on objects made of plastic materials, such as bakelite and similar materials. On the question of modern electroplating machinery, the contention was made that in certain respects, particularly as regards metal rectifiers, Great Britain is ahead of America.

The second session was held in the evening of Wednesday, March 3, the subject covered being the electrodeposition of base metals. Nine papers were presented. A. Chaybany, a French research worker, contributed a paper on "A Chemical Study of Alkaline Cyanide Degreasing and Coppering Baths." A Dutch contribution was: "The Etching of Copper by Ferric Chloride Solutions," by B. Baars and L. S. Ornstein, of Utrecht. A British paper, "A Method of Obtaining Adherent Electrodeposits on Chromium and Stainless Steel," was given by G. E. Gardam, of the Research Department, Wool-

wich. Another paper from the same source was contributed by A. W. Hothersall on "The Adhesion of Electrodeposited Nickel to Nickel." A Russian paper was: "Copper Plating on Textiles," by Dr. Kydriatzev. "Recent Developments in the Electrodeposition of Tin" was presented by D. J. Macnaughtan, Research Department, Woolwich. Prof. Dr. Ing. Max Schlotter, of Germany, dealt with "Chromium Plating from Non-Chromic Acid Solutions with Chromium Anodes."

An American paper was: "History, Development and Application of the Cyanide Cadmium Plating Solution," by Dr. Gustaf Soderberg, technical director, the Udylite Co., Detroit. Another paper from Russia, by Director A. M. Yulin, was: "Zinc Plating of Strip—Standard Methods of Electrodeposition."

The third session, devoted to the properties of electrodeposits, took place on the morning of Thursday, March 4. Six papers were read. "Anomalies in the Microstructure of Electrodeposited Metals and Their Influence on the Mechanical Properties" was presented on behalf of Michel Cymboliste, of Usines d'Automobiles Chenard et Walcker, France. Prof. Ing. Dr. Techn. A. Glazunov, of the Mining School of Pibram, Czechoslovakia, and Dr. M. Schlotter, of Technical High School, Berlin, contributed: "Comments on the Electrolysis of Solutions of Complex Salts."

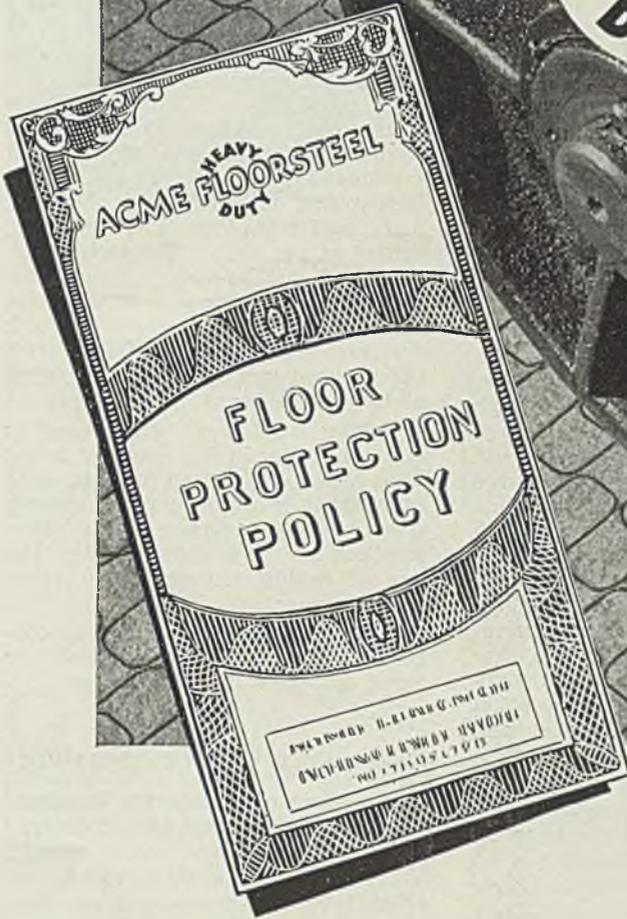
P. A. Jacquet, Laboratoire d'Electrochimie de l'Ecole Pratique des Hautes Etudes, Paris, gave two papers: "Comparative Properties of Metallic Surfaces Polished Mechanically and Electrolytically" and "The Structure of Thin Coatings of Copper Electrodeposited on Crystalline Copper." "Optical Research on Thin Layers" was contributed by L. S. Ornstein and P. J. Haringhuizen, of Utrecht, Holland. Another American paper, by Prof. Arthur Phillips, Yale University, and Walter R. Meyer, was on "The Crystal Structure of Copper Electrodeposits."

Precious Metals Discussed

The final session, in the afternoon of the Thursday, was devoted to the electrodeposition of precious metals. Here again six papers were given: "Electrodeposition of Platinum: Historical and General Review," by R. H. Atkinson, Mond Nickel Co. Ltd., Acton, London; "Platinum Plating from Alkaline Solutions," by E. C. Davies and A. R. Powell, Johnson Matthey & Co. Ltd., London; "Studies in Evaluating the Brightness of Electrodeposits," by B. Egeberg and N. E. Promisel, International Silver Co., Meriden, Conn.; "Modern Developments in the Electrodeposition of Gold," by H. W. J. Pope, Baker Platinum Co. Ltd., Lon-

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dón; "A Resume of Silver Plating," by Frank C. Mesle, Research Engineer, Oneida Ltd., Oneida, N. Y.; "Developments in the Electrodeposition of the Platinum Metals," delivered by K. Schumpelt, chief electrochemist, Baker & Co. Inc., Newark, N. J.

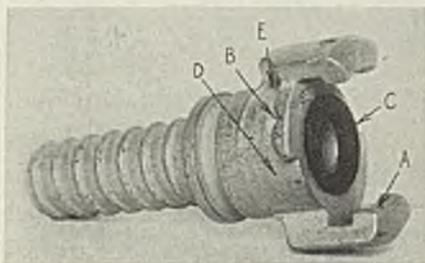
It will be seen that of a total of 27 papers from various countries, the part taken by America was of inter-

est and importance. The standard of papers generally was high, and the meetings were well attended. Many members of the conference took part in the discussions, which were of quite a high technical, and at times scientific, nature. On the Thursday night the conference was concluded with a dinner and dance given at the Criterion Restaurant, London.

Hose Couplings Made From Alloy Steel Have Increased Life In Hard Service

COUPLINGS used with hose in many industrial applications frequently are subjected to severe usage. They are dropped on hard floors, stepped on, run over with heavy equipment and often whipped about at the end of a hose length to come into forcible contact with wood, metal and the like. It is common to cast such couplings from brass, composition, bronze or malleable iron. While such castings are not easily broken, they are readily bent out of shape, resulting in a coupling which will not function correctly. Since these metals cannot be heat treated, couplings made from them wear easily under hard service.

To meet current needs, Cleveland Rock Drill Co., Cleveland, has devised a heat treated alloy steel coupling turned from solid bar stock. The alloy used contains 0.48 chrome,



Heat treated couplings like this one are turned from alloy steel bars. Pin A locks into the depression shown at B. The rubber gasket C seals the coupling from leakage. Contacts are made on the milled surfaces at D and E to insure a positive fit

1.12 manganese, 0.43 carbon and 0.16 molybdenum. Couplings made from this alloy are neither male nor female, as any two couplings may be locked together, two pins locking into two depressions with a rubber gasket provided to make the joint tight. A metal retaining ring holds the gasket in place when the coupling is not in use.

The first manufacturing operation

is on a 4-spindle 2¼-inch Acme-Gridley automatic screw machine. In this operation, the stock is rough turned, centered, formed, rough drilled, stamped, drilled and cut off. The stamping operation is required to imprint the company's trade mark; this is rolled in place with a circular stamp which works on the principle of the knurling tool. In the following operation, the hole is finish drilled on a Gisholt turret lathe. In the first operation, the hole was not drilled entirely through the stock. Also in this operation the recesses to fit the gasket and form the lugs are turned and bored.

After the radial surfaces are formed, the shank is provided with a spiral thread to hold the hose securely in place. This thread has ¼-inch pitch and is a continuous single spiral 1/32-inch high and 1/16-inch wide. In cutting this thread, the work is held in a special fixture in an engine lathe and the thread is chased with a die provided for the purpose. In addition to this operation, four holes must be drilled and two surfaces milled. The locking pins are welded into place by the oxyacetylene method.

After all machining is completed, the couplings are heat treated and cadmium plated for rust resistance.

Extend Radio Towers with Rail Carbon Tubing

On occasion of the recent consolidation of WHK and WJAY, Cleveland radio stations, an interesting engineering problem arose when it was decided to increase the height of the WHK radio towers from 200 to 300 feet. Engineers reasoned that by adding 100 feet to the original towers which held the cantenary, each tower could support an individual 30-foot circular radiator over which the two transmitters could broadcast separate programs simultaneously.

Calculations showed that if the

usual structural sheet members were used, weight of the extensions plus the additional wind loads would require greater strength than the supporting towers possessed. It was found, however, that by the use of high-tensile, light weight, rail carbon tubing, the weight and wind loads would be reduced below strength limitations of the structural supporting towers.

The tubing selected has a yield point of 65,000 to 75,000 pounds per square inch, with an elongation of 15 per cent in 2 inches. The vertical members were fabricated of 2½ inch tubing with wall thicknesses of 0.217 and 0.154-inch, flattened and drilled at the ends. The lacing was made of 1 5/16-inch tubing with 0.105 wall thickness. The entire structure had reamed holes and was fastened with machine bolts, with the vertical members having bolted sleeve connections.

Tubing for towers, while used to a lesser extent in this country, is not new, having been used for a number of years in Europe for radio towers, transmission line towers and other applications. In this country the use of tubing for structural work is increasing.

Tubing for this radio tower construction work was supplied by Steel & Tubes Inc., Cleveland.

Conserves Oil Temperature

In order to conserve the temperature of the oil in its line of centrifugal hot oil pumps, Pacific Pump Works, Huntington Park, Calif., has recently designed a new removable lagging encased in steel. This new product replaces the old method of conserving heat by covering the pump with a mixture of plaster and asbestos. This mixture was necessarily destroyed whenever the pump was moved or altered. The new installation, encased in steel, is an effective as the old method, it is claimed, and can be removed or replaced without loss.

Embosses Prefinished Strip

Prefinished bright metals are now being embossed and furnished in sheets or in coiled strip by the American Nickeloid Co., Peru, Ill. Three designs are being offered, including a deep vertical crimp, a 4-line horizontal crimp with paralleling wide strips of metal at the sides and a square overall crimp pattern. Intended principally for trim, these new designs are being used also for interiors and panelling.

Special machinery has been designed for producing this strip, which is available in steel, zinc, brass and copper, with electroplated surfaces of nickel, chrome, brass and copper.



PROGRESS IN STEELMAKING

Modern Fume and Acid Sewer Serves Continuous Strip Pickling Unit

BY J. R. HOOVER
Manager Chemical Sales Division,
B. F. Goodrich Co., Akron, O.

OVER a year ago, the Youngstown Sheet & Tube Co. added a second continuous strip pickling unit at its Campbell, O. works. This unit consists of four 60-foot acid tanks and two water tanks, all built of steel and lined with rubber and brick. As a further protection against corrosion, acid tank covers and fume ducts also are rubber lined. Fig. 1 shows a partial

view of one of the 60-foot acid tanks with covers and fume ducts.

An interesting feature of this installation is the sewer, which was designed by engineers of the B. F. Goodrich Co., Akron, O. for the direct handling of acid, water and fumes discharged from these six tanks. A unique combination of flanged steel pipe, rubber and brick plus a new type of rubber expansion

joint has made possible a sewer construction capable of withstanding the high temperatures and corrosive fluids and fumes encountered in this service.

The sewer located beneath and at one side of the pickling unit comprises three different pipe sizes in order to accommodate a gradually increasing volume of gases and liquid. The pipe line starts at the hot water tank and drains towards the No. 1 acid tank. The pipe at the hot water tank is 17 inches in diameter. At the intake from the cold water tank it increases to 25 inches diameter. When reaching the No. 4 acid tank, the pipe diameter changes to 36 inches and remains the same for the rest of the run. The line empties into a large sump which is served by a rubber-lined exhaust fan.

All pipe is lined with a ¼-inch

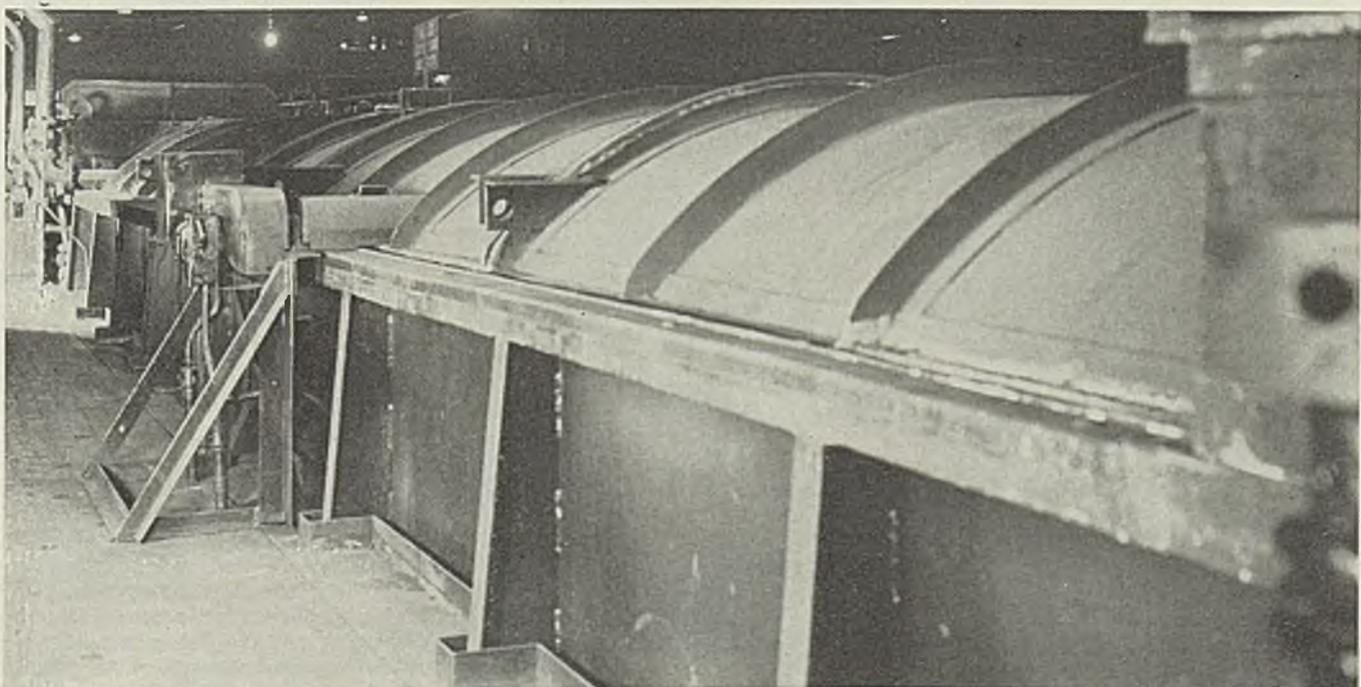


Fig. 1—Partial view of one of the continuous pickling tanks serving an Ohio continuous strip mill

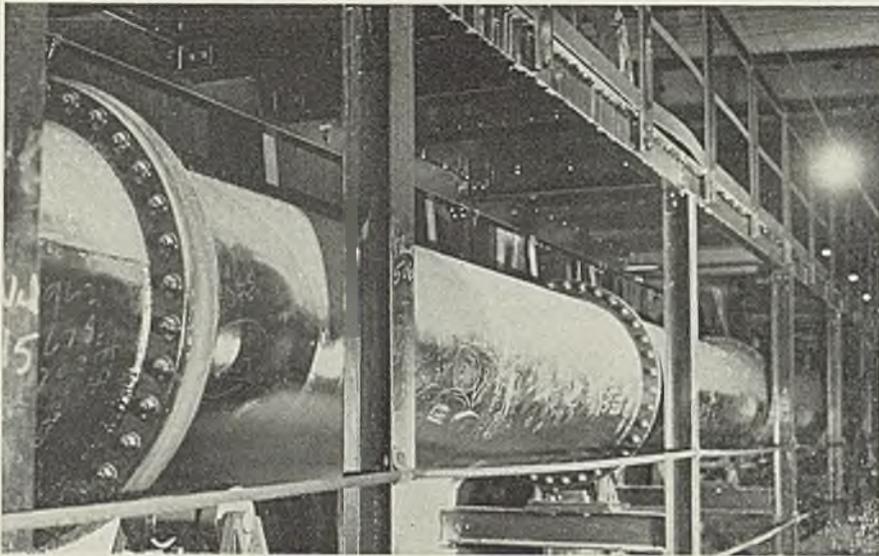


Fig. 2—Section of the acid sewer. At extreme left is shown one of the rubber expansion joints

thickness of Goodrich triflex rubber. As a means of protecting the rubber lining from excessive temperatures, the lower inside half of the 36-inch pipe, which carries the hot waste acid discharged from the four pickling tanks, is equipped with a 4-inch sheathing of acidproof brick.

Pipe Mounted on Steel Rollers

Provision for expansion and contraction has been made by mounting the pipe on a series of steel rollers and installing three patented expansion joints, (U. S. patent 1,948,211) which are spaced to divide the line into four approximately equal parts. Fig. 2 shows a section of the 36-inch portion of the sewer which is made up of 15-inch pipe lengths. The rubber expansion joint and steel rollers

are shown at the extreme left of the illustration.

These special expansion joints consist of the two flat steel plate rings joined by a 2-inch thickness of soft, resilient pure gum rubber. Each ring is provided with a series of stud bolts on a standard bolt circle to which flanges of the adjoining pipe lengths are attached. The joints are designed to take as much as $\frac{1}{2}$ -inch stretch or compression. At those points where the expansion joints are inserted in the 36-inch pipe, it is also necessary to make provision for the expansion and contraction of the brick sheathing. This is accomplished by filling the 2-inch gap in the sheathing with a soft rubber similar to that used in the expansion joint.

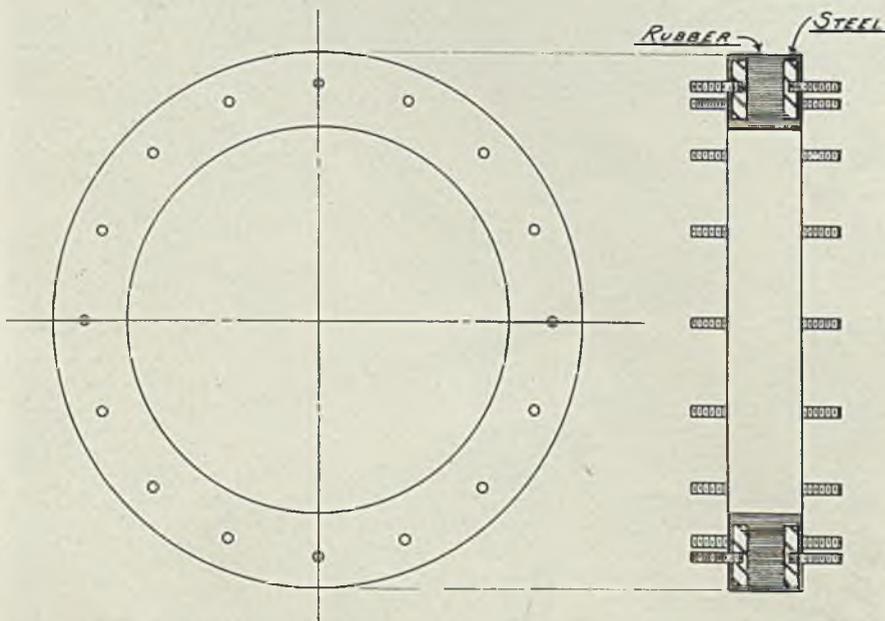


Fig. 3—Cross section of expansion joint which employs soft rubber as sole joining medium

Fig. 3 shows a cross section of the expansion joint which is designed to eliminate all metal-to-metal contact, soft rubber being the sole joining medium between adjacent pipe flanges at this point. The stud bolts do not pass through the rubber slab. Such a construction is only made possible through the development of the Vulcalock process which enables rubber to be attached to metal with almost integral adhesion.

This fume and acid sewer has shown satisfactory operation and at no time has there been any indications of leakage.

♦ ♦ ♦

Removes Stains from Tile

Removing stains from tile walls and floors in steel plant motor rooms, from sanitary equipment and from enamel trays used at company hospitals and commissaries has been made possible by the marketing of a new nonexplosive nonflammable liquid which is applied with a cloth or sponge, allowed to stand a few minutes, and then rinsed off with water. For cleaning tile work a sponge wet with the liquid and wrung out nearly dry is used to wipe the surface. The dirt comes off on the sponge which is washed with water. The liquid, according to claim, removes any stain from any type of porcelain, porcelain enamel or glass surface. If the finish is intact the cleaner will restore the original appearance.

♦ ♦ ♦

Installs Rail Normalizer

In line with the development in the heavy rolled products division of the steel industry a steelmaker in the Chicago district has installed a rail normalizing furnace, 10 feet wide and 250 feet long, which will permit rails to be heat treated in their full length. The furnace, fired with coke oven gas, is equipped with a control for regulating the heating and cooling cycle. Approximately 3000 tons of rails can be normalized per 24 hours.

♦ ♦ ♦

Uses Low-Manganese Ore

A successful method for manufacturing high-grade manganese steel from ore of low-manganese content has been developed by a Swedish metallurgist. Funds for the research were provided by a Swedish-American company. Claim is made that the process will enable the utilization of the low-manganese and high-phosphorus ores of S. Dakota for making high-quality steel. Swedish companies also will make use of the process for working the low-manganese ores in that country.

MATERIALS HANDLING



Strip Aluminum Handled By Roller Conveyors

(Concluded from Page 52)

where the strip is trimmed and cut to specified lengths.

Billets from which the strip is rolled weigh 250 pounds and are heated to 900 degrees Fahr. for rolling. Averaging 21 inches in diameter and up to 36 inches in length, the coils weigh 250 pounds.

Designs Cradle Truck for Long Overhanging Loads

A CRADLE truck, designed specially for handling long overhanging loads of steel bars, tees, angles or pipe, or similar material, has been placed on the market recently by the Service Caster & Truck Co., Albion, Mich. This truck, which is



Long, awkward loads are handled conveniently with this new type of cradle truck

60 inches long, 26 inches wide and 21 inches high, is mounted on two 18-inch diameter center wheels and two 6-inch diameter casters, one at each end, as shown in the accompanying illustration. When the truck is being moved, the casters do not touch the floor—their function is to support the vehicle on one end or the other during loading. Wheels and casters are mounted on antifriction bearings.

Three curved segments mounted to the truck frame at the two ends and the middle constitute a cradle to support the loads. Provision is made for six stakes of 1-inch diameter steel pipe to prevent built-up loads from falling off. Built of steel, the

standard truck has a capacity of 8000 pounds. Smaller or larger sizes are built by the manufacturer on special order.

Wear of Metals Subject of Philadelphia Symposium

Philadelphia district committee of the American Society for Testing Materials is sponsoring a symposium on wear of metals to be held April 5 at the Engineers club, Philadelphia. The technical program will comprise six papers considering the problem of wear from the viewpoint of several industries. A dinner will be served before the evening session.

Harold Farmer, chief chemist, Philadelphia Electric Co., is secretary of the Philadelphia district committee of the society.

Speakers at the symposium and the titles of their papers are listed as follows:

AFTERNOON

"General Discussion and Considerations Involved in Wear Testing, Including the Classification of Various Types of

Wear," by H. W. Gillett, chief technical advisor, Battelle Memorial Institute, Columbus, O.

"Some Important Variables Encountered in Wear Tests on Cast Iron," by D. E. Ackerman, metallurgist, research laboratory, International Nickel Co. Inc., Bayonne, N. J.

"Wear from the Textile Industry Viewpoint," by Albert Palmer, Crompton & Knowles Loom Works, Worcester, Mass.

EVENING

"Wear of Metals from the Railroad Viewpoint," by L. W. Wallace, director, equipment research division, Association of American Railroads, Chicago.

"Wear from the Automotive Viewpoint," by W. E. Jomly, metallurgical department, research laboratories section, General Motors Corp., Detroit.

"Wear from the Power Equipment Viewpoint," by N. L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co., Philadelphia.

Proposes Revisions in Recommended Can Sizes

The standing committee of the bureau of standards, Washington, in charge of simplified practice recommendation R155-34, cans for fruits and vegetables, has proposed a revision of this recommendation, and has mailed copies to all interests for consideration and acceptance. The original recommendation which became effective Sept. 1, 1934, established a simplified list of 27 standard stock sizes for fruit and vegetable cans.

The current revision proposes certain changes in the original schedule of recommended sizes, including the elimination of 11 sizes and the addition of five sizes that have since come into general use.

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Hemp Center
Wire Rope Center
Metallic Core
Seale - Filler Wire
Warrington

Discusses Gray Iron Production

NORTHEASTERN chapter of the American Foundrymen's association entertained national officers of the association at its March meeting held in Cleveland recently. National officers attending and participating in the program were President James L. Wick Jr., Falcon Bronze Co., Youngstown, O.; Vice President Hyman Bornstein, John Deere & Co., Moline, Ill.; and Secretary-Treasurer D. M. Avey, Chicago.

Mr. Bornstein was the technical speaker, discussing gray cast iron with particular reference to practices employed in the John Deere & Co. tractor division, Waterloo, Iowa. Selection of raw materials for the cupola depend on market price and geographical location, he said. Essentially, the iron charges are composed of pig iron, silvery iron, automobile cylinder scrap, No. 1 scrap, steel scrap, briqueted iron borings and briqueted steel turnings. The latter two comprise 17.5 per cent of the charge.

Total cost of cast iron briqueting is \$1.01 per ton, while that of steel turnings is \$1.52 per ton, according to Mr. Bornstein. Four cupolas are used alternately, and of the two in operation on one day, one is in blast 15 hours and the other 8 hours. Average melting rate is 18 to 20 tons per hour. Cupola beds are 52 inches above the top tuyeres, and 4000-pound iron charges with 480-pound coke splits are used.

Typical analysis of the iron shows total carbon 3.25, silicon 2.40, sul-

phur 0.110, phosphorus 0.23 and manganese 0.60 per cent. Transverse strength of the iron is 2650 pounds per square inch on the standard A.S.T.M. bar with 0.26-inch deflection, and brinell hardness of the bar is 228. Tensile strength determinations show a range from 35,000-40,000 pounds per square inch. Metal at the cupola spout averages 2800 degrees Fahr.

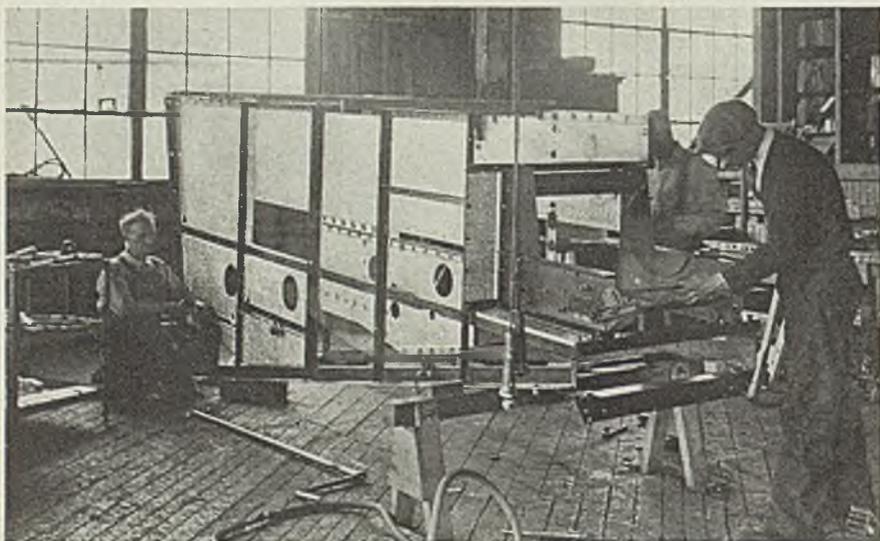
Cylindrical covered mixing ladles and main transportation ladles are employed and have been found to result in an appreciable conservation of heat. For example, in the transportation ladles a heat loss of 15 to 23 degrees per minute occurred with open ladles, while with closed, insulated ladles the loss is 8 to 10 degrees per minute.

Addition of alloys where required is made in the transportation ladles, Mr. Bornstein asserted. In some cases, Mexican graphite is added to reduce the tendency toward formation of hard corners and edges. Graphite also is added in the transportation ladles in the proportion of 3 to 4 pounds per ton of iron. Close control is maintained on total carbon content of the iron through frequent chemical determinations and adjustment of the coke splits.

Chill characteristics of the iron are determined by chill test bars poured every 15 minutes, these bars being $\frac{3}{4}$ x 2 x 4 inches. One face is cast against a chill and the others are formed in a dry sand core.

Mr. Avey outlined aims of the new enlarged program of the American Foundrymen's association, which includes broadening and coordination of various activities, extension of membership and chapters, and establishment of codes and ethics for the foundry industry.

Resists Atmospheric Corrosion



TO provide resistance to atmospheric corrosion, Frick Co., Waynesboro, Pa., uses Bethlehem-Cu-Loy, copper bearing, galvanized steel sheets, made by Bethlehem Steel Co., Bethlehem, Pa., in fabricating this threshing machine housing

Program Arranged for East Lansing Foundry Meeting

Several technical papers and discussions of interest have been arranged for the sectional meeting of the American Foundrymen's association to be held April 9-10 at Michigan State college, East Lansing, Mich., in co-operation with the Detroit chapter of the association and the college. The program schedules three sessions and a dinner. C. C. Sigerfoos, department of mechanical engineering, Michigan State college, is handling arrangements for the meeting.

Details of the program follow:

Friday, April 9

MORNING

"Testing of Materials with Particular Regard to Cast Iron," by R. E. Schneldewind, University of Michigan, Ann Arbor, Mich.

AFTERNOON

"Adaptability of Gray Iron as an Engineering Material," by G. P. Phillips, International Harvester Co., Chicago.
"Wear Testing"—discussions by W. E. Jominy, General Motors Corp., Detroit; S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago; and P. S. Lane, American Hammered Piston Ring Division, Koppers Co., Baltimore.

EVENING

Banquet. Address: "Fair and Equitable," by C. C. Carlton, Motor Wheel Corp., Lansing, Mich.

Saturday, April 10

MORNING

"Artificial Molding Sands," by Dr. R. A. Smith, Michigan department of conservation, Lansing, Mich.
"Core Making," by R. E. Aptekar, American Brake Shoe & Foundry Co., New York.

Announce Graphitic Steel

A new type of steel, combining the free machining qualities of cast iron with the high strength and response to heat treatment of steel, is announced in a folder on "Graphitic Steel" just issued by the Timken Roller Bearing Co., Canton, O. This new steel is produced for water hardening uses under the trade mark "Graph-sil" and for the oil hardening uses under the trade mark "Graph-mo." Both grades are suitable for dies used in cold working and shaping steel, brass, Dow metal, aluminum, paper and bronze.

Revises Sheet Specification

Association of American Steel Manufacturers technical committees has issued a Manufacturers' Standard Practice specification covering standard permissible variations in gage weight, gage thickness, size camber and flatness of sheets. Copies are available from the association.

NEW EQUIPMENT

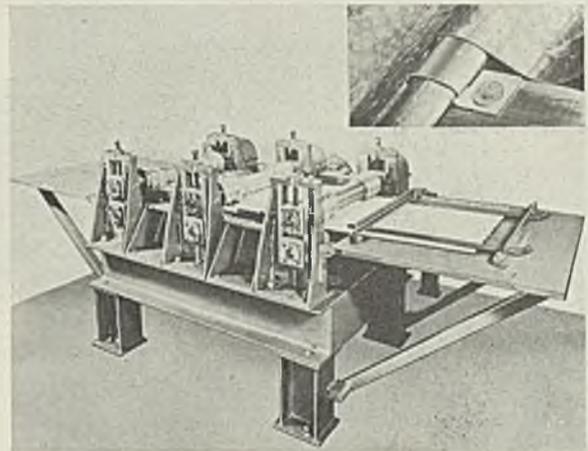
Metal Roofing—

Kor-Lok Co., Cleveland, is introducing to the sheet metal market an interlocking corrugated sheet for roofing and siding that defeats capillary attraction and eliminates nail holes. The machine illustrated herewith, supplied by the company to the dealers, crimps the sides of ordinary corrugated sheets, forming a clamp interlocking joint. The sheets are held fast by small clips that fit snugly over the curvature along the side of the bottom sheet. The clip in position is nailed to the wood deck. The top sheet is then slid over it into position, as shown in the inset.

utilize hollow mill cutters and the cutter heads are provided with rapid traverse to and from cutting position. During the cutting period the spindles rotate while locating

has a single work head with two cutter spindles, both designed to machine simultaneously a single part; the 4-C is a combination of two 4-A machines in a single base,

Machine recently introduced for fabricating Kor-Lok metal roofing. Inset shows the method used in laying this new type roof



Gear Chamfering Machine—

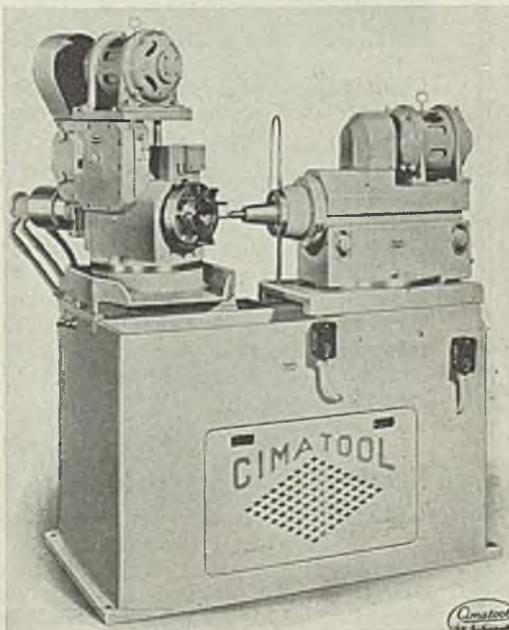
Cimatool Co., Dayton, Ohio, announces a high speed gear chamfering machine available in three different models, and providing production speeds on chamfering and burring, ranging as high as 600 teeth per minute. The three types are known as model 4-A, 4-B, and 4-C available for air, hydraulic or manual operation. These machines

against an adjustable backstop in a stationary position. The 4-A is the smallest type, and is comprised of a single work head and a single spindle in one base; and 4-B model

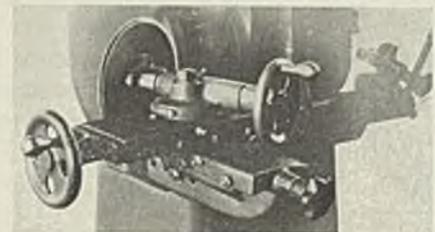
or two complete single spindle machines on one base.

Disk Grinding Attachment—

Landis Machine Co., Waynesboro, Pa., has recently placed on the market grinding attachments for resharpening cutter disks as used on a roller pipe cutter. The attachment was particularly designed for regrinding disks used on the Geist



Cimatool high speed gear chamfering machine available in three models



Disk grinding attachment for Geist roller pipe cutter built by Landis Machine Co.

roller pipe cutter marketed by this company. The attachment will take disks 6, 7, or 8 inches in diameter. The cutter disk is mounted

on the end of a cutter shaft which is adjustable in a horizontal plane for obtaining any desired bevel on the cutting edge. A hand wheel on the opposite end of the cutter shaft permits revolving the cutter disk against the face of the grinding in order to grind uniformly the entire circumference.

◆ ◆ ◆

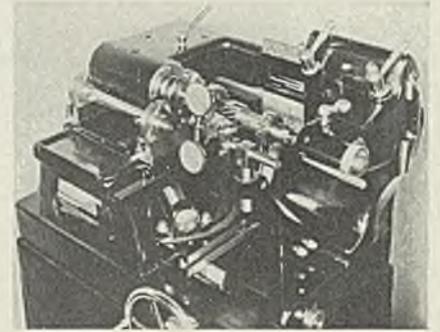
Gear Checking Equipment—

Michigan Tool Co., Detroit, has recently introduced two new gear checking machines. The first is a combined tooth form and tooth spacing checker, which requires no master forms or master base circle disks.

It is designed for obtaining readings rapidly and is adaptable for taking of charts for comparison with other checking devices. The sine bar on these machines acts as a compensator for differences between the lengths of arc on the friction disk, which originates the machine movement on the base circle of the gear being checked. Frictional disk is integral with the work holding spindle and imparts movement to the sine bar carriage, while the angular setting of the sine bar controls the movement of the indicator head. The smaller the gear being checked the smaller the angular setting of the sine bar, and each degree of

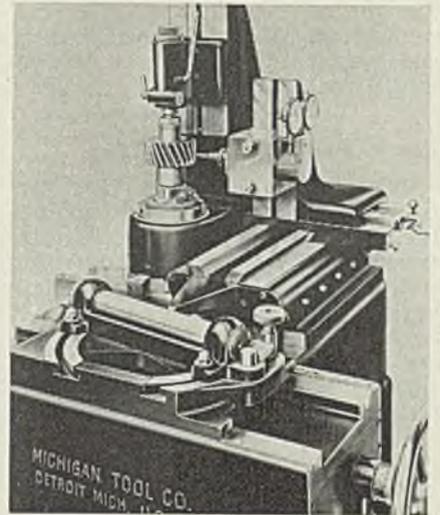
work rotation may be read on a scale beside the carriage. Capacity of gears which may be checked on this machine is 12-inch diameter by 12 inches in length.

The second machine is a spiral lead checker, on which the lead is



Spiral lead checker which will take gears up to 16 inches in diameter

checked in preference to the helix angle for the reason that the lead is constant no matter at what depth or portion of the tooth the measurement is taken while the specified helix angle is only correct at one di-



Combined tooth form and tooth spacing checker built by Michigan Tool Co.

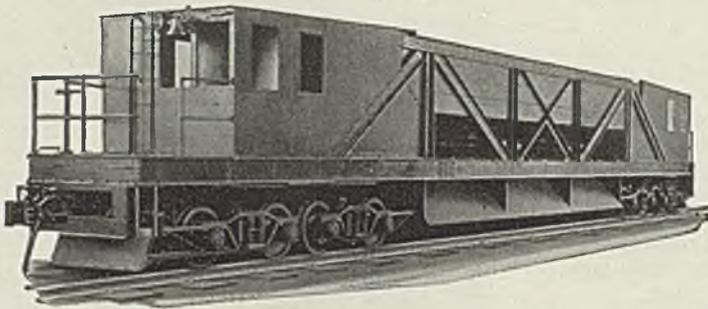
ameter and varies with the depth at which the measurement is taken. This machine will take gears up to 16-inch diameter with leads of 6 inches or over for either right or left hand spirals. When the indicator is in contact with the gear tooth, any variations of the proper lead is shown.

◆ ◆ ◆

Movable Truck Floor—

Easton Car & Construction Co., Easton, Pa., has introduced a new development in truck body design: a floor which simplifies loading and unloading. This new device consists

ATLAS ORE TRANSFERS



100 ton—3 compartment Ore Transfer. Roller Bearing Journals. Double end control for car operation. Individually operated discharge gates.

OTHER ATLAS PRODUCTS

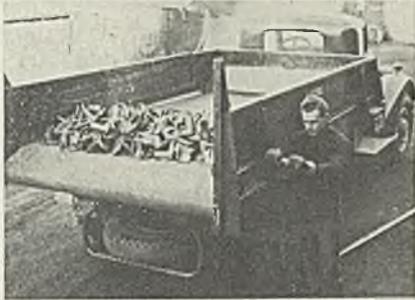
- Gas-Electric and Diesel-Electric Locomotives . . .
- Electric Transfer Cars for Blast Furnaces and Steel Plants . . .
- Stockhouse Scale Cars for Blast Furnaces . . .
- Concentrate and Calcine Cars for Copper Refineries . . .
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of a single sheet of extremely durable cold rubber belting supported beneath by tiers of steel rollers. The belting is long enough to be rolled one complete length to either end of the truck. This complete movement of the floor from end to end of the body provides a new method of loading and unloading. It is operated by means of a crank handle which is used to roll up the floor. The operator may use the handle

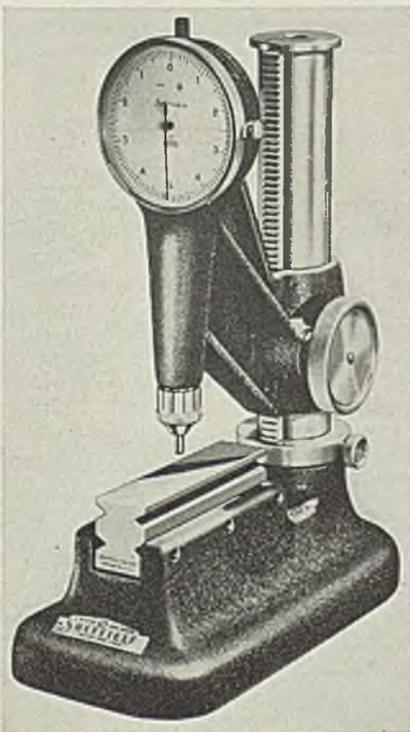


Easton Loryflor for trucks which aids the trucker in loading and unloading

at either end, or either side of the truck, and it requires little effort for one man to move the load in or out of the body regardless of the weight or nature of the load.

◆ ◆ ◆
Gaging Head—

Sheffield Gage Corp., Dayton, O., has recently announced a new comparator-type gaging head. The head is raised and lowered by a con-



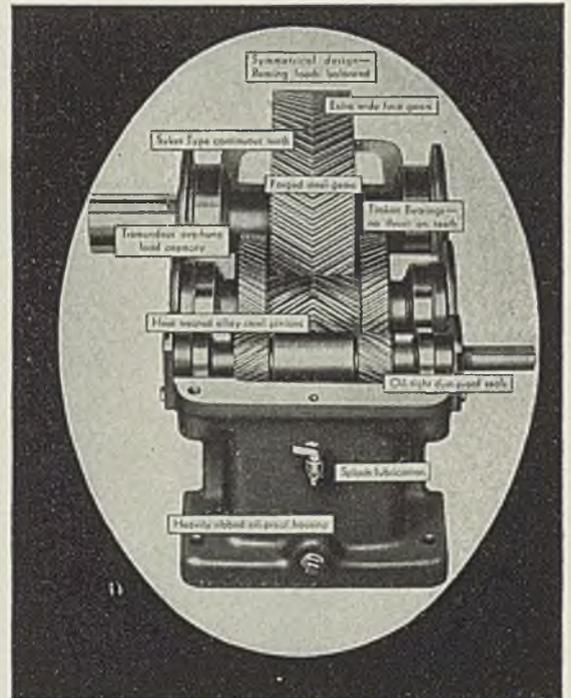
New Sheffield comparator type gaging head available in one or three thousandths range

venient hand wheel on the right, providing smooth adjustment to the proper height above the lower anvil. The clamping wheel on the left locks the head at the desired height. The entire head may be swiveled on the column to provide gaging from surfaces other than the self-contained anvil. Standard make indicators are mounted on the head which can be secured in both one and three-thousandths range.

◆ ◆ ◆
Power Shovel—

Northwest Engineering Co., Chicago, announces a new $\frac{5}{8}$ -yard

power shovel. This machine will be known as the Model 20 and it is fully convertible from shovel to crane or dragline by simply changing the boom. Bases of these machines are of cast steel, the side frames are cast integral with the rotating base and travel gears are fully enclosed. Swinging clutches are of the cone type; ball or roller bearings are used on all the high speed shafts and the power take-off is through helical gears running in oil an oil-tight housing. Gasoline from electric or diesel power is available; the shovel equipment will be standard Northwest welded dipper



★
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stick equipped with a manganese $\frac{5}{8}$ -yard dipper.

Heat is regulated at four points, and the electrodes are water cooled.

♦ ♦ ♦
Spot Welder—

Agnew Electric Co., Milford, Mich., has recently presented its new Model J foot operated spot welder. The new machine is of all-steel body, grey iron base and top plate. Welding capacity on full 10 kilovolt amperes is two pieces of 16 gage or thinner stock. Standard throat depth is 8 inches, and sizes up to 18 inches are available. The switch is automatic and adjustable to the type of work done.

♦ ♦ ♦
Rotating Cam Switches—

General Electric Co., Schenectady, N. Y., has recently announced a new line of rotating-cam switches, designed especially for built-in control applications and adaptable to a variety of electrical functions and machine requirements. For non-built-in applications, the devices are available as standard switches without the flanges used for flush-mounting on machines. Two sizes are available—the size 0 being rated at

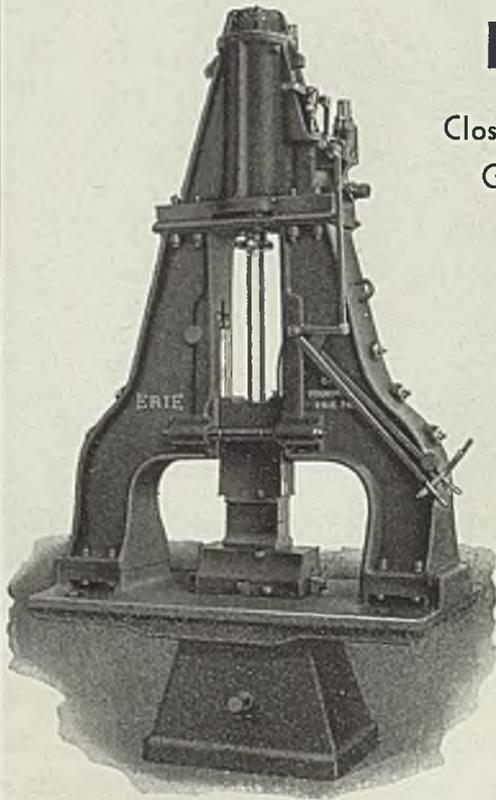
15 amperes continuous, and the size 1 being rated at 25 amperes continuous, both for 600 volts or less, alternating current. Four standard types are obtainable for controlling single-speed motors for reversing application, two-speed, separate-winding motors for non-reversing application, and two-speed, single-winding motors for non-reversing application and three- or four-speed motors for three or four speeds forward and one speed reverse.

♦ ♦ ♦
Drill Chuck—

K. O. Lee & Son Co., Aberdeen, S. Dak., has recently announced a new line of drill chucks adaptable to many types of drilling equipment. These chucks are so designed that the work load tightens the grip in proportion to the resistance en-

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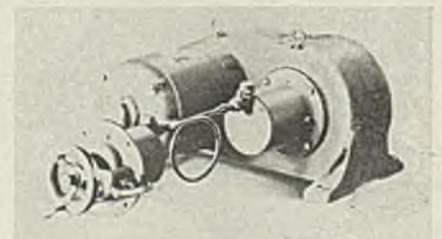


Lee keyless knock-out drill chuck adaptable to many types of drilling equipment

countered. Of the keyless type, a slight twist of the feed screw cap is sufficient to grip the drill as the chuck is self-energizing. Five sizes are now in production; 0- $\frac{1}{4}$ -inch, 0- $\frac{1}{2}$ -inch, 3/16- $\frac{5}{8}$ -inch and $\frac{1}{4}$ - $\frac{7}{8}$ -inch.

♦ ♦ ♦
Remote Control—

U. S. Electrical Motors Inc., Los Angeles, has recently announced a remote control for variable speed units using a hydraulic linkage. The operator can vary the speed of unit over a wide range by turning the handwheel at the remote control station. The remote control is hydraulic and provides a smooth regulation of speed and infinite



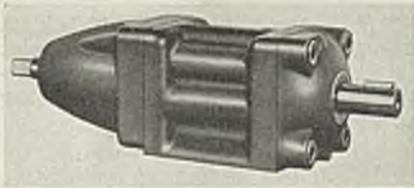
Hydraulic linkage is used in this new remote control system for variable speed drives built by U. S. Electrical Motors

changes within the speed range provided. Liquid at the remote control station cylinder is forced through copper tubing to the cylinder at the variable speed unit itself and the movement of this cylinder changes the speed.

♦ ♦ ♦

Fluid Motor—

Sundstrand Machine Tool Co., Rockford, Ill., announces a new line of fluid motors of the multiple piston type. The first unit has a rating of 1 horsepower at 900 revolutions per minute, and larger capacity motors of the same type will be put in production in the near future. The 1-horsepower unit



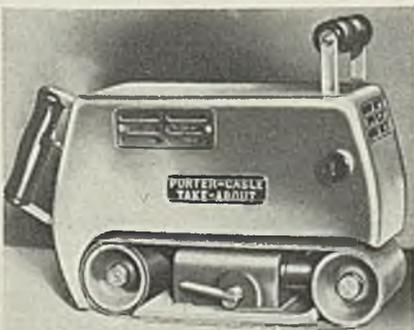
Sundstrand single horsepower fluid motor, first unit in a new line

is very small and compact, being especially designed for high speed applications although it is suitable for speeds as low as 20 revolutions per minute. It can be reversed instantly while running at speeds as high as 3000 revolutions per minute. The 1-horsepower unit as well as future units will be built with a variable speed adjustment or for a constant speed. A new line of multiple piston pumps for use with these motors is to be announced at an early date.

♦ ♦ ♦

Portable Sander—

Porter-Cable Machine Co., Syracuse, N. Y., has just placed on the market a balanced, portable sander using a 4 by 27 inch abrasive belt. This machine is designated as the Type T-4. The frame is polished aluminum, with molded bakelite intake and exhaust air grids. Both front and rear handles are non-



Porter-Cable portable sander containing a 4 x 27-inch abrasive belt

metallic, and the front and rear pulleys are each 4 inches wide by 2 3/4 inches in diameter. The rear pulley drive is operated through a silent transmission powered by a 1 1/4 horsepower universal motor. Standard belt speed is 1650 revolutions per minute, and is adapted to grinding operations on metal, wood, plastics, paint or glass.

♦ ♦ ♦

Respirator—

Chicago Eye Shield Co., 2300 Warren boulevard, Chicago, has recently developed a respirator for use

particularly in type A dusts. This unit has been approved by the United States Bureau of Mines and bears the name of Cesco No. 90 health-guard respirator. The filtering element removes all dust, while allowing free passage of air, it is claimed. There is only one filtering surface of large area and a sensitive outlet valve permits no inside air pressure. The seal at the facial contour is effected with the aid of a soft metal band which serves the additional purpose of reducing the headband pressure and making the respirator more comfortable for the wearer.

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MILWAUKEE

DEEP DRAWN SHELLS AND SHAPES

Basic Open Hearth

(Continued from Page 41)

flame appears indicating that the phosphorous is burning out. This continual blowing for 3 to 4½ minutes after the carbon is burned out of the metal is called the after-blow.) Thus, to these two young men goes the credit of the basic lining in steelmaking and it is referred to either as the Thomas process or the Thomas-Gilchrist process.

News of this process spread rap-

idly throughout Europe and America and the discoverers of this process and the steel plant where the experiments were carried out were besieged with visitors who returned to their plants with samples of this low phosphorous steel, samples of lining and data on the after-blow. The idea of a basic lining and a basic slag was immediately applied to the open hearth process, borrowed so to speak, from the basic bessemer process. These pioneers of the basic open hearth process soon learned that a basic slag was an excellent oxygen carrier and that

both phosphorous and sulphur could be removed from the metal to points well under 0.050.

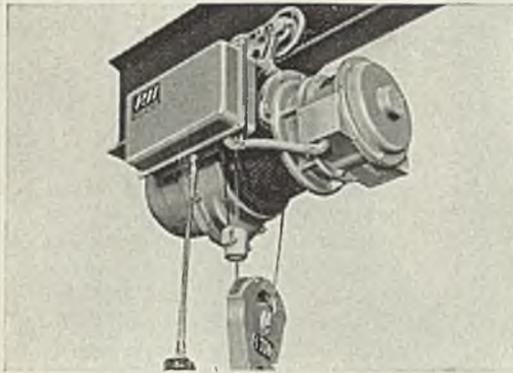
In 1880 Messrs. Goetz and Wellman built the first basic lined open hearth steel furnace in this country at the Otis Steel Co., Cleveland. Other steel plants followed in lining some of their new open hearth furnaces with a basic lining and by 1888 engineers completed the installation of the basic lined open hearth furnaces at the Homestead, Pa., works of Carnegie-Phipps & Co. In 1890 there were 47 plants in 10 states in this country which made 574,800 net tons of open hearth steel, both acid and basic. The large proportion of this was tapped from acid lined furnaces as there were only 15 basic open hearth furnaces in operation in this country in 1890. These furnaces tapped heats varying from 15 to 30 tons. In the next year, 1891, there were basic furnaces in operation tapping as much as 45 ton heats.

Production Increases Rapidly

Ten years later in 1901 steel plants of this country produced a total of 13,473,000 tons of steel. Of this total, 3,619,000 tons was from the basic open hearth process, 1,037,316 tons from the acid open hearth and 8,713,000 tons from the acid bessemer. Thus, at the turn of the century the basic open hearth process produced more than three-fourths of the open hearth steel, and the size of the furnaces was increasing to 60 and 65 tons as improvements in design were made. By 1929 there was a total steel production in this country of 56,433,000 tons of which 47,232,000 tons was from basic lined open hearths, 1,120,470 tons from acid lined open hearths, and 7,122,500 tons from the acid bessemer process. There appears to be a definite field for acid bessemer and acid open hearth steel which will probably maintain its ground in the years to come, but in contrast to this the basic open hearth process has shown enormous growth. Reasons for this growth are analyzed further on in this article. It may suffice to say here that the large bulk of this basic steel is in tonnage rolled products of commercial grade.

Steel castings made by the acid open hearth process amounted to 544,000 tons or about 50 per cent of the acid steel made in 1929, the remainder being cast into ingots. Of the 1901 tonnage about 20 per cent was poured into castings. The lower oxide content and a soundness of castings which can be obtained with repeated dependability has made the acid process a favorite in the steel castings field. This process reliability was early recognized. In 1901 although the basic open hearth process produced a total of more

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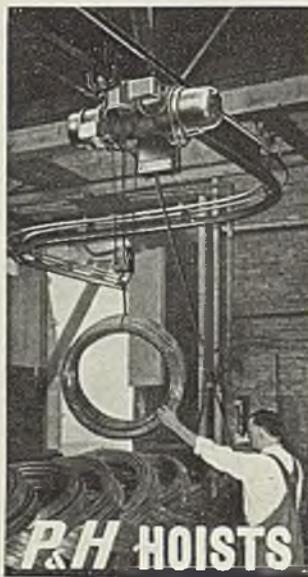
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than three times as much steel as the acid process, only 95,000 tons or 3 per cent was poured into castings. This low figure was due probably to the lack of uniform soundness from heat to heat which was troublesome at that time from the more oxidizing basic process. With a better understanding of the de-oxidation process, more and more basic steel was used in casting and by 1929, 588,000 tons were used for this purpose, more than used by the acid process.

A comparison of the tonnage output of these processes in the production of alloy steel indicates that the basic open hearth process has found an outstanding position. In 1914 a total of 1,021,000 tons of alloy steel was produced in this country, of which 644,000 tons was made in basic open hearths and 267,353 tons in acid open hearths, the remainder being made by the bessemer, crucible and electric furnace processes. By 1929 the total tonnage of alloy steel produced in this country was 3,960,000 tons of which 3,240,500 tons was from the basic open hearth and 108,000 tons from the acid open hearth. We find the acid open hearth the favorite for steel castings, about half of the alloy steel made by that process being poured into castings, the balance being poured into ingots and rolled. About 15 per cent of the basic alloy steel made was poured into castings, the balance being rolled products. The depression years through to 1936 have found the same relative positions maintained by the various processes as in the year 1929, although the output of each process was correspondingly lowered.

Reasons for Growth of the Basic Open Hearth Process

The unusual growth of the basic open hearth process is undoubtedly due to certain outstanding metallurgical and economic advantages, some of these which may be listed as follows:

1—Ability of the process to remove phosphorous and sulphur and by so doing, open up vast tonnages of ores, and large tonnages of steel scrap which ordinarily could not be used by the acid open hearth process;

2—It permits the use of all types of steel scrap from the lightest and bulkiest to the heaviest and most dense type of scrap commonly used in quality alloy heats;

3—Furnace operators may vary the percentage of steel scrap to pig iron charged to suit economic conditions. During the economy years of 1932-1933, some basic steel makers used a 100 per cent steel scrap charge because of lower costs compared to pig iron. To obtain the proper carbon content, coke was charged with the steel scrap. This

flexibility of charge makes it a popular process.

4—A wide range in the types of fuels and a greater range of sulphur content in fuels is permitted by the process;

5—Considerable range of chemical composition and physical characteristics of the lining material and slag base is permissible in the basic process;

6—The process permits a fair amount of ease in working the slag;

7—A wide range of carbon content is permissible in the process. Heats may be conveniently tapped

with a carbon range from 0.03 carbon as in the case of ingots iron up to 1.10 carbon for tool steels.

8—A wide range of quality may be obtained with this process, from the open or rimmed steel and the commercial grade of steel where deoxidation is only carried out in the ladle up to the specially furnace deoxidized, grain controlled, guaranteed forging grade and alloy steels used for such highly stressed automotive parts as crankshafts, axle drive shafts, transmission gears, and the like;

9—A wide range of alloy steels may be made with a high degree of

WHEN the Phosphor Bronze Smelting Co. recently decided to put in a new Three-High Mill for rolling large Phosphor Bronze Shafts, they did not hesitate as to the make of Speed Reducing Unit they desired . . . they knew that strength, durability and reliability, plus continuous, smooth, accurate operation were essential. They also knew that a Speed Reducer in such service just "had to take it"—day in and day out . . .

The answer was a Philadelphia Double Reduction Herringbone Reducer with Sykes Continuous Tooth Herringbone Gears. You, too, can follow the example of Phosphor Bronze Smelting Company (and hundreds of others) by putting your Speed Reduction problems up to us.

PHILADELPHIA *Speed Reducers*



Philadelphia Gear Works
Industrial Gears and Speed Reducers
Erie Avenue and "G" St.
PHILADELPHIA

quality and chemical accuracy by the basic open hearth process. Such S.A.E. alloy steels of the straight nickel series 2000, 2100, 2300 and 2500; the nickel chromium series 3100, 3200, and 3400; the nickel-molybdenum 4600 and 4800 types, the nickel-chromium-molybdenum series of the 4300 type and the 4100, 5100 and 6100 series are all made by the basic open hearth process in batch lots ranging from 10 tons to 120 tons.

These may be considered the out-

standing reasons for the present popularity of the basic process in this country. Its flexibility was early recognized and considerable effort was put forth during the past 50 years to improve the furnace. The greatest improvements have been made by increasing the size of furnace, perfecting heating equipment to meet increased size of charge and by study and improvement of the deoxidation process.

(To be continued)

cific problems in the industrial handling field and diagrams showing simplified construction and operation, with vital points in modern hoist design.

Nickel Additions Improve Properties of Cast Iron

The role of nickel in development of modern cast irons was discussed by A. G. Zima, Pacific Coast representative of the International Nickel Co. Inc., Los Angeles, before a recent meeting of the Engineering Institute of Canada in Vancouver, British Columbia. The address centered on the improvements in properties of the iron resulting from addition of varying amounts of nickel.

Chief among the improvements, according to Mr. Zima, are finer and more uniform grain structure which is such an important factor in promoting improved wearing quality, machinability and uniform hardness. Castings with greatly increased properties of strength and hardness can be obtained by adding small percentages of nickel to a suitable base mixture.

Heat treatment characteristics of various cast irons also were considered by Mr. Zima. Emphasis was placed on properties and uses of special types of nickel alloy irons. One containing approximately 4.5 per cent nickel and 1.5 per cent chromium is especially suitable for castings requiring great hardness or subject to highly abrasive conditions. Another usually containing 14 per cent nickel, 2 per cent chromium and 6 per cent copper possesses a high degree of resistance to corrosion and resistance to growth.

A third type contains nickel ranging from 1.4 per cent, depending upon the properties of strength, hardness and machinability desired. This type is used extensively for gears, valves, heavy frames, heavy machine tool spindles, and many other applications where the utmost strength is required of cast iron.

British Income and Sur-Taxes in Clear Analysis

Trolley's Tax Manual, Sur-Tax, by Charles H. Trolley; third edition; paper, 105 pages, 5¼ x 8¼; supplied by STEEL, Cleveland; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This is the current issue, bringing up to date the British sur-tax and companies' sur-tax, how it is computed and assessed, with index of decided cases. It is invaluable for those American companies with British branches, to explain provisions of the complicated income tax regulations and requirements of the law.



RECENT PUBLICATIONS OF MANUFACTURERS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing STEEL, in care of Readers' Service Department, 1213 West Third Street, Cleveland

Bolts and Nuts—Dardelet Theadlock Corp., 55 Liberty street, New York. Bulletin No. 16, describing its self-locking bolts and nuts.

Welder—Lincoln Electric Co., Cleveland. Bulletin No. 320, describing shield-arc SAE welder, engine-driven model, type S-6018, 400 amperes.

Motor Control—Electric Controller & Mfg. Co., Cleveland. Booklet No. 67, illustrating and describing its steel-clad motor control units.

Motor-Generator Sets—Reliance Electric & Engineering Co., Ivanhoe road, Cleveland. Bulletin No. 501, describing and illustrating its motor-generator sets.

Belt Vulcanizer—James C. Heintz & Co., 3738 West street, Cleveland. Folder No. 1236 5M, describing and illustrating its new light-weight diagonal belt vulcanizer.

Water Tank—Pittsburgh-Des Moines Steel Co., Pittsburgh. Bulletin No. 101, containing illustrations and information for efficient water storage in elevated steel tanks.

Switching Equipment—Delta-Star Electric Co., 2400 Fulton street, Chicago. New prices and discount sheets Nos. 6-1, 7-1, 8-B, 32-C2, 35-B3, 36-F2, 39-B3 and 303-1, on switching equipment.

Steam Conduit—H. W. Porter & Co., 825 Frelinghuysen avenue, Newark, N. J. Booklet showing step-by-step operations on installing Therm-O-Tile underground steam conduit.

Nogas and Inhibitors—Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. Booklets on function and applica-

tion of nogas and inhibitors in pickling iron and steel.

Controllers—C. J. Tagliabue Mfg. Co., Park and Nostrand avenues, Brooklyn, N. Y. Catalog No. 900C, describing and illustrating its non-indicating controllers for temperature, pressure and time.

Flexible Couplings—T. B. Wood's Sons Co., 1200 Fifth avenue, Chambersburg, Pa. New catalog pages Nos. 38-A and 38-B, illustrating and describing its universal giant flexible coupling, known as type B.

Concrete Floor Treatments—Truscon Steel Co., Youngstown, O. Folder covering metallic floor hardeners, non-slip floor hardeners, integral hardening and coloring, surface treatments and floor enamel.

Bent-Tube Boilers—Combustion Engineering Co. Inc., 200 Madison avenue, New York. Catalog No. BT-5, covering its line of bent-tube boilers, illustrating cross-sections of typical installations of various types.

Alemite Industrial Lubrication—Stewart-Warner Corp., 1826 Diversey Parkway, Chicago. A revised manual for maintenance men. Besides listing Alemite industrial lubricants, this book is a comprehensive reference manual.

Dissolver—Patterson Foundry & Machine Co., East Liverpool, O. Booklet describing dissolver for cutting cotton, dissolving cellulose acetate and natural and synthetic resins and other similar materials of various viscosities.

Hoists—Harnischfeger Corp., 4400 West National avenue, Milwaukee. Bulletin No. H-5, illustrating with more than 25 industrial applications photographs of its hoists; includes treatment of both general and spe-

Steel Buyers Flooding Mills With Inquiry

Production Up but

Backlogs Increase;

Auto Output Gains

A STRONG seller's market exists, with steel-makers scrutinizing all inquiries closely, limiting shipments to consumers' usual needs and using every effort to prevent speculative buying and hoarding. In many instances sales representatives are ordered to submit all inquiries to the home office before completing sales.

Every indication is that consumers are using steel as rapidly as it is shipped and that efforts to obtain deliveries are based on actual needs, to meet demand for their products. Cessation of shipments to strike-bound Detroit automobile manufacturers made no impression on steel mills. It has given some steel to other users.

Buying shows no sign of easing. Current bookings are in excess of shipments and backlogs are increasing. In the effort to obtain preference some consumers are offering premiums over present prices, but mills hesitate to accept these offers. Price seems no bar to buyers, delivery being the important factor.

Heavy bookings have pushed back deliveries on current buying to an average of close to three months, somewhat less in a few cases and much more in some grades of sheets. Steel bars in some cases can be obtained within eight weeks and in others not short of 12 weeks.

Importance of rapidly increasing exports of steel scrap is being recognized and some sentiment has developed for regulation by the government. This is based on the fact that in the past three years more than 5,000,000 tons of scrap has been exported to Japan, Great Britain and Italy. This is estimated to represent more than 25,000,000 tons of natural resources in ore, coal and limestone. However, opinion in the steel and the scrap industry is not unanimous for or against regulation. Meantime congestion at ports of shipment has been relieved to a great extent by arrival of ships.

In spite of inevitable interruptions for furnace repair the steel industry is gradually increasing its rate of operation and last week edged up an additional point to 90 per cent of capacity. Pittsburgh gained two points to 93 per cent, Chicago one point to 83½ per cent, Buffalo three points to 90 and Cincinnati eight points to 80. Cleveland was off a point and a half to 80½ and New England lost 12 points to 85 per cent. Both these declines were on account of repairs. No change was made in the rate in the following districts:

MARKET IN TABLOID

DEMAND Heavy from all consumers.

PRICES Strong; scrap advances to new high.

PRODUCTION Operations gain one point to 90 per cent.

SHIPMENTS Eight weeks to more than 22 weeks' delay.

Eastern Pennsylvania 58, Youngstown 85, Wheeling 97, Birmingham 80, Detroit 100 and St. Louis 82.

Breaking of the impasse which for some time prevented steelmakers bidding on government projects particularly for the navy, has resulted in award of the latter of some 6000 tons of various grades of steel to a number of producers. More tonnage for the navy will be distributed soon.

A secondary wave of railroad buying apparently getting under way with current inquiries for more than 8000 cars and a number of other large lots under consideration. This is indicative of belief by railroad executives that no recession in steel demand or price is within reaching distance.

A significant index of the steel situation is found in the sharp increase in production of beehive coke in the past year. From a total production so small that it was not considered important, beehive coke output in 1936-37 to date totaled 2,044,600 tons. This compares with 973,100 tons in the corresponding period a year earlier. Without this reserve coking capacity the steel industry would have been hampered tremendously in meeting demands for its products.

Production of automobiles totaled 101,805 last week an increase of 2792 over the preceding week. General Motors rolled 54,020 from the assembly lines, a gain of 1415 over the week before and the Ford output was unchanged at 34,800. The remainder of the gain was distributed among the smaller production units. With Chrysler and Hudson still strike-bound a considerable segment of production is idle, which has cut deeply into the expected March output.

Moderate increases in steelmaking scrap at Chicago and Pittsburgh caused the composite price to advance 43 cents to \$21.60 and the iron and steel composite \$40.13. Finished steel composite is unchanged at \$60.70.

COMPOSITE MARKET AVERAGES

	Mar. 27	Mar. 20	Mar. 13	One Month Ago Feb., 1937	Three Months Ago Dec., 1936	One Year Ago Mar., 1936	Five Years Ago Mar., 1932
Iron and Steel	\$40.13	\$40.10	\$39.99	\$36.74	\$35.15	\$33.20	\$29.28
Finished Steel	60.70	60.70	60.70	55.92	53.90	52.32	47.09
Steelworks Scrap	21.60	21.17	20.91	19.19	16.92	14.48	7.89

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.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material	March 27,	Feb.	Dec.	Mar.	Pig Iron	March 27,	Feb.	Dec.	March
	1937	1937	1936	1936		1937	1937	1936	1936
Steel bars, Pittsburgh	2.45c	2.20c	2.05c	1.85c	Bessemer, del. Pittsburgh	\$25.26	22.30	21.8132	20.8132
Steel bars, Chicago	2.50	2.25	2.10	1.90	Basic, Valley	23.50	20.50	20.00	19.00
Steel bars, Philadelphia	2.74	2.49	2.36	2.16	Basic, eastern del. East Pa.	25.26	22.46	21.8132	20.8132
Iron bars, Terre Haute, Ind.	2.35	2.10	1.95	1.75	No. 2 fdy., del. Pittsburgh	25.21	22.21	21.3132	20.3132
Shapes, Pittsburgh	2.25	2.05	1.90	1.80	No. 2 fdy., Chicago	24.00	21.00	20.50	19.50
Shapes, Philadelphia	2.45½	2.25½	2.11½	2.01½	Southern No. 2, Birmingham	20.38	17.63	16.88	15.50
Shapes, Chicago	2.30	2.10	1.95	1.85	Southern No. 2, del. Cincinnati	23.69	20.94	20.44	20.2007
Tank plates, Pittsburgh	2.25	2.05	1.90	1.80	No. 2X eastern, del. Phila.	26.135	23.385	22.6882	20.6882
Tank plates, Philadelphia	2.43½	2.23½	2.09	1.99	Malleable, Valley	24.00	21.00	20.50	19.50
Tank plates, Chicago	2.30	2.10	1.95	1.85	Malleable, Chicago	24.00	21.00	20.50	19.50
Sheets, No. 10, hot rolled, Pitts.	2.40	2.15	2.10	1.85	Lake Sup., charcoal, del. Chicago	30.04	26.54	26.2528	25.2528
Sheets, No. 24, hot ann., Pitts.	3.15	2.80	2.75	2.40	Gray forge, del. Pittsburgh	24.17	21.17	20.6741	19.6741
Sheets, No. 24, galv., Pitts.	3.80	3.40	3.35	3.10	Ferromanganese, del. Pittsburgh	99.79	84.79	82.65	80.13
Sheets, No. 10, hot rolled, Gary	2.50	2.25	2.25	1.95	Scrap				
Sheets, No. 24, hot anneal., Gary	3.25	2.90	2.90	2.50	Heavy melting steel, Pittsburgh	\$23.75	\$19.65	\$18.55	\$15.75
Sheets, No. 24, galvan., Gary	3.90	3.50	3.50	3.20	Heavy melt. steel, No. 2, East Pa.	19.25	17.75	14.12½	12.55
Plain wire, Pittsburgh	2.90	2.60	2.60	2.30	Heavy melting steel, Chicago	21.25	19.50	17.00	14.75
Tin plate, per base box, Pitts.	\$4.85	\$4.85	\$5.25	\$5.25	Rail for rolling, Chicago	22.75	20.75	17.50	15.75
Wire nails, Pittsburgh	2.75	2.25	2.20	2.15	Railroad steel specialties, Chicago	23.25	21.00	19.00	16.25
Semifinished Material					Coke				
Sheet bars, open-hearth, Youngs.	\$37.00	\$34.00	\$32.50	\$28.50	Connellsville furnace, ovens	\$4.15	\$4.00	\$4.00	\$3.50
Sheet bars, open-hearth, Pitts.	37.00	34.00	32.50	28.50	Connellsville, foundry, ovens	4.25	4.25	4.40	4.10
Billets, open-hearth, Pittsburgh	37.00	34.00	32.50	28.40	Chicago, by-product foundry, del.	10.25	10.25	9.75	9.75
Wire rods, No. 5 to 3/8-inch, Pitts.	47.00	43.00	40.75	40.00					

Steel, Iron, Raw Material, Fuel and Metals Prices

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel	Tin Mill Black No. 28	Corrosion and Heat-Resistant Alloys	Structural Shapes
Prices Subject to Quantity Extras and Deductions (Except Galvanized)	Pittsburgh 3.30c	Pittsburgh base, cents per lb. Chrome-Nickel	Pittsburgh 2.25c
Hot Rolled No. 10, 24-48 in.	Gary 3.40c	No. 302 No. 304	Philadelphia, del. 2.45½c
Pittsburgh 2.40c	St. Louis, delivered 3.53c	Bars 24.00 25.00	New York, del. 2.50¼c
Gary 2.50c	Granite City, Ill. 3.50c	Plates 27.00 29.00	Boston, delivered 2.63¼c
Chicago, delivered 2.53c	Cold Rolled No. 10	Sheets 34.00 36.00	Bethlehem 2.35c
Detroit, del. 2.60c	Pittsburgh 3.10c	Hot strip 21.50 23.50	Chicago 2.30c
New York, del. 2.73c	Gary 3.20c	Cold strip 28.00 30.00	Cleveland, del. 2.45c
Philadelphia, del. 2.69c	Detroit, delivered 3.30c	Straight Chromes	
Birmingham 2.55c	Philadelphia, del. 3.39c	No. No. No.	Buffalo 2.35c
St. Louis, del. 2.63c	New York, del. 3.43c	410 430 442 446	Gulf Ports 2.65c
Granite City, Ill. 2.60c	St. Louis, del. 3.33c	Bars 18.50 19.00 22.50 27.50	Birmingham 2.40c
Pacific ports, f.o.b. dock 2.95c	Granite City, Ill. 3.30c	Plates 21.50 22.00 25.50 30.50	Pacific ports, f.o.b. cars, dock 2.80c
Hot Rolled Annealed No. 24	Pacific ports, f.o.b. dock 3.70c	Sheets 26.50 29.00 32.50 36.50	St. Louis, del. 2.52c
Pittsburgh 3.15c	Cold Rolled No. 20	Hot strip 17.00 17.50 23.00 28.00	Bars
Gary 3.25c	Pittsburgh 3.55c	Cold stp. 22.00 22.50 28.50 36.50	Soft Steel (Base, 3 to 25 tons)
Chicago, delivered 3.28c	Gary 3.65c	Pittsburgh 2.45c	
Detroit, delivered 3.35c	Detroit, delivered 3.75c	Chicago or Gary 2.50c	
New York, del. 3.48c	Philadelphia, Pa. 3.84c	Duluth 2.60c	
Philadelphia, del. 3.44c	New York, del. 3.88c	Birmingham 2.60c	
Birmingham 3.30c	St. Louis 3.78c	Cleveland 2.50c	
St. Louis, del. 3.38c	Granite City, Ill. 3.75c	Buffalo 2.55c	
Granite City, Ill. 3.35c	Enameling Sheets	Detroit, delivered 2.60c	
Pacific ports, f.o.b. dock 3.80c	Pittsburgh, No. 10 2.90c	Pacific ports, f.o.b. cars, dock 3.00c	
Galvanized No. 24	Pittsburgh, No. 20 3.50c	Philadelphia, del. 2.74c	
Pittsburgh 3.80c	Gary, No. 10 3.00c	Boston, delivered 2.85c	
Gary 3.90c	Gary, No. 20 3.60c	New York, del. 2.78c	
Chicago, delivered 3.93c	St. Louis, No. 10 3.13c	Pitts., forg. qual. 2.80c	
Philadelphia, del. 4.09c	St. Louis, No. 20 3.73c	Rail Steel	
New York, delivered 4.13c	Tin and Terne Plate	To Manufacturing Trade	
Birmingham 3.95c	Gary base, 10 cents higher.	Pittsburgh 2.30c	
St. Louis, del. 4.03c	Tin plate, coke, (base box), Pittsburgh \$4.85	Chicago or Gary 2.35c	
Granite City, Ill. 4.00c	Waste-waste, 2.75c; strip, 2.50c	Moline, Ill. 2.35c	
Pacific ports, f.o.b. dock 4.40c	Long ternes, No. 24 unassorted, Pitts. 4.10c	Cleveland 2.35c	
		Buffalo 2.20c	

Iron

Terre Haute, Ind.	2.35c
Chicago	2.40c
Philadelphia	2.39c
Pittsburgh, refined ...	2.75-7.50c

Reinforcing

New billet, straight lengths, quoted by distributors	
Pittsburgh	2.55c
Chicago, Gary, Buffalo	
Cleve., Birm., Young...	2.60c
Gulf ports	2.65c
Pacific coast ports f.o.b.	
car docks	2.95c
Philadelphia, del.	2.54c
Rail steel, straight lengths, quoted by distributors	
Pittsburgh	2.40c
Chicago, Buffalo, Cleve-	
land, Birm., Young....	2.45c
Gulf ports	2.80c

Wire Products

Prices apply to straight or mixed carloads; less carloads \$5 higher; less carloads fencing \$5 over base column

Base Steel—Cleve. 100 lb. keg.	
Standard wire nails	\$2.75
Cement coated nails	\$2.75
(Per pound)	
Polished staples	3.45c
Galv. fence staples	3.70c
Barbed wire, galv.	3.40c
Annealed fence wire	3.20c
Galv. fence wire	3.60c
Woven wire fencing	
(base column, c. l.)	\$74.00
Single loop bale ties,	
(base column, c. l.)	63.00

To Manufacturing Trade

Plain wire, 6-9 ga.	2.90c
Anderson, Ind. (merchant	
products only) and Chicago	
up \$1; Duluth and Worcester	
up \$2; Birmingham up \$3.	
Spring wire, Pitts. or	
Cleveland	3.50c
Do., Chicago up \$1, Worc.	
\$2.	

Cold-Finished Carbon Bars and Shafting

Pittsburgh	2.90c
Chicago	2.95c
Gary, Ind.	2.95c
Detroit	2.95c
Cleveland	2.95c
Buffalo	3.00c

Subject to quantity deductions and extras. List dated Aug. 26, 1935; revised Oct. 1, 1936.

Alloy Steel Bars (Hot)

(Base, 3 to 25 tons)

Pittsburgh, Buffalo, Chi-			
cago, Massillon, Can-			
ton, Bethlehem	3.00c		
Alloy			
S.A.E. 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. 15-			
2.00 Ni.	1.10		
5100 0.80-1.10 Cr.	0.45		
5100 Cr. spring	0.15		
6100 bars	1.20		
6100 spring	0.85		
Cr. Ni., Van.	1.50		
Carbon Van.	0.85		
9200 spring flats	0.15		
9200 spring rounds, squares	0.40		

Piling

Pittsburgh	2.60c
Chicago, Buffalo	2.70

Strip and Hoops

(Base, hot rolled, 25-1 ton)
(Base, cold-rolled, 25-3 tons)

Hot strip to 23½-in.	
Pittsburgh	2.40c
Chicago or Gary	2.50c
Birmingham base	2.55c
Detroit, del.	2.60c
Philadelphia, del.	2.69c
New York, del.	2.73c
Cooperage hoop,	
Pittsburgh	2.50c
Chicago	2.60c
Cold strip, 0.25 carbon	
and under, Pittsburgh,	
Cleveland	3.20c
Detroit, del.	3.40c
Worcester, Mass.	3.40c
Carbon	
0.26—0.50	3.20c 3.40c
0.51—0.75	4.45c 4.65c
0.76—1.00	6.30c 6.50c
Over 1.00	8.50c 8.70c

Rails, Track Material

(Gross Tons)

Standard rails, mill	\$42.50
Relay rails, Pittsburgh,	
20—100 lbs.	32.50-35.50
Light rails, billet qual.	
Pittsburgh, Chicago....	\$43.00
Do., rerolling quality..	42.00
Angle bars, billet, Gary,	
Pittsburgh, So. Chicago	2.80c
Do., axle steel	3.35c
Spikes, R. R. base	3.15c
Track bolts, base	4.35c
Tie plates, base	\$46.00
Base, light rails 25 to 40	
lbs.; 50 to 60 lbs., inclu-	
sive up \$2; 16 and 20	
lbs. up \$1; 12 lbs. up	
\$2; 8 and 10 lbs., up	
\$5. Base railroad spikes	
200 kegs or more; base	
tie plates 20 tons.	

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade as per Dec. 1, 1932, lists:

Carriage and Machine	
½ x 6 and smaller	65-5 off
Do. larger	60-10 off
Tire bolts	50 off
Flow Bolts	
All sizes	65-5 off

Stove Bolts
In packages with nuts attached 72½ off; in packages with nuts separate 72½-5 off; in bulk 81½ off on 15,000 of 3-inch and shorter, or 5000 over 3-inch.

Step bolts	60 off
Elevator bolts	50-10-5 off

Nuts
S. A. E. semifinished hex.:
½ to ¾-inch 60-20 off || Do., ½ to 1-inch | 60-15 off |
| Do., over 1-inch | 60-12½ off |

Hexagon Cap Screws
Milled 50-10 off || Upset, 1-in., smaller | 60 off |

Square Head Set Screws
Upset, 1-in., smaller 75 off || Headless set screws | 75 off |

Rivets, Wrought Washers

Structural, Pittsburgh,	
Cleveland	3.60c
Structural, Chicago	3.70c
¾-inch and smaller	
Pitts., Chi., Cleve.	70 off
Wrought washers, Pitts.,	
Chi., Phila. to jobbers,	
and large nut, bolt	
mfrs.	\$5.75 off

Cut Nails

Cut nails, Pitts. (10% dis-	
count on size extras) ..	\$3.35

Do. less carloads, 5 kegs or more, no discount on size extras... \$3.65
Do., under 5 kegs, no disc. on size extras... \$3.80

Pipe and Tubing

Base \$200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago, del. 2½ less. Wrought pipe, Pittsburgh.

Butt Weld Steel			
In.	Blk.	Galv.	
¼ and ¾	55	38½	
½	59½	49	
¾	62½	53	
1—3	64½	55½	
Iron			
¼	20	1½	
½	26	8	
1—1½	30	14	
2	33½	16	

Lap Weld Steel			
2	57	47½	
2½—3	60	50½	
3½—6	62	52½	
7 and 8	61	50½	
9 and 10	60½	50	
Iron			
2	26½	10	
2½—3½	27½	12½	
4½—8	28½	15	

Line Pipe Steel			
¾, butt weld	51		
½ and ¾, butt weld	54		
¾, butt weld	58½		
¾, butt weld	61½		
1 to 3, butt weld	63½		
2, lap weld	56		
2½ to 3, lap weld	59		
3½ to 6, lap weld	61		
7 and 8, lap weld	60		

Iron			
¾—1½ inch, black and galv.			
take 4 pts. over; 2½—6-inch			
2 pts. over discounts for same			
sizes, standard pipe lists, 8—			
12-inch, no extra.			

Boiler Tubes			
C. L. Discounts, f.o.b. Pitts.			
Lap Weld Charcoal			
Steel Iron			
2—2½	33	1½	8
2½—2	40	2—2½	13
3	47	2½—2	16
3½—3	50	3	17
4	52	3½—3	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 pts. under base.

Boiler Tubes			
C. L. Discounts, f.o.b. Pitts.			
Lap Weld Charcoal			
Steel Iron			
2—2½	33	1½	8
2½—2	40	2—2½	13
3	47	2½—2	16
3½—3	50	3	17
4	52	3½—3	18
4½—5	42	4	20
		4½	21

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 pts. under base.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 pts. under base.

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Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 pts. under base.

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 for quantity, length, etc.

Seamless Boiler Tubes		
Hot Rolled Cold Drawn		
1" OD x 13 Ga.	\$ 8.41	\$ 9.46

1¼" OD x 13 Ga.	9.96	11.21
1½" OD x 13 Ga.	11.00	12.38
1¾" OD x 13 Ga.	12.51	14.09
2" OD x 13 Ga.	14.02	15.78
2¼" OD x 13 Ga.	15.63	17.60
2½" OD x 12 Ga.	17.21	19.37
2¾" OD x 12 Ga.	18.85	21.22
3" OD x 12 Ga.	19.98	22.49
3½" OD x 12 Ga.	20.97	23.60
4" OD x 10 Ga.	40.15	45.19
3½" OD x 11 Ga.	26.47	29.79
4" OD x 10 Ga.	32.83	36.96
5" OD x 9 Ga.	50.38	56.71
6" OD x 7 Ga.	77.35	87.07

Cast Iron Water Pipe

Class B Pipe—Per Net Ton

6-in. & over, Birm.	\$46.00-47.00
4-in., Birmingham	49.00-50.00
4-in., Chicago	57.00-58.00
6 to 24-in., Chicago.	54.00-55.00
6-in. & over, cast fdy.	50.00
Do., 4-in.	53.00
Class A pipe \$3 over Class B	
Std. ftgs., Birm. base.	\$100.00

Semifinished Steel

Billets and Blooms	
4 x 4-inch base; gross ton	
Pitts., Chi., Cleve., Buf-	
falo and Young.	\$37.00
Philadelphia	42.30
Duluth	39.00

Forging Billets	
6 x 6 to 9 x 9-in., base	
Pitts., Chicago, Buffalo.	43.00
Forging, Duluth	45.00

Sheet Bars	
Pitts., Cleve., Young.,	
Sparrows Point	37.00
Slabs	
Pitts., Chicago, Cleve-	
land, Youngstown	37.00

Wire Rods	
Pitts., Cleve., No. 5 to	
½-inch incl.	47.00
Do., over ¾ to 1¼-inch	
incl.	52.00
Chicago up \$1; Worcester up	
\$2.	

Skelp	
Pitts., Chi., Young., Buff.,	
Coatesville, Sparrows Pt.	2.10c

Coke

Price Per Net Ton	
Beehive Ovens	
Connellsville, fur.	\$4.10-4.25
Connellsville, fdry.	4.75-5.00
Connell. prem. fdry.	5.50-5.85
New River fdry.	6.00
Wise county fdry.	4.45-5.00
Wise county fur.	4.00-4.50

By-Product Foundry	
Newark, N. J., del.	10.17-10.60
Chi., ov., outside del.	9.50
Chicago, del.	10.25
New England, del.	12.00
St. Louis, del.	10.50-11.00
Birmingham, ovens	6.50
Indianapolis, del.	9.65
Cincinnati, del.	9.75
Cleveland, del.	10.30
Buffalo, del.	10.50
Detroit, del.	10.70
Philadelphia, del.	9.85

Coke By-Products	
Spot. gal. Producers' Plants	
Pure and 90% benzol.	16.00c
Toluol	30.00c
Solvent naphtha	30.00c
Industrial xylol	30.00c
Per lb. f.o.b. Frankford	
Phenol (200 lb. drums) ..	15.00c
Do., (450 lbs.)	14.00c

Eastern Plants, per lb.	
Naphthalene flakes and	
balls, in bbls., to job-	
bers	7.25c
Per 100-lbs. Atlantic seaboard	
sulphate of ammonia.	\$1.35
Western prices, ¼-cent up.	

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; 50c diff. for each 0.25 below 1.75. Gross tons.

Basing Points:	No. 2	Malle-	Basic	Besse-
	Fdry.	able		mer
Bethlehem, Pa.	\$25.00	\$25.50	\$23.50	\$26.00
Birdsboro, Pa.	25.00	25.50	24.50	26.00
Birmingham, Ala.†	20.38	.....	19.38	24.50
Buffalo	24.00	24.50	23.00	25.00
Chicago	24.00	24.00	23.50	24.50
Cleveland	24.00	24.00	23.50	24.50
Detroit	24.00	24.00	23.50	24.50
Duluth	24.50	24.50	.....	25.00
Erie, Pa.	24.00	24.50	23.50	25.00
Everett, Mass.	25.75	26.25	25.25	26.75
Hamilton, O.	24.00	24.00	23.50	.....
Jackson, O.	24.00	24.00	.....	.....
Neville Island, Pa.	24.00	24.00	23.50	24.50
Provo, Utah	21.00	.....	.....	.....
Sharpville, Pa.	24.00	24.00	23.50	24.50
Sparrows Point, Md.	25.00	.....	24.50	.....
Swedeland, Pa.	25.00	25.50	24.50	26.00
Toledo, O.	24.00	24.00	23.50	24.50
Youngstown, O.	24.00	24.00	23.50	24.50

†Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:

Akron, O., from Cleveland.....	25.26	25.26	24.76	25.76
Baltimore from Birmingham....	25.58	.....	24.46	.....
Boston from Birmingham.....	26.37	.....	25.87	.....
Boston from Everett, Mass.....	26.25	26.75	25.75	27.25
Boston from Buffalo	26.25	26.75	25.75	27.25
Brooklyn, N. Y., from Bethlehem	27.27	27.77	.....	.....
Brooklyn, N. Y., from Bmghm....	27.05	.....	.....	.....
Canton, O., from Cleveland.....	25.26	25.26	25.76	25.76
Chicago from Birmingham.....	24.22	.....	24.10	.....
Cincinnati from Hamilton, O....	24.07	25.01	24.51	.....
Cincinnati from Birmingham....	23.69	.....	22.69	.....
Cleveland from Birmingham.....	24.12	.....	23.62	.....
Mansfield, O., from Toledo, O....	25.76	25.76	25.26	25.26
Milwaukee from Chicago.....	25.00	25.00	24.50	25.00
Muskegon, Mich., from Chicago,	.....	.....	.....	.....
Toledo or Detroit	26.90	26.90	26.40	27.40
Newark, N. J., from Birmingham....	26.01	.....	.....	.....
Newark, N. J., from Bethlehem....	26.39	26.89	.....	.....
Philadelphia from Birmingham....	25.38	.....	25.26	.....
Philadelphia from Swedeland, Pa.	25.76	26.26	25.26	.....
Pittsburgh district from Neville	.....	.....	.....	.....
Island .....	.....	.....	.....	.....
Saginaw, Mich., from Detroit....	26.25	26.25	25.75	25.75
St. Louis, northern	24.50	24.50	24.00	.....

	No. 2	Malle-	Basic	Besse-
	Fdry.	able		mer
St. Louis from Birmingham.....	†24.12	.....	23.82	.....
St. Paul from Duluth	25.94	25.94	.....	26.44

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., \$28.50, Phila. base, standard and copper bearing, \$29.63.

Gray Forge	Charcoal	
Valley furnace	\$23.50 Lake Superior fur.....	\$27.00
Pitts. dist. fur.	do., del. Chicago	30.04
	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		Chester, Pa., and Baltimore bases (bags) ..	\$45.00
Fire Clay Brick		Domestic dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags) ..	43.00
Super Quality		Domestic dead - burned gr. net ton f.o.b. Chewelah, Wash. (bulk) ..	25.00
Pa., Mo., Ky.	\$64.60		
First Quality			
Pa., Ill., Md., Mo., Ky....	51.30		
Alabama, Georgia	51.30		
Second Quality			
Pa., Ill., Ky., Md., Mo....	46.55		
Georgia, Alabama	41.80		
Ohio			
First quality	43.70		
Intermediate	39.90		
Second quality	35.15		
Malleable Bung Brick			
All bases	\$59.85		
Silica Brick			
Pennsylvania	\$51.30		
Joliet, E. Chicago	59.85		
Birmingham, Ala.	51.30		
Ladle Brick			
(Pa., O., W. Va., Mo.)			
Dry press	\$30.00		
Wire cut	\$28.00		
Magnesite			
Imported dead - burned grains, net ton f.o.b.			

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton....	\$23.50
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	\$19.00
Do., for barge	\$20.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82%, tidewater, duty paid..	\$95.00
Do., Baltimore, base..	95.00
Do., del. Pittsburgh..	99.79
Spiegeleisen, 19-20% dom.	
Palmerston, Pa., spot	30.00
Do., New Orleans....	30.00
Ferrosilicon, 50% freight allowed, c. l.	69.50
Do., less carload	77.00
Do., 75 per cent....	126-130.00
Spot, \$5 a ton higher.	
Silicomani, 2½ carbon..	89.00
2% carbon, 94.00; 1%, 104.00	
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. del.	10.50
Ferrotungsten, stand., lb. con. del. (L.C.L.)....	1.40-1.45
Ferrovandium, 35 to 40% lb., cont.	2.70-2.90
Ferrotitanium, c. l., prod. plant, frt. all., net ton	142.50
Spot, 1 ton, frt. allow., lb.	7.50c
Do., under 1 ton, lb. 8.00-8.50c	
Ferrophosphorus, per ton, c. l., 17-19% Rockdale, Tenn., basis, 18%, \$3 unitage	58.30
Ferrophosphorus, electrolytic, per ton c. l., 28-26% f.o.b. Anniston, Ala., 24% \$3 unitage..	75.00
Ferromolybdenum, stand. 55-65%, lb.	0.95
Molybdate, lb. cont....	0.80
†Carloads. Quan. diff. apply	

Nonferrous

METAL PRICES OF THE WEEK

Spot unless otherwise specified. Cents per pound

Copper				Straits Tin		Lead	Lead	Zinc	Alumi-	Antimony	Nickel
Electro,	Lake,	Casting,		New York	Lead	East		num	Chinese	Cath-	
del. Conn.	del. Midwest	refinery		Spot	Futures	N. Y.	St. L.	St. L.	Spot, N. Y.	odes	
Mar. 20 16.25	16.37½	16.25		63.87¼	62.25	7.00	6.85	7.50	*20.00	17.00	35.00
Mar. 22 16.25	16.37½	16.25		62.12½	61.25	7.00	6.85	7.50	*20.00	17.00	35.00
Mar. 23 16.25	16.37½	16.25		64.00	62.75	6.95	6.80	7.50	*20.00	17.00	35.00
Mar. 24 16.25	16.37½	16.25		65.50	64.00	6.95	6.80	7.50	*20.00	17.00	35.00
Mar. 25 16.25	16.37½	16.25		66.12½	65.00	6.95	6.80	7.50	*20.00	17.00	35.00
Mar. 26 16.25	16.37½	16.25		66.00	64.37½	6.95	6.80	7.50	*20.00	17.00	35.00

*Nominal range 20.00 to 21.00.

MILL PRODUCTS

F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 16.25c, Conn. copper

Sheets	
Yellow brass (high).....	21.25
Copper, hot rolled	23.87½
*Lead, cut to jobbers.....	10.50
Zinc, 100-lb. base.....	12.50-13.00
Tubes	
High yellow brass	24.00
Seamless copper	24.62½
Rods	
High yellow brass.....	17.62½
Copper, hot rolled.....	20.62½
Anodes	
Copper, untrimmied	21.12½
Wire	
Yellow brass (high).....	21.50

OLD METALS

Deal. buying prices, cents lb.

No. 1 Composition Red Brass	
New York	11.75-12.00
Cleveland	12.00-12.50
*Chicago	11.50-12.00
*St. Louis	11.00-11.50
Heavy Copper and Wire	
New York, No. 1....	14.00-14.25
Cleveland, No. 1....	13.50-14.00
*Chicago, No. 1....	13.25-13.50
*St. Louis, No. 1....	13.00-13.50
Composition Brass Borings	
New York	10.87½-11.00
Light Copper	
New York	12.00-12.25
Cleveland	11.50-11.75
*Chicago	11.25-11.75
*St. Louis	11.50-12.00

Light Brass

*Chicago	7.75- 8.00
Cleveland	7.00- 7.25
*St. Louis	7.50- 8.00
Lead	
*New York	5.75-5.87½
Cleveland	5.75- 6.00
*Chicago	5.75- 6.00
*St. Louis	6.00- 6.25
Zinc	
New York	4.00-4.12½
Cleveland	4.00- 4.25
*St. Louis	4.00- 4.50
Aluminum	
Borings, Cleveland..	10.75-11.00
Mixed, cast, Cleve..	14.00-14.25
Clips, soft, Cleve..	15.50-15.75
Mixed, cast, St. L..	14.00-14.50
SECONDARY METALS	
*Brass, ingot 85-5-5-5, lcl, 17.00	
Stand. No. 12 alum. 18.25-19.25	

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS

Baltimore	3.85c
Boston ††	4.05c
Buffalo	3.10c
Chattanooga	3.96c
Chicago (j)	3.85c
Cincinnati	3.55c
Cleveland	3.75c
Detroit	3.93 1/2 c
Houston	3.10c
Los Angeles	4.30c
Milwaukee	3.96c-4.11c
New Orleans	4.20c
New York† (d)	4.12c
Pitts. (h)	3.80c
Philadelphia	4.00c
Portland	4.45c
San Francisco	4.20c
Seattle	4.45c
St. Louis	4.09c
St. Paul	4.10c-4.25c
Tulsa	3.35c

IRON BARS

Portland	3.50c
Chattanooga	3.96c
Baltimore*	3.10c
Cincinnati	3.55c
New York† (d)	3.65c
Philadelphia	4.00c
St. Louis	4.09c
Tulsa	3.35c

REINFORCING BARS

Buffalo	2.60c
Chattanooga	3.96c
Cleveland (c)	2.55c
Cincinnati	3.40c
Houston	3.25c
Los Angeles, c.l.	2.45c
New Orleans*	3.14c
Pitts., plain (h)	2.55c
Pitts., twisted squares (h)	2.85c
San Francisco	2.97 1/2 c
Seattle	4.02 1/2 c
St. Louis	3.99c
Tulsa	3.25c
Young	2.30c-2.60c

SHAPES

Baltimore	3.85c
Boston††	3.92c
Buffalo	3.35c
Chattanooga	4.01c
Chicago	3.75c
Cincinnati	3.65c
Cleveland	3.86c
Detroit	3.95c
Houston	3.10c
Los Angeles	4.30c
Milwaukee	3.86c
New Orleans	4.10c
New York† (d)	3.97c
Philadelphia	3.90c
Pittsburgh (h)	3.70c
Portland (i)	4.45c
San Francisco	4.05c
Seattle (j)	4.45c
St. Louis	3.99c
St. Paul	4.00c
Tulsa	3.60c

PLATES

Baltimore	3.80c
Boston††	3.93c
Buffalo	3.47c
Chattanooga	4.01c
Chicago	3.75c
Cincinnati	3.65c
Cleveland, 1/2-in. and over	3.86c
Detroit	3.95c
Detroit, 3/8-in.	4.15c
Houston	3.10c
Los Angeles	4.30c
Milwaukee	3.86c
New Orleans	4.10c
New York† (d)	4.00c
Philadelphia	3.90c

Phila. floor	4.95c
Pittsburgh (h)	3.70c
Portland	4.25c
San Francisco	4.05c
Seattle	4.25c
St. Louis	3.99c
St. Paul	4.00c
Tulsa	3.60c

NO. 10 BLUE

Baltimore	3.80c
Boston (g)	4.00c
Buffalo	3.72c
Chattanooga	3.91c
Chicago	3.85c
Cincinnati	3.50c
Cleveland	3.91c
Det. 8-10 ga.	3.93 1/2 c
Houston	3.45c
Los Angeles	4.50c
Milwaukee	3.96c
New Orleans	4.10c
New York† (d)	4.07c
Portland	4.50c
Philadelphia	4.00c
Pittsburgh (h)	3.75c
San Francisco	4.30c
Seattle	4.50c
St. Louis	4.39c
St. Paul	4.10c
Tulsa	3.80c

NO. 24 BLACK

Baltimore*†	4.50c
Boston (g)	4.75c
Buffalo	3.35c
Chattanooga*	4.06c
Chicago	4.45c-5.10c
Cincinnati	4.05c
Cleveland	4.66c
Detroit	4.68 1/2 c
Los Angeles	5.05c
Milwaukee	4.56c-5.21c
New York† (d)	4.82c
Philadelphia	4.65c
Pitts.** (h)	4.75c
Portland	5.35c
Seattle	5.35c
San Francisco	5.15c
St. Louis	4.84c
St. Paul	4.75c
Tulsa	4.85c

NO. 24 GALV. SHEETS

Baltimore*†	4.70c
Buffalo	4.10c
Boston (g)	5.30c
Chattanooga*	4.76c
Chicago (h)	5.10c-5.75c
Cincinnati	4.65c
Cleveland	5.31c
Detroit	5.40c
Houston	4.50c
Los Angeles	5.55c
Milwaukee	5.21c-5.86c
New Orleans*	4.49c
New York† (d)	5.47c
Philadelphia	5.30c
Pitts.** (h)	5.40c
Portland	5.90c
San Francisco	5.85c
Seattle	5.90c
St. Louis	5.49c
St. Paul	5.40c
Tulsa	5.20c

BANDS

Baltimore	3.85c
Boston††	4.25c
Buffalo	3.52c
Chattanooga	4.16c
Cincinnati	3.75c
Cleveland	4.16c
Chicago	4.10c
Detroit, 3/8-in. and lighter	4.185c
Houston	3.35c
Los Angeles	4.50c
Milwaukee	4.21c
New Orleans	4.75c
New York† (d)	4.32c

Philadelphia	4.10c
Pittsburgh (h)	4.00c
Portland	4.95c
San Francisco	4.50c
Seattle	4.95c
St. Louis	4.34c
St. Paul	4.35c
Tulsa	3.55c

HOOPS

Baltimore	4.10c
Boston††	5.25c
Buffalo	3.52c
Chicago	4.10c
Cincinnati	3.75c
Detroit, No. 14 and lighter	4.185c
Los Angeles	6.55c
Milwaukee	4.21c
New York† (d)	4.32c
Philadelphia	4.35c
Pittsburgh (h)	4.50c
Portland	6.30c
San Francisco	6.50c
Seattle	6.30c
St. Louis	4.34c
St. Paul	4.35c

COLD FIN. STEEL

Baltimore (c)	4.50c
Boston*	4.65c
Buffalo (h)	3.70c
Chattanooga*	4.86c
Chicago (h)	4.30c
Cincinnati	4.15c
Cleveland (h)	4.30c
Detroit	4.30c
Los Ang. (f) (d)	6.85c
Milwaukee	4.41c
New Orleans	5.10c

New York† (d)	4.57c
Philadelphia	4.53c
Pittsburgh	4.15c
Portland (f) (d)	5.85c
San Fran. (f) (d)	6.80c
Seattle (f) (d)	5.85c
St. Louis	4.54c
St. Paul	4.77c
Tulsa	4.80c

COLD ROLLED STRIP

Boston	3.845c
Buffalo	3.39c
Chicago	3.87c
Cincinnati	3.00c
Cleveland (b)	3.60c
Detroit	3.43c
New York† (d)	3.92c
St. Louis	4.54c

TOOL STEELS

(Applying on or east of Mississippi river; west of Mississippi 1c up.)

Base	62c
High speed	62c
High carbon, high chrome	41c
Oil hardening	24c
Special tool	22c
Extra tool	18 1/2 c
Regular tool	15c
Uniform extras apply.	

BOLTS AND NUTS

(100 pounds or over)	
Discount	
Chicago (a)	65
Cleveland	60-5-5
Detroit	70-10
Milwaukee	65

New Orleans	65
Pittsburgh	65-5

(a) Under 100 lbs., 60 off.

(b) Plus straightening, cutting and quantity differentials; (c) Plus mill, size and quantity extras; (d) Quantity base; (e) New mill classif. (f) Rounds only; (g) 50 bundles or over; (h) Outside delivery, 10c less; (i) Under 3 in.; (j) Shapes other than rounds, flats, fillet angles, 0.15c higher.

On plates, shapes, bars, hot strip and blue annealed quantity extras and discounts as follows: Under 100 lbs., add \$1.50; 100 to 399 lbs., add 50c; 400 to 999 lbs., base; 1000 to 9999 lbs., deduct 10c; over 10,000 lbs., deduct 15c At Cleveland, under 400 lbs., add 50c, with \$1 minimum invoice.

†Domestic steel; *Plus quantity extras **One to 9 bundles; *†50 or more bundles. †New extras apply. ††Base 10,000 lbs., extras on less.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, March 25

Export Prices f. o. b. Ship at Port of Dispatch—(By Cable or Radio)

	British gross tons U. K. ports £ s d	Continental Channel or North Sea ports, metric tons	
		Quoted in dollars at current value	**Quoted in gold pounds sterling £ s d
PIG IRON			
Foundry, 2.50-3.00 Silicon	\$19.15 3 18 6*	\$28.22	3 9 0
Basic bessemer	19.15 3 18 6*	14.31	1 15 0
Hematite, Phos. .03-.05	21.35 4 7 6		
SEMIFINISHED STEEL			
Billets	\$30.50 6 5 0	\$24.54	3 0 0
Wire rods, No. 5 gage	46.97 9 12 6	49.09	6 0 0
FINISHED STEEL			
Standard rails	\$42.70 8 15 0	\$49.09	6 0 0
Merchant bars	2.07c 9 10 0	1.85c	5 0 0
Structural shapes	1.99c 9 2 6	1.80c	4 17 6
Plates, 1 1/4 in. or 5 mm.	2.22c 10 3 9	2.27c	6 2 6
Sheets, black, 24 gage or 0.5 mm.	2.83c 13 0 0	2.87c	7 15 0††
Sheets, gal., 24 gage, corr.	3.65c 16 15 0	3.61c	9 15 0
Bands and strips	2.18c 10 0 0	2.22c	6 0 0
Plain wire, base	2.40c 11 0 0	2.77c	7 10 0
Galvanized wire, base	2.73c 12 10 0	2.96c	8 0 0
Wire nails, base	2.62c 12 0 0	3.14c	8 10 0
Tin plate, box 108 lbs.	\$ 5.26 1 1 6		

British ferromanganese \$95 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	\$19.76 4 1 0(a)	\$18.32 400	\$25.28 750	\$25.34 63
Basic bessemer pig iron	20.13 4 2 6(a)	12.60 275	14.66 435	27.96 (b) 69.50
Furnace coke	5.86 1 4 0	6.29 137	5.73 170	7.64 19
Billets	30.50 6 5 0	27.02 590	23.93 710	38.82 96.50
Standard rails	1.80c 8 5 0	1.64c 780	1.80c 1,200	2.40c 132
Merchant bars	2.07c 9 10 0	1.68c 800	1.46c 975	2.00c 110
Structural shapes	1.99c 9 3 0	1.64c 780	1.46c 975	1.95c 107
Plates, 1 1/4 in. or 5 mm.	2.14c 9 16 9	2.12c 1,010	1.76c 1,170	2.31c 127
Sheets, black	2.62c 12 0 0	2.84c 1,350†	2.19c 1,460†	2.62c 144†
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.05c 14 0 0	4.41c 2,100	2.85c 1,900	6.73c 370
Plain wire	2.56c 11 15 0	2.73c 1,300	2.03c 1,350	3.15c 173
Bands and strips	2.23c 10 5 0	1.92c 915	1.88c 1,250	2.31c 127

*Basic. †British ship-plates. Continental, bridge plates. \$24 ga. 11 to 3 mm. basic price British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel a del. Middlesbrough. b hematite. ††Close annealed. **Gold pound sterling carries a premium of 67.50 per cent over paper sterling.

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†	14.50-15.00
Bos. dock, No. 1, exp.	17.50-18.00
N. Eng. del. No. 1	17.50
Buffalo, No. 1	19.50-20.50
Buffalo, No. 2	18.00-18.50
Chicago, No. 1	21.00-21.50
Cleveland, No. 1	21.00-21.50
Cleveland, No. 2	19.50-20.00
Detroit, No. 1	18.25-18.75
Eastern Pa., No. 1	20.00-20.50
Eastern Pa., No. 2	19.00-19.50
Federal, Ill.	16.25-16.75
Granite City, R. R.	18.00-18.50
Granite City, No. 2	16.25-16.75
New York, No. 1	17.00-17.50
N. Y. dock, No. 1 exp.	17.00-17.50
Pitts., No. 1 (R. R.)	24.50-25.00
Pitts., No. 1 (dlr.)	23.50-24.00
Pittsburgh, No. 2	20.00-20.50
St. Louis, R. R.	18.50-19.00
St. Louis, No. 2	16.75-17.25
Toronto, (dlrs. No. 1)	11.00-12.00
Toronto, No. 2	10.00-11.00
Valleys, No. 1	22.00-22.50

COMPRESSED SHEETS

Buffalo, dealers	17.50-18.50
Chicago, factory	20.50-21.00
Chicago, dealer	19.50-20.00
Cleveland	20.50-21.00
Detroit	19.00-19.50
E. Pa., new mat.	19.50-20.00
E. Pa., old mat.	17.50
Pittsburgh	23.50-24.00
St. Louis	16.00-16.50
Valleys	22.00-22.50

BUNDLED SHEETS

Buffalo	15.00-15.50
Cincinnati, del.	15.00-15.50
Cleveland	16.50-17.00
Pittsburgh	21.00-21.50
St. Louis	13.50-14.00
Toronto, dealers	8.00

SHEET CLIPPINGS, LOOSE

Chicago	14.00-14.50
Cincinnati	14.00-14.50
Detroit	14.00-14.50
St. Louis	13.00-13.50

STEEL RAILS, SHORT

Birmingham	17.00-18.00
Buffalo	24.00-25.00
Chicago (3 ft.)	23.00-23.50
Chicago (2 ft.)	25.00-25.50
Cincinnati, del.	23.00-23.50
Detroit	24.00-24.50
Pitts., 3 ft and less	26.50-27.00
St. Louis, 2 ft. & less	20.00-20.50

STEEL RAILS, SCRAP

Boston district	†17.00-17.25
Buffalo	20.50-21.50
Chicago	21.50-22.00
Cleveland	22.00-22.50
Pittsburgh	24.00-24.50
St. Louis	20.00-20.50

STOVE PLATE

Birmingham	10.50-11.00
Boston district	†11.00-11.50
Buffalo	15.00-16.00
Chicago	12.00-12.50
Cincinnati, dealers	12.50-13.00
Detroit, net	12.00-12.25
Eastern Pa.	16.50-17.00
New York, fdry.	11.75-12.25
St. Louis	12.00-12.50
Toronto, dealers, net	9.50-10.00

SPRINGS

Buffalo	22.50-23.50
Chicago, leaf	25.00-25.50
Chicago, coil	27.00-27.50
Eastern Pa.	25.50-26.00
Pittsburgh	27.50-28.00
St. Louis	22.00-22.50

ANGLE BARS—STEEL

Buffalo	14.50-15.00
Chicago	23.00-23.50
St. Louis	19.50-20.00

RAILROAD SPECIALTIES

Chicago	23.00-23.50
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LOW PHOSPHORUS

Buffalo, billet and bloom crops	22.00-22.50
Cleveland, billet, bloom crops	25.00-26.00
Eastern Pa., crops	26.00-26.50
Pittsburgh, billet, bloom crops	27.50-28.00
Pittsburgh, sheet bar crops	26.50-27.00

FROGS, SWITCHES

Chicago	21.00-21.50
St. Louis, cut	20.00-20.50

SHOVELING STEEL

Chicago	21.50-22.00
Federal, Ill.	16.25-16.50
Granite City, Ill.	16.25-16.50
Toronto, dealers	9.00-9.50

RAILROAD WROUGHT

Birmingham	12.00-14.00
Boston district	†10.00-10.25
Buffalo, No. 1	18.00-18.50
Buffalo, No. 2	19.50-20.50
Chicago, No. 1, net	18.50-19.00
Chicago, No. 2	21.50-22.00
Cincinnati, No. 2	18.50-19.00
Eastern Pa.	22.00
St. Louis, No. 1	15.50-16.00
St. Louis, No. 2	18.00-18.50
Toronto, No. 1 dlr.	15.00

SPECIFICATION PIPE

Eastern Pa.	18.00-18.50
New York	13.50-14.00

RUSHING

Buffalo, No. 1	17.50-18.50
Chicago, No. 1	18.50-19.00
Cincin., No. 1, deal.	12.25-12.75
Cincinnati, No. 2	10.50-11.00
Cleveland, No. 2	14.00-14.50
Detroit, No. 1 new	18.00-18.50
Valleys, new, No. 1	21.00-21.50
Toronto, dealers	9.00

MACHINE TURNINGS

Birmingham	7.00-8.00
Buffalo	12.50-13.50
Chicago	11.50-12.00
Cincinnati, dealers	12.50-13.00
Cleveland	13.50-14.00
Detroit	13.25-13.75
Eastern Pa.	14.00-14.50
New York	†9.00-9.50
Pittsburgh	16.00-16.50
St. Louis	10.50-11.00
Toronto, dealers	8.00-8.50
Valleys	15.50-16.00

BORINGS AND TURNINGS

<i>For Blast Furnace Use</i>	
Boston district	†8.75-9.25

Buffalo	13.50-14.00
Cincinnati, dealers	11.75-12.25
Cleveland	14.00-14.50
Detroit	13.50-14.00
Eastern Pa.	14.00
New York	†9.00-9.50
Pittsburgh	14.50-15.00
Toronto, dealers	8.00-8.50

CAST IRON BORINGS

Birmingham	7.00-7.50
Boston dist. chem.	†9.75-10.00
Boston dist. for mills	†9.25-9.50
Buffalo	13.00-14.00
Chicago	13.50-14.00
Cincinnati, dealers	11.75-12.25
Cleveland	14.00-14.50
Detroit	13.50-14.00
E. Pa., chemical	15.00
New York	†8.50-9.00
St. Louis	10.50-11.00
Toronto, dealers	9.00

PIPE AND FLUES

Cincinnati, dealers	11.50-12.00
Chicago, net	14.50-15.00

RAILROAD GRATE BARS

Buffalo	15.50-16.00
Chicago, net	13.50-14.00
Cincinnati	12.50-13.00
Eastern Pa.	16.50-17.00
New York	†11.50-12.00
St. Louis	12.50-13.00

FORGE FLASHINGS

Boston district	†13.00-13.25
Buffalo	17.50-18.50
Cleveland	19.50-20.00
Detroit	16.50-17.00
Pittsburgh	19.50-20.00

FORGE SCRAP

Boston district	†6.50-7.00
Chicago, heavy	24.00-24.50
Eastern Pa.	17.50-18.00

ARCH BARS, TRANSOMS

St. Louis	19.00-19.50
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AXLE TURNINGS

Boston district	†11.00-11.50
Buffalo	15.50-16.50
Chicago, elec. fur.	21.00-21.50
Eastern Pa.	18.50-19.50
St. Louis	12.50-13.00
Toronto	9.50

STEEL CAR AXLES

Birmingham	18.00-20.00
Buffalo	21.00-22.00
Boston district	†20.00-21.00
Chicago, net	24.50-25.00
Eastern Pa.	28.00-28.50
St. Louis	24.00-24.50

SHAFTING

Boston district	†24.00-25.00
Eastern Pa.	24.00-24.50
New York	†19.50-20.00
St. Louis	15.00-15.50

CAR WHEELS

Birmingham	16.00-17.00
Boston dist. iron	†13.00-13.50
Buffalo, iron	19.00-20.00
Buffalo, steel	22.50-23.50
Chicago, iron	20.50-21.00
Chicago, rolled steel	23.00-23.50

Cincinnati, iron	20.00-20.50
Eastern Pa., iron	22.00-22.50
Eastern Pa., steel	25.00
Pittsburgh, iron	20.00-20.50
Pittsburgh, steel	27.50-28.00
St. Louis, iron	18.00-18.50
St. Louis, steel	21.00-21.50

NO. 1 CAST SCRAP

Birmingham	13.00-14.00
Bos. dist. No. 1 mach.†	15.25-15.75
N. Eng. del. No. 2	15.00-15.50
N. Eng., del. textile	16.50
Buffalo, cupola	18.00-19.00
Buffalo, mach.	19.00-20.00
Chicago, agri. net	14.00-14.50
Chicago, auto	16.25-16.75
Chicago, mach. net	17.50-18.00
Chicago, rall'd net	16.50-17.00
Cinci., mach. cup.	18.00-18.50
Cleveland, mach.	20.00-20.50
Eastern Pa., cupola	21.50-22.00
E. Pa., mixed yard.	18.50-18.75
Pittsburgh, cupola	19.50-20.00
San Francisco, del.	13.50-14.00
Seattle	12.00-13.00
St. Louis, No. 1	14.00-14.50
St. L., No. 1, mach.	15.50-16.00
Toronto, No. 1, mach., net	16.00-17.00

HEAVY CAST

Boston dist. break	†14.00-14.50
New England, del.	15.50-16.00
Buffalo, break	15.50-16.50
Cleveland, break	15.50-16.00
Detroit, No. 1 mach. net	13.50-14.00
Detroit, break	14.50-15.00
Detroit, auto net	16.50-17.00
Eastern Pa.	20.00
New York, break	†15.00-15.50
Pittsburgh	17.50-18.00

MALLEABLE

Birmingham, R. R.	15.00-15.50
New England, del.	18.75
Buffalo	21.00-22.00
Chicago, R. R.	22.50-23.00
Cinci., agri. del	17.50-18.00
Cleveland, rail.	21.50-22.00
Detroit, auto, net	17.50-18.00
Eastern Pa., R. R.	20.00
Pittsburgh, rail	21.00-21.50
St. Louis, R. R.	20.00-20.50

RAILS FOR ROLLING

<i>5 feet and over</i>	
Birmingham	16.50-17.00
Boston	†17.50-18.00
Buffalo	22.00-23.00
Chicago	22.50-23.00
Eastern Pa.	22.00-23.00
New York	†18.50-19.00
St. Louis	20.00-20.50

LOCOMOTIVE TIRES

Chicago (cut)	23.50-24.00
St. Louis, No. 1	20.00-20.50

LOW PHOS. PUNCHINGS

Buffalo	22.50-23.50
Chicago	23.50-24.00
Eastern Pa.	26.00-27.00
Pittsburgh (heavy)	26.00-26.50
Pittsburgh (light)	25.00-25.50

Iron Ore

Lake Superior Ore	
Gross ton, 51½%	
<i>Lower Lake Ports</i>	
Old range bessemer	\$5.25
Mesabi nonbess.	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbess.	5.10

Eastern Local Ore	
<i>Cents, unit. del. E. Pa.</i>	
Foundry and basic	
56.63% con.	9.00-10.00
Cop.-free low phos.	
58-60%	nominal
Foreign Ore	
<i>Cents per unit, f.a.s. Atlantic ports</i>	
Foreign manganiferous ore, 45.55%	

iron, 6-10% man.	*16.00
No. Afr. low phos.	*16.00
Swedish low phos.	nominal
Spanish No. Africa basic, 50 to 60%	*15.50
Tungsten, spot sh. ton unit, duty pd.	\$22.00
N. F., fdy., 55%	7.00
Chrome ore, 48%	
gross ton, c.i.f.	\$24.50-25.00
*Nominal asking price.	

Manganese Ore

<i>(Nominal)</i>	
Prices not including duty, cents per unit cargo lots.	
Caucasian, 50-52%	34.00-36.00
So. African, 50-52%	34.00-36.00
Indian, 50-52%	34.00-36.00

Bars

Bar Prices, Page 84

Pittsburgh — Requirements of diversified sources for hot-rolled bars are holding up well and high rate of mill activity should not be reduced to any great extent in second quarter. Specifications and shipments are considerably ahead of last month. Deliveries range from five to seven weeks. Among a number of good-sized orders last week, large tonnages were awarded producers here by the navy for its 1937 building program. Hot-rolled bars are quoted 2.45c, Pittsburgh, and alloy bars, 3.00c, Pittsburgh.

Cleveland — Demand continues to keep backlogs well extended, despite close to capacity operations. Farm and roadmaking equipment and nut and bolt companies are particularly active, with some seeking to place specifications for third quarter. The market for commercial and cold-drawn alloy steel bars is exceptionally active as machine tool builders and auto partsmakers continue to specify freely at the higher prices.

Chicago—Some bar producers still are accepting business for June delivery, but others are practically sold out for second quarter. Specifications are heavy in all directions though restricted somewhat in the automotive industry by strikes. Farm implement and tractor plants are running near capacity, with no slackening in sight for at least 60 days.

Boston—Commercial steel, alloy and forging bars are active. Pressing for delivery, users are offering considerable tonnage at current prices. Heat treated and alloy bars are especially delayed. Demand by industrial interests, bolt and nut makers and warehouse distributors is especially heavy with mills servicing jobbers and regular customers preferentially.

New York—Commercial bar sellers are scheduled six to seven weeks with one interest booked solid for second quarter. Several railroads, including New York Central, are opening bids on routine second quarter requirements.

Philadelphia — Commercial bar deliveries are being extended, with six weeks appearing to be about the best that can be done. In practically all cases district sellers are submitting specifications to home offices for acceptance, with no definite promises as to deliveries being made. Prices are unchanged.

W. C. Naegel has been appointed chief coach engineer in the new

factory division of White Motor Co., Cleveland. Mr. Naegel has had 26 years experience in the design of all-metal coaches and the past eight years has been working on White buses.

Plates

Plate Prices, Page 84

Philadelphia — Plate deliveries are becoming further extended, as new orders, particularly against identified projects, are placed. District sellers are now generally following the policy of making no definite promises without first referring the individual inquiries to their home offices. The volume of identified work is proving particularly sizable as March 31 is the deadline for acceptance of prices submitted before the recent advance, and more identified work now is coming out for figuring, including considerable railroad equipment tonnage. The largest local car inquiry is that of the Pennsylvania railroad on which bids were opened March 24 under the Clayton act. The original inquiry called for 2300 cars, but indications point to a larger number being bought.

Eastern producers participated in the recent navy openings, with Lukens Steel Co., Coatesville, Pa., receiving one lot of 1082 tons, Alan Wood Steel Co., Conshohocken, Pa., approximately 200 tons, and Bethlehem Steel Co., one lot involving 120 tons. Central Iron & Steel Co., Harrisburg, Pa., was a successful bidder on a small lot. Eastern producers will also figure indirectly on some of the tonnage booked through Philadelphia galvanizing companies, Enterprise Galvanizing Co. successfully bidding on approximately 650 tons and the Penn Galvanizing Co. on a smaller lot. Joseph P. Cattie & Bros., also of this city, were successful bidders with Jones & Laughlin Steel Corp., Pittsburgh, on one schedule, involving 500 tons of black and galvanized sheets.

Jones & Laughlin Steel Corp. participated in other lots and Carnegie-Illinois Steel Corp., Pittsburgh, received substantial amounts.

Pittsburgh — Obtaining plate deliveries from the mills in less than ten weeks is difficult, according to many purchasers. Inquiries generally are good, although some decrease in tank work has been noted in the last ten days. Good-sized tonnages are being taken for railroad equipment and marine work. Large contracts were awarded mills here last week for the navy building program. Export demand con-

tinues at a peak. Bids are scheduled to close March 30 for five to eight oil barges for the St. Louis army engineers.

Cleveland — Deliveries continue at six to ten weeks. Much protective tonnage has been placed, although inquiries have been dull, particularly for tank and boiler work. Carnegie-Illinois Steel Corp. has booked 7000 tons of plates from the American Shipbuilding Co., Cleveland, for the boats for the Pittsburgh Steamship Co., Cleveland. Additional tonnage required for the same purpose is expected to be placed with Carnegie-Illinois Steel Corp. soon.

Chicago—While plate buying for railroad equipment has been light recently, producers have substantial backlogs and purchase of additional freight cars is in prospect. Plate orders from tank builders are fairly heavy but few inquiries for line pipe are actively pending. Plate shipments are at about capacity though production is limited in some instances by lack of sufficient semi-finished material.

Boston—Broad demand for plates at 2.65c, Boston, is heavy. Substantial volume is being bought with delivery promised in four to five weeks and considerable first quarter volume to be shipped next month. Shipyards, bridges, small tank and most boiler shops are buying well and striving to get in current quarter tonnage. A feature in shipyard demand includes another steel trawler of new design taking 300 tons. A large tonnage of plates for delivery to the Boston and Portsmouth, N. H., navy yards, in l.c.l. lots brought out bids of 3.23c, Boston, and 3.25c, Portsmouth (Kittery, Me.).

New York—Protections expiring March 31 against identified projects account for considerable plate tonnage with attractive releases by oil refinery equipment. Bids will be opened April 1 on a United States liner requiring over 16,000 tons of hull steel. The following week bids will be opened on one to three passenger-cargo ships for the Panama Railway Steamship Line, requiring 4500 tons of steel.

San Francisco—Most plate inquiries are in lots of less than 100 tons. To date this year 20,817 tons have been booked, as compared with 47,869 tons for the corresponding period in 1936.

Plate Contracts Placed

310 tons, two derrick barges, Calro, Ill., to Dubuque Boat & Boiler Co., Dubuque, Iowa.

300 tons, gate outlets for Bonneville dam, to unstated interests; Star Iron Works, Tacoma, general contractor.

255 tons, foundation cylinders, Hartford,

Conn., to Tippet & Wood, Phillipsburg, N. J.
250 tons, welded barge for United States engineers' office, Huntington, W. Va., to Chas. Hegewald Co., New Albany, Ind.
180 tons, producer piping, Bridgeton, N. J., to Reiter Engineering Co.
150 tons, digester tanks, Kennebec Pulp & Paper Corp., Augusta, Me., to Portland Corp., Portland, Me.
115 tons, for 1,000,000-gallon standpipe, Kingston, N. Y., to Chicago Bridge & Iron Works, Chicago; bids March 24.
105 tons, tanks, Cities Service Co., Norwalk, Conn., to Norwalk Tank Co., South Norwalk, Conn.
Unstated tonnage, 150,000-gallon naphthalene storage tank, Merrimac Chemical Co., Everett, Mass., to Graver Tank & Mfg. Co. Inc., East Chicago, Ind.

Plate Contracts Pending

1200 tons, eight oil barges, for St. Louis army engineers; bids March 30.
700 tons, 30-inch city water pipe for Spokane; bids April 1.
420 tons, plates and angles, bureau of supplies and accounts, navy department; bids April 2.
300 tons, spillway and structures, headwaters, Connecticut river, Pittsburgh, N. H.; S. J. Groves & Son, Ridgefield, N. J., low.
300 tons, trawler, General Sea-Foods Corp., Boston; bids in.
260 tons, boiler plate steel, bureau of supplies and accounts, navy department; bids March 30, also 575 tons of bars for stock; delivery to several yards.
125 tons, oil barge, Standard Oil Co. of Ohio; bids closed March 22.
100 tons, 36-inch welded steel pipe, East Bay municipal utility district, Oakland, Calif.; bids opened.
100 tons, two boilers, Riverside county hospital, Riverside, Calif.; bids opened.
100 tons, oil storage tank for Seattle Gas Co., Northlake avenue; bids soon.
Unstated tonnage, 1,500,000-gallon elevated waterworks tank, Manitowoc, Wis.; bids closed March 25.

Sheets

Sheet Prices, Page 84

Pittsburgh — Since sheet mills are booked solidly for second quarter, instances have been reported of a few buyers offering premiums on sizes especially hard to obtain. Sellers constantly are running into complications on deliveries and are becoming increasingly cautious on making promises. The current high rate of national activity finds hot and cold strip, full finished, and common black mills operating between 80 and 83 per cent of capacity, jobbing mills at around 60 per cent, and galvanized at 73.

Cleveland — Producers report an active market with shipments in March exceeding both February and January, and comparing favorably with November and December, the best months of last year. In spite of this new business continues to extend deliveries, in some cases

to 23 weeks. Some buyers have specified for third quarter deliveries at prices prevailing at that time. Most mills have hesitated about accepting such tonnage, in any case limiting to average needs.

Chicago—Sheet mills are able to accept little additional business for delivery before July. Backlogs of galvanized and hot-rolled annealed sheets are particularly heavy and settlement of automobile strikes will see a heavier movement to motor car centers. While most consumers have ordered ahead, mills constantly are under pressure for delivery. Prices are steady.

Boston—As in other steel products, premiums for reasonably early delivery have been offered for some grades of sheets. Sellers, however, have refused to take orders on this basis. Some mills are practically out of the market for tonnage unless delivery is left open until late next quarter and in some instances beyond. One New England railroad is buying heavily, copper-bearing sheets, especially. New Hampshire has bids on 100 tons of No. 23 gage license tank stocks.

New York—No diminution in sheet demand prevails and some producers are completely out of the market, others accepting third quarter tonnage at price prevailing at delivery.

Buffalo—Production of sheets is at capacity. The new strip mill is steadily increasing its output. Bethlehem continues to operate its Seneca works on heavy schedules and has no intention of reducing output of that unit, it was said this week in well informed quarters.

Cincinnati—Books of sheet mills for second quarter are nearly filled and the leading interest is accepting orders for delivery at prices then prevailing, for third quarter delivery. Despite slackening in shipments for automobile manufacturers affected by strikes, pressure for material is strong. New prices are firm. Export business, even when premiums are offered, is being refused.

St. Louis—Sheet demand continues active, with pressure for deliveries urgent. In some instances premiums have been offered for prompt shipment. Granite City Steel Co. has established Granite City as a basing point for sheet steel and tin plate, the effect of which will be a reduction of \$1.80 in the delivered price to St. Louis.

Seattle—Jobbers report strong demand for light sheets for construction and repair jobs, a large turnover being reported notwithstanding recent price increases. Stocks are short and deliveries uncertain, three to four months forward.

Pipe

Pipe Prices, Page 85

Pittsburgh—March has been unusually active from the standpoint of shipments of tubular goods, largely the result of the price announcement which was made on March 5. While some decline in business is anticipated early in April, sellers say it will not be as great as might be expected because many buyers were unable to protect themselves as fully as they desired. Standard pipe and oil country goods are unusually strong, deliveries on the latter ranging around four weeks, while on seamless, mechanical, and boiler tubes, shipments are much more extended. Several large line pipe projects will be in the open soon.

Cleveland — Jobbers report little change in stock turnover, although some improvement is expected during April. Mills report backlogs of four or five weeks, with but little headway made against order backlogs. Cast iron pipe requirements continue dull, with little new work in sight outside of PWA projects.

Chicago—Cast pipe inquiries are slow and recent price increases are expected to result in some delays in municipalities' obtaining additional appropriations to cover higher cost of proposed projects. Chicago has ordered 2355 tons of 6, 8 and 12-inch pipe from Glamorgan Pipe & Foundry Co. and Alabama Pipe Co. Steel pipe demand is moderately heavier, with mechanical tubing moving well.

Boston — Steel and cast pipe inquiry and buying are substantially heavier, notably from utilities. Cast pipe foundries are operating at higher schedules. Deliveries on cast specials is about five weeks. A steady demand prevails for wrought pipe which has been advanced \$8 to \$18 a ton.

New York—Cast pipe buying is heavier, about 6500 tons being placed in the east, including 3000 tons for New York yard stocks distributed among four foundries. An additional New York tonnage is expected out in about a month. Foundries have again increased operations. There is a lull in new cast pipe inquiry. Utilities, in some instances, are showing more interest in supplies, both cast and steel, and steel pipe requirements for general construction are larger.

Buffalo—There is active inquiry for pipe in the nearby gas and oil fields for delivery in the next four months. Important line and tank construction is planned by many producers. In each such develop-

ment there will be attendant piping and fittings purchases of large size. Niagara Falls has a large water main development and numerous similar projects are pending.

San Francisco — Inquiries are more numerous although the tonnages involved are not particularly large. United States Pipe & Foundry Co. was awarded the biggest contract, 1090 tons for the East Bay municipal utility district, Oakland, Calif. No award has yet been made on 3500 tons for Los Angeles.

Seattle—Conditions are unchanged in the cast iron pipe market, with buying in small lots, and no large tonnages pending. Business pending includes 550 tons at Tacoma, 100 tons at Hoquiam, Wash., 125 tons at Yakima and 120 tons at Medical Lake, Wash. Juneau, Alaska, will take bids soon for replacements estimated at \$8000. Kalispell, Mont., is planning a \$23,000 project with WPA aid. Puyallup, Wash., has awarded 7250 feet of cast iron pipe to Pacific Water Works Supply Co., Stattle.

Cast Pipe Placed

2900 tons, 16-inch and under, New York yard stocks, divided; 1200 tons to R. D. Wood & Co., Florence, N. J.; 700 tons, United States Pipe & Foundry Co., Burlington, N. J.; 600 tons, Donaldson Iron Works, Emaus, Pa., and 400 tons to Warren Foundry & Pipe Co., Phillipsburg, N. J.; bids March 16.

2355 tons, 6, 8 and 12-inch, Chicago; 2000 tons of 12-inch to Glamorgan Pipe & Foundry Co., Lynchburg, Va., remainder to Alabama Pipe Co., Anniston, Ala.

1300 tons, 6 and 8-inch, Stony Brook water district, Brookhaven, N. Y., to R. D. Wood & Co., Florence, N. J.

1200 tons, 16-inch and under, Yonkers, N. Y., United States Pipe & Foundry Co., Burlington, N. J.

1090 tons, 4 to 12-inch, East Bay municipal utility district, Oakland, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

300 tons, 6 and 16-inch, Meriden, Conn., procurement division, treasury department, to Warren Foundry & Pipe Co., Everett, Mass.

275 tons, 8-inch, Buffalo, United States Pipe & Foundry Co., Burlington, N. J.

100 tons, 60-inch, Los Angeles county sanitation district, Los Angeles, to United States Pipe & Foundry Co., Burlington, N. J.

Cast Pipe Pending

500 tons, standard cast pipe and specials, filtration plant, Lawrence, Mass.

440 tons, 6 to 20-inch, East Bay municipal utility district, Oakland, Calif.; bids March 31.

192 tons, 4 and 6-inch, South Gate, Calif.; bids rejected.

130 tons, 8 to 14-inch, Grass Valley, Calif., purchased sheet metal pipe.

108 tons, 4 to 12-inch, South Gate, Calif.; bids rejected.

100 tons, 6 and 8-inch, Olympia, Wash.; American Cast Iron Pipe Co., Birmingham, Ala., low.

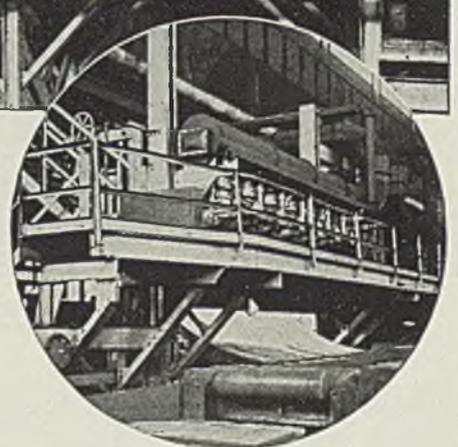
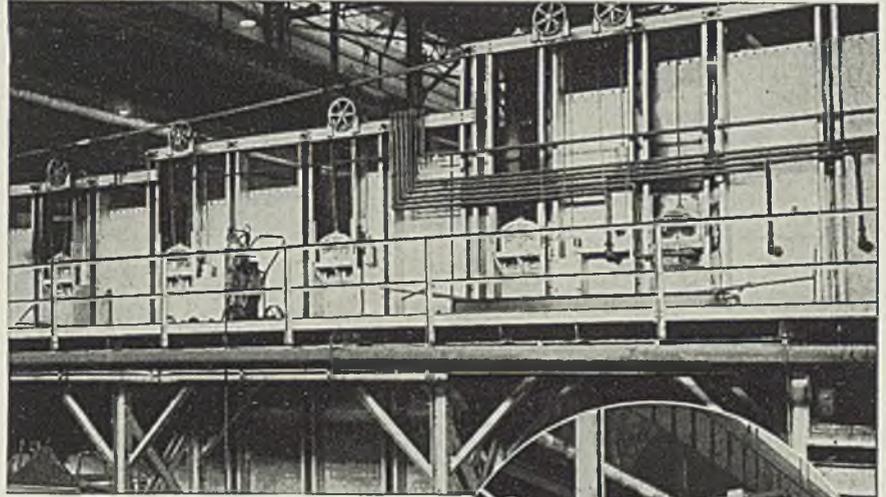
100 tons, 6 and 8-inch, Sacramento, Calif.; bids April 1.

Unstated tonnage, 4200 lineal feet of 6-inch, De Perre, Wis.; bids close March 30.

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Armstrong's

HIGH TEMPERATURE INSULATION

Transportation

Track Material Prices, Page 85

Renewed activity in railroad buying is apparent, with nearly 10,000 cars under inquiry and other lots under consideration. The largest car inquiry is by the Southern railroad for 5600 cars for its subsidiary, Cincinnati, New Orleans & Texas.

Central of Georgia has placed 600 box cars and Canadian Pacific

30 passenger cars to its own shops. The latter road has also distributed 29,590 tons of rails to Canadian mills.

Rail production at Chicago is at practical capacity though output is reduced below theoretical capacity because special heat treatment being given a large proportion of the rails rolled. While there is no new business in rails some additional purchases are looked for around midyear. Light rail demand from domestic users is fair while there is a heavy call for export.

Rail Orders Placed

Canadian Pacific, 29,590 tons, including 20,800 tons of 100-pound rail and 8710 tons of 80-pound rail, with 14,200 tons of 100-pound rail going to the Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont., and 6680 tons of 100-pound rail to the Dominion Steel & Coal Corp. Ltd., Sydney, N. S., and the remaining 8710 tons of 80-ton rail going to the Algoma Steel Corp.

Car Orders Placed

Canadian Pacific, 30 passenger cars, to its own Angus shops, with underframes to be supplied by the National Steel Car Corp. Ltd., and five mail and express cars and two baggage and express cars to the National Steel Car Co.

Central of Georgia, 500 box cars to Pullman-Standard Car Mfg. Co., Chicago and 100 to American Car & Foundry Co., New York.

Car Orders Pending

Chesapeake & Ohio, 1000 box cars. Cincinnati, New Orleans & Texas Pacific, a subsidiary of the Southern Railway, 5600 freight cars, including 2500 steel sheathed box cars and 500 steel sheathed auto cars, all of 40 tons capacity, 1250 all-steel high side gondolas and 250 all-steel low side gondolas and 1100 all-steel hopper cars, all of 50 tons capacity, bids asked; in last week's issue it was noted that the Southern Railway system was contemplating the purchase of approximately 5000 cars.

Erle railroad, 1000 box cars.

Lehigh & New England, 100 gondolas and 75 cement cars.

Pacific Fruit Express, 500 refrigerator cars.

Seaboard Airline, 500 to 1000 box cars.

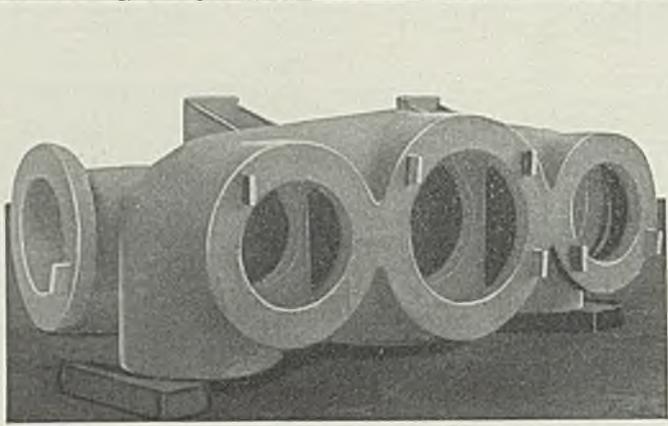
Strip

Strip Prices, Page 85

Pittsburgh—With deliveries ranging around five weeks on hot strip and seven to eight weeks on cold, high rate of mill activity in this district appears assured for weeks. One producer estimates that around 20 per cent of his backlog is at the higher prices and others report that buying at new levels is well maintained, even better than expected. Consumer demand encountered by many manufacturers has made it difficult to estimate requirements accurately, with result that they are forced to re-enter market sooner than they anticipated, increasing pressure upon sellers. Hot-rolled strip is 2.40c, Pittsburgh, and cold strip, 0.25 carbon and under, 3.20c, Pittsburgh and Cleveland.

Cleveland—Mills report little let-up in new business and in some cases the backlogs have been still further extended. A few buyers have covered as far as September, at prices prevailing at delivery. However, this is by no means general as most mills are limiting commitments to second quarter. Most

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of the tonnage placed at old prices is expected to be shipped before the end of the month.

Chicago—Backlogs of both hot and cold-rolled strip are increasing despite near-capacity shipments. Producers generally are unable to deliver cold-rolled strip within 60 days except on occasions when new orders fit in current rolling schedules. Automotive consumption still is curtailed by strikes but no let-down by other users is apparent.

Boston—Cold-rolled strip buying is active for second quarter delivery as mills, operating practically at capacity, seek to ship material taken at lower prices as early next month as possible. Demand is from a widely diversified range of consumers. Although not pressing for business, most producers are taking volume close to current rate of production.

New York—Sellers of hot and cold-rolled narrow strip are booked ahead about eight weeks. Possible early auto strike settlement may tighten hot strip delivery by lifting of suspensions.

Wire

Wire Prices, Page 85

Pittsburgh—As quarter nears end, specifications for wire and wire products continue heavy. Requirements for both bright and galvanized are exceptionally good. Buying of nails at new prices, however, has been light. Most mills are encountering great pressure for deliveries. Export situation continues strong with advantageous prices offered.

Cleveland—Specifications continue strong, as consumers continue to order heavily for delivery as soon as possible. Backlogs of mills are extended well into May and on some products nothing is left for second quarter delivery. Shipments of merchant products to the farming trade has been much heavier than at any time in the last few years.

Chicago—Wire and wire products backlogs still are expanding in spite of shipments comparable to best movement of previous years. Demand is brisk, both in merchant products and in manufacturers' wire. Material is moving promptly into consumption with little speculative tonnage on producers' books. Pressure for delivery is insistent and only slackening in consumption is what curtailment has resulted from automotive strikes. Prices are firm on new business.

Boston—Wire orders continue heavy with buying at 3.00c, Worcester, for manufacturers' wire for second quarter delivery, mounting. Spring wire and specialties are also

active. Merchant wire products are slightly less brisk. Recent buying of nails has also declined, following heavy purchasing a few weeks ago.

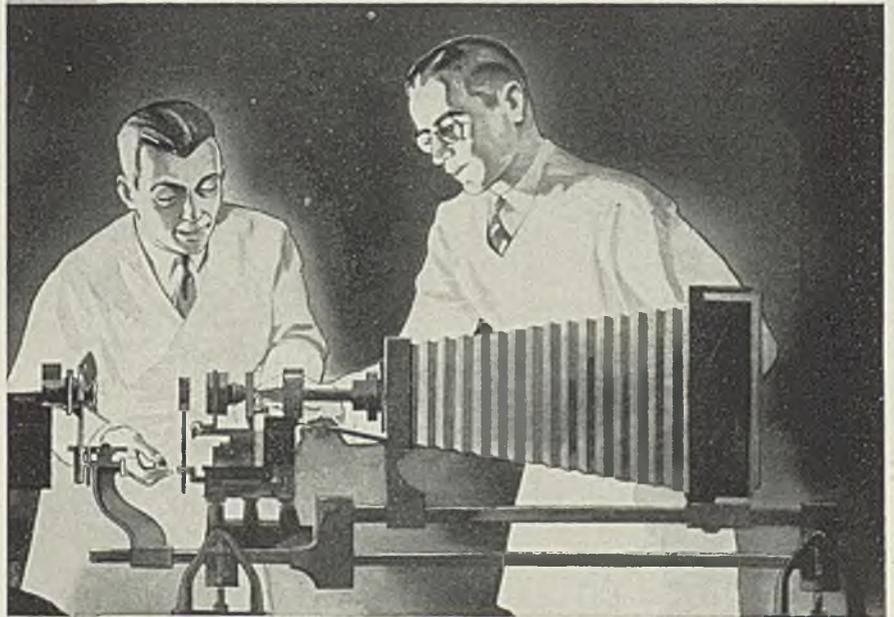
Shapes

Structural Shape Prices, Page 84

New York—With most large pending contracts placed during the

last 10 days, active requirements being figured are smaller. General contractor buyers are covering needs on specified work promptly after receiving formal awards. Another World's Fair building to house New York City exhibits at the 1939 event and costing \$1,000,000 is expected out shortly. Revision of plans for a Sixth avenue subway section, 3700 tons, to have closed March 26, caused temporary withdrawal of the inquiry. Grade crossing bonds aggregating \$15,000,000

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have been sold by New York state.

Boston—Including two bridges tentatively placed, structural contracts approximate 7000 tons in New England. Most fabricators are active with fair backlogs, although a good part of current contracts have gone to Pennsylvania shops. Inquiry is fair with more private industrial work out.

Philadelphia—With the deadline on a number of identified projects figured at first quarter prices expiring at the end of this month, fabricators are in receipt of considerable

tonnage. Projects in this district are not large but are fairly numerous, and further substantial work is in prospect, with specifications due April 1 on two large schools in this city and a little later on the proposed court house on Ninth and Market streets, which will require at least 5000 tons of shapes.

Pittsburgh—Shape awards and inquiries continue heavy. A mill building at Richmond, Ind., 1250 tons, has been taken by International Steel Co. Pending awards include 1300 tons for the superstruc-

ture for a four-span I-beam bridge in Juniata county, Pennsylvania.

Cleveland — Inquiries have declined somewhat since the price advance. To some the lapse was less than expected. The encouraging feature of present outlook is that fully half the present demand is from private sources, although still in relatively small tonnages. Little headway is being made against backlogs with delivery delayed four to six weeks.

Chicago — Awards of fabricated structural steel are light but considerable is accumulating in pending business. Shipments of plain material continue heavy, both to fabricators and freight car builders. Inquiries include 1700 tons for an industrial plant at Alcoa, Tenn.

San Francisco—Structural market was active with 7069 tons reported placed, bringing the total to 65,459 tons, compared with 34,520 tons last year. Bethlehem Steel Corp. took 5600 tons for a shop building at Sacramento, Calif., for the government air depot.

Seattle—New projects include two high pressure gate assemblies and pier nose outlet works for the Unity dam, Burnt river project, Oregon, bids by reclamation bureau, Denver, April 1.

Behind the Scenes with STEEL

Bloodless Tuesday

HAVING just missed out on the Russian revolution, we went up to Detroit last week to take part in what they were saying was to be the 1937 model American overthrow by the proletariat. Scheduled to pop late in the afternoon, we stopped off at the office of a fellow we know in one of the downtown skyscrapers. Except for this fellow, the office was deserted, the door locked tight. Stenographers had fled home in fright. Even our friend seemed to be wearing a furtive, hunted look.

We visited a few other nearby buildings and found conditions the same. The capitalists had fled to their homes, leaving their lofty strongholds to the mercy of the coming mob. It was while we were on the 35th floor of one of them, someone took up the shout, "Here they come." But the promised 175,000 had dwindled to 15,000—all loyal unionists. Made quite a picture, streaming down Woodward avenue in the soft spring sunshine—most certainly not a revolutionary sunshine.

To be a good unionist, you have to know a good many different verses to *Hinky-Dinky Parlez-Vous* and *Glory, Glory Hallelujah*, and be able to rip off some choice boos and raspberries when anyone mentions the name of the police commissioner. For the police, you see, are butchers controlled by the money barons, paid to brutalize and slug the innocent workingman.

Oh, by the way, we almost forgot to report that the revolution was postponed finally. The massed mob was getting hungry, and anyway most of them wanted to get home to hear Amos 'n' Andy. Nobody got hurt, not even the motorcycle cop who was tossed off his machine in a collision with a motorist who mistook the copper for a parking space.

To the Steppes

YOU probably know of the famous Rust brothers whose recent mechanical cotton picker so excited the scientific and economic world. Well, M. D. Rust, one of the brothers, is an ardent reader of STEEL and not so long ago set out on a trip to Russia where he is going to see whether he can interest the soviet in his invention. Naturally, he wants to keep

posted on developments in American industry while he is away, so he entered a special subscription to STEEL which will be sent each week to his Russian address.

A good many copies embark for the USSR each week, incidentally; the Russians, it seems, are indefatigable searchers into the mechanics of American industry, and they spend long hours poring over pages of STEEL and translating our terse sentences into the mother tongue.

Then, too, there are a number of Russian visitors in this country who apparently scan our pages carefully every week. We hear from one of them occasionally—a halting, broken sort of letter wanting to know "please if we will be so kindly to explaining who is making egg shell grinder which is prints on pages 44."

Opening the Hearth

FIRST portion of four segments describing the modern basic open hearth process is dished up on page 38. Continuing in our next and next and next, the story will cover from lizzard to lizzard of the most important steel making process and is written to interest you and you and the office force as well.

Taiulour

WE PASS a sign every morning coming to this office which vaguely disturbs our matutinal stroll, but we don't know what is to be done about it. The placard is just a smallish affair which reads "PRESSING AND AULTERING DONE DOWNSTAIRS".

Sometime we mean to have a talk with the proprietor about his "aultering" department, and then we can report further on the matter.

Welcomat

LATCH strings are out at the new Washburn Wire plant, up there in the shadow of Triborough bridge. And on page 32 the company has a map for the benefit of the hinterlanders, complete even to the cars going through the Holland Tunnel. We are in that second jalopy heading for the great outdoors. Yoo hoo!

—SHRDLU

Shape Contracts Placed

5600 tons, shop building, government air depot, Sacramento, Calif., to Bethlehem Steel Corp., Alameda, Calif.
3610 tons, bridge over Connecticut river, Gill-Montague, Mass., to Phoenix Bridge Co., Philadelphia, through Daniel O'Connell Sons Inc., New York.
1250 tons, mill building, for the Wayne Works, Richmond, Ind., to International Steel Co., Evansville, Ind.
1175 tons, fertilizer plant, Farmers' Exchange, Cambridge, Mass., to New England Structural Co., Everett, Mass.; M. Spinelli & Sons, Boston, general contractor.
1100 tons, addition to store building, for Rike-Kumler Co., Dayton, O., to Ingalls Iron Works, Birmingham, Ala.
1100 tons, Hockey rink, Cleveland, to Fort Pitt Bridge Works, Pittsburgh.
1000 tons, various buildings, Fremont, O., for H. J. Heinz Co., Pittsburgh, to American Bridge Co., Pittsburgh.
965 tons, cadet armory, West Point Military academy, New York, to American Bridge Co., Pittsburgh; Edmund

Shape Awards Compared

	Tons
Week ended March 27.....	28,151
Week ended March 20.....	33,013
Week ended March 13.....	35,780
This week, 1936.....	10,988
Weekly average, 1936.....	16,332
Weekly average, 1937.....	27,803
Weekly average, February.....	22,141
Total to date, 1936.....	274,337
Total to date, 1937.....	361,434

J. Rappoli Co. Inc., Cambridge, Mass., general contractor.

915 tons, bridges, Virginian Railroad Co., to Virginia Bridge Co., Roanoke, Va.

810 tons, stack house, Great Lakes Steel Corp., Detroit, to Lackawanna Steel Construction Corp., Buffalo.

800 tons, power house, Dresden, N. Y., placed through the Utilities Purchasing & Supply Co., Reading, Pa., with the Belmont Iron Works, Eddystone, Pa.

800 tons, building, for Louisiana state university, Baton Rouge, La., to Bethlehem Steel Corp., Bethlehem, Pa.

782 tons, repairs to Milwaukee railroad bridge, Minneapolis, to Minneapolis-Moline Power Implement Co., Minneapolis.

600 tons, viaduct, West Side elevated highway, 186th to 191st street, New York, to American Bridge Co., Pittsburgh; Duffy Construction Corp., New York, general contractor.

575 tons, building, for Crown Can Co., St. Louis, to Bethlehem Steel Corp., Bethlehem, Pa.

520 tons, building, for Montgomery-Ward & Co., Dearborn, Mich., to Whitehead & Kales, Detroit.

465 tons, bridge approaches, Clinton, Iowa, to Clinton Bridge Works, Clinton, Iowa.

420 tons, alterations to foundry building, for Link Belt Co., Chicago, to Reuter Bros., Chicago.

360 tons, addition, Benson & Rixon Co., Chicago, to Carnegie-Illinois Steel Corp., Chicago.

347 tons, bridge, over Erie railroad, Lake county, Indiana, to Bethlehem Steel Corp., Bethlehem, Pa.; through J. C. O'Connor & Sons, Fort Wayne Structural, Fort Wayne, Ind.

340 tons, grade crossing, Washington avenue, New Market, N. J., to American Bridge Co., Pittsburgh.

295 tons, store, Springfield, Mass., to Lehigh Structural Steel Co., Allentown, Pa.

275 tons, gates for Bartlett dam, Arizona, to unnamed interest.

267 tons, four bridges in Cheyenne and Lincoln county, Colorado, to unnamed interest.

265 tons, state highway bridge FAP-327-B&C, Ellis county, Oklahoma, to J. B. Klein Iron & Foundry Co., Oklahoma City, Okla.

255 tons, 135-foot turntables, Northern Pacific railroad, to American Bridge Co., Pittsburgh.

250 tons, state highway bridge FAP-843-A, DeWitt county, Texas, to Illinois Steel Bridge Co., Jacksonville, Ill.

240 tons, bridge, Lehigh Valley railroad, Mendon, Monroe county, New York, to Phoenix Bridge Co., Phoenixville, Pa.

235 tons, three bridges, Larimer county, Colorado, to unnamed interest.

235 tons, Esquire theater, Chicago, to New City Iron Works, Chicago.

225 tons, building No. 12, Hilton Davis Chemical Co., Cincinnati, to Joseph T. Ryerson & Son Inc., Chicago.

200 tons, addition, Du Pont interests, Carneys Point, Pa., to Belmont Iron Works, Eddystone, Pa.

200 tons, plant addition, International Silver Co., Meriden, Conn., to Austin Co., Cleveland.

185 tons, dormitory D, Notre Dame university, South Bend, Ind., to Mississippi Valley Structural Steel Co., Decatur, Ill.

170 tons, steel stringer bridge, flood replacement project No. APFR 33, Ludlow-Wilbraham, Mass., to Bethlehem Steel Corp., Bethlehem, Pa.; Mario Pandolf, general contractor.

162 tons, two gates for Caballo dam, New Mexico, to unnamed interest.

155 tons, Goodall factory, Danville, Ky., to Bedford Foundry & Machine Co., Bedford, Ind.

150 tons, warehouse, for Chicago Bridge & Iron Co., Hillside, N. J., to American Bridge Co., Pittsburgh.

150 tons, Aquacade building, Cleveland exposition, to Kilroy Structural Steel Co., Cleveland.

150 tons, building for Gladding, McNear & Co., Los Angeles, to Consolidated Steel Corp., Los Angeles.

130 tons, factory building, Perfection Vault Co., Gallon, O., to Ingalls Iron Works Co., Birmingham, Ala.

120 tons, building, University of Indiana, Bloomington, Ind., to Central States Bridge & Steel Co., Indianapolis.

115 tons, tower construction, Atlantic Refining Co., Point Breeze, Pa., to the Lehigh Structural Steel Co., Allentown, Pa.

115 tons, veneer plant, North West Veneer & Ply Co., Gladstone, Mich., to American Bridge Co., Pittsburgh.

115 tons, building, Kimberly, Wis., to Vulcan Mfg. Co., Fond du Lac, Wis.

105 tons, soy bean plant, Champaign, Ill., to Mississippi Valley Structural Steel Co., Decatur, Ill.

100 tons, building alterations, 120 East Thirty-fourth street, New York, to Drier Structural Steel Co., New York; through Sunlight Realty Corp., New York.

100 tons, alterations to Pennsylvania railroad passenger station, Trenton N. J., to Keystone Structural Co., Trenton, N. J.; through George A. Fuller Co., New York.

Unstated tonnage, 100-ton trolley un-



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loading crane, for power house, Pickwick Landing dam TVA, Knoxville, Tenn., to Harnischfeger Corp., Milwaukee.

Shape Contracts Pending

- 3800 tons, express highway viaduct, city structure No. 7, for New York Central railroad, New York.
- 2250 tons, bridges for Easy Bay Facilities yards, San Francisco-Oakland bridge project, Oakland Calif.; bids March 31.
- 1900 tons, state highway bridge over Kansas river, Topeka, Kans.
- 1300 tons, superstructure of a four-span I-beam bridge, Juniata county, Pennsylvania; bids to state highway department, Harrisburg, Pa., April 2.
- 1300 tons, state bridge, Port Royal, Pa.; bids April 2.
- 559 tons, dam, Gunthersville, Ala.
- 545 tons, tram rail supports, Memphis, Tenn.
- 525 tons, reconstruction of rockers, pins and other repairs, Manhattan bridge; bids April 2, department of plants and structures, New York.
- 500 tons, addition to Haskell exchange building, for Southwestern Bell Telephone Co., Dallas, Tex.
- 500 tons, Potomac-Decatur telephone exchange building, Washington.
- 500 tons, building, Kingsport, Tenn.
- 428 tons, eight-span continuous I-beam bridge, Lycoming county, Pennsylvania; bids to state highway department, Harrisburg, Pa., April 2.
- 400 tons, factory building, for Olds Motor Works, Lansing, Mich.

- 400 tons, Pine Creek bridge near Victor, Idaho; bids April 1.
- 350 tons, bridges, various locations in Missouri and Indiana, for Wabash railway.
- 310 tons, crossing, Green River, Wyo.; bids opened.
- 304 tons, through steel truss bridge, Westmoreland-Indiana counties, Pennsylvania; Westwood Construction Co. Inc., Pittsburgh, low at \$78,994.75 on general contract.
- 300 tons, can cooling building, for Thomas F. Gibson, Camden, N. J.
- 275 tons, plate girder highway underpass, Lycoming county, Pennsylvania; T. M. Flanagan, Reading, Pa., low at \$201,420.25 on general contract.
- 250 tons, manufacturing and storage building, for Columbia Mills Inc., Minette, N. Y.
- 250 tons, repairs to bridge over Mississippi river, for Chicago, Milwaukee, St. Paul & Pacific railroad, Minneapolis.
- 250 tons, bridge over Atlantic Coast Line railroad, Elm City, N. C.
- 215 tons, gates for Alamogorda dam, Carlsbad, New Mex. and Bull Lake dams, Riverton, Wyo.; bids opened.
- 200 tons, five overhead traveling cranes, Metropolitan Water district, Los Angeles, spec. 201; bids April 13.
- 130 tons, state bridge, Yarmouth, Me.
- 110 tons, filtration plant, Lawrence, Mass.
- Unstated, high pressure gate assemblies and outlet works for Unity dam, Burnt river project, Ore.; bids to reclamation bureau, Denver, April 1.
- Unstated, six sluice gates and 137 valves for water system, Everett, Wash.; bids April 2.

Reinforcing

Reinforcing Bar Prices, Page 85

Pittsburgh—Inquiries for concrete reinforcing cars have increased recently and include some large tonnages for private projects. J. A. Utley, Detroit, is general contractor for the new tire plant for Ford Motor Co., River Rouge, Mich., 859 tons. Two filtration plants, one at Omaha, Nebr., involving 850 tons, and one at Minneapolis, involving 650 tons, are pending.

Cleveland — Awards are limited to relatively small tonnages from private sources. Considerable state work is expected soon, as more favorable weather nears. Mills are able to furnish delivery within two to three weeks, by far the best that can be claimed for any steel product. Prices are firm at the advanced figures, although no real test has been offered.

Chicago—Reinforcing bar orders are less active following a flurry in buying when prices were advanced. A number of public and private building projects are pending, however, and upturn in bookings is in early prospect. In the meantime producers and distributors have sufficient backlogs to support active shipments during the next 30 days. Prices are steadier.

Boston—Reinforcing bar buying in small lots is more active. Bridges and public works account for the bulk of inquiry. Recently advanced prices are still untested by substantial volume bid since the \$6 per ton increase.

New York—Reinforcing steel buying and inquiry is light, most tonnage projects bid during the last month and generally protected before the price advance, having been placed. As a result the 2.88c, delivered, New York, price on billet bars has not yet been subject to much test on tonnage. Early resumption of inquiry for New York state bridges, highways and grade crossings is expected.

Philadelphia—Reinforcing bar buy-

New
13oz. WELDIT

MODEL W
WELDING
TORCH

with BUILT-IN
Automatic
GAS AVER



SAVES fuel—reduces welding cost—eliminates idle flame hazards. As operator grasps handle of torch placing thumb on lever in natural position, full welding flame is instantly on. Release thumb, and automatically flame is reduced to pilot size. No re-lighting or re-adjusting flame between welds. Weighs only 13 ounces, no mechanism in handle, fuel control valves are conveniently located in front of torch handle. Actual savings will soon pay for torch.

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Test this
WELDING
TORCH
★ Free ★
FOR TWO WEEKS
IN YOUR PLANT

642 BAGLEY AVE. DETROIT, MICH.

Concrete Awards Compared

	Tons
Week ended March 27.....	3,878
Week ended March 20.....	4,786
Week ended March 13.....	4,997
This week, 1936.....	1,738
Weekly average, 1936.....	6,005
Weekly average, 1937.....	3,979
Weekly average, February.....	3,877
Total to date, 1936.....	103,103
Total to date, 1937.....	51,721

ing is in small lots, although one order for 600 tons for further work for Gongoleum-Nairn Inc., Marcus Hook, Pa., has been awarded. The total tonnage will be augmented by much institutional construction, for which the state has appropriated \$65,000,000. On new work now being figured more strength is being shown in prices than at any time in the past two years.

San Francisco—Demand for reinforcing bars continues to hold up well, although awards are not particularly large, aggregating only 1115 tons and bringing the total for the year to 19,270 tons as compared with 69,813 tons last year. Concrete Engineering Co. took 500 tons for the bureau of reclamation for the Bartlett dam in Arizona.

Seattle—New business is conspicuously absent except for minor construction jobs. Northwest state highway departments are drafting plans for early bids and demand for reinforcing is expected to be materially stronger within a month. Business pending is of small proportions.

Reinforcing Steel Awards

700 tons, building, for Unversal Atlas Cement Co., Hudson, N. Y., to Concrete Steel Co., New York.

600 tons, approximately, further plank construction for Gongoleum-Nairn Inc., Marcus Hook, Pa., awarded through the Turner Construction Co., New York, to the Bethlehem Steel Corp., Bethlehem, Pa.

500 tons, bureau of reclamation, for Bartlett dam, Arizona, to Concrete Engineering Co., Omaha, Nebr.

450 tons, bureau of reclamation, Denver, schedule 42631-A-1, to Concrete Engineering Co., Omaha, Nebr.

275 tons, regional market building, Syracuse, N. Y., to Joseph T. Ryerson & Son Inc., Chicago.

250 tons, postoffice, Peoria, Ill., to Concrete Engineering Co., Chicago.

173 tons, filtration plant, Braddock, Pa., to Lind Co., Pittsburgh; Lowensohn Co., Cleveland, general contractor.

155 tons, viaduct, west side elevated highway, 185th-191st streets, New York, to Carroll-McCreary & Co. Inc., Long Island City, N. Y., Duffy Construction Corp., New York, general contractor.

140 tons, high school, Lemoore, Calif., to Kyle & Co., Fresno, Calif.

135 tons, Metropolitan sewer, Medford, Mass., to Morrison-Stevens Co., Boston.

100 tons, approximately, sewer construction, Philadelphia, through Lombardi Bros., that city, to the Truscon Steel Co., Philadelphia.

100 tons, Fox & Co., store, Hartford, Conn., to Truscon Steel Co., Youngstown, O.

100 tons, school, Lindsay, Calif., to unnamed interest.

100 tons, theater, Brawley, Calif., to unnamed interest.

100 tons, bridge, over Erie railroad, Lake county, Indiana, to Holliday & Co., Indianapolis; through J. C. O'Connor & Sons, Fort Wayne Structural, Fort Wayne, Ind.

Reinforcing Steel Pending

859 tons, tire plant, for Ford Motor Co., River Rouge, Mich.; J. A. Utley, De-

troit, general contractor.
850 tons, filtration plant, Omaha, Nebr.
650 tons, filtration plant, Minneapolis.
380 tons, city waterworks department, Minneapolis; bids April 5.
340 tons, building, for Sears, Roebuck & Co., Detroit.
300 tons, Westside Elevated highway, section 153 to 160th street, New York.
211 tons, building, for Grocery Co., Grand Rapids, Mich.
200 tons, plant, National Portland Cement Co., Broadhead, Pa., M. A. Long, Philadelphia, low on the general contract.
200 tons, hospital for chronic diseases, Welfare Island, New York; bids March 25.
150 tons, sewer section, Metropolitan district, Hartford, Conn.; George Evans

Co., Warren, O., low.
149 tons, mausoleum, Holy Cross cemetery, San Francisco; bids opened.
138 tons, crossing near San Onofre, San Diego county, California; bids April 8.
125 tons, building, for Unversal Gear Works, Detroit.
111 tons, superstructure of four-span I-beam bridge, Juniata county, Pennsylvania; bids to state highway department, Harrisburg, Pa., April 2.
100 tons, eight-span continuous I-beam bridge, Lycoming county, Pennsylvania; bids to state highway department, Harrisburg, Pa., April 2.
Unstated tonnage, foundation work, high school, North Philadelphia; bids March 29; plans for the superstructure, involving a substantial tonnage of bars, will be issued around April 1.



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Pig Iron

Pig Iron Prices, Page 86

Pittsburgh—Pig iron producers are in tightest situation in many years, with shipments running considerably ahead of production and consumers ordering heavily for both current requirements and second quarter. Limitation of producing capacity is being felt keenly. If high rate of demand keeps up, premiums may be offered, some observers predict. Inquiries for pig iron for export have been unusually numerous in this district recently.

Cleveland — Shipments during March are expected to exceed both the previous two months, as many consumers are specifying heavily against contracts at old prices. Most sellers will be able to clear their books before April 1 of all first quarter tonnage. Shipments continue to exceed production, and stocks are becoming depleted. Prices are firm at the higher levels.

Chicago—Most pig iron consumers have covered second quarter needs and producers are heavily booked for next three months. March shipments will be about 50 per cent ahead of February and

will rank near highest total in history. Market is firm at \$24, furnace, for No. 2 foundry and malleable.

Boston—Pig iron buying for second quarter delivery is active at \$25.75, Everett, Mass., for No. 2 foundry. Demand is largely from numerous small consumers, most of the larger melters being well covered. The Everett, Mass., furnace, physically ready to go into blast, will start about April 20, due to delayed ore arrivals.

Buffalo—Demand is quiet following recent heavy covering. A little iron is being accumulated for movement by barge canal when that waterway opens. Nearly 7500 tons of iron is still stuck in the ice near Lake Oneida but shippers have been promised state assistance in freeing these barges, held in the waterway since last December. Melt of basic iron in open hearths continues very heavy.

Philadelphia—Pig iron sellers are becoming increasingly far ahead, with some now having little available for second quarter. In such cases they are allocating tonnage. Rumors of further increase in pig iron prices within 30 days are discredited by some trade leaders. However, market is exceptionally strong and in-

creases before end of second quarter are considered probable.

Cincinnati—Melters are loath to take orders for second quarter pig iron but are expected to cover needs soon. All tonnage against old contracts has been specified but shipment will not be completed by April. Foundry melt is near capacity, part of demand being traced to flood suspensions.

St. Louis—Purchasing of pig iron is reported on a fairly liberal scale, and shipments this month insure the largest first quarter, and the highest March since 1929. Notwithstanding a sizable carryover from first to second quarter, melters are increasing their commitments as a protective measure against possible higher prices and scarcity.

Toronto, Ont.—Brisk demand and soaring prices are features of the Canadian iron and steel markets, with substantial improvement reported in merchant pig iron sales and prices up \$4 per ton on all grades. New business is increasing and inquiries are appearing for spot and future delivery. Sales are running around 2000 tons weekly with individual orders ranging from a car to 500 tons. Orders are appearing at frequent intervals and melters are taking larger tonnages to offset the shortage of scrap. The advance in price has been responsible for competition from United States iron producers and it is stated that Canadian melters again can take supplies from across the line, whereas under the former price schedules importations were not profitable.

Canadian pig iron prices are as follows: Base grade, 2.25 silicon and under, \$25.50; malleable, \$26, Toronto. Montreal prices, base grade, \$27; malleable, \$27.50; basic, \$27. Each 0.25 increase in silica calls for advance of 25 cents per ton.

Metallurgical Coke

Coke Prices, Page 85

With April 1 only a few days distant, coal and coke operators anticipate important developments momentarily in regard to wages. Meanwhile, furnace coke contracts have been written for second quarter on the basis of \$4.15 to \$4.25, subject to revision when the outcome of the wage situation is known. Late last week most persons anticipated that any delay in production would be short. Operations may be suspended for a few days this week, they pointed out, since April 1 usually is a holiday, but operators will charge their ovens heavily Wednesday and the suspension may not be serious. Steelworks are expected to be in the market for more coke soon.

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Beehive production in the 1936-37 season up to March 8 was estimated by the bureau of mines at 2,044,600 net tons, compared to 973,100 tons in the corresponding period of the 1935-36 season. According to the Allegheny advisory board, Pittsburgh, coke shipments are expected to show a rise of 370 per cent in the second quarter of this year, compared to the second quarter of last year. Combined shipments of coal and coke are expected to reach 453,176 cars.

By-product foundry coke, New England delivery, has been advanced 50 cents to \$12.50, effective April 1. No change in this grade at other seaboard points has yet been announced.

Scrap

Scrap Prices, Page 88

Pittsburgh — Ordinary No. 1 heavy melting steel reached the highest point since April, 1923, when a sale was made into mill consumption at around \$24 per ton last week. Hydraulic bundles commanded the same price and railroad specialties, \$28. Other lines continued strong, with the exception of No. 2 and machine shop turnings, where the differential with No. 1 heavy melting has been widening constantly. After a few days' inactivity before the closing of the railroad lists, many dealers anticipated that possible higher levels will be reached. Export demand continues strong in the east and south, heightening the difficulty of obtaining material for this district.

Cleveland — Advanced quotations for iron and steel scrap are bringing out a steady supply. This is enabling dealers and brokers to deliver on orders and also make occasional sales. Purchase by a Youngstown steelmaker in a somewhat larger volume than its ordinary custom, caused a little flurry. It is understood the purchaser paid the top of the current market, \$22.50 for No. 1 heavy melting, and took several grades, totaling a fair-sized tonnage.

Chicago — Prices have advanced further, with heavy melting steel up 50 cents on mill buying at \$22. Current prices are bringing out good tonnages but there is no weakness in bids of sellers, who are active in covering heavy orders received the past few weeks. Steel foundry grades are strong, with supplies limited.

Boston — Although still effective, the railroad embargo on scrap for delivery at the army base and Mystic wharf appears likely to end

soon. Several grades for Pennsylvania shipment are higher, including cast borings for steel works and chemical use, No. 1 machinery cast, forge flashings, scrap rails and skeleton. For New England delivery prices are stronger and more in line with those offered for export. This is especially true of melting steel scrap and cast. Brokers are paying up to \$18, dock, for export, No. 1 heavy melting steel, and \$16.50 for No. 2. Stove plate for shipment to all points is firmer. The Worcester, Mass., steel works is buying more heavily, No. 1 heavy melting steel scrap being \$17.50 delivered.

New York — Fewer grades of scrap were increased in price last week but advances of 50 cents were made on heavy melting steel and No. 2 cast for dock delivery. Activities of domestic and export buyers are less, probably because of the Easter holiday.

Buffalo — Dealers continue to negotiate quietly with consumers of scrap and it is believed numerous sales are being made with a minimum of publicity. Last admitted sales of No. 1 heavy melting steel were made at \$19.50, which certainly cannot be duplicated for tonnage transactions now. Leading dealers

say some tonnage might be picked up at \$20.50 but that any concerted buying movement would surely force prices higher. Short steel rails recently have brought \$25 for local delivery, this being the first time this price has been obtained here for any grade of scrap in recent years. Stove plate has crossed the \$15 mark and is headed higher in the opinion of dealers.

Local dealers expect to have an important part in marketing the scrap obtained from 22 steamships of Canadian registry which are to be scrapped this spring and summer. Much of the scrap will be exported, it is believed. Because of superior facilities for converting the ships into scrap which are found at American ports the work will be done on this side of the border rather than in Canada.

Philadelphia — Although steel scrap prices are unchanged, a number of other grades, including the principal cast grades, have been advanced. Heavy breakable cast is now \$20 and cupola cast \$21 to \$21.50. Blast furnace borings and turnings have been increased to \$14, stove plate to \$16.50 to \$17, and several railroad specialties have been advanced. Meanwhile, exporters of scrap continue out of the market,

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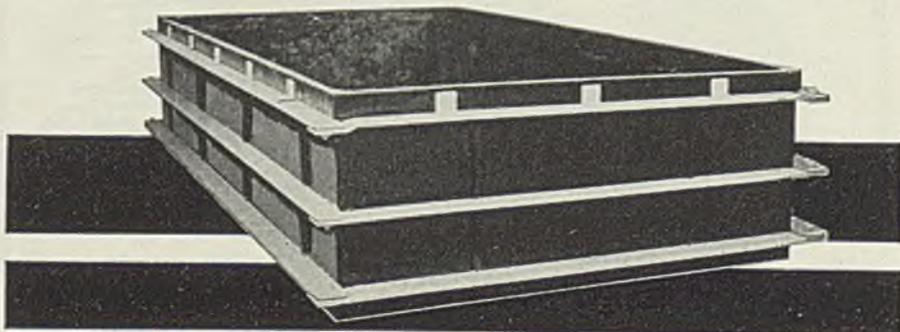
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although inquiries from abroad remain heavy. It is believed that local exporters will be active again as soon as the present accumulation at Port Richmond is worked off. Some estimate there will be less than 300 cars on sidings by April 1.

Detroit—Upward movement of prices has resumed, with some of the easiness observable earlier in the week disappearing. Prospective settlement of the Chrysler strike probably is the chief reason for the added strength although it will likely be ten days or two weeks before supplies from this source are resumed, even assuming early start of car production.

Cincinnati — The scrap iron and steel market hesitated in the upward climb last week. Dealers and others who had been holding scrap were inclined to take their profits, making supplies somewhat more free than in recent weeks. Reports that brokers in nearby districts were able to cover recent contracts slightly under March peaks were unconfirmed.

St. Louis—Prices of iron and steel scrap continue to rise, bringing the average to the peak of the upward movement, and to the highest point since the World war. Steel plants

are snapping up every ton dealers are willing to sell. Sellers who have made commitments are being hard driven for delivery. Heavy melting steel and railroad specialties are especially strong, advances of from 25c to \$1 per ton being made.

Seattle—After a spurt of buying, Japanese importers are hesitating about placing forward business under prevailing high prices of \$15 gross, f. a. s. plus \$8 freight. Immediate needs have been supplied at these levels and the Oriental market is content to wait in the hope of price recessions. Local mills continue to buy steadily in volume, the going price for local use averaging \$12 per net ton.

Toronto, Ont.—Canadian scrap consumers now are complaining of difficulty in obtaining supplies and dealers report shortage in some lines. Mills are in the market for all the heavy melting steel offered and have been pushing dealers for delivery. Turnings and other steel grades also have a brisk market. Machinery cast and dealers' cast are scarce and dealers are unable to fill all orders now appearing and have made substantial increases in buying prices to stimulate offerings. Some interests with large holdings

of scrap are placing accumulations on the market but are demanding prices above present quotations.

Warehouse

Warehouse Prices, Page 87

Pittsburgh—Even though price advances resulted in considerable forward buying early this month, warehouses have found demand at new quotations well maintained. Aggregate business so far this month is considerably ahead of February. Warehouses report structurals moving well, while demand for sheets continues high.

Cleveland — Warehouse distributors report March the best month this year in both sales and shipments. Extended mill deliveries on all steel products, particularly lighter flat rolled material, have contributed a good deal to optimistic outlook of jobbers here. They have difficulty in keeping their own stocks filled. New prices are firm, with little opposition offered.

Boston — Warehouse buying is heavy, volume with most jobbers this month being the heaviest in years. Demand is well spread as to products and recently advanced prices are firm.

Philadelphia—March undoubtedly will be one of the most active months in a long time. Sharp increases effective early this month stimulated buying and, according to some distributors, there has not been much let-up since. Extended deliveries at mills undoubtedly are diverting more than normal amount of tonnage to jobbers, seasonal influences are proving stimulating.

Detroit—Further clarification of warehouse price schedules is being accomplished, sales continuing strong with buyers showing little concern over the higher levels, except in the case of smaller interests.

Bolt and nut discounts have been reduced, about 10 points on the average. Nail prices still are difficult to determine.

Cincinnati—Steel buying from warehouses continues at high level. Sheets are moving actively, with part of demand due to slow mill deliveries. Many building projects are scheduled but construction tonnage has not been stepped up yet.

St. Louis—Purchasing of iron and steel from store continues active. Interest extends fairly well through the entire line, but requirements of users of sheets and plates lead, due in large measure to deferred mill deliveries. Wire fencing and accessories are moving in large volume



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to the country, particularly to the flood areas.

Seattle — While business has dropped from last month's high level, buying is steady and in good volume in spite of increased prices. Effective March 18, Portland houses adopted the prices announced by Seattle dealers March 11 and both states are practically on the same level. This has stabilized the situation after months of price cutting in Oregon territory.

Iron Ore

Iron Ore Prices, Page 88

Cleveland — The Ford iron ore inquiry has been closed for a total of 315,000 tons of various grades, being divided among four or five shippers. It is understood that the ore was placed at current market prices. Little ore is left for sale for this season's delivery. Some producers have withdrawn from the market as all their available ship capacity has been contracted.

Cold Finished

Cold Finished Prices, Page 85

Pittsburgh—Deliveries on cold-finished are somewhat unbalanced at present, ranging from three weeks to as high as 10 and 12 in certain grades, depending upon size, whether the material can be taken out of stock, the finish, or the ability of hot mills to meet requirements. Ordering at the higher prices, while light, is steady. Considering all angles, the present situation is satisfactory and second quarter will be good from the standpoint of production. Cold-finished carbon bars are quoted 2.90c, Pittsburgh.

Tin Plate

Tin Plate Prices, Page 84

Pittsburgh—Operations of tin plate mills are still at nearly 100 per cent. In addition to steady specifications from domestic consumers, a feature of the market recently has been heavy demand for export at highly advantageous prices. The seasonal increase in demand for packers' cans is beginning. Tin plate remains quoted \$4.85 per base box, Pittsburgh.

New York—As high as \$5.25, Pittsburgh equivalent, has been done recently on a substantial order for tin plate for Europe, May delivery. Meanwhile domestic prices are unchanged but with some trade interests convinced there will be an increase during second quarter on non-contract tonnage.

Ferroalloys

Ferroalloy Prices, Page 86

New York—With contract customers facing an advance of \$15 a ton, April 1, on ferromanganese, they are making every effort to get in as much tonnage as possible before that time. This is making for an unusually heavy movement. Meanwhile, spot buyers are having to pay \$95, duty paid, tidewater, which went into effect for them March 15. Much the same situation prevails in domestic spiegeleisen, 19 to 21 per cent, on which a \$4 increase to \$30 a ton, Palmerton, Pa., has been named.

Tungsten ores have again advanced sharply, with Chinese wolframite now being quoted at \$22, duty paid, for short ton unit, the highest price since the World war, it is said. The current price represents an increase of around \$7 within the past month or so.

Chrome ore also has jumped sharply, with Turkish concentrates, 52 per cent now holding at \$26 to \$26.50, c.i.f. per gross ton; and 48 to 49 per cent concentrates and 48 to 49 per cent lump ore, at \$24.50 to \$25. Turkish 45 to 46 per cent lump ore has been moved up 50 cents per ton to

\$20.50 to \$21 and 40 to 44 per cent lump ore to \$18.50 to \$19. Indian chrome ore for metallurgical purposes has made similar gains, although the refractory grades are unchanged, with 44 to 47 per cent, for instance, holding nominally at \$19 to \$20. Transvaal chrome has been advanced.

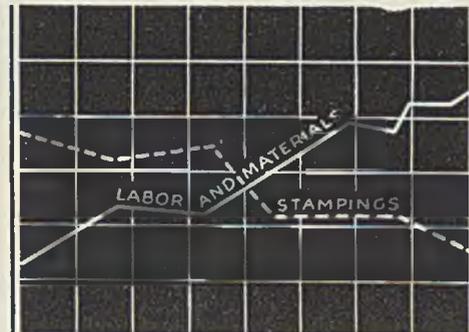
Advances reflect continued heavy buying both here and abroad, with supplies becoming increasingly scarce. Ocean freights for the moment appear steady, although word is being awaited with respect to rates for the last half, with the feeling in some quarters that higher charges will be asked.

Semifinished

Semifinished Prices, Page 85

Demand for sheet bars, billets, slabs and other semifinished steel continues to exceed output, and with finishing mills booked heavily, the tight situation will remain unchanged for some time. Most nonintegrated mills had the foresight to protect ordinary needs, but obtaining additional tonnage is almost out of the question. Producers are checking closely on all contracts. Export

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demand for wire rods and other lines remains strong, with high prices easily obtainable. A group of foreign buyers visited this district last week seeking material. Rerolling billets, blooms, slabs, and sheet bars, Pittsburgh, are quoted \$37 per gross ton; forging blooms, billets and slabs \$43, and skelp, 2.10c.

Ore, Pig Iron Imported

Philadelphia—Imports of 5065 tons of chrome ore from South Africa, 1000 tons of pig iron from Brit-

ish India and 465 tons of pig iron from the Netherlands arrived here the week ended March 20. Other importations included 99 tons of structural shapes, 39 tons of steel bars and five tons of steel floor plates for Belgium; 14 tons of steel bars, nine tons of steel billets and two tons of steel tubes from Sweden.

6000 Tons Steel Awarded by Navy

Washington—The navy department has announced the following steel awards, bids for which were received March 16:

For furnishing high tensile steel plates, sheets and strips, 1,590,000 pounds to Carnegie-Illinois Steel Corp., at \$122,607; 420,000 pounds to Alan Wood Steel Co., at \$25,025.

For medium steel plates; 660,000 pounds to Carnegie-Illinois Steel Corp., at \$317,299.50; 240,000 pounds to Bethlehem Steel Co., \$7,624.

For high tensile steel shapes; 1,475,000 pounds to Carnegie-Illinois Steel Corp., at \$51,412.50; 53,000 pounds to Penn Galvanizing Co., at \$1661.

For bar and strip steel; 732,000 pounds to Carnegie-Illinois Steel Corp., at \$24,748.

For high tensile steel shapes; Enterprise Galvanizing Co., 1,398,000 pounds at \$79,649.50.

For steel angles and shapes; Carnegie-Illinois Steel Corp., 766,000 pounds at \$24,624.50 and Joseph P. Cattie & Bros. Inc., 22,500 pounds at \$1182.56.

For steel plates, sheets and strips; Carnegie-Illinois Steel Corp., 1,035,000 pounds at \$60,990; Jones & Laughlin, 1,845,000 pounds at \$68,900 and Lukens Steel Co., 2,165,000 pounds at \$76,650.

For special steel I beams; 540,000 pounds to Jones & Laughlin Steel Corp., at \$18,560.90; and 450,000 pounds to Joseph P. Cattie & Bros. Inc., at \$26,302.

For special steel I beams; 180,000 pounds to Enterprise Galvanizing Co., at \$15,500.

Granite City New Basing Point on Sheets, Tin Plate

Granite City Steel Co., Granite City, Ill., has established that city as a basing point on steel sheets and tin plate, effective April 1, prices being 10 cents per hundred pounds higher than at Gary, Ind. This change in basing will result in a saving of \$1.80 per ton to users in the St. Louis district. Consumers in

this area in a normal year buy about 300,000 tons of finished steel products, according to an estimate by the St. Louis chamber of commerce.

In the past the price of steel delivered in the St. Louis district has been the price at Gary, with 22 cents per hundred pounds freight added, in carload lots. Under the new plan the base price will be 10 cents over Gary, with three cents switching charge, giving a saving of nine cents per hundred pounds.

The St. Louis district in recent years has been advancing as a steel producing center but fabricating has not grown in proportion.

Steel in Europe

Foreign Steel Prices, Page 87

London—(By Cable)—Shortage of raw materials continues acute in Great Britain and prices are rising. The recent arrangement for importation of 400,000 tons of pig iron from India promises to relieve the situation somewhat. Domestic production of pig iron is also expected to increase soon. The present output is sold for three months. Deliveries of steel from the Continent remain below expectations. Steel plants are working at capacity except those prevented by lack of raw materials.

The Continent reports intense demand continues, with the supply position slightly easier.

Nonferrous Metals

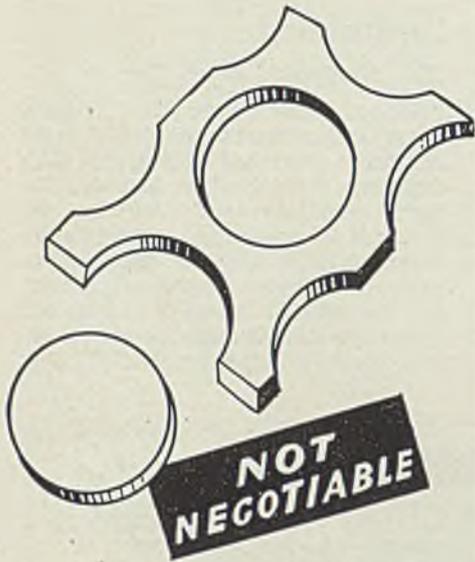
Nonferrous Metal Prices, Page 86

New York—A stronger undertone developed in nonferrous metal markets last week on the resumption of the upward swing in prices on the London Metal Exchange. Consumers were conservative in making additional commitments while sellers' offerings were restricted by limited supplies.

Copper—Export copper rose gradually to close around 17.30c, c.i.f., compared with a low of 16.50c earlier in the week. Strength in the foreign market was due principally to short covering by bears. Domestic sellers restricted offerings late in the week following a freer policy earlier when some independents secured tonnages. Electrolytic held at 16.25c, Connecticut.

Lead—American Smelting & Refining Co. lowered its quotation Tuesday \$1 per ton to the basis of 6.80c, East St. Louis, but St. Joseph Lead Co. continued to quote 6.85c, East St. Louis. Consumer buying interest was light.

Zinc—Prime western zinc held unchanged at 7.50c, East St. Louis,



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with the undertone extremely firm. Supplies of metal for spot delivery continued tight. Consumption continues at an active pace, indicating that there will be no relief in the tight supply situation for at least several weeks.

Tin—Straits spot tin advanced steadily from 62.12½c on Monday to 66.12½c on Thursday. Due to the closing of foreign metal markets activity was dull on Friday and prices were off about ¼-cent. The advance was attributed to covering by shorts and bullish news regarding consumption in this country and the European political situation.

Antimony—Prices held unchanged last week in quiet markets on the basis of 17.00c, duty paid New York, for Chinese spot and 16.50c for American spot.

Win Scrap Safety Honors

Eleven out of 20 scrap firms entered in the New York state Accident prevention contest conducted by the Institute of Scrap Iron & Steel Inc., have thus far been placed on the "honor roll," with ratings showing no accidents. A group of members of the Buffalo and New York chapters have formed a compensation insurance pool under the state insurance fund.

The pool is serviced by a special bureau of the institute, under a safety code. The accident prevention contest, with prizes to be awarded, is an incident in the program.

Abrasives Makers Gain in Production, Employment

Manufacturers of abrasive wheels, stones, paper, and cloth, and related products in the United States reported substantial increases in employment, production and expenditures for labor and materials in 1935 as compared with 1933, according to census figures just released.

Wage earners employed in 1935 totaled 6766, an increase of 38.4 per cent over 4890 reported for 1933; their total wages, \$8,333,949, exceeded the 1933 figure, \$4,980,561, by 67.3 per cent. Total value, f.o.b. factory prices, of abrasive wheels, stones, paper, and cloth, and related products made in 1935 was \$52,115,102, representing an increase of 102.7 per cent over the 1933 total, \$25,707,436.

American Zinc, Lead & Smelting

Co. now is producing metallic cadmium at its East St. Louis, Ill., plant.

Living Costs 21.6 Per Cent Above Depression Low

Living costs of wage earners in the United States advanced 0.3 per cent from January to February, according to the National Industrial Conference board. Food prices excepted, costs of all major divisions

of the budget, housing, clothing, fuel and light and sundries, increased.

Since February, 1936, living costs have advanced 4.4 per cent, and since April, 1933, the low point of the depression, 21.6 per cent. Living costs in February were still 12.5 per cent below those of February, 1929.

Purchasing value of the dollar was 114.7 cents in February, compared with 115.1 cents in January, 119.8 cents in February, 1936, and 100 cents in 1923.

KRON

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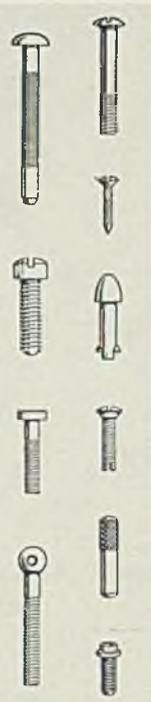
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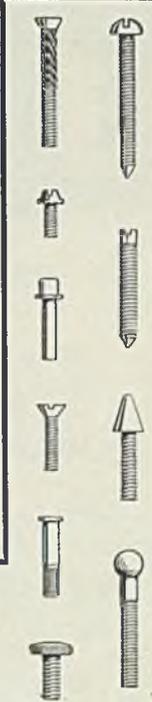
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More Science, Less Zoology Now in Steel Names

TULIP, Daisy, Swan, Drake and many other once highly respected trade names for various makes of iron and steel products which appear in the archives of the American Iron and Steel institute, are now only memories of a more romantic era.

Increasing appreciation of engineering data among manufacturers and users of iron and steel and standardization are chiefly responsible.

As recently as 35 years ago the trade names of tin plate were more closely allied with botany and zoology than with the steel business. Among the tin plate brands chosen from floriculture were Crocus, Hyacinth, Jonquil, Cornflower, Sweetbrier, Holly Wood, Golden Rod, Moonflower and Star Flower. Zoology contributed the well-known tin plate brand names of Duck, Drake, and Swan.

Under the patriotic names of U. S. Eagle and U. S. Grant were sold theterne plate products—steel or iron coated with a lead-tin alloy to retard rust—of one well-known manufacturer.

16,240 Are Employed in Iron Mining, Census Shows

Steady expansion of the local textile industry in Netherland India offers American manufacturers of textile machinery an opportunity to re-enter that market, in the opinion

of American Trade Commissioner Donald W. Smith, Batavia.

Japanese manufacturers now practically dominate the market, with British producers accounting for a small part. A small volume of textile machinery was imported from the United States during 1934 but no arrivals were recorded in 1935, statistics show.

Aid granted to local textile manufacturers by the industrial bureau of the department of economic affairs has been largely responsible for their success. This bureau maintains an experimental textile mill where tests are made to determine practicability of producing various materials by both small and large scale enterprises.

The bureau actually purchases and operates machinery to determine its efficiency and most equipment has been recommended by government textile experts. It is obvious, therefore, that the first step which American manufacturers should take is to obtain the approval from this government agency, according to the report.

American Manufacturers Offered Equipment Outlet

Iron ore mines and beneficiating plants in the United States in 1935 employed 14,873 wage earners and paid wages totaling \$14,623,599, an average of \$983. The number of wage earners was obtained by averaging totals reported on payrolls on the fifteenth of each month. This procedure gave a lower figure than the total number actually employed during the year for more than 16,

000 were employed in peak months. Salaried officers, technical and supervisory employes, and others working on a salary basis totaled 1,367 in 1935 with salaries amounting to \$3,020,285, according to the commerce department.

Expenditures for supplies and materials, fuel and purchased electric current were \$10,871,646. Supplies and material comprised 61 per cent of the total; fuel, 15 per cent; purchased electric current, 24 per cent.

Value of iron ore produced in 1935 was \$76,733,841 which includes \$12,413 derived from work or services as well as manganese-bearing ore valued at \$1,165,643. Ores containing up to 35 per cent manganese are included in the 1935 figures.

400 WORKERS SING IN CHORUS

The tri-state industrial chorus of 400 voices, including singers from the Aluminum Co. of America, Carnegie-Illinois Steel Corp., Jones & Laughlin Steel Corp., Weirton Steel Co., Wheeling Steel Corp. and Westinghouse Electric & Mfg. Co., held its first musical festival March 20 in Pittsburgh. Directors were James S. Mace, John M. Ferguson, Oscar Grosskopf, T. Grenfell, Jr., Walter Jones, Frank Oliver, Tom Jones and Evan Lloyd.

Equipment

Cleveland—Equipment inquiries and sales eased slightly in Cleveland district last week although demand for small orders continued fairly active. Tieup of Chrysler plants which obtained large quantities of machine tools in this district was attributed by some dealers for slackening of demand for automotive equipment. Cincinnati machine tool builders mostly have recovered from effects of flood although damage to patterns still hinders production. Operations are estimated to be 80 per cent of normal capacity.

Seattle—Logging camps and lumber mills are active and are buying equipment. Mining operators are placing seasonal requirements. Road machinery, electrical and pumping equipment are in good demand. Canneries and fishing fleets are buying some items. Seattle light department will receive bids April 22 for four kilovolt-ampere switchgears and on April 1 for suspension insulators and other equipment. McNeil Island, Wash., will open bids March 30 for steam generating plant and complete automatic unit. Seattle Gas Co. will install generator and precipitator for smoke control.

Pittsburgh—Both sales and inquiries for machinery are holding up well, with activity fairly evenly spread. Sellers report delivery situation is still a matter of concern.

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TARENTUM, PA. (PITTSBURGH DISTRICT)

Construction and Enterprise

Ohio

AMESVILLE, O. — Village plans construction of waterworks and distribution system, including elevated 75,000-gallon reservoir, two deep wells and pumps at an estimated cost of \$25,000. T. Clark is mayor; Paul Elwell, 5005 Euclid avenue, Cleveland, is consulting engineer.

CLEVELAND — City, department of public service, is in the market for a crawler type diesel engine crane with 50-foot boom. Miles E. Evans, Room 217, city hall, is director of public service.

CLEVELAND — Ira E. Baker Co., 1029 East Sixty-second street, has acquired property at 4400 Perkins avenue, formerly occupied by Metals Welding Co., from the Guardian Trust Co. Alterations and improvements will be started at once.

CIRCLEVILLE, O. — City has preliminary plans completed for construction of sewage disposal plant at an estimated cost of \$136,363. David Courtright is city engineer; Floyd G. Brown, Marion, O., is consulting engineer.

DEFIANCE, O. — Northwestern Electric Co-operative Inc. has funds for construction of 289 miles of rural transmission lines in Defiance and Williams counties at a cost of approximately \$285,000. Bids will be asked about April 5 at the office of Carl Frye, 620 East Broad street, Columbus, O.

DELPHOS, O. — City is taking bids for construction of municipal electric light plant, including three generators, three diesel engines, controls and distribution system. Cost of project is estimated at about \$300,000. Carl Simon, Van Wert, O., is consulting engineer. W. H. Taylor is mayor.

FINDLAY, O. — North Central Rural Electric Co-operative Inc. is completing plans for construction of 844 miles electric power lines. Carl Frye, 620 East Broad street, Columbus, O., is engineer. Bids will probably be taken about May 1 at Columbus.

FINDLAY, O. — City plans extensions to sewage disposal plant, probably including installation of activated sludge type disposal machinery, to cost about \$125,000. Homer O. Dorsey is mayor; H. P. Jones & Co., Second National Bank building, Toledo, O., is consulting engineer.

GREENVILLE, O. — Darke County rural electric co-operative, care of Ohio Farm Bureau Rural Electrification Inc., 620 East Broad street, Columbus, O., will be ready for bids about April 1 on construction of approximately 200 miles of rural power lines in Darke and Preble counties at an estimated cost of \$225,000. Carl Frye, 620 East Broad street, Columbus, is engineer.

LAKEMORE, O. — Village plans to spend \$115,000 on construction of water plant and distribution system, including wells, softener, 100,000-gallon tank and tower and distributing mains. Charles E. Michaels is mayor; Paul W. Elwell, 5005 Euclid avenue, Cleveland, is consulting engineer.

MOUNT PLEASANT, O.—Village plans construction of \$66,000 waterworks system. Maturity of plans is dependent upon WPA approval. Paul W. Elwell, 5005

Euclid avenue, Cleveland, is consulting engineer.

NAPOLEON, O.—Village is taking bids, due April 15, for additional equipment for light plant improvements. Equipment includes 500-horsepower boiler and auxiliary equipment unit. Ray B. Muston is chairman of board of public affairs; Froelich & Emery, Second National Bank building, Toledo, are consulting engineers.

NEW ATHENS, O. — City has preliminary plans prepared for construction of water plant and distribution system, maturity dependent upon WPA approval, application to be made immediately. Plans include installation of valves, hydrants, service pumps, softening plant, elevated 100,000-gallon tank and tower. Paul W. Elwell, 5005 Euclid avenue, is consulting engineer. Cost is estimated at \$46,000.

RIPLEY, O. — Village plans waterworks and light plant repairs and additions, including waterworks building, water softener, two diesel engines, motors, light plant and transformers, to cost to something over \$100,000. Ed. Chapman is village engineer.

SIDNEY, O. — City plans construction of waterworks additions, including distribution system improvements, 500,000-gallon elevated steel tank and diesel engine-driven generator set and appurtenances. Floyd E. Browne, Marion building, Marion, O., is consulting engineer.

TOLEDO, O. — DeVilbiss Co., 296 Phillips avenue, will build completely new rubber products plant here at an estimated cost of over \$175,000, on La-Grange street near the new bridge over the Ottawa river.

WILLIAMSPORT, O. — Village has tentative plans for construction of waterworks system and electric light plant, to be discussed April 5 with consulting engineer Burgess & Niple, 568 East Broad street, Columbus, O. W. D. Radcliff is mayor.

WELLSVILLE, O.—Sterling China Co. will double capacity of its pottery here by construction of two-story factory addition at a cost of approximately \$44,000. C. C. Pomeroy is president.

Connecticut

BRIDGEPORT, CONN. — Bridgeport Brass Co. plans erection of rolling mill and other additions and improvements to its properties here. Cost of project is estimated at \$2,300,000.

Massachusetts

WORCESTER, MASS. — Arcade Malleable Iron Co. is installing a new annealing furnace with about four times the capacity of the present equipment.

New York

NEW YORK—Harris Coupling Co. Inc., Manhattan, has been formed by Phillip C. Samuels, 42 Broadway, to manufacture couplings, machinery and attachments.

Pennsylvania

BRADDOCK, PA.—Borough is receiving bids at the office of Henry Wodkowski, Municipal building, until April 6 for pumping equipment in connection with filtration plant. Chester Engineers, 1050 Century building, Pittsburgh, have plans and specifications.

CHAMBERSBURG, PA. — City is considering enlargement and improvement of its electric light and power plant. Application will be made to PWA for financing.

STROUDSBURG, PA. — City plans to complete its sewerage disposal system



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and will apply to PWA for funds for that purpose.

SUNBURY, PA. — Sunbury Improvement Co. is having plans prepared for two-story factory building, 72 x 200 feet, including elevator, boiler house, etc. Will be ready for bids about April 1. Davis & Rice, Sunbury, are architects.

Michigan

BRONSON, MICH.—Kingston Products Co., Kokomo, Ind., has acquired ownership of H. A. Douglas Mfg. Co., here, maker of electrical equipment for the auto industry.

DETROIT—Arrow Distilleries Inc., 3539 Concord avenue, will build addition to its plant here. Robert Finn, 2411 Trumbull, is architect.

DETROIT—Hydraulic Devices Inc. 45 East Baltimore avenue, has awarded contract for construction of factory building on Wildemere avenue to Stewart Oldford, 4349 Clements avenue.

DETROIT—Scott Machine & Tool Co., 439 East Fort street, has been incorporated to manufacture machine shop products by Paul J. Scott.

GRAND RAPIDS, MICH. — Grand Rapids Wholesale Grocery Co., 13 Ionia street S. W., plans construction of warehouse. Knecht, McCarty & Thebaud, 724 Grand Rapids National Bank building, are taking figures on the work.

JACKSON, MICH.—Plant of Thorez-Maes Mfg. Co., maker of screw machinery, was damaged by fire March 14.

MASON, MICH.—City must spend \$46,000 for additional sewage disposal equipment to free Sycamore creek from pollution, according to city engineer.

Illinois

GENEVA, ILL. — William Horn Structural Steel Co. has been incorporated by W. J. Horn and associates, to deal in iron, steel and other metals. James Leaton, 111 West Monroe street, is correspondent.

Indiana

EVANSVILLE, IND. — Acme Tool & Die Co. Inc., 823 East Virginia street, has been incorporated by W. H. Schnacke and associates, to manufacture tools and dies and fabricated metal products. W. H. Schnacke, 1721 South Elliott street, Evansville, is resident agent.

District of Columbia

WASHINGTON — Procurement division, treasury department, Federal warehouse, will take bids until April 2 for one 50,000-gallon steel water tank, invitation RA-2962-M-4-2, fabricated and erected complete near Althelmer, Arkansas.

WASHINGTON — Office of the general purchasing officer, Panama Canal will open bids April 7 on miscellaneous quantities of tinned sheet steel, bar steel, hollow drill rods, strip brass, brass rods, phosphor-bronze sheets, sheet zinc, bolt dies and split dies, schedule 3238, for delivery Cristobal or Balboa, Canal Zone, Isthmus of Panama.

WASHINGTON — Procurement division, treasury department, federal warehouse, will receive bids until March 30 for two deep well turbine pumps, invitation RA-2921-D-3-30, for delivery Trussville, Ala.; until March 31 for one steel water tank and steel staircase erected complete, invitation RA-2963-M-3-31, at Crossville, Tenn.; and until April 5 for one 10-kva, 120-volt, 60-cycle, 3-

phase alternating current, full automatic electric plant, invitation 222-2955-A-4-5, for delivery Burns City, Ind.

WASHINGTON — Bureau of supplies and accounts, navy department, will receive bids April 2 for one motor-driven planer, complete with motor generator set, schedule 216, for delivery Keyport, Wash.; one motor-driven, radial drill, schedule 222, for delivery Puget Sound, Wash.; seven heavy-duty motor-driven engine lathes, schedule 237, for delivery Mare Island, Calif.; miscellaneous diesel generator sets, schedule 245, for delivery various east and west coast points; miscellaneous high-tensile steel plates and angles, schedule 251, for delivery Washington; miscellaneous corrosion-resisting steel floor plates, schedule 252, for delivery Washington; and for miscellaneous diesel generator sets, with spare parts and tools, schedule 268, for delivery Norfolk, Va. Until April 6, bids will be received for one portable, hand-operated wire rope shear, schedule 244, for delivery various east or west coast points; and one light duty, motor-driven engine lathe, schedule 250, for delivery Mare Island, Calif.

Florida

DELAND, FLA. — City votes March 30 on issuance of \$398,000 light and power plant bonds.

MIAMI, FLA. — Davis & Olsson Machine Works Inc. has been formed recently by R. M. Davis, 50 Northwest Twenty-first street, and C. O. Olsson.

Georgia

DOUGLAS, GA.—Satilla Rural Electrification Corp., Rexford Peterson, chairman, has allotment of \$425,000 for extension of power lines in this vicinity.

WAYNESBORO, GA. — Planters Power Co. plans construction of rural electric transmission lines in Burke, Jenkins and Screven counties. Porter W. Carswell is president.

Kentucky

FRANKFORT, KY. — Penfield Co., Carew Tower, Cincinnati, O., plans to enlarge plant of Toms Bixler Distilling Co., near here. Cost is estimated at \$300,000. M. H. Greulich, Carew Tower, Cincinnati, is manager of the Penfield Co.

HOPKINSVILLE, KY.—City will receive bids April 1 for erection of \$65,000 sewage disposal plant as final unit of its \$400,000 sewage disposal project. V. V. Long & Co., 1620 Sixteenth avenue south, Nashville, Tenn., is architect.

Louisiana

OPELOUSAS, LA. — City receives bids April 5 for furnishing one 1500-horsepower generating unit estimated to cost \$75,000.

RODESSA, LA.—L. F. Clawson, Courthouse building, Shreveport, La., receives bids April 8 for furnishing materials and constructing sewage disposal system here. A. A. Lyons is engineer.

SALTVILLE, LA.—Mathleson Alkali Works, 250 Fifth avenue, New York, plans construction of a new chlorine plant at Saltville or Lake Charles, La.

North Carolina

CHARLOTTE, N. C.—City voted in favor of \$1,365,000 bond issue to finance construction of waterworks system, including 3,000,000-gallon reservoir, 3 storage tanks, and additions to feeder mains. J. B. Marshall is city manager.

GREENSBORO, N. C.—City receives

bids April 5 for waterworks improvements estimated to cost \$120,000 at Reedy Fork pumping station. C. W. Lundberg, room 308, City Hall, is director of public utilities.

LEAKSVILLE, N. C.—Town will receive bids April 2 for construction of improvements to waterworks system. H. N. Anderson, is clerk. A. C. Linberg, Burlington, Va., is consulting engineer.

REIDSVILLE, N. C.—City voted approval for bond issue of \$120,000 for construction of sewer, waterworks and street improvements. E. P. Nichols is city clerk.

Tennessee

COWAN, TENN.—Spalde Shirt Co., Butler, Pa., maker of men's shirts, is installing machinery in temporary headquarters here and plans construction of 2-story fireproof factory building.

PULASKI, TENN. — Town receives bids April 2 for construction of filter plant improvements. W. R. Rackley is mayor; C. N. Harrub Engineering Co., 711 American National Bank building, Nashville, is consulting engineer.

Alabama

BIRMINGHAM, ALA.—Chicago Bridge & Iron Works, 2492 Old Colony building, Chicago, has begun extensive improvements on its Birmingham plant which will include a modern annealing furnace and X-ray equipment. Total cost of the program is estimated at about \$50,000.

West Virginia

BLUEFIELD, W. VA.—West Virginia Water Service Co. plans installation of filter plant at waterworks here.

CAMERON, W. VA. — Appalachian Electric Power Co., 1003 Electric building, Richmond, Va., plans construction of transmission line between here and Glenn Daniel; work to start about April 1. J. H. Collins is engineer.

WHEELING, W. VA. — City is receiving proposals for construction of electric power plant capable of supplying all municipal requirements; capacity will be about 1500 kilowatts. J. M. Jenckes, 425 South Penn street, is power engineer receiving bids.

Virginia

DANVILLE, VA.—City receives bids April 2 for furnishing electrical equipment for Pinnacles hydro-electric project, including generators, excitors, transformers and switching equipment. Charles T. Main Inc., 201 Devonshire boulevard, Boston, Mass., is engineer.

NORFOLK, VA. — Virginia Iron & Steel Corp. has been formed, with capital of \$10,000 by W. E. Sadler Jr., 611 Carolina avenue, and Herman A. Sacks.

RICHMOND, VA. — Smith-Moore Vehicle Co., 408 North Fifth street, will erect \$40,000 fireproof factory building at corner of Roberts street and Brook road.

Missouri

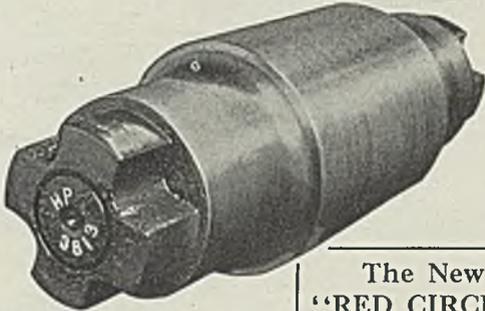
KANSAS CITY, MO. — Central Can Co., Twenty-ninth street and Brooklyn avenue, has leased building at 1004-06 Santa Fe street and plans to remodel building and install new machinery.

ST. LOUIS — Owens-Illinois Can Co., subsidiary of Owens-Illinois Glass Co., Toledo, O., has tentatively selected site here for proposed \$500,000 plant.

(Please turn to Page 108)

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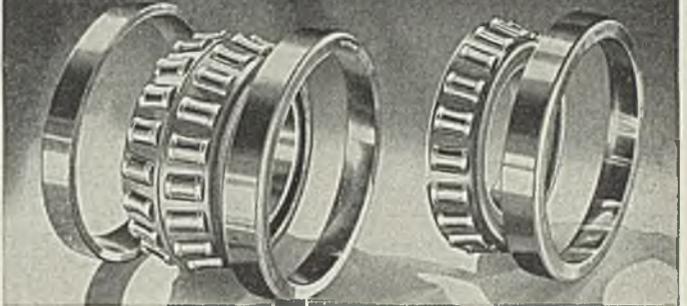
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(Concluded from Page 106)

Texas

ARANSAS PASS, TEX. — H. H. Hill plans to erect 2-story factory for the production of oil well equipment, at a cost of about \$70,000.

AUSTIN, TEX. — Board of directors, Lower Colorado river authority, room 820, Littlefield building, receives bids April 7 for furnishing one 12,500-kva generator, one 15,750-horsepower hydraulic turbine and one governor with pumping equipment.

GAINESVILLE, TEX.—City has applied to WPA for funds to enlarge and improve sewage disposal plant at an estimated cost of \$22,000.

PORT ARTHUR, TEX. — Socony Specialties Co. Inc., Beaumont, manufacturer of paint products, plans to double capacity of its plant here at an estimated cost of \$100,000.

SULPHUR SPRINGS, TEX.—Tri-county Electric Co. has \$360,000 allotment for construction of 400 miles of power lines in Rains, Hunt and Hopkins counties. Wm. G. Morrison, 204 Professional building, Waco, Tex., is electrification engineer.

Wisconsin

FOND DU LAC, WIS.—Reporter Printing Co., publisher of Fond Du Lac Commonwealth-Reporter, will build newspaper and job printing plant and radio broadcasting station at Western avenue and Cort street, beginning work about September 1. Cost is estimated at \$100,000.

MILWAUKEE — City sewerage commission, Jones Island, is taking bids until April 1 for furnishing and installing an auxiliary coal conveyor in boiler house addition at sewage treatment plant. Lydia Bauer is secretary.

MILWAUKEE — Milwaukee Valve Co., 2375 South Burrell street, will start work at once on 2-story foundry plant, 70 x 160 feet. L. E. Peterson, 312 East Wisconsin avenue, is consulting engineer preparing plans. Valentine Fina is president.

North Dakota

HATTON, N. DAK.—Voters authorized \$14,000 bond issue on March 9 for construction of waterworks system estimated to cost \$24,000. PWA project.

Iowa

DENISON, IOWA—South Crawford rural electrification co-operative will apply for loan from REA for construction of transmission lines in the southern part of the county. Harry W. Frank is secretary.

IOWA FALLS, IOWA—Federated co-operative power association plans construction of generating plant to furnish power to co-operatives in the locality. REA has allotted \$225,000.

PRESTON, IOWA—Jones county rural electric co-operative has been allotted an additional \$95,000 for construction of 98 miles transmission lines in Jones county. A. P. Ogden is secretary of the co-operative.

Nebraska

BRAINARD, NEBR.—City has filed application and plans with PWA for construction of water tank and tower at an estimated cost of \$7500. Manley Faulk is clerk.

CENTRAL CITY, NEBR.—Merrick county rural electrification association will apply to REA for loan to construct about 72 miles of rural transmission lines. Fred A. Marsh is chairman.

COLUMBUS, NEBR.—City has filed application with PWA for \$180,000 grant and \$220,000 loan for construction of a municipal electric distribution system. J. S. Nicholas is mayor; L. F. Gottschalk is city engineer.

FAIRBURY, NEBR.—Norris rural public power district. P. D. Peterson, chairman, has applied to REA for \$350,000 loan for the construction of about 300 miles of transmission lines in Jefferson and Saline counties. H. A. Davis, Crete, Nebr., is consulting engineer.

HAIGLER, NEBR.—City has filed application with PWA for \$18,427 grant and \$22,522 loan for the construction of a municipal electric light and power plant. C. R. Fulton, 2327 South Nineteenth street, Lincoln, is consulting engineer.

McCOOK, NEBR.—City will vote April 6 on granting franchise to McCook public power district for construction of complete primary and secondary electric distribution system. M. L. Search is secretary of the district.

OMAHA, NEBR.—Nebraska Power Co., Seventeenth and Harney streets, has completed plans for construction of power plant in South Omaha to furnish electric power to packing plants in the vicinity. Cost of the project is estimated at \$1,200,000; work will begin about June 1. J. E. Davidson is president; Clarence Milnard is company engineer.

SCHUYLER, NEBR.—Colfax county rural public power district has applied to REA for loan of \$397,000 for construction of 350 miles of rural transmission lines. H. H. Henningsen, 326 Union State Bank building, Omaha, is consulting engineer.

Idaho

LEWISTON, IDAHO — Clearwater Valley Light & Power Association has been allotted \$325,000 by REA for construction of 264 miles of rural transmission lines and generating plant to serve 900 customers.

Pacific Coast

LOS ANGELES — Simonds Machinery Co. is erecting store and shop building

at 451-455 East Fourth street. Structure will be 55 x 100 feet and will cost about \$9800.

LOS ANGELES—Wesix Electric Heater Co., 390 First street, San Francisco, maker of electric air and water heaters, will build a branch plant at 2424 East Eighth street, Los Angeles.

LOS ANGELES — J. I. Case Co., 700 State street, Racine, Wis., manufacturer of farm machinery, is building a branch plant at 4350 District boulevard here.

LOS ANGELES — Pacific Gear & Tool Works, 1635 Folsom avenue, San Francisco, has acquired former property of Empire Tool & Mfg. Co., East Thirty-eighth and Alameda, this city.

VERNON, CALIF. — Elco Welding works is having shop building erected at Downey road and Simpson avenue at an estimated cost of \$6975.

SEATTLE — Aircraft Plywood Corp., 4000 Fifteenth avenue West, is building a steel craneway at its plant here.

SEATTLE — Hydraulic Supply Mfg. Co., 7500 Eighth avenue South, will build a 200 x 32-foot addition to its steel fabricating plant here.

SEATTLE — Seattle Gas Co. will install electric precipitator for smoke control and will shortly open bids for a steel oil storage tank, 102 x 42 feet.

SEATTLE — Simmons Co., 99 Spokane street, is building \$35,000 mattress factory, 163 x 60 feet. Sound Construction and Engineering Co. has general contract.

SEATTLE — City light department will open bids April 1 for furnishing suspension insulators and hardware for Skagit transmission line No. 2, and on April 22 for four KVA switchgears for south substation.

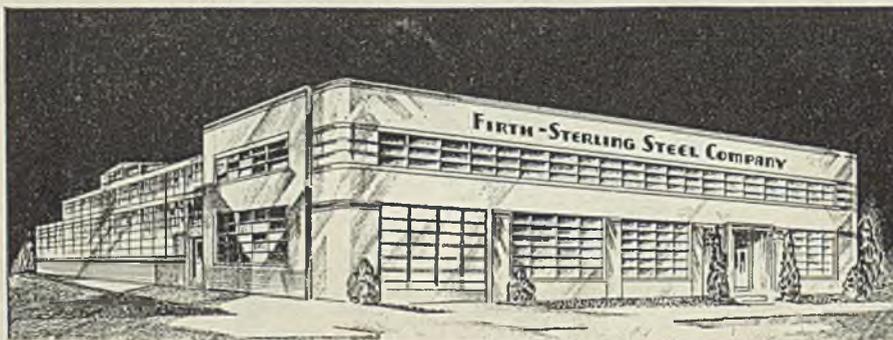
YAKIMA, WASH. — Members of Yakima growers co-operative have voted to proceed with construction of \$100,000 plant.

HOOD RIVER, OREG. — Hood River apple growers association is considering construction of \$350,000 cold storage plant. Arvo Hukari is sales manager.

Canada

MONTREAL, QUE. — Florasynth Laboratories Co. Ltd., care Albert Ellison, 437 St. James street, plans erection of factory, at a cost of about \$50,000, to manufacture chemical products.

Warehouse to be Built in Detroit Area



FIRTH-STERLING STEEL CO., McKeesport, Pa., has completed plans for construction of this modern, steel, glass and concrete warehouse building at West Chicago and Oakland avenues in Detroit. The building also will house the company's Detroit offices and will double its facilities for supplying steel to manufacturers in this area. The Austin Co., Cleveland, is general contractor

