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STEEL

ESTABLISHED 1882

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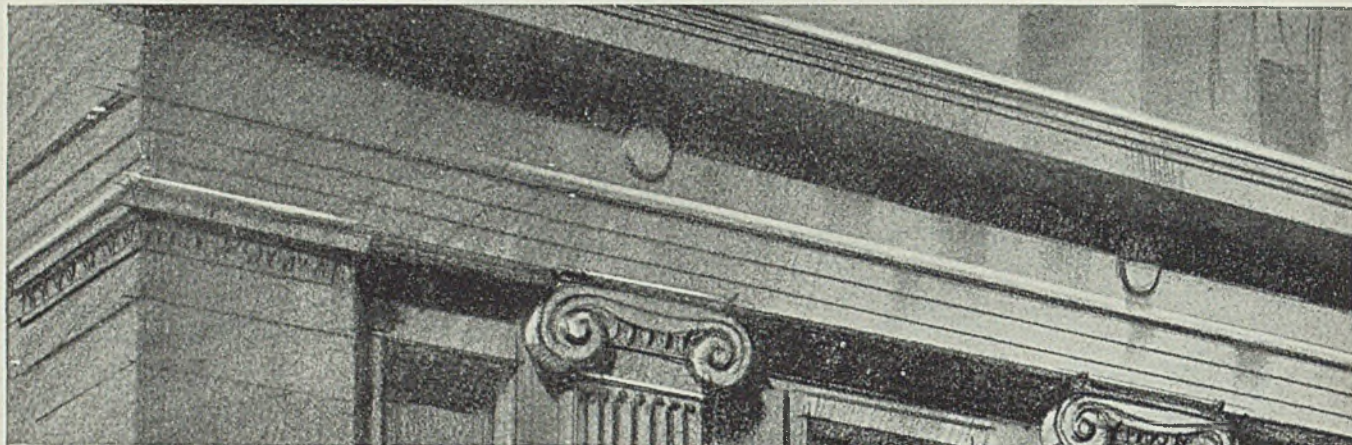


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PRODUCTION • PROCESSING • DISTRIBUTION • USE

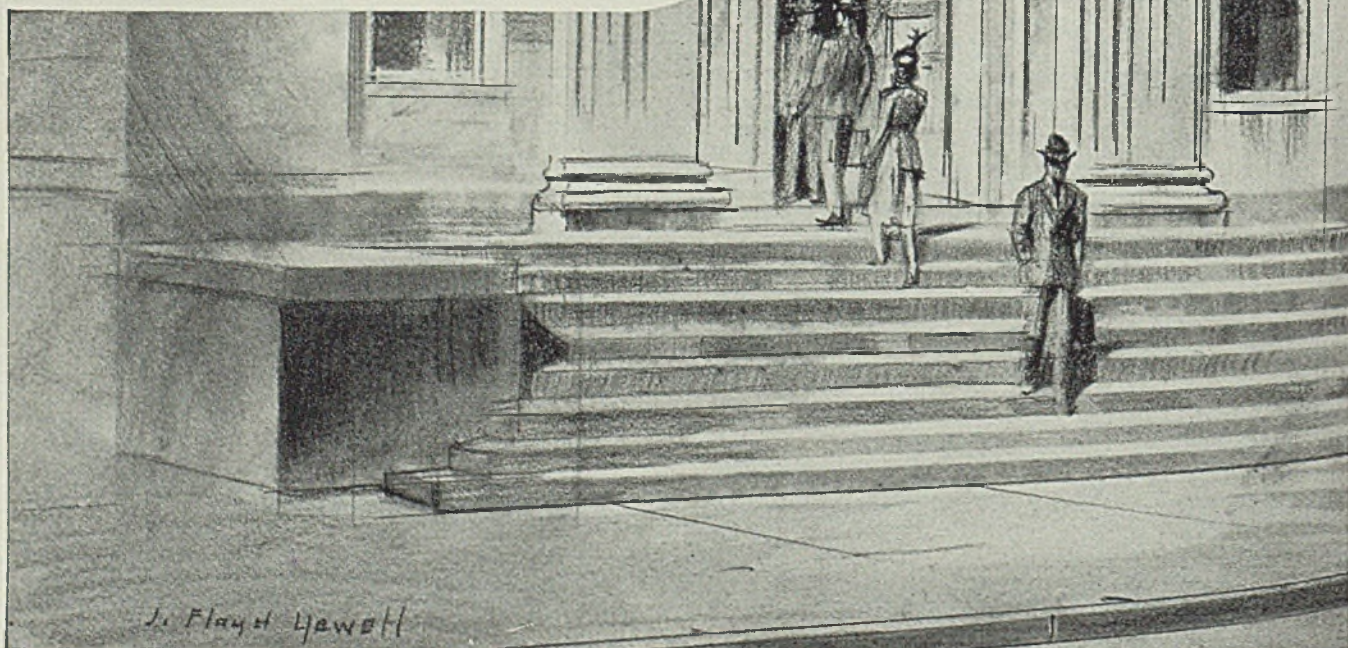


ON DEPOSIT...

...a fund of information

A source of comfort and strength in times of personal emergency are the funds put away over the years. To the metal working industries, at a time like the present, the fund of information on Nickel Alloys accumulated by our technical staff can also be a source of help and satisfaction. The facts and data thus available are the natural product of wide experience in the solution of problems involving the use of Nickel and its alloys. Our helpful literature may well be of real assistance to you because it deals with the selection, fabrication and use of these materials. You are also offered the assistance of our technical staff in solving material problems arising from a temporary lack of Nickel. We suggest that you drop us a line asking for a list of available literature. Your request for the assistance of our technical staff will receive prompt attention.

NICKEL



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK, N. Y.

HIGHLIGHTING THIS ISSUE OF STEEL

■ RECENT warnings from Washington of the early termination of "business-as-usual" now are proving to have been based on sound premises. While substantially all users have been receiving, and continue to receive, needed metals, all of last week's developments indicated that the problem of supply from now on is to be a much more difficult one for civilian manufacturers. Major move (p. 31) was the announcement of a pig iron rationing system under which civilians will be supplied only after defense requirements have been met . . . In the first two of a series of meetings throughout the country (p. 28), manufacturers, distributors and consumers were warned as to steps they must take to be sure of getting materials even for defense.

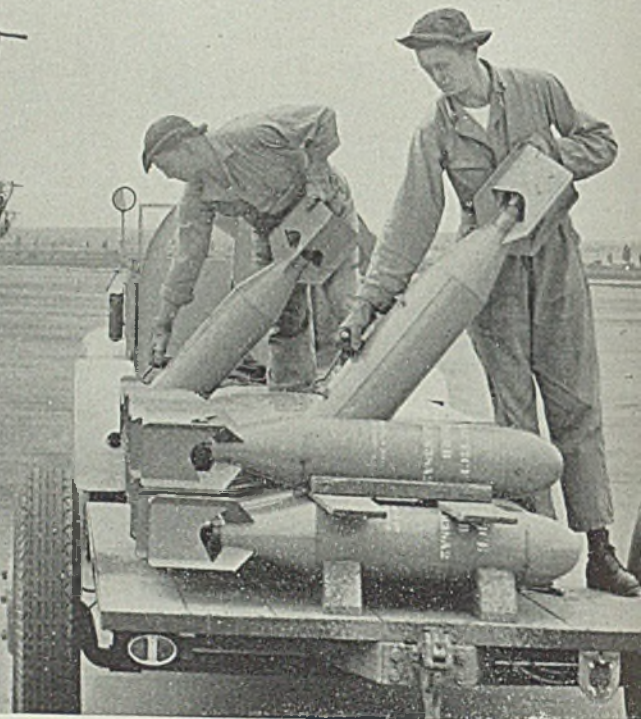
Far overshadowing all other problems in steel is the present scrap shortage, says E. G. Grace (p. 27). He predicts the situation will become even worse and fears a drop in steel production from this cause. Already (p. 89) scrap shortage has been a contributing factor in causing open-hearth furnaces to be retired for relining earlier than otherwise would be the case . . . An effort to set a pattern for a country-wide auto wrecking campaign is under way in Ohio . . . Bethlehem, incidentally, is importing scrap from Cuba and Mexico . . . OPACS will undertake an investigation in the next few days of steel earnings, to determine (p. 32) whether present price ceilings are fair.

In the formative stage is a "defense product list" (pp. 32 and 38) from which manufacturers can select items they would like to supply . . . Well-informed Canadian opinion (p. 24) is that union with the United States "is inevitable within a period of 30 years." Canada expects a sustained peace-time development after the war

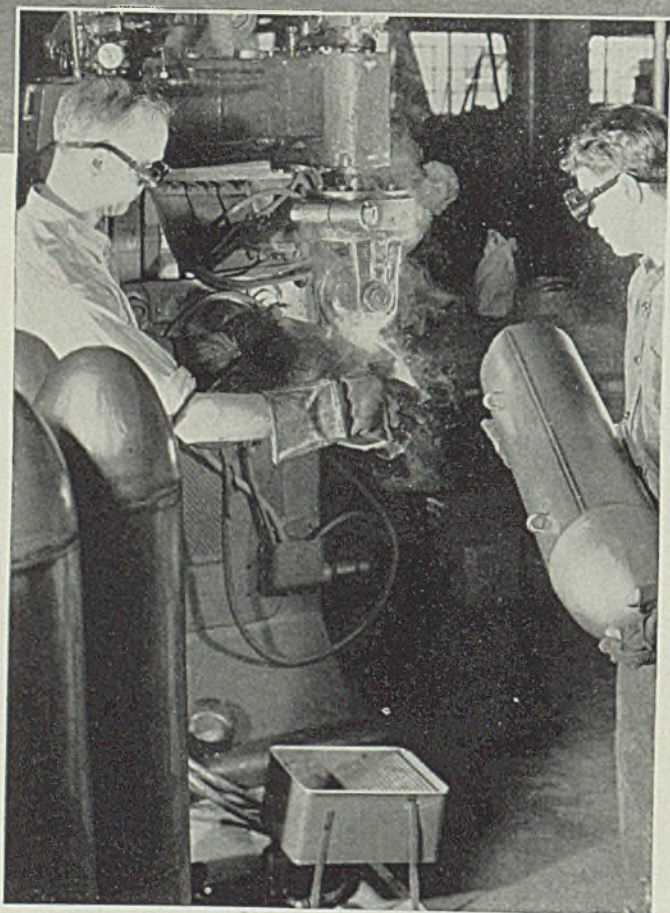
. . . Price control is a two-edged sword, says STEEL'S editor-in-chief who (p. 48) warns of careless wording which would permit maladministration . . . Regulation of cutting tools (p. 34) is more severe . . . ASM in collaboration with OPM (p. 31) is working to encourage use of molybdenum high speed steel . . . Food packing requirements (p. 34) are assured . . . Price ceiling may be placed (p. 32) on tin.

Production of 0.30-caliber Browning air-cooled machine guns is detailed (p. 54) by A. H. Allen, STEEL'S Detroit Editor. . . E. W. P. Smith enumerates (p. 60) factors which affect production speed and cost in arc welding—the first of a series on how to get the most from arc welding in your own shop. . . Methods employed for tool maintenance by a bolt and nut maker are outlined (p. 68) by A. E. Buelow. . . In new internally heated salt bath furnaces, approximately 80 per cent of the heat is generated at the bottom of the pot (p. 78). This is claimed to cause active thermal circulation and thus exceptionally uniform heating of the work.

G. B. Berlien presents (p. 74) a guide to the heat treatment of stainless steels from the standpoint of the practical steel treater. . . A relatively new development in metalworking shops, interprocess cleaning, aids subsequent machine operations. One plant practically tripled output in tumbling department (p. 52) by use of a combined tumbling and cleaning unit. . . P. H. G. Willan discusses (p. 62) three base methods of reclaiming spent pickle liquor. . . An automatic coke weighing and charging setup (p. 71) speeds handling of materials to blast furnace. Gate door record furnishes double check on system.



Moving 100-lb. sand practice bombs up to "Flying Fortresses" scheduled for bombing drill.



Seam-welding the nose to the body of a practice bomb.

PRACTICE BOMBS for Our Air Force—

Another INLAND STEEL Defense Job

Thousands of practice bombs are being used by the United States Army and Navy to develop the marksmanship of America's crack young aviators. Shown at the left are 100-lb. practice bombs being fabricated by a manufacturer from 16 and 20 ga. Inland Hot Rolled Pickled Sheets. All seams are resistance welded. The capacity of these bombs is 2.08 cu. ft. The Navy loads them with water—the Army prefers sand.

Like many other Government jobs, the order for these sheets has the right-of-way in the Inland schedules, for our entire organization is geared to our No. 1 job—National Defense.

SHEETS . STRIP . TIN PLATE . BARS . PLATES
FLOOR PLATE . STRUCTURALS . PILING . RAILS
TRACK ACCESSORIES . . REINFORCING BARS

INLAND STEEL CO.

Ten Years' Industrial Expenditures Crowded Into Two, All for War

Canada building "arsenal for democracy" with 70 per cent of cost supplied by governments . . . Metals expansion receiving great stimulus . . . Need 1,000,000 tons of steel from U.S. this year . . . British firms to locate in dominion

TORONTO, ONT.

■ ENTRY of Canada into the war in September, 1939, marked the beginning of a new era in the social and economic structure of the Dominion.

Almost overnight the country turned from ordinary peace-time pursuits, with less than 50 per cent of its industrial capacity operating, to a nation at war, calling for the utmost its plants could produce.

In many respects Canada's industrial and political leaders had to start from scratch to build a war industry that would enable the Dominion to play its part in the British Commonwealth of Nations.

Almost with the declaration of war they met in Ottawa to prepare plans for industrial expansion never before equalled in the Dominion.

In the two years that followed expenditure for new plants, additions and equipment totaled \$750,000,000, which by far exceeds that of any prior decade. Of the total expenditure for industrial expansion, the governments of Canada and Great Britain to date have contributed almost \$515,000,000. The Canadian government's outlay accounts for 35 per cent, Great Britain's 26 per cent, while 39 per cent is credited to joint account of the two governments.

The balance was provided by private capital in Canada, for new plants and additions, and by British firms for locating subsidiary plants here. Also a number of United States companies entered Canada, establishing subsidiaries to partici-

pate in business on war account.

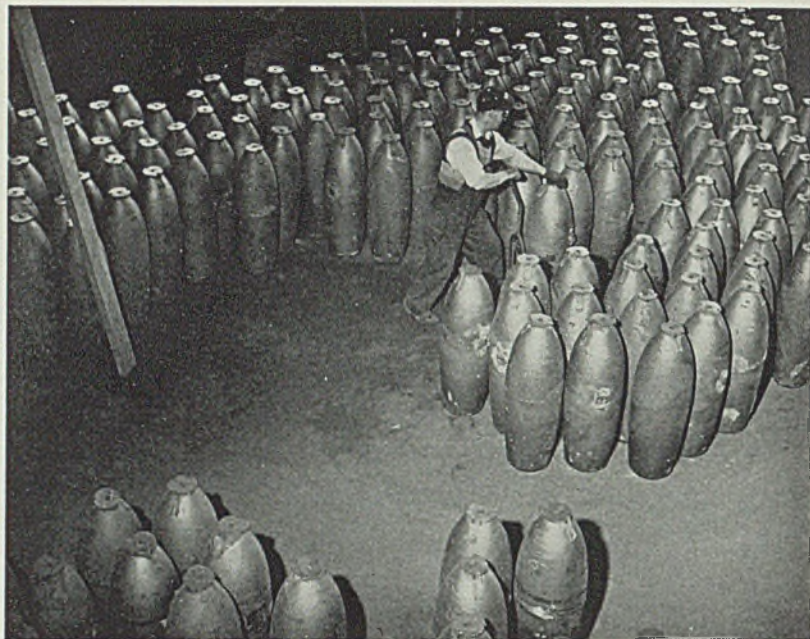
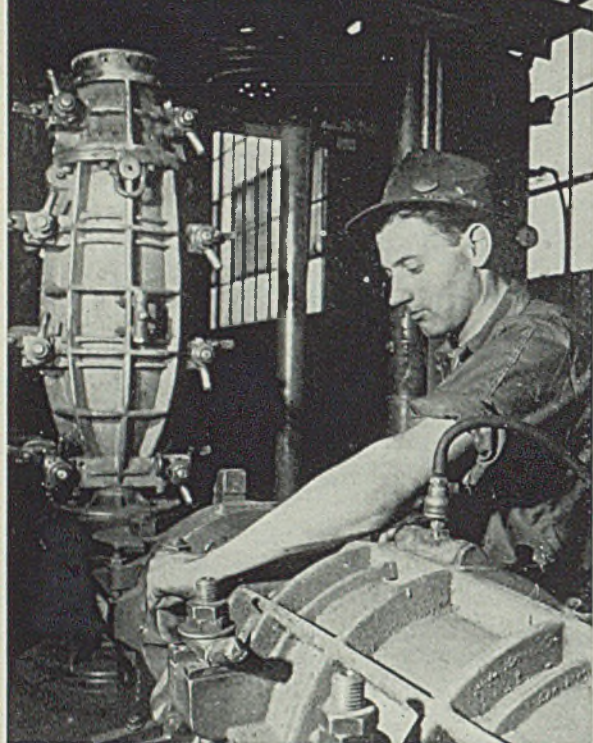
Practically the entire sum on British account, together with the larger part provided by the Canadian government was to provide new industries and lines of manufacture, all of which are directly associated with the war. Also a large expenditure was directed

toward enlarging prevailing facilities to speed production of war materials.

Among the new lines of production for Canada, directly resulting from the war, with capital expenditure by the two governments, are: Chemicals and explosives, \$116,193,973; guns, mountings and carriages,



■ Squinting through the sights in expert fashion, Prime Minister W. L. Mackenzie King is shown manning an anti-tank gun during a recent inspection at Shilo training camp in Manitoba



\$113,786,295; shells, \$52,952,759; tanks and carriers, \$14,377,774; aircraft, \$23,682,010; bombs, depth charges and mines, \$2,757,969.

Expenditure necessary for the production of other war materials, amounted to \$136,211,741. Also, expenditures for additions to plant and equipment to produce machine tools and technical equipment required \$19,646,054; for automotive equipment alone, \$7,413,248. In all, 233 firms participated in expenditures by the two governments. Some ten wholly-owned government companies were formed to supervise and manage new industries.

Through the Department of Munitions and Supply, operating under the direction of Hon. C. D. Howe, and its predecessors, the Canadian and British governments have placed war orders in Canada totaling \$1,500,000,000. This does not include contracts awarded for new plants, additions and equipment.

Among the more important developments in Canada's industrial sphere are those relating to the iron and steel industry. At the beginning of 1940 capacity for producing pig iron was rated at 1,550,000 gross tons per year. This was divided between the following blast furnace operators:

Dominion Steel & Coal Corp. Ltd., Sydney, N. S., three stacks with daily capacity of 1200 tons; Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont., four stacks, 1600 tons; Canadian Furnace Co., Port Colborne, Ont., one stack, 350 tons; Steel Co. of Canada Ltd., Hamilton, Ont., two stacks, 975 tons.

The Steel Co. of Canada, is completing a new 1000-ton blast furnace, giving the company a rated capacity of 1975 tons per day. This will bring total potential capacity in Canada to about 1,900,000 tons

Manufacturing 500-pound bombs in Quebec. In casting, a core of hard-packed sand is used as a mold for the interior. Cores are produced by forcing sand into the forms at a pressure of 140 pounds to the square inch. Right. bomb shells in the rough

a year. At no time has Canadian pig iron production reached maximum capacity. The peak was attained last year, when output totaled 1,168,894 tons, while on only five prior occasions did yearly production pass the million-ton mark. The former record was made in 1929 with 1,080,000 tons, while prior to that the peak was 1918 with 1,078,000 tons.

In the first six months this year production totaled 625,551 tons, which with the new furnace about to blow in at Hamilton, would indicate an output this year in excess of 1,250,000 tons.

Ingot Capacity Increased

At the start of war the country's capacity for producing steel ingots and direct castings was 2,094,700 gross tons a year. With open-hearth furnaces and other equipment completed or in process of installation, a capacity of about 2,750,000 tons will be available before 1942.

Canada's peak production of ingots and castings was 2,011,172 tons in 1940. The prior record was in 1918, closing year of World War 1, with 1,672,954 tons.

The highest for any peace year was 1937 when 1,402,882 tons were reported.

Production in the first six months this year totaled 1,148,435 gross tons. A new record for 1941 is indicated.

Steel Co. of Canada was one of

the first to see the writing on the wall, and began an expansion program that in less than two years has required an expenditure of \$10,000,000. Additions to its Hamilton works included a new tin plate mill; a 110-inch, four-high, universal plate mill; two open-hearth furnaces and a 1000-ton blast furnace, also a number of additions to facilities at subsidiary plants in Ontario and Quebec.

Dominion Steel & Coal with an expenditure of some \$7,000,000, stepped up its steelmaking facilities more than 30 per cent, to an annual rate of more than 600,000 tons. It now is preparing its 110-inch plate mill to resume operations early next year, after a suspension since 1918.

Algoma Steel doubled the capacity of its tin plate mill last year, and now is erecting a 44-inch blooming mill and 25-inch continuous billet mill. The expenditure over the two years, including work underway, will be about \$5,000,000. When the new mills are completed early next year, its rolling mill capacity will equal steel-melting capacity, which formerly was about 250,000 tons short. These mills also will increase annual rolled steel capacity in Canada by about 12½ per cent.

Dominion Foundries & Steel Ltd., Hamilton, expended about \$5,000,000 to enlarge various departments. The company was the original producer of plate for this war.

Other primary producers of steel, which collectively in the past two years have spent upwards of \$10,000,000 for plant expansions are Atlas Steels Ltd., Welland, Ont.; Burlington Steel Co. Ltd., Hamilton; Canadian Car & Foundry Co. Ltd., Montreal; Canadian Steel & Tube Products Ltd., Montreal; London

Rolling Mills, London, Ont.; and the Manitoba Rolling Mills Ltd., with mills at Selkirk, and Calgary, Alta., a subsidiary of Dominion Bridge Co. Ltd., Montreal.

Manitoba Rolling Mills at Calgary have been idle for a number of years but early resumption is planned.

Several new electric furnaces have been installed including one at the Sorel, Que., plant of Sorel Industries Ltd., which is producing its own steel for the manufacture of 25-pounder guns.

Upwards of 60 per cent of capital required for the expansion of Canada's steel industry has been provided by the government. Demands on war account have far outstripped production which has been maintained practically at capacity almost since the war began.

To supplement this country's steel output the government estimates it will be necessary to import upwards of 1,000,000 tons from the United States this year. At present Canada's primary steel is booked up for the remainder of the year. Some producers are refusing additional orders.

Through contracts placed last year Canada is the principal source of supply for the United Kingdom for nickel, copper, lead and zinc, and also is arranging to supply large quantities of some of these materials to the United States.

Canada is one of the world's leading producers of aluminum, and with the Aluminum Co. of Canada's \$60,000,000 expansion program now under way will become a much greater factor within the next year or two.

In production of precious metals which are of special importance for purchasing war materials and to stabilize foreign exchange, Canada is about equal with the United States, being surpassed only by South Africa and possibly Russia,

the latter providing no official figures.

With regard to mineral production, Canada registered the highest record in history in 1940 when output reached a value of \$520,174,439.

At the outbreak of war Canada's producers were asked by the British government to supply metals needed at prices, which though somewhat above the actual cost of production, were slightly under those prevailing at the time. They agreed to this, and immediately entered into long-term contracts for all of Canada's surplus output. The prices agreed upon were slightly over 10 cents per pound for copper; just over 3½ cents for electrolytic zinc, and a bit more than 3 cents for lead.

Nickel and Aluminum Lead

Mining development has fallen far short of that in the other industrial fields. With the exception of International Nickel Co. of Canada Ltd., which has announced a \$25,000,000 expansion program, and the Aluminum Co. of Canada, comparatively little outlay has been undertaken by mining companies, while practically no assistance has been forthcoming from the government.

Canada has vast mineral areas, comparable to those of Russia, that have never been explored and are available for exploitation. Only one mine is producing iron ore, using sintering methods to improve the quality. That is the new Helen mine in Southwestern Ontario, controlled

■ Filling bombs with Tri-Nitro-Toluene. Left, the TNT is kept warm and fluid, passing through insulated pipes. Right, "puddling", or mixing, the liquid TNT to remove small air bubbles which might destroy the effectiveness of the explosion

by Algoma Steel Corp. Steel Rock Iron Mines Ltd., also in that section of the province, has been under development for about three years.

Copper, lead, zinc and nickel have received more attention. However, production of these metals is limited to some half-dozen companies, while there are many other commercial deposits throughout Ontario, Quebec and Manitoba, available for development, as well as large areas to be explored. Oil production in Western Canada is growing in importance, and though supplies from those sources are not yet available to Eastern Canadian markets they are important factors. Recent work in the newer oil fields indicates numerous other deposits are still to be tapped.

In the production of precious metals, gold, silver and platinum, Canada now is depending almost exclusively on old and established mines. Prospecting and development of new properties is almost at a standstill due mainly to lack of capital.

Unparalleled manufacturing expansion has been responsible for creating a new army of skilled workers, recruited from graduates of schools, and "white-collar" men. Skilled mechanics and tradesmen by the thousands are being trained to man industries that are almost entirely new to Canadians.

In the last six months men of 40 to 50 have been enrolled as trainees. Western Canadians are to be brought to Ontario for this purpose. Training of more women for semiskilled work is not far off. There will be a great shortage of labor by the year's end. Under a new plan skilled workers may be employed only through a public employment office, thus preventing employers from raiding each other.

Canadian law now provides that until a conciliation board has had time to deal with a labor dispute





■ The 500-pound bomb is completed by inserting a steel explosive container in the nose. This part supplies one of two explosions which occur when the missile hits its mark

any strike will be illegal. A labor organizer who incited an illegal Canadian General Electric strike has been interned. Of 80 to 90 Communists who have been interned 10 or 12 are trade unionists.

The Canadian government, by an Order-in-Council dated Dec. 16, 1940, provided for stabilization of wages by stating that there should be no basic wage increase over the maximum paid in a base period from 1926 to December, 1940.

It also provided for "cost of living bonuses," which were clarified by an amendment on June 27. The wartime wage bonus it recommends is usually one of \$1.25 a week for each rise of 5 per cent in the cost of living. The Canadian Labor Department states that though this plan fixes a wage ceiling it is at the highest level ever reached.

Time-and-a-half is paid for overtime but overtime does not start until 48 hours have been worked. The average work-week is 54 hours. Three shifts are employed where possible.

What will become of these new war industries, the enlarged plants, and the huge army of specialized workers after this great conflict?

While the answer is a matter of conjecture, the general opinion favors the idea that there will be no great let-down.

It is now stated that many of the so-called war industries have been built on a permanent foundation and are destined to remain as useful peace-time industries. No doubt some will be demolished or revamped for new lines.

In recent months reports have come from the British Isles that a number of British companies are considering establishing plants in Canada, some to move their entire

works. During the past two years several have located plants here. Their purpose is to strengthen their place in the Dominion markets, and to obtain advantageous position from which to capture and develop South American trade. Canadian industrial leaders also hope to participate in rebuilding European countries after the war.

For the post-war reconstruction period, Canada will have many advantages unequalled by many other

countries. This Dominion has an area greater in extent than the United States, with a population of slightly over 11,000,000 people. There are natural resources to be exploited that could absorb labor and provide good wages.

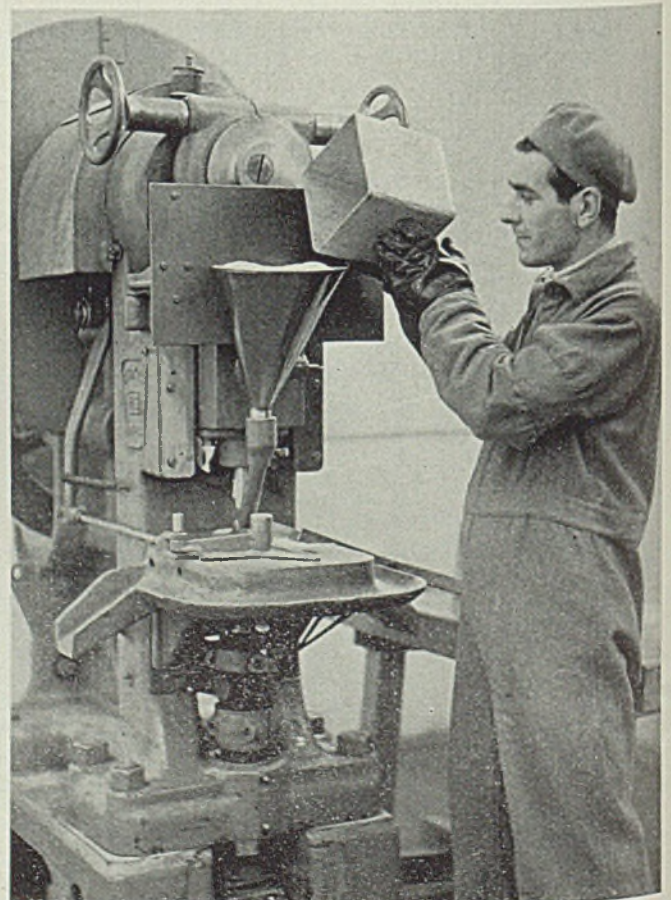
However, one of Canada's important drawbacks is a lack of aggressive leaders, men of action to give impetus to the development of natural resources.

Canada is destined to become the principal center of immigration after the war. A popular estimate seems to be that within a period of ten years the population through immigration will be increased to at least 15,000,000.

One of the more important results of the war has been a new understanding between Canada and the United States. A mutual admiration appears to have wiped out old animosities. It is believed fresh opportunities will be thrown open to American industry.

In some quarters there is a growing attachment for the United States, which has resulted in diverse opinions regarding the actual joining of the two North American countries under a single government.

One of Canada's leading newspaper editors was asked: "What do you think of the possibilities for the annexation of Canada with the United States?" He replied: "It is inevitable within 30 years."



■ This worker is operating a continuous action pelleting machine in a Canadian shell and bomb plant. The machine, working to an accuracy of one-thousandth of an inch, punches out pellets from TNT in solidified form for anti-aircraft shells. Photos from Office of Director of Public Information, Ottawa

Steel Income Cut 24.5 Per Cent in Second Quarter by Taxes, Wage Boosts

SEVENTEEN leading steel producers, representing nearly 85 per cent of the industry's capacity, earned a combined total net income of \$58,864,188 in the second quarter. This was 24.5 per cent less than combined total of \$77,983,710 earned by these companies in the first quarter this year, but 30 per cent more than \$44,188,328 in the second quarter last year.

Ten of the 17 companies reported their individual net profit in the second quarter this year was substantially lower than in the period ended March 31.

Principal factor responsible for the decrease was the proposed amendment to the Second Revenue Act of 1940, necessitating much larger provisions for federal tax.

Several producers provided for anticipated tax increases for the first quarter, out of second quarter earnings. Tax provision for many of the companies was much larger than the final net income, in some cases several times as large.

Increased operating costs, due to higher prices of raw materials, and the steel wage increase last spring, also were important factors in reducing net income.

Net profit earned in the first half this year by the 17 companies totaled \$137,809,484. This compared with \$83,201,031 reported for the period in 1940. None of the companies reported deficits incurred in the six months, against two that operated at a loss in the first half, 1940.

Accompanying tabular summary

compares the earnings records of the 17 companies, and includes Crucible Steel Co., which releases its reports on a semiannual basis.

**Bethlehem's Net Profit \$5,651,457,
Provision for Taxes \$17,630,000**

Consolidated net income reported by Bethlehem Steel Corp., Wilmington, Del., for the second quarter of 1941 was \$5,651,457 after all charges and provisions for federal taxes on the basis of proposed amendments. This was equal, after dividend requirements on the corporation's 7 per cent cumulative preferred stock, to \$1.34 per share on common.

In the comparable period last year net income totaled \$10,807,318, and was equal to \$3.07 per common share. Net profit in the quarter ended March 31, 1941, was \$10,436,028 or \$2.95 per share on common.

Tax provision for the first quarter this year, based on tax laws in effect at the end of the period, was \$7,270,000. Aggregate provision for the second quarter, based on rates in the proposed amendments, and providing for anticipated increase for the first quarter, was \$17,630,000.

Total profit for the first half, computed from quarterly reports, was \$16,087,485. In the period last year, net income totaled \$21,698,457.

Dividend of \$1.75 per share on the 7 per cent cumulative preferred stock was declared, payable Oct. 1 to record of Sept. 5. Declaration of \$1.50 per share on common, pay-

ble Sept. 2 to record of Aug. 11 was also reported.

On the basis of present tax calculations for the first six months, 69 cents of every dollar will go to the tax collector, leaving 31 cents for the business and stockholders, said E. G. Grace, president in releasing the corporation's statement. Figuring taxes at that rate for the year it would mean \$23 a share on the common. Last year, taking it as a whole, 45 cents of each dollar went for taxes.

A profit of \$2.68 a ton for steel produced was indicated for the first six months, as compared with \$4.54 for last year. Put in another way, he said this would represent a 4 per cent profit on billings for the first six months, compared with 8 per cent last year. These figures take into account earnings from shipbuilding and all other operations.

He estimated that 35 to 40 per cent of Bethlehem's steel shipments in the second quarter was for national defense, and that this work represents 46 per cent of the steel order book today, including business for Great Britain and her allies.

Orders on hand June 30 valued at \$1,367,500,000 represented a new high. Unfilled steel orders represented capacity operations for five to six months.

Export shipments have fallen off sharply, amounting to 6.4 per cent of the total in the second quarter, as compared with the 32.8 per cent high in the third quarter last year.

Employment in the second quarter reached a peak of 156,801, against 141,321 in the preceding period and 112,316 in the corresponding period a year ago. Payrolls amounted to \$84,629,000 in the second quarter; \$68,406,000 in the first, and \$48,457,000 in the second quar-

Steel Producers Earnings Statements Summarized

	Second 1941 Quarter	Second 1940 Quarter	First 1941 Quarter	First 1941 Half	First 1940 Half
United States Steel Corp.	\$24,814,751	\$19,201,008	\$36,559,995	\$61,374,746	\$36,315,003
Bethlehem Steel Corp.	5,651,457	10,807,318	10,436,028	16,087,485†	21,698,457
Republic Steel Corp.	5,428,749	3,337,730	8,189,966	13,618,715	6,449,453
Jones & Laughlin Steel Corp.	3,937,720	2,141,645	4,160,507	8,098,227	3,276,256
Youngstown Sheet & Tube Co.	4,765,997	1,169,283	4,576,197	9,342,194	2,423,212
Inland Steel Co.	4,102,572	2,873,655	3,469,046	7,571,619	5,933,499
American Rolling Mill Co.	3,068,735	1,079,405	3,599,241	6,667,976	2,084,599
Wheeling Steel Corp.	2,708,187	1,981,009	1,019,426	4,689,196	1,664,078
Crucible Steel Co. of America. ....	.....	.....	.....	2,924,430	1,817,293
Otis Steel Co.	493,072	196,629*	594,183	1,088,255	362,143*
Alan Wood Steel Co.	283,267	224,312	473,794	757,061	521,558
Sharon Steel Corp.	285,988	79,327	527,253	813,242	388,903
Allegheny Ludlum Steel Corp.	1,449,183	1,008,121	2,720,164	4,169,347	1,893,291
Granite City Steel Co.	24,828†	7,238†	93,195	118,023	50,390
Continental Steel Corp.	324,435	141,339	313,122	637,553	352,795
Wickwire Spencer Steel Co. \$.....	460,256	177,471*	231,172	691,428	440,171*
Rustless Iron & Steel Corp.	582,762	217,411	581,698	1,164,460	430,537
Copperweld Steel Co.	481,229†	293,627	438,723	919,952	521,314
TOTAL	\$58,864,188	\$44,188,328	\$77,983,710	\$137,809,484†	\$83,201,031†

*Loss; †indicated; \$before taxes; ‡excluding Crucible Steel Co.

ter in 1940. A new record in average earnings per hour also was established, amounting to 105.2 cents, compared with 97.3 in the first quarter, and 93.1 in the second quarter last year. Hours worked per week averaged 39.2, against 37.9 and 35.

Mr. Grace said that during the first six months the company spent \$18,200,000 for plant extensions, and has at present \$34,000,000 authorized for new work, but unexpended. He estimated that Bethlehem will spend at least \$40,000,000 this year out of the total of \$58,200,000 either spent or pending under authorization. Bethlehem also has spent for government account, most of it this year, approximately \$28,000,000, and will spend further, \$52,000,000, or a total of \$30,600,000.

U. S. Steel's Profit Lower; Tax Provision Up Nearly 250%

United States Steel Corp.'s net income in the quarter ended June 30 was \$24,814,751, after all charges including provision for federal income and excess profits taxes covering the first half of 1941 on the basis of proposed tax legislation.

This equaled \$2.12 per share on common after preferred dividend requirements, and compared with net profit of \$19,201,008, or \$1.48 per common share in the corresponding quarter last year. In the first period, 1941, net income was \$36,559,995, equal to \$3.47 per common share.

Net income in the first six months was \$61,374,746, against \$36,315,003 in the first half in 1940.

Total tax provision in the second quarter, \$52,958,292, was nearly two and a half times as large as \$22,603,379 provided for taxes in the first period.

No decision as to whether the corporation will seek the government's permission to increase steel prices to help offset greatly increased taxes and higher operating costs has been reached, it was reported.

Dividend of \$1 per share on common was declared payable Sept. 20 to record of Aug. 20. Regular quarterly of \$1.75 per share on preferred, payable Aug. 20 to record of Aug. 1, was also declared.

Summarized comparison of the corporation's second quarter opera-

tions, against the comparable period last year and the first quarter of 1941 are given in the table below.

About 60 per cent of the corporation's backlogs, including shipwork, are for defense, Irving S. Olds, chairman, estimated at a press conference following the directors quarterly meeting. This includes tonnage for Great Britain and her allies.

Unfilled orders for rolled and finished steel represent approximately six months' shipments at the present rate. Much of this tonnage will not be needed for many months; in case of some shipwork, not until 1945.

He said the shortage of scrap undoubtedly is retarding steel production, although it has not materially affected the corporation, which still is in a fairly comfortable position. He explained that the corporation is a large producer of scrap, hence is not as dependent on outside sources as others. He thought the heavy exportation of scrap in the past five or six years had contributed considerably to the present shortage.

Export business fell sharply during the first half. On a sales basis, this business was perhaps less than 10 per cent of the total, against 20 per cent in the period last year.

He remarked that authorization on which there were unexpended balances of approximately \$176,600,000 at the end of the first half included three lake boats, but no especially outstanding plant projects.

The number of the corporation's employes at the end of June was 308,000, highest since Jan. 1, 1929.

\$7,571,619 Net Income Earned in First Half by Inland Steel Co.

Inland Steel Co., Chicago, reports net income in the June quarter, after all charges and with tax provisions based on rates included in the proposed amendments, was \$4,102,572. Equal to \$2.51 per share on the company's capital stock, this compared with net earnings totaling \$2,873,655 or \$1.76 per share in the quarter last year.

In the period ended March 31, 1941, net profit, based on proposed tax amendments, would be reduced to \$3,469,046 or \$2.13 per share.

Net profit in the first six months

this year was \$7,571,619 or \$4.64 per share. This compared with \$5,933,499 or \$3.64 per share in the corresponding half in 1940.

Cash dividend of \$1 per share on the capital stock was declared, payable Sept. 2, to record of Aug. 15.

Crucible Steel Co.'s Tax Provision Double Net Profit

First half net income reported by Crucible Steel Co., New York, was \$2,924,430 after all charges, including provisions for federal income and excess profits taxes, provisions for anticipated increase in tax rates and a \$500,000 contingencies reserve.

This was equal to \$1.69 per share on common after preferred dividend requirements, and compared with net profit of \$1,817,293 or \$2.20 per share on common.

Total tax provision for the half was \$6,126,186, without the provision for contingencies. Tax deductions in the comparable period last year totaled \$1,152,469.

American Rolling Mill Co. Earned \$6,667,976 Net in First Half

American Rolling Mill Co., Middletown, O., reports net income in the June quarter, after all charges including federal income and excess profits taxes and provision for anticipated tax increases, was \$3,068,735. Equal to 89 cents per share on common after preferred dividend requirements, this compared with reported net income of \$1,079,405 or 20 cents per share on common in the comparable period in 1940. Net income in first quarter this year was \$3,599,241 or \$1.08 per share on common.

For the six months ended June 30, total net income was \$6,667,976, equal to \$1.97 per common share after dividend requirements on the company's 4½ per cent cumulative convertible preferred. It compared with aggregate net income of \$2,084,599 or 37 cents per share in the period in 1940.

National Steel's Second Quarter Profit \$5,291,430

National Steel Corp., Pittsburgh, reports net income in the quarter ended June 30 was \$5,291,430 or \$2.41 per share on the corporation's capital stock after all charges and provision for federal taxes. This compared with \$3,004,624 or \$1.36 per share in the corresponding period last year and \$5,430,389 or \$2.46 per share in the March quarter, 1941.

Net profit in the first half, after provision for federal taxes based on proposed amendments to the revenue law, was \$9,721,819. Equal to \$4.42 per share, this compared with \$7,013,817 or \$3.18 per share in the first six months last year.

U. S. Steel's Balance Sheet Summary

	Second Quarter 1941	First Quarter 1941	Second Quarter 1940
Net income.....	\$24,814,751	\$36,559,995	\$19,201,008
Earnings per share for common stock.....	\$2.12	\$3.47	\$1.48
Shipments of finished steel products			
Net tons	5,101,606	4,951,271	3,201,645
Per cent of capacity	102.4	100.6	66.4
Provision for taxes:			
State, local and social security.....	\$20,158,292	\$10,803,379	\$15,087,632
Federal income, excess profits.....	32,800,000	11,800,000	5,475,000
Total taxes	\$52,958,292	\$22,603,379	\$20,562,632

Scrap Shortage Steel's Worst Problem, Says Grace; Blames Exportations

■ FAR overshadowing all other problems in steel is the present shortage of scrap, Eugene G. Grace, president, Bethlehem Steep Corp., declared at a press conference last week following the directors' quarterly meeting.

The situation is promising to get worse before it gets better, he stated.

"There is no use in talking about the need for increased steelmaking capacity until we can gain some assurance that there will be an adequate supply of scrap and pig iron."

He indicated that the recently proposed program for adding 6,500,000 tons of pig iron capacity has been suggested primarily to fill the gap created by the scarcity of scrap, and this program, he added, will take from 12 to 24 months to complete. He said he did not know precisely what the industry will do meanwhile to maintain the present high rate of operations.

Mr. Grace described the situation with respect to his company as "bad." Bethlehem has scarcely no scrap supplies and is literally operating on a hand-to-mouth basis. He said the company now requires about 300,000 tons of purchased scrap per month, and is "scouring the country from one end to the other," and is even bringing scrap from Cuba and Mexico.

He cited in particular the unfavor-

able position of the Lackawanna plant, which has a steel capacity of about 300,000 tons per month. Normally, he said, the plant during the open season on the Great Lakes accumulates most of its requirements for the winter. So far this season Lackawanna has not been able to increase its inventory of scrap by so much as a ton. What this plant was going to do when cold weather sets in, he did not know.

For the past 12 months Bethlehem has been able to hold steelmaking operations at a rate of 100 per cent or better, but it would be difficult under the circumstances to continue on indefinitely at this rate.

Attention on Semifinished

Declaring he did not believe the country's "reservoirs" contained much scrap, Mr. Grace attributed much of present scarcity to heavy exportations over recent years. He also pointed out that a substantial tonnage of scrap was being lost to this country by the heavy shipments of semifinished steel to Great Britain. He thought where possible shipments should be in finished, instead of semifinished form. Attention is now being directed to this question in Washington.

The scrap situation is causing his company much more concern than supplies of such strategic materials as tin and manganese, which have to be imported.

"Not the Cause," Scrap Institute Says

WASHINGTON

■ Refusing to accept responsibility for any shortage of iron and steel scrap that may cause a shutdown of steel mills and foundries, the Institute of Scrap Iron and Steel Inc., through its executive secretary, E. C. Barringer, last Friday issued a statement in reply to heads of steel companies who commented on the situation in their quarterly reports.

"The steel mills are not telling the public the whole story about scrap," Barringer stated. "The mills have failed to indicate the rapidly increasing demand together with the fact that throughout the country they are not only engaged in record-breaking defense work but are also manufacturing the usual consumer goods. Furthermore, when prices of scrap were abnormally low the mills refused to purchase it, which resulted in the original exportation of scrap to foreign

countries. In slack periods the mills expect the scrap dealers to be their bankers and hold the scrap for them."

Ohio To Be Testing Ground For Round Up of Old Cars

Ohio automobile wreckers will speed up the junking of derelict automobiles in order to double their production of iron and steel scrap for the defense program.

This action was pledged last week at a conference of 20 wreckers representing a total of about 1000 in Ohio, appointed by the Office of Production Management, Washington, following a general convention of Ohio wreckers in Columbus.

Due to a scarcity of scrap, some steel mills and foundries already have curtailed operations.

From the scrap industry the government is requiring almost 10,000,

000 tons more scrap this year than last.

It is estimated that the number of derelicts in automobile graveyards, not including those on used car lots, is between 4,000,000 and 7,000,000. At least 1,000,000 additional can be wrecked annually, in addition to the normal scrapping of 2,500,000, without impairing the supply of old models from which parts are sold.

Ohio having been selected as a test state by OPM, the state committee of 20 was created to work out a detailed scrapping program. Ben Solomon, Ben's Auto Parts, Toledo, was elected chairman; Ben Kaplan, Pearl Road Auto Wrecking Co., Cleveland, was chosen vice chairman; and Samuel Waterman, Waterman Iron & Metal Co., Steubenville, was made secretary.

Herbert H. Ridgway, scrap consultant for OPM, Washington, pointed out that the auto wrecking drive differs from the aluminum drive in that the public was asked to contribute to the latter, while in the case of autos the effort is to speed up an already established industry.

"Auto wreckers can scrap at least 50 per cent more cars without in the least stripping them of parts which are all the more required to service cars now on the highways because output of new cars is being curtailed," said Mr. Ridgway. "Each car wrecked yields about 1500 pounds of iron and steel scrap, 20 pounds of aluminum, 60 pounds of copper and brass scrap, and other valuable secondary materials."

An educational campaign is being planned in Ohio to attract derelict cars from farmers and individuals, some of whom are holding for higher prices. Published scrap prices have misled holders of such cars, it is claimed, because government fixed prices for scrap are for material delivered at the mills, and from this price must be subtracted transportation, cost of preparation, and other charges.

The pattern set in Ohio for an auto wrecking campaign is expected to be followed in other states shortly under the auspices of OPM.

Gray Iron Founders To Consider Supply Situation

Members of the Gray Iron Founders' Society Inc. from Ohio will meet in Hotel Cleveland at 2 o'clock Tuesday, Aug. 5, to discuss the scrap and raw materials situation.

W. W. MacMillen, chief purchasing agent, National Malleable & Steel Castings Co., who represents the foundry industries on the Scrap Advisory Committee to the OPM, will report the activities of that committee.

W. W. Rose, executive vice president of the society, will outline plans looking toward increasing supplies.

How To Obtain Material Under Defense Supplies Rating Plan Is Explained

■ AT two meetings last week, in Waterbury, Conn., July 28, and Cleveland, July 30, manufacturers, distributors and consumers were warned that unless they avail themselves of the provisions of the Defense Supplies Rating Plan developed in May and set up in the OPM Priority Division they may be unable to get steel and other materials needed for defense.

The meetings were held under auspices of the Industrial Supply Defense Committee of which H. K. Clark, vice president and general manager, Norton Co., Worcester, Mass., was chairman up until last Thursday when he resigned the latter post to join OPM. They were the first of a series to be held in at least 40 other key cities in the next six weeks.

The reason, Mr. Clark said, is that the Defense Supplies Rating Plan has not yet been accepted to the desired extent. It therefore becomes necessary, he explained, that a vast amount of educational work be done without delay. It becomes increasingly evident that there are not enough critical and essential materials and manufactured products to go around, he stated. Without the protection assured under the Defense Supplies Rating Plan consumers cannot be assured that they will get materials needed for defense.

"To detail the list of materials already declared critical and as such under regulatory or mandatory control would require an hour, and the list is growing each week," declared Mr. Clark. "Sometimes 40 or 50 items a week are added, and I fail to remember one which has been removed because supply has caught up with demand. And it is going to be worse, much worse."

How the plan operates was explained by Joseph L. Overlock, assistant deputy director, OPM's Priority Division. Under it business that qualifies as defense automatically receives a priority rating of A-10. This rating, however, does not interfere with orders carrying higher ratings. In order to obtain A-10 it is necessary to fill out the Priority Division's form P. D. 25. As the plan is intended only to protect those who now are having difficulty in obtaining materials and manufactured articles, it can be disregarded by those companies who now obtain such goods without difficulty.

Under the plan those consumers who fill in the form are allowed to indicate the quantities of materials

they will need for defense over the next quarter, so that they may receive their materials sufficiently in advance of actual consumption needs.

In analyzing anticipated sales over three months, a distributor, for example, must obtain affidavits from customers representing 85 per cent of his dollar sales, and these affidavits must be filled in completely, warned Mr. Overlock. Shown on the screen were quite a few actual affidavits in which customers of distributors failed to indicate the defense percentage of their requirements; as a result they were classified as "defense zero." The cus-



H. K. Clark

tomers thus involved have no priority protection and the amount of priority protection for the particular distributors in such cases is reduced considerably.

Elimination of sizes and styles is one way of increasing production and thus fighting scarcities at this time, said Mr. Overlock. He told of 10 to 40 per cent increases in production through elimination of sizes and styles, without requiring more men, space or equipment.

A Metal Warehouse Plan similar to the Defense Supply Rating Plan has been worked out by OPM and soon will be ready for application, he stated, although he did not go into detail.

H. H. Kuhn, Hardware & Supply Co., Akron, O., declared that if manufacturers, distributors and consumers fail to help make the Defense Supplies Rating Plan work industry will get mandatory priorities, a situation that would place it in a straight-jacket.

H. F. Seymour, Columbian Vise

& Mfg. Co., Cleveland, gave facts about relieving scarcities through substitutions. A manufacturer of portable electric tools, for example, substituted for aluminum seven parts now made of plastics, gray iron and steel. As an instance of benefits obtained through reduction of variations in specifications he said that one industry which worked under seven different federal specifications now is working under one federal specification.

In discussing the E-2 order regulating high-speed tool steels (see page 34) he cited some interesting figures: The cutting tools required to produce an automobile engine cost from \$8 to \$12 per engine; the cutting tools required to produce an airplane engine cost \$17 per 100-horsepower.

June Steel Employment at Record Level of 638,000

■ Steel industry employment increased in June, for the fifteenth consecutive month, to a new peak of 638,000 wage earning and salaried employes, according to the American Iron and Steel Institute, New York. Total for the month was up 6000 from May, and compared with 535,000 in June last year. In April, 1940, when the rise in employment started, total was 503,000.

Combined payrolls for the industry in June totaled \$110,504,000, down slightly from \$115,267,000 in May. In June, 1940, the industry's payroll totaled \$77,388,000.

Wage earning employes averaged 99.2 cents per hour, against 85.9 cents in June, 1940, and 98.1 cents in May this year. The work-week in June averaged 38.2 hours, against 39.7 in May and 35.9 in June of 1940.

NAM Survey Shows Labor Shortage Acute

■ Increased demand for labor in defense and other industries has decreased the number of jobless in the nation to less than 4,000,000, nearly the normal number of unemployed, it was reported last week by the National Association of Manufacturers, New York.

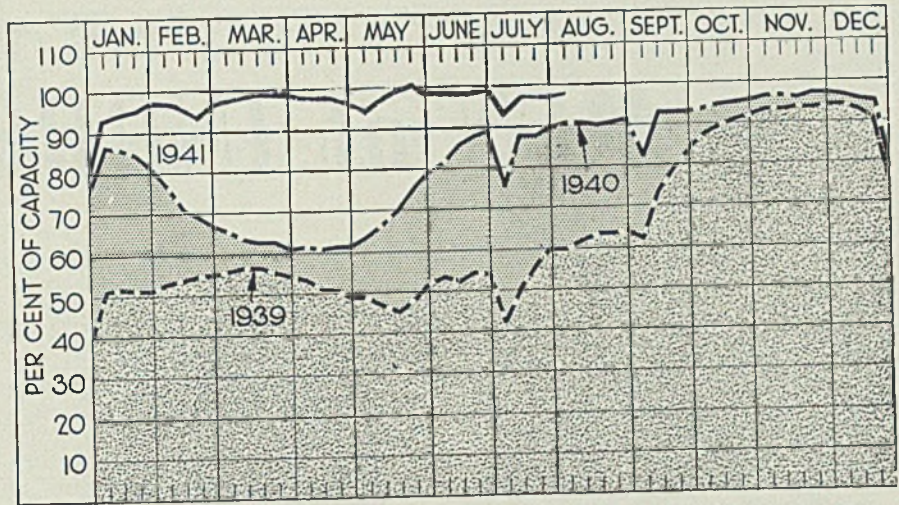
Employment, according to a survey conducted by the association in 21 key defense cities, is at the highest rate since 1929, and relief rolls have been cut more than half.

Skilled labor shortage is so acute that in some instances industries are reported training women and physically handicapped men for work in defense production. Relief rolls are being further depleted and WPA work has fallen considerably behind schedule.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Aug. 2		Same week	
	Aug. 2	Change	1940	1939
Pittsburgh	100	None	86.5	50
Chicago	101	+ 1	97	56
Eastern Pa.	95.5	None	88	41
Youngstown	98	None	85	54
Wheeling	93	None	98	79
Cleveland	96	None	80.5	73
Buffalo	90.5	- 2.5	90.5	58
Birmingham	90	None	88	70
New England	88	+ 3	80	68
Cincinnati	91.5	+ 6	81	31
St. Louis	98	None	62.5	47.5
Detroit	87	- 1	99	64
Average	98.5	+ 1.5	90.5	60



400 Attend Priority School

WASHINGTON

Four hundred trade association executives attended the OPM's "priority school" last Friday to hear preference and priority systems explained by officials who administer the regulations.

The school was inaugurated July 18 with an all-day course for steel company employes who are assigned to priority duties.

Sessions for other branches of the metals industry will be held soon.

Overhauling of shipping practices to reduce the time which railroad cars are idle was demanded last week by OPM spokesmen. G. Lloyd Wilson, director of transportation, said industrialists should give carriers adequate notice when cars are needed, specifying exactly where they will be required. Goods should be properly and economically packed.

PRODUCTION Up

STEELWORKS operations last week rose 1½ points to 98½ per cent. Three districts reported higher rates, two declined and seven were unchanged. A year ago the rate was 90½ per cent; two years ago it was 60 per cent.

Central eastern seaboard — Continued at 95½ per cent after the drop of the preceding week. Raw material supply continues a threat. Alan Wood Steel Co. suspended plate production three days and sheet production for two days due to lightning damage to a power unit.

Detroit — Off 1 point to 87 per cent, due largely to unusually high temperatures.

Chicago — Gained 1 point to 101 per cent, all but one of six plants at capacity or better.

Carnegie-Illinois Steel Corp. blew in its No. 1 blast furnace at South Chicago July 31. For the first time

in history all stacks at South Chicago and Gary are active at the same time. Two Joliet stacks, long idle, are still out. That 38 of the 40 stacks in the district are operating is also a record.

St. Louis — Unchanged at 98 per cent, which has held for four months.

Cincinnati — Advanced 6 points to 91½ per cent. Mills are planning a slightly lower schedule to conserve scrap and allow furnace repairs.

Birmingham, Ala. — Held at 90 per cent for the fifth consecutive week.

New England — Up 3 points to 88 per cent, with two open hearths still under repair, to be relighted soon.

Cleveland — Slight shifts in active equipment caused no change in the rate, which remained at 96 per cent.

Wheeling — For the second week production here was at 93 per cent, the highest level since February.

Pittsburgh — Pressure for steel delivery holds production at 100 per cent, necessity of furnace repair preventing higher output. Jessop Steel Co., Washington, Pa., is installing additional plate capacity of 100 tons per day, a two-stand 84-inch mill, which is expected to be in operation in six weeks.

Buffalo — An accident to the Wickwire Spencer blooming mill caused four open hearths to be taken off temporarily, causing a loss of 2½ points in the week's production, to 90½ per cent.

Youngstown, O. — Continued at 98 per cent for fourth week with 75 open hearths part of week, 76 the remainder, and three bessemer. Schedule for this week is for the same rate. Scrap shortage may cause curtailment soon.

Institute Reports Stainless Steel Production

American Iron and Steel Institute reports stainless steel production by 24 companies in May totaled 23,688 net tons and for six months 106,828 tons. Production of 4 to 6 per cent chromium steel by 12 companies in May was 2,635 tons and for six months 10,013 tons. Further details follow:

	Number of companies	PRODUCTION FOR SALE—NET TONS					
		May - 1941			Year to Date		
		Total	Shipments	To members of the industry for conversion into further finished products	Total	Shipments	To members of the industry for conversion into further finished products
Inputs, blooms, billets, slabs, sheet bars, etc.	12	5,851	232	5,165	24,738	287	22,811
Structural shapes (a)				xxxxxx			xxxxxx
Plates	6	449	2	-	2,361	18	30
Sheets—Hot rolled	10	4,268	78	228	20,136	406	752
Sheets—Cold rolled				xxxxxx			xxxxxx
Strip—Hot rolled	4	194	-	125	1,822	-	1,473
Strip—Cold rolled	6	5,520	13	xxxxxx	22,744	132	xxxxxx
Bars—Hot rolled	15	3,868	742	799	17,889	2,133	3,676
Bars—Cold finished	7	1,818	170	xxxxxx	8,217	679	xxxxxx
Wire rods	5	573	-	213	2,124	10	793
Wire—Drawn	4	580	4	136	2,650	25	623
All other	7	547	25	116	4,137	147	626
TOTAL STAINLESS STEEL	24	23,688	1,266	6,782	106,828	3,837	30,784
ALL PRODUCTS—4% TO 6% CHROMIUM	12	2,635	-	804	10,013	203	2,072

(a) Included in "All other"

MEN of INDUSTRY

■ **VICTOR H. LAWRENCE** has become associated with Otis Steel Co., Cleveland, as assistant to **E. J. Kulas**, president. He formerly was assistant to executive vice president, Alan Wood Steel Co., Conshohocken, Pa., with which company he had been affiliated since 1926. From 1920 to 1926 Mr. Lawrence served as assistant to works manager of Jessop Steel Co., Washington, Pa., and before that was associated with the Minnesota Steel Co. and Mayville Iron Co.

Irvin Ruder has resigned as manager, warehouse department, Iron & Steel Products Inc., Chicago.

Glenn Crandall has been promoted from territorial sales work to special representative of the Plomb Tool Co., Los Angeles.

Archie A. Morris has been named southern California representative for McKenna Metals Co., Latrobe, Pa.

John W. Converse has been elected a director and member of the executive committee of General Steel Castings Corp., Eddystone, Pa.

R. H. Olson, associated with Electric Machinery Mfg. Co., Minneapolis, 25 years, and since 1929 New York district manager of sales, has been appointed eastern sales manager.

Edward L. Biersmith Jr. has been promoted to production manager, Columbian Steel Tank Co., Kansas City, Mo. Mr. Biersmith, formerly assistant sales manager, has been in Washington the past year representing the firm's interests in defense contracts. He has been associated with the company 12 years.

D. T. Haddock has been placed in charge of the office opened by A. Milne & Co., New York, in the Bar-riester building, Washington.

L. L. Horchitz, since 1929 manager of the Los Angeles district, mechanical goods division, B. F. Goodrich Co., Akron, O., has been named manager of the newly created California district, which in-



Victor H. Lawrence



Edward L. Biersmith Jr.

cludes the present Los Angeles district and revised San Francisco district. Offices will remain at 1931 Bay street in Los Angeles and 355 Brannan street in San Francisco. **H. A. Schultz** has been named branch manager at San Francisco, succeeding **W. D. Rigdon**, retired. **C. M. Christensen** has been made manager of the Denver district, succeeding **Max Schmidt**, who remains on the district staff in an advisory capacity.

Richard B. Engdahl has joined the research staff of the Battelle Memorial Institute, Columbus, O., and has been assigned to the division of fuels research. He formerly was research assistant and member of

the faculty, University of Illinois. Mr. Engdahl is a member, American Society of Mechanical Engineers and American Society of Heating and Ventilating Engineers.

H. Edgar Lewis, chairman and president, Jones & Laughlin Steel Corp., has been appointed to the Steel Defense Industry Advisory Committee, as announced by OPM last week. The original list appointed by OPM was published in STEEL, July 28, page 32.

William Peterson has been elected vice president in charge of traffic, Chicago, South Shore & South Bend railroad, Chicago. He has been traffic manager since 1925.

W. E. Sloan, founder and president, Sloan Valve Co., Chicago, has been elected chairman of the board. He will be succeeded as president by **Ralph M. Nelson**, vice president.

Robert B. Whyte, since 1925 general superintendent, Macwhyte Wire Rope Co., Kenosha, Wis., has been promoted to vice president in charge of operations. Mr. Whyte joined the company in 1917 as wire mill superintendent, and was elected a director in 1937.

Arthur S. Goble has been appointed assistant manager, Chicago district office, Baldwin Locomotive Works, Philadelphia. **Curtis G. Green**, formerly associated with the St. Louis and Chicago district offices, has been named manager in charge of diesel locomotive sales, with headquarters at Eddystone, Pa.

C. B. Voldrich has been named a research engineer on the technical staff of Battelle Memorial Institute, Columbus, O., where he will assist in the institute's program of welding research. The past four years he was associated with the Navy's Bureau of Ships.

W. W. Gilbert, formerly advertising manager, Watson-Stillman Co., Roselle, N. J., has been appointed general office manager of the fittings division. **Fay Keyler**, vice president, O. S. Tyson & Co. Inc., New York, will act as advertising manager, having an office at Roselle.

Pig Iron Under Federal Control; Pooled for Defense

WASHINGTON

AS a further step by the Priorities Division to insure prompt flow of iron and steel products into defense channels, pig iron was put under full priority control last Friday in a general preference order signed by E. R. Stettinius Jr., Director of Priorities.

Under the order producers will be required to set aside stipulated quantities of pig iron each month in an emergency pool for special allocation. The order also provides that schedules of pig iron shipments to customers must be approved by the Priorities Division.

The order is the latest in a series of regulations affecting iron and steel, which is already subject to three kinds of control. The terms include seven main points:

1. All defense orders (Army, Navy, British, etc.) carry a preference rating of A-10 unless higher ratings are specifically assigned.
 2. Defense orders must be accepted in preference to and given priority over non-defense orders.
 3. During each month beginning with September, each producer of pig iron must set aside a quantity to be specified by the Director of Priorities, and the total amount thus set aside will form an emergency pool from which the director may make allocations for the ensuing months to meet emergency needs.
 4. Beginning Aug. 1 any customer ordering pig iron must do so on a special form in accordance with instructions from the director.
 5. Each producer of pig iron is required to submit before the 15th of each month a proposed shipment schedule of pig iron for the following month, not including the pig iron withheld for allocation. Beginning Sept. 1, no shipments may be made to any person unless these shipments have been approved on the schedule or unless special provisions have been made by the director of priorities.
 6. In regulating distribution of pig iron for non-defense purposes the director of priorities will be guided by any Civilian Allocation Program promulgated by the Office of Price Administration and Civilian Supply.
 7. The order contains provisions designed to prevent the building up of excess inventories.
- In an accompanying statement OPM pointed out that the indicated shortage in pig iron for 1941 will range above 5,000,000 short tons ac-

ording to data of the OPM Bureau of Research and Statistics.

"By directing deliveries of pig iron both from the emergency pool and in accordance with the usual priority ratings, the director can make sure that pig iron goes to iron foundries and steel plants and other consumers in quantities necessary to fulfill defense requirements," it said.

"While the order does not constitute any additional priority control over steel, it does provide control over the pig iron which is the major part of that steel. At present the pig iron and steel scrap used in the production of steel are divided about 56 per cent pig iron and 44 per cent scrap."

At present steel itself is now on the priorities critical list, giving Army and Navy orders priority; it is on general metals order No. 1, designed to prevent accumulation of excess inventories, and it is subject to general steel preference delivery order No. 1, designed to expedite orders for defense customers.

Cranes, Hoists, Mining Machinery Protected

New limited blanket preference rating was issued last week to about 75 producers of cranes and hoists vital to manufacturing plants engaged on Army, Navy and other defense projects by Edward R. Stettinius Jr., priorities director. The new order replaces one which expired July 31 and expands the list of materials to deliveries on which the rating may be applied.

To facilitate production of mining machinery and equipment, considered of crucial importance to defense, Mr. Stettinius also issued last week a limited blanket rating to about 40 mining machinery manufacturers. Order is designed to relieve shortage of machinery for underground and open cut mining operations.

Office of Production Management is reported considering a broad preference order for agricultural machinery.

Compiling Data on Molybdenum Speed Steel

Because of the necessity for conserving tungsten, literature on heat treatment of molybdenum high speed steel is in preparation, accord-

ing to announcement by Dr. Bradley Stoughton, chief, Heat Treating Equipment Unit, Tools Section, OPM, Room 3425 Social Security building, Washington. The purpose is to compile instructions for proper heat treatment of molybdenum high speed steels.

The work is in charge of the following committees; all served by J. Edward Donnellan, 7301 Euclid avenue, Cleveland, editor of the American Society for Metals handbook, as secretary:

Heat Treating of Molybdenum High Speed Steels: Norman I. Stotz, chairman; W. H. Wills, F. Lloyd Woodside, J. H. McCadie,

Furnaces and Controlled Atmospheres: C. I. Hayes, chairman; P. B. Crocker, W. M. Hepburn, Norbert Koebel, Karl Ness,

Salt Baths: Artemus F. Holden, chairman; James McElgin, Joseph N. Bourg, W. J. Levy.

Literature already is in preliminary form and will be released after a check by experts. The work is through collaboration of the American Society for Metals which shortly will schedule chapter meetings to be addressed on this subject by experts.

More Pig Iron and Ore Vessel Capacity Studied

WASHINGTON

Following Director Knudsen's recent statement that pig iron capacity will have to be increased 6,500,000 tons as a step to increasing steel capacity 10,000,000 tons negotiations have been conducted here by OPM, RFC and representatives of leading steel companies.

It is understood that Republic Steel Corp. has agreed to build four stacks, one each at Cleveland, Birmingham, Gadsden, Ala., and Youngstown, O.;

Bethlehem Steel Co., two stacks, one each at Buffalo and Johnstown, Pa.;

Inland Steel Co., two at Indiana Harbor;

Carnegie-Illinois Steel Corp., one at Edgar Thomson works, Braddock, Pa.;

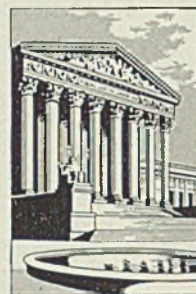
Colorado Fuel & Iron Co., one at Pueblo, Colo.

Columbia Steel Co., Provo, Utah, U. S. Steel subsidiary, with one stack, is to get three more stacks, two now idle to be moved from Edgar Thomson works and a third, a dormant stack to be moved from Joliet, Ill.

OPM has asked Elton Hoyt, senior partner of Pickands, Mather & Co., Cleveland, for advice as to the number of additional Great Lakes ore and coal carriers that will be required to increase the supply of iron ore in accordance with blast furnace expansion dependent on lake ore.

Windows of WASHINGTON

President Roosevelt tells labor price stability is preferable to abnormal wage increases. Says pay schedules in defense industries should not substantially exceed those in comparable non-defense work . . . OPACS plans study of steel industry's second quarter earnings to point way to future price policy . . . Proposal giving defense orders priority over all civilian business is being considered



By L. M. LAMM

Washington Editor, STEEL

WASHINGTON

■ PRESIDENT Roosevelt last week sent to Congress his message asking statutory authority to establish price ceilings because "we face inflation."

He told Congress the price control legislation should also include the following features:

1. Authority for the government to stabilize the market by buying and selling as the exigencies of price may require in order to make ceiling prices effective.
2. Power to deal more extensively with excesses in the field of installment credit.
3. Authority to arrest rent profiteering.

Although Mr. Roosevelt did not ask for authority to control wages, he said that "there can not be price stability if labor costs rise abnormally." He told labor that it has far more to gain from price stability than from abnormal wage increases. He said wages in defense industries should not substantially exceed those in comparable non-defense industries, where fair labor policies have been maintained.

"Faced now with the prospect of inflationary price advances, legislative action can no longer prudently be postponed," said the President. "Our national safety demands that we take steps at once to extend, clarify and strengthen the authority of the government to act in the interest of the general welfare.

"Legislation should include authority to establish ceilings for prices and rents, to purchase materials and commodities when necessary to assure price stability, and to deal more extensively with excesses in the field of installment credit. To be effective, such authority must be flexible and subject to exercise through license or regulations under expeditious and workable administrative procedures. Like other defense legislation, it should expire with the passing of the need within a limited time after the end of the emergency.

"The concept of a price ceiling is

already familiar to us as a result of our own World war experience. Prices are not fixed or frozen—an upper limit alone is set. Prices may fluctuate below this limit but they cannot go above it.

"To make ceiling prices effective, it will often be necessary among other things for the government to increase the available supply of a commodity by purchases in this country or abroad. In other cases it will be essential to stabilize the market by buying and selling as the exigencies of price may require."

OPACS To Study Need for Revising Steel Price Ceiling

OPACS will begin a fact-finding expedition into the steel industry within a few days to determine if earnings in the second quarter reveal a need for revision of the ceiling price schedule.

Questionnaires on operating costs, volume, unit cost, and similar basic data are being prepared by OPACS. No date has been picked for their release, but officials say that they will be in the hands of the industry "very soon."

Preliminary reports received by OPACS are based on the financial statements of steel companies.

The officials in OPACS emphasize that the agency is ready to alter its price schedules in all cases where hardships can be proved and where operating costs have reached a higher level than is compatible with the top prices fixed by the government.

Whether this is the case in the steel industry will be decided, not on the basis of the companies' financial reports, but on the facts as revealed in the questionnaires.

Henderson Says Rising Tin Prices May Bring 50-Cent Limit

OPACS Administrator Henderson said last week that recent increases in the price of tin may force him to

set maximum prices. He said that the government buying price of 50 cents is a fair one and indicated that a schedule may be based on that price.

Recently the price of tin has advanced 2 cents. Henderson said the supply problem is primarily one of shipping and that a price above 50 cents would not necessarily relieve this situation.

New Munitions "Shopping List" Prepared by Government

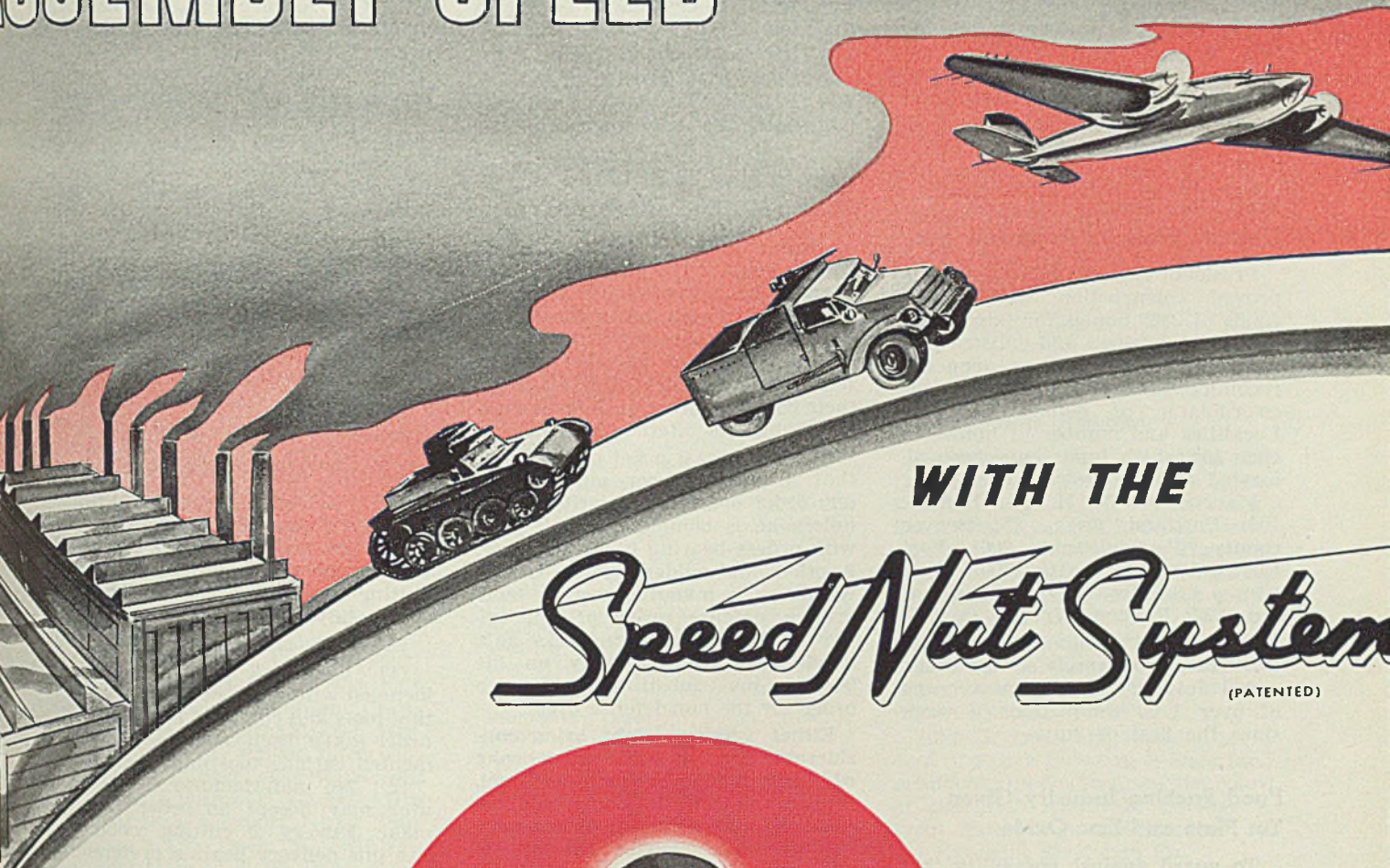
Automobile manufacturers and producers of other consumer durable goods shortly will be presented with the government's latest munitions shopping list under a new plan for their increased participation in the defense program. From this list they will be given the opportunity to choose those items which they can turn out with facilities now used in the manufacture of autos, refrigerators, washing machines, etc.

This new method of dealing with industry, which it is hoped will replace the normal buying procedure, will have the effect of automatically reducing civilian goods output and increasing the production of defense materials, officials explained. It will also obviate the need of ordering arbitrary percentage cuts in the production of civilian goods such as those recently proposed by both the OPM and OPACS.

Evolution of this plan apparently has made possible an agreement between OPM and OPACS to unify their separate efforts to divert a steadily increasing proportion of facilities of producers of consumer durable goods to the manufacture of parts for guns, ammunition, tanks, airplanes, etc.

The funds to finance this new

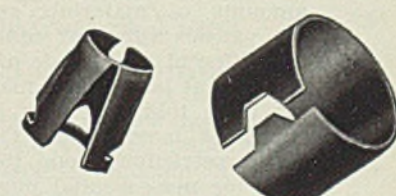
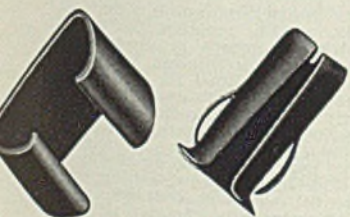
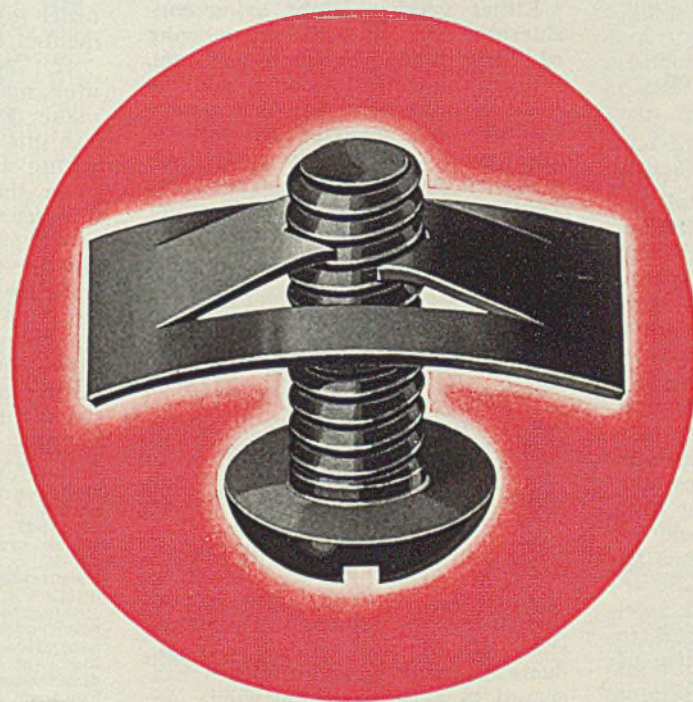
ASSEMBLY SPEED HITS A NEW HIGH



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OVER A BILLION IN USE—OVER 700 SHAPES AND SIZES

buying program are expected to come from the pending \$8,000,000,000 defense appropriation bill passed by the house last week and from a supplemental Lease-Lend appropriation which is expected to be asked of congress shortly.

2865 More Homes for Defense Workers Approved

President Roosevelt last week approved construction with public funds of 2865 homes for families of industrial workers and enlisted personnel in eight localities, upon the recommendation of C. F. Palmer, co-ordinator of defense housing. Localities and number of homes in each for which funds have been allocated are as follows: *Permanent*—Manchester, N. H., 85; Buffalo, 200; Portland, Oreg., 85; Beaver county, Pennsylvania, 900; Fort Eustis, Va., 75; Seattle, 700. *Temporary Shelter*—Weldon Springs, Mo., 320; Ravenna-Warren, O., 500.

More than 1700 homes for defense workers were completed the week ended July 19, making an average of over 1700 completions a week since the first of July.

Food Packing Industry Given Tin Plate and Zinc Oxide

To guard against possibility that supplies of cans required to pack the current food crop may fall below the necessary total, the Civilian Allocation Division, OPACS, has issued an allocation program giving tin plate and zinc oxide needed for this purpose a preference over other civilian demands.

Announcement of the program followed a meeting between OPACS and principal can manufacturers at which the manufacturers agreed to furnish OPACS with data on the amounts of materials going into the various types of cans and on the different uses made of cans by industry at large. The manufacturers were told that iron and steel shortages may compel OPACS to place restrictions upon the use of cans for non-essential purposes.

There is no present shortage of tin plate or zinc oxide, but other civilian and defense demands and defense priorities may act to create one while the current food crop is being processed. Should this occur, there is danger that appreciable quantities of perishable food will spoil. Preservation of all food available is essential to industrial efficiency and civilian morale, hence the need to assure an adequate supply of cans.

Any preferences obtained under the new program may not be used to accumulate excessive inventories of tin plate or zinc oxide and man-

ufacturers are cautioned to exercise the most rigid economy in the use of critical materials.

The Priorities Division of the Office of Production Management will administer the new program.

Defense May Be Switched in Ahead of Non-Defense Bookings

Change in the priorities system which would put defense first and darken the outlook for nondefense producers is reported under consideration. The change would require manufacturers to dislodge non-defense orders which they have on their books in favor of defense business which is offered them.

One proposal is a flat requirement that a manufacturer must accept any order bearing a priority rating unless he is completely booked up with orders bearing higher priority. Another, and milder version, is that whenever a manufacturer is tendered a defense order of approximately the same size and price as a nondefense order already on his books he must substitute the defense order for the non-defense order.

Either version might bring considerable revision in the order books of basic industries such as steel, copper and zinc. It also would becloud the materials outlook for such non-defense industries as automobiles even though they now have arranged for comfortable supplies. These arrangements could be completely disrupted by incoming defense business.

Coal Price Consultant, Executive Assistants Named to OPACS

Gerald B. Gould, president, Fuel Engineering Co., New York, has been appointed advisory consultant on coal prices in the Fuel Section of the Office of Price Administration and Civilian Supply.

Dr. Joel Dean, assistant professor in the school of business, University of Chicago, was named price executive in charge of industrial machinery, Price Division, OPACS. An industrial engineer, Dr. Dean has served in a consulting capacity on price and marketing problems, working in various industrial fields.

Albert A. Thornbrough was appointed to the Price Division, and will work under Dr. Dean. He will specialize in agricultural machinery and equipment, in the heavy machinery section. He formerly was associated with the Department of Agriculture.

Four appointments to OPACS' Accounting Division were announced. Frank P. Smith, professor of accounting at Rochester University, was appointed policy assistant. Herbert Wachsman, formerly on the engineering staff of Keasbey & Mat-

tison Co., Ambler, Pa., was named industrial assistant. Albert Nilsson, professor of economics at Oberlin College, selected as a consultant, has served as a staff member in both the Securities and Exchange Commission and the National Defense Advisory Committee. Harold B. Barnett, public accountant, New York, was appointed executive assistant.

Department of Commerce will be represented on OPM's industrial advisory committees by Walter A. Janssen, metals specialist. Paul Matix now is the department's automotive and aircraft products specialist.

Cemented Carbide Cutting Tools Receive Preference

E. R. Stettinius, Director of Priorities, has announced several changes in the general preference order directing the use and distribution of cutting tools. The original order was issued July 17.

The major changes are:

(1) Cemented carbide tools are included within the definition of cutting tools and copies of the amended order have been addressed to cemented carbide tool manufacturers.

(2) No manufacturer or distributor may accept an order for or make delivery of cutting tools unless this delivery bears a preference rating of A-10 or higher, except upon the specific direction of the director of priorities. The original order permitted deliveries of non-defense orders if defense orders on hand had been completed.

(3) The new order clarifies the special provisions which relate to manufacturing processes carried on during a six weeks' period dating from July 17, 1941. Section (h) of the new order says:

"Any other provision of this order to the contrary notwithstanding, for a period of six weeks, commencing July 17, 1941, work on orders or contracts which are in actual production on July 17, 1941, may be continued by a manufacturer in accordance with existing production schedules, and deliveries of such cutting tools, as defined herein, as have been completed either prior to or during said six weeks period, may be made during said period by a manufacturer or distributor, to fill orders or contracts on hand on, or prior to, July 17, 1941, without regard, in either event, to preference ratings assigned to, or delivery dates specified in, any orders or contracts during said period. Provided, however, that nothing in this paragraph shall apply to work on, or deliveries under, orders or contracts which, at any time, have been, or are, assigned an AA preference rating."

The cutting tools order was issued because of a shortage of these tools vitally needed for defense work. It provided that, in general, defense orders are assigned a preference rating of A-10 unless higher preferences have been specifically awarded.

The general purpose of the order is to make sure that defense needs for cutting tools are filled ahead of non-defense needs.

Three-Fourths of Defense Supply Contract Values held by 56 Firms

■ FIFTY-SIX corporations having defense supply contracts with the War and Navy Departments have contracted for almost three-fourths of the total dollar volume of such contracts, according to a compilation made by the Bureau of Research and Statistics, Office of Production Management. The remainder is divided among several thousand contractors, the exact number reported as "not available."

Under supply contracts the government is provided with ships, airplanes, tanks, guns, other equipment, food and fuel, in contrast with construction contracts under which cantonments, bases, depots, arsenals and factories are built.

Bethlehem Steel Corp. at the close of May held the largest volume of supply contracts—a total of \$927,000,000. The next largest was held by the New York Shipbuilding Corp., the total being \$507,300,000. General Motors Corp. ranked third with \$490,000,000, and Curtiss-Wright Corp. fourth with \$444,000,000. Fifth in order was Newport News Shipbuilding & Dry Dock Co., \$389,000,000; and sixth E. I. du Pont, \$318,500,000.

The combined defense supply orders of these six companies total \$3,075,000,000, or 31.3 per cent of \$9,839,000,000 representing the total volume of all defense supply contracts.

Companies with contracts totaling \$25,000,000 and over, June, 1940, through May, 1941, follow:

	In Millions of Dollars
\$600,000,000 to \$1,000,000,000	
Bethlehem Steel Corp.	\$926.9
\$500,000,000 to \$600,000,000	
New York Shipbuilding Corp.	507.3
\$400,000,000 to \$500,000,000	
General Motors Corp.	489.9
Curtiss-Wright Corp.	443.9
\$300,000,000 to \$400,000,000	
Newport News Shipbuilding & Dry Dock Co.	389.2
E. I. duPont de Nemours & Co. Inc.	318.5
\$200,000,000 to \$300,000,000	
Glenn L. Martin Co.	249.1
Consolidated Aircraft Corp.	226.4
United Aircraft Co.	224.5
Douglas Aircraft Inc.	221.2
United States Steel Corp.	209.9
\$100,000,000 to \$200,000,000	
Seattle Tacoma Shipbuilding Co.	179.6
Boeing Airplane Corp.	170.1
Bath Iron Works	166.5
General Electric Co.	152.5
Ford Motor Co.	128.5
Electric Boat Co.	126.1
North American Aviation Inc.	123.9
Cramp Shipbuilding Co.	114.8
Sperry Corp.	108.0
Bendix Aviation Corp.	107.3
Western Cartridge Co.	102.9
\$90,000,000 to \$100,000,000	
Consolidated Steel Corp.	98.2

\$80,000,000 to \$90,000,000	
Los Angeles Shipbuilding & Dry Dock Corp.	83.4
Baldwin Locomotive Works.	82.6
American Car & Foundry Co.	81.2
\$70,000,000 to \$80,000,000	
American Woolen Co.	74.3
Chrysler Corp.	74.0
\$60,000,000 to \$70,000,000	
Packard Motor Car Co.	63.8
Tampa Shipbuilding Co. Inc.	62.1
\$50,000,000 to \$60,000,000	
Republic Aviation Co.	57.3
Grumman Aircraft Engineer- ing Corp.	53.9
American Locomotive Co.	51.3
Ingalls Shipbuilding Co.	50.0
\$40,000,000 to \$50,000,000	
White Motor Co.	48.4
Lockheed Aircraft Corp.	46.5
Vultee Aircraft Inc.	41.8
Fairbanks Morse & Co.	40.3
Continental Motors Corp.	40.2
\$30,000,000 to \$40,000,000	
Gulf Shipbuilding Corp.	39.7
Stevens, J. P. & Co.	38.2
Western Electric Co. Inc.	38.1
Moore Dry Dock Co.	38.0
Atlas Powder Co.	36.0
Diamond T Motor Co.	35.3
Studebaker Corp.	35.1
Manitowoc Shipbuilding Co.	30.5
\$25,000,000 to \$30,000,000	
Hercules Powder Co.	29.9
Lake Washington Shipyards.	29.9
Savage Arms Corp.	27.2
Bell Aircraft Corp.	27.0
Todd & Brown Inc.	26.8
Northern Pump Co.	25.8
Willamette Iron & Steel Corp.	25.7
Crucible Steel Co. of America.	25.5
Arma Corp.	25.1

OPM Priorities Service Established in 13 Areas

■ Priority field service representatives have been appointed in 13 key cities by Office of Production Management. Their chief function is to aid manufacturers who have defense contracts and need to obtain priority ratings to get raw material.

Applicants are instructed on how to fill out forms for departments at Washington. Representatives also will advise whether an applicant has a logical reason for seeking a priority rating.

In addition to the following representatives serving their areas, some more appointments on the Pacific Coast are expected soon.

Boston—William P. Homans, 30 Pearl street, Boston.

New York—Phillip M. McCullough, 33 Liberty street, New York.

Philadelphia—Frederick W. Slack, 925 Chestnut street, Philadelphia.

Cleveland—William T. Walker, Federal Reserve Bank of Cleveland, Cleveland.

Pittsburgh—Charles C. Cruciger, Grant street and Ogle Way, Pittsburgh.

Chicago—Warren G. Bailey, 230 S. LaSalle street, Chicago.

Detroit—Walter Hall, 160 West Fort street, Detroit.

St. Louis—Louis E. Crandall, 411 Locust street, St. Louis.

Denver—Virgil Board, U. S. National Bank building, Denver.

Dallas—James B. Crockett, Wood and Akard streets, Dallas.

Atlanta—John B. Reeves, Federal Reserve Bank building, Atlanta.

San Francisco—Andrew L. Kerr, Federal Reserve Bank building, San Francisco.

Cincinnati—Bruce W. Burroughs, Union Trust building, Cincinnati.

More Defense Contract

Co-ordinators Appointed

Co-ordinators for the Defense Contract Service at Buffalo, Jacksonville, Fla., Little Rock, Ark., Louisville, Ky., and Seattle, Wash., were appointed last week. They will be in charge of field offices at Federal Reserve Banks or branch banks in the cities named. Service is a branch of the Office of Production Management, designed to help the Army and Navy spread defense work. The appointees:

John J. Lenahan, Buffalo, president of Frank Lenahan & Sons Inc.; president and chairman of the board of the Irish American Savings & Loan Association, and president of the Excelsior Steel Ball Co.

George W. Simons Jr., Jacksonville, consulting city plan engineer to the city of Jacksonville.

Charles L. Thompson, Little Rock, architect and director in several manufacturing and merchandising companies.

Charles W. Allen, Louisville, vice president and general manager, Belknap Hardware & Mfg. Co.

U. M. Dickey, Seattle, president, Sound View Pulp Co., Everett, Wash.

Navy Ordnance Flags

Awarded to 14 Companies

■ Fourteen companies last week were awarded Naval Ordnance flags "for outstanding production of naval material for national defense." The list announced by Secretary of the Navy Knox follows:

Arma Corp., Brooklyn, N. Y.
Bausch & Lomb Optical Co., Rochester, N. Y.

Cameron Iron Works, Houston, Tex.
E. I. Du Pont de Nemours & Co., Wilmington, Del.

Fisher Body Co., Detroit.
Ford Instrument Co., Long Island City, N. Y.

International Nickel Co., Huntington, W. Va.
Keuffel & Esser Co., Hoboken, N. J.

Midvale Co., Nicetown, Pa.
Miehle Printing Press & Mfg. Co., Chicago.

Norris Stamping Co., Los Angeles.
Northern Pump Co., Minneapolis.

Pollak Mfg. Co., Arlington, N. J.
Textile Machine Works, Reading, Pa.

KEEP THEM YOUNG WITH HYATTS

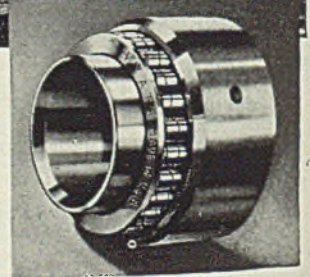
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LIKE THIS CALL
FOR QUALITY
BEARINGS
LIKE HYATTS



BUILT TO TAKE IT Hyatt Roller Bearings are found in the toughest assignments! And where bearing precision as well as bearing capacity is vital, you'll find Hyatts just as extensively used. That's what we mean by Hyatt Quality—correctness of design and accuracy of manufacture to meet bearing applications of every description. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, N. J., San Francisco, Chicago, Pittsburgh, and Detroit.



For the new equipment you will purchase or for the changeovers you contemplate let us work with you on the bearing layouts.



HYATT

R O L L E R B E A R I N G S

Q U I E T

Mirrors of MOTORDOM

Detroit gets first diesel-electric passenger train service as B. & O. christens fourteenth locomotive purchased from GM subsidiary, now largest builder of diesel-electrics in world . . . Hudson partially unveils 1942 models which will be second in importance to \$70,000,000 defense orders . . . Many problems in accelerating auto wrecking to relieve shortage of iron and steel scrap



By A. H. ALLEN
Detroit Editor, STEEL

DETROIT
■ HEAT and humidity, those perverse summer twins, have been up to some of their old tricks. Last week the boys in the Hudson Motor plant decided it was too hot to work one day so they packed up and trekked out, bringing production to a halt. They were back the next day, but the temperature had not moderated so it was impossible to know for sure whether they might not take some more time off.

Another strange sight for heat-weary eyes was the motor capitol being host to several hundred railroad men to commemorate the start of diesel-electric passenger train service between Detroit and Washington. The Baltimore & Ohio road joined hands with General Motors' Electromotive Corp. to christen the road's fourteenth diesel-electric locomotive, ceremonies being held in a blistering sun along the tracks of the Union Station.

Radio Aids in Christening

Incidentally, the champagne bottle, released through the magic of radio by the whistle of a distant B. & O. limited, bounced off the streamlined steel shroud of the new Ambassador locomotive but did not break. This appeared to be the only flaw in a well-organized and perfectly timed program, at which Roy B. White, president of the B. & O., and C. F. Kettering, vice president of General Motors, perspired a few words of eulogy.

At a luncheon in advance of the ceremony, Mr. Kettering pointed out that diesel-electrics were "tried out" in 150 other cities before bringing one to Detroit, the "home of power." And if anyone does not believe this is the home of power, let him consider that it has supplied a billion and a half horsepower for the thirty million automobiles now in service in the country.

On the matter of diesel-electrics, Kettering observed there was nothing new about the diesel, since it is at least 40 years old. For the first

20 years the effort was made to build a diesel like a steam engine, for the next 20 years like a gasoline engine, and now finally they are being built like diesels. The locomotives, with 4000-horsepower and top speed of around 115 miles an hour, are virtually electric locomotives carrying their own power plant in the form of four large 12-cylinder diesels. They cost no more to build than a steam locomotive and give improved service at lower cost.

These new railroad units, of which Electromotive has built 500 switchers and 140 passenger type, present the interesting anomaly of one automobile company developing an improved type of power unit for the railroads to help them meet the competition of buses and trucks which the auto industry also builds in large quantities.

Mr. White, who stepped from the presidency of Western Union to take over the reins of the B. & O. from Daniel Willard, stated his company had pioneered the use of diesel-electrics, as it had pioneered many other innovations in railroading, such as electric locomotives (in 1851), air-conditioned cars (in 1930) and air-cooled sleeping cars (in 1932). He added that the company was well satisfied with the diesel-electrics and on Feb. 25, 1940, completed a full year of daily operation of a train between Washington and Chicago without once having to make shop repairs on the locomotive.

Progressiveness of the railroads in improving transportation efficiency was demonstrated by some figures on daily freight car mileage on the B. & O. In January, 1940, the road was showing 33 miles per car per day, and in June of this year this figure had risen to 43 miles per car per day, the highest in the company's history. This was accomplished by moving cars faster between terminals and by shippers loading cars faster, loading them

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full and requisitioning no more cars than actually were needed.

Mr. White said his road planned to buy some more diesel-electrics, particularly if General Motors could be persuaded to "get the price down a little."

So, Detroit, a stub-line town which by the force of its giant industry dragged railroad transportation to its doors by the heels, acclaimed the contribution of some of its own engineers to more efficient and economical railroading. For accuracy's sake it might be added that these 4000-horsepower diesel-electrics are built, not in Detroit, but in the Chicago district.

No Lack of Sparkle in Hudson Lines for 1942

Hudson Motor rushed together a few sample 1942 models for display to distributors here last Monday. A. E. Barit, president, told his selling forces that while defense was Hudson's first assignment, present commitments being around \$70,000,000, the company was glad to be able to present 1942 models, built to serve better, last longer and cost less to run.

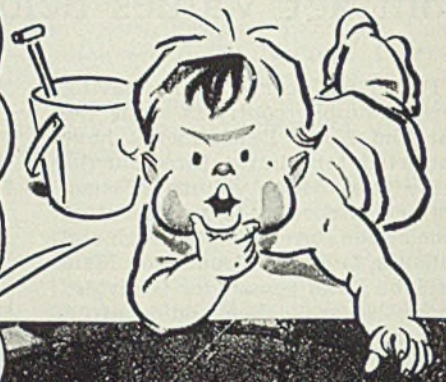
Three new lines were shown, featuring slightly altered front end styling with no apparent stripping off of bright metal decorations, lower body lines, a new type of clutch control, new upholstery fabrics and other minor embellishments.

There seemed to be some question among Hudson sales officials whether the bright metal trim was stainless steel, chrome-plated steel or just plain bright metal. Opinions were heard on all three, but the consensus appeared to favor the latter, indefinite though it is. Announcement of complete details in a few weeks may clear up the perplexing matter.

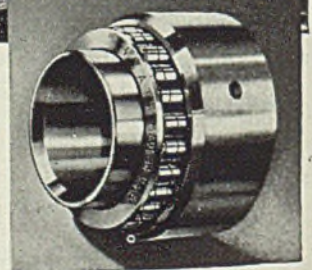
Packard Motor Car Co. threw a Grade A party Saturday making of-

KEEP THEM YOUNG WITH HYATTS

TOUGH JOBS
LIKE THIS CALL
FOR QUALITY
BEARINGS
LIKE HYATTS



BUILT TO TAKE IT Hyatt Roller Bearings are found in the toughest assignments! And where bearing precision as well as bearing capacity is vital, you'll find Hyatts just as extensively used. That's what we mean by Hyatt Quality—correctness of design and accuracy of manufacture to meet bearing applications of every description. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, N. J., San Francisco, Chicago, Pittsburgh, and Detroit.



For the new equipment you will purchase or for the changeovers you contemplate let us work with you on the bearing layouts.

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ROLLER BEARINGS

QUIET

Mirrors of MOTORDOM

Detroit gets first diesel-electric passenger train service as B. & O. christens fourteenth locomotive purchased from GM subsidiary, now largest builder of diesel-electrics in world . . . Hudson partially unveils 1942 models which will be second in importance to \$70,000,000 defense orders . . . Many problems in accelerating auto wrecking to relieve shortage of iron and steel scrap



By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ HEAT and humidity, those perverse summer twins, have been up to some of their old tricks. Last week the boys in the Hudson Motor plant decided it was too hot to work one day so they packed up and trekked out, bringing production to a halt. They were back the next day, but the temperature had not moderated so it was impossible to know for sure whether they might not take some more time off.

Another strange sight for heat-weary eyes was the motor capitol being host to several hundred railroad men to commemorate the start of diesel-electric passenger train service between Detroit and Washington. The Baltimore & Ohio road joined hands with General Motors' Electromotive Corp. to christen the road's fourteenth diesel-electric locomotive, ceremonies being held in a blistering sun along the tracks of the Union Station.

Radio Aids in Christening

Incidentally, the champagne bottle, released through the magic of radio by the whistle of a distant B. & O. limited, bounced off the streamlined steel shroud of the new Ambassador locomotive but did not break. This appeared to be the only flaw in a well-organized and perfectly timed program, at which Roy B. White, president of the B. & O., and C. F. Kettering, vice president of General Motors, perspired a few words of eulogy.

At a luncheon in advance of the ceremony, Mr. Kettering pointed out that diesel-electrics were "tried out" in 150 other cities before bringing one to Detroit, the "home of power." And if anyone does not believe this is the home of power, let him consider that it has supplied a billion and a half horsepower for the thirty million automobiles now in service in the country.

On the matter of diesel-electrics, Kettering observed there was nothing new about the diesel, since it is at least 40 years old. For the first

20 years the effort was made to build a diesel like a steam engine, for the next 20 years like a gasoline engine, and now finally they are being built like diesels. The locomotives, with 4000-horsepower and top speed of around 115 miles an hour, are virtually electric locomotives carrying their own power plant in the form of four large 12-cylinder diesels. They cost no more to build than a steam locomotive and give improved service at lower cost.

These new railroad units, of which Electromotive has built 500 switchers and 140 passenger type, present the interesting anomaly of one automobile company developing an improved type of power unit for the railroads to help them meet the competition of buses and trucks which the auto industry also builds in large quantities.

Mr. White, who stepped from the presidency of Western Union to take over the reins of the B. & O. from Daniel Willard, stated his company had pioneered the use of diesel-electrics, as it had pioneered many other innovations in railroading, such as electric locomotives (in 1851), air-conditioned cars (in 1930) and air-cooled sleeping cars (in 1932). He added that the company was well satisfied with the diesel-electrics and on Feb. 25, 1940, completed a full year of daily operation of a train between Washington and Chicago without once having to make shop repairs on the locomotive.

Progressiveness of the railroads in improving transportation efficiency was demonstrated by some figures on daily freight car mileage on the B. & O. In January, 1940, the road was showing 33 miles per car per day, and in June of this year this figure had risen to 43 miles per car per day, the highest in the company's history. This was accomplished by moving cars faster between terminals and by shippers loading cars faster, loading them

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full and requisitioning no more cars than actually were needed.

Mr. White said his road planned to buy some more diesel-electrics, particularly if General Motors could be persuaded to "get the price down a little."

So, Detroit, a stub-line town which by the force of its giant industry dragged railroad transportation to its doors by the heels, acclaimed the contribution of some of its own engineers to more efficient and economical railroading. For accuracy's sake it might be added that these 4000-horsepower diesel-electrics are built, not in Detroit, but in the Chicago district.

No Lack of Sparkle in Hudson Lines for 1942

Hudson Motor rushed together a few sample 1942 models for display to distributors here last Monday. A. E. Barit, president, told his selling forces that while defense was Hudson's first assignment, present commitments being around \$70,000,000, the company was glad to be able to present 1942 models, built to serve better, last longer and cost less to run.

Three new lines were shown, featuring slightly altered front end styling with no apparent stripping off of bright metal decorations, lower body lines, a new type of clutch control, new upholstery fabrics and other minor embellishments.

There seemed to be some question among Hudson sales officials whether the bright metal trim was stainless steel, chrome-plated steel or just plain bright metal. Opinions were heard on all three, but the consensus appeared to favor the latter, indefinite though it is. Announcement of complete details in a few weeks may clear up the perplexing matter.

Packard Motor Car Co. threw a Grade A party Saturday making of-

ficial start of production on the Rolls-Royce aircraft engine in its vast new plants adjoining the motor car division here. A tour of the machining operations was followed by a visit to engine tear-down and reassembly plant where the several hundred guests listened to an international broadcast with pickups from Detroit, Canada, London and Washington. Guests then assembled in the main assembly plant to hear addresses by W. S. Knudsen, Sir Henry Self, Maj. Gen. George H. Brett of the Army Air Forces, M. M. Gilman, president of Packard, a representative of the Canadian Air Force, and William L. Shirer, CBS correspondent.

Any Old Cars To Wreck Today?

Tightness of scrap iron and steel supplies, emphasized in this district by the low production in motor plants incident to model changeovers, is focusing attention more sharply on the possibilities of wrecking old cars at an accelerated pace. The Institute of Scrap Iron and Steel in a recent report forecast the availability of 1,000,000 tons of iron and steel scrap resulting from a planned salvage campaign and stepping up the annual rate of wrecking cars from 2,500,000 to 3,500,000. However, there is more to the problem than merely going out and wrecking a lot of old cars. And furthermore there are thousands of old cars in junk yards now which are potentially valuable scrap, but which cannot be turned over to melters, for at least one important reason. That is, if anyone is in the market for a certain part for an old car, he goes to a junk yard and insists on seeing the part removed from the old car which duplicates his own. He will not buy these parts "off the shelf" and hence the junkers have to be held until all saleable parts have been removed. This naturally ties up a lot of iron and steel which otherwise could be passed on the scrap dealers.

The remedy is not clear, but perhaps will materialize in the test campaign which auto wreckers in Ohio now have undertaken. There is some opinion that the total tonnage of scrap in auto graveyards is not nearly so large as it is generally imagined. Too, a lot of it is beyond the limits of the scrap market under present price regulations.

An additional complicating factor is that many people are holding on to old cars, reconditioning them for more service, in the fear that prices of newer cars will be going up sharply, as they undoubtedly will, and supplies will become restricted. Furthermore, thousands of workmen in outlying defense plants are finding motor transportation essential and are buying up old cars. And many one-car families are loosen-

Automobile Production

Passenger Cars and Trucks—United States and Canada			
By Department of Commerce			
	1939	1940	1941
Jan.	356,962	449,492	524,058
Feb.	317,520	422,225	509,326
March	389,499	440,232	533,849
April	354,266	452,433	489,854
May	313,248	412,492	545,321
5 mos. ...	1,731,495	2,176,874	2,602,408
June	324,253	362,566	.....
July	218,600	246,171	.....
Aug.	103,343	89,866	.....
Sept.	192,679	284,583	.....
Oct.	324,689	514,374	.....
Nov.	368,541	510,973	.....
Dec.	469,118	506,931	.....
Year	3,732,718	4,692,338	.....
Estimated by Ward's Reports			
Week ended:	1941	1940†	
July 5	96,457	51,975	
July 12	114,318	62,176	
July 19	109,912	53,020	
July 26	105,635	34,822	
Aug. 2	62,146	17,373	

†Comparable week.

ing the budget to the point of acquiring another car, usually a used variety.

New Defense Shopping List

From conferences held in Washington last week it is apparent an entirely new tack has been taken on the problem of curtailment of consumer goods production, including automobiles. The latest plan, still in the formative stage, is to present what amounts to a "defense product shopping list" and then to ask manufacturers to select the items they would like to supply instead of their present production. It is reasoned that such a selection will automatically bring about slackened production of consumer goods without the necessity for arbitrary government edict.

The plan sounds reasonable, but the key to it lies in the preparation of the master shopping list. Whether army, navy, air force and aid-to-Britain agencies can get together and decide how much and what they want, and how soon, remains to be seen. Again it is one of those things which looks fine on paper but may have many practical obstacles in the way of its fulfillment.

Foot-controlled radios will appear on at least one line of 1942 models. In addition to tuning, and switching on and off, a foot button will permit reduction of volume when approaching railroad tracks so that a distant whistle will not be missed.

A reliable report has been circulated to the effect that supplies of nickel for use in plating of automobile parts have been purchased in Canada where priorities do not require all nickel to be used on defense work.

Murray Corp. of America here has

followed in the footsteps of Ford in signing a closed shop and check-off system contract with the UAW-CIO.

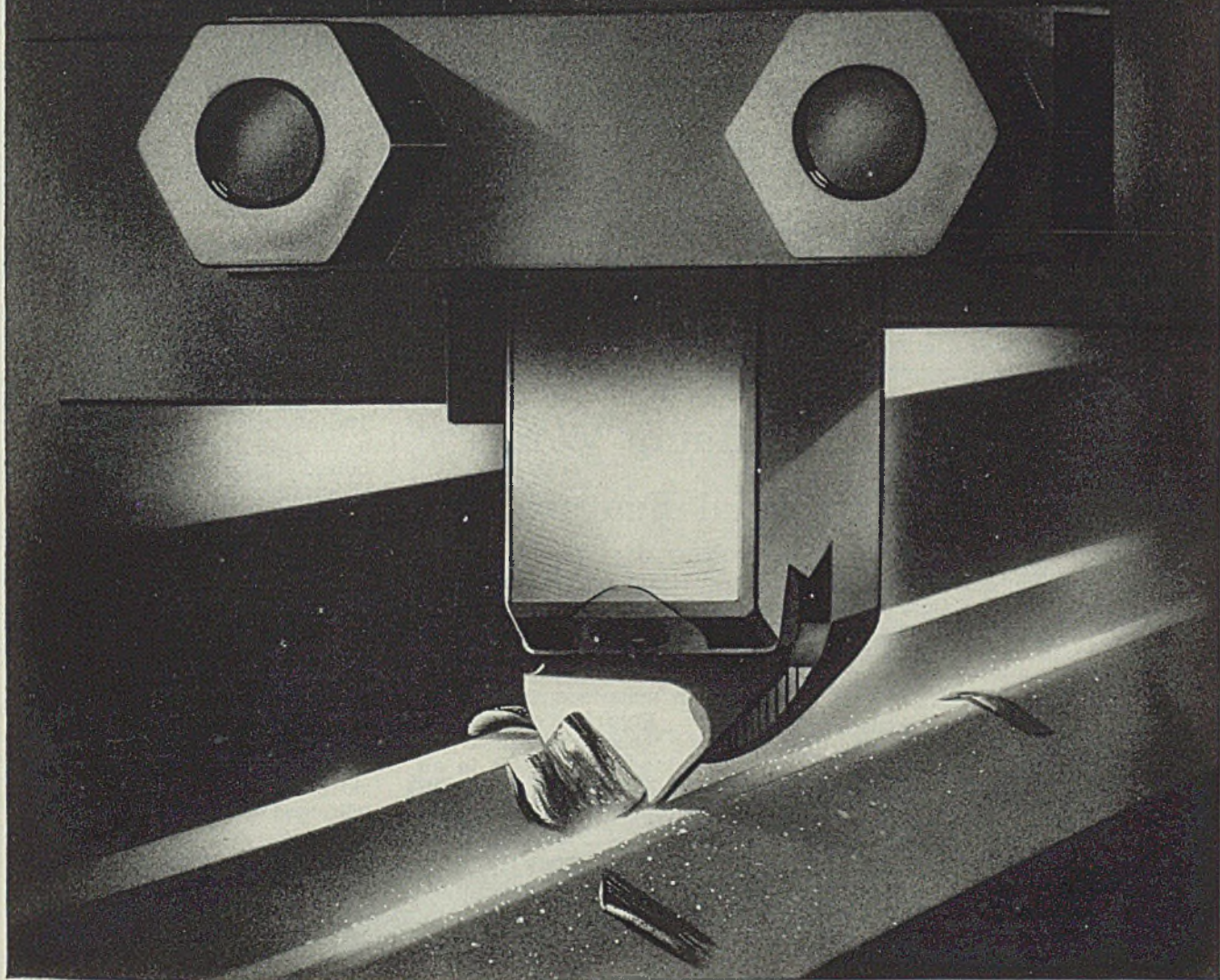
Concealed running boards will be popular on many of the 1942 models, but one line of bodies sports boards which have shrunk still further and now resemble a small, curved step just outside of the door sill.

Shipyard, Plane Plant Expansions Financed

War Department last week reported Defense Plant Corp. has completed agreements for expansion of facilities certified necessary for national defense. Establishment of the facilities, title to which will be retained by the government, has been approved also by the Office of Production Management. Companies with whom the Defense Corp. completed agreements:

- Alabama Dry Dock & Shipbuilding Corp., Mobile, Ala., \$5,010,000 for a navy shipyard facility at Mobile.
- Atlantic Basin Iron Works Inc., Brooklyn, N. Y., \$1,000,000 for ship repair facilities at Brooklyn.
- Champion Machine & Forging Co., Cleveland, \$2,699,680, for purchase of land, construction of buildings and equipping them with machinery and facilities for manufacture of steel forgings for aircraft struts and engines.
- Crucible Steel Co. of America, New York, \$1,000,000 increase to previously reported lease agreement for construction of facilities at Harrison, N. J., for the manufacture of artillery shell.
- Emerson Electric Mfg. Co., St. Louis, \$10,529,173, for purchase of land, construction of buildings and installation of machinery and equipment for manufacture of gun turrets.
- General Motors Corp., Aero Products Division, Vandalia and Morain City, O., \$11,606,078 for purchase of machinery and equipment; Hyatt Bearings Division, Harrison, N. J., \$567,000 for machinery for the aircraft parts plant.
- Hudson Motor Car Co., Detroit, additional \$166,886 for the aircraft parts plant at Detroit.
- Maryland Dry Dock Corp., Baltimore, \$3,894,256 for facilities at Baltimore.
- M. B. Mfg. Co., \$100,000 for additional machinery to be used in manufacture of aircraft parts at its New Haven, Conn., plant.
- McDonnell Aircraft Corp., Robertson, Mo., \$19,770 increase to previously announced lease agreements for plant manufacturing aircraft parts.
- Menasco Mfg. Co., Burbank, Calif., \$1,639,058 for an aircraft equipment plant at Burbank.
- Metal Cutting Tools Inc., Rockford, Ill., \$250,000 for purchase of machinery and equipment to expand facilities for manufacture of metal cutting tools.
- Pipe Machinery Co., Cleveland, \$200,000 for machinery and equipment for its machine tool plant.
- Remington Arms Co., Bridgeport, Conn., \$225,000 for shell machinery.
- Sullivan Dry Dock & Repair Corp., Brooklyn, N. Y., \$1,710,500 for facilities at Brooklyn.
- Tletjen & Lang Dry Dock Co., Hoboken, N. J., \$5,750,000 for conversion and repair facilities at Hoboken.
- Todd Seattle Dry Docks Inc., Seattle, \$1,000,000 for facilities at Seattle.
- Todd-Johnson Dry Docks Inc., New Orleans, \$3,140,000 for facilities at New Orleans.

Molybdenum High Speed Steels combine performance with economy



No reduction in the cost of tools could be enough to overcome inferior performance. Fortunately, Molybdenum high speed steels, which cost less than the Tungsten types, combine lower purchase price with equal performance.

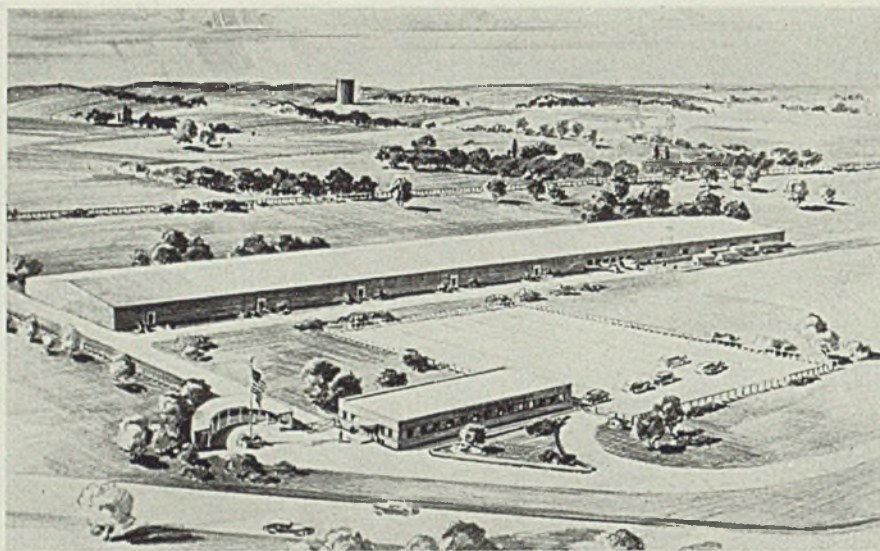
Users know that improved cutting properties, better

toughness and lower cost progressively bring about tool cost reduction.

It will pay you to call in your supplier for the analysis and heat treatment of the Molybdenum high speed steel that is most suitable for your cutting and cost requirements.

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■ Artist's drawing of Westinghouse fluorescent lamp works near Fairmont, W. Va., gives an idea of the windowless construction and general layout of site, which required the moving of 260,000 cubic yards of earth in leveling operations

Fairmont Fluorescent Lamp Works Embodies Many Unusual Features

■ CITY and state officials joined with officers of Westinghouse Electric & Mfg. Co., Aug. 2, in dedicating the company's new fluorescent lamp works, in a suburb of Fairmont, W. Va.

This climaxed a rapidly executed plant construction job. Starting on a snow-covered hillside last March the builders erected 710 tons of structural steel in 76 hours working time. Within five months they had completed a \$3,000,000 windowless, air conditioned plant, nearly five acres under one roof, with ultimate capacity for 200,000 fluorescent lamps per day.

There also are seven auxiliary buildings, paved roads, railroad sidings, water reservoir, bus terminal and parking lot, all enclosed by fencing and flood lighted for protection against sabotage. A glass plant is projected for construction later.

The main plant, a single-story, structure 224 feet wide and 885 feet long, houses all lampmaking machines, a six-weeks' supply of raw material and finished lamps, general offices, recreation rooms, cafeteria and kitchen, hospital and machine shop. The building is fire-proof, having structural steel frame, masonry walls and poured gypsum roof deck, topped with tar and gravel.

Roof trusses are of design familiar in bridge construction but seen less often in buildings. Units consist of a suspended truss carried

by two cantilever trusses. This makes a light, strong and economical assembly which could be shop-fabricated and shipped by rail.

Dust-free air is of paramount importance in manufacturing fluorescent lamps. Precipiton electrostatic air-cleaning cells supplement the usual filtering system. Air in all ducts is irradiated by Sterilamps to destroy bacteria and other micro-

organisms. Receiving and shipping rooms have separate double doors with air chambers between to keep out dust at those points.

Cooling is provided by water at 55 degrees Fahr., which is pumped out of an abandoned coal mine nearby. This mine water is pumped into a heat-exchanging reservoir and then returned to the mine. It cools city water in a secondary cooling system which in turn cools the air. Heat exchange is accomplished by copper coils submerged in the cool mine water.

Low-voltage secondary network power distribution is used for reliability, economy and ease of expansion. One system takes care of power and 120-volt lighting. Two 66-kilovolt incoming lines feed this system through two unit substation-type transformers. All lights except in the cafeteria are 40-watt fluorescent tubes, of which there are 5100. These are in continuous troughs 12 feet, 3 inches apart at heights varying from 10 to 13 feet. The average intensity at working level is 40 foot-candles. Power required to generate this light is about 1.3 watts per square foot.

A number of considerations entered into the selection of this plant location, one being the plentiful supply of natural gas for glassmaking and glassworking operations, another being a favorable labor situation. A large proportion of employes in the lamp works will be women, probably up to 90 per cent. While there have been employment opportunities for men in the district, this has not been true as regards women. The new plant will tend to balance the situation.



■ Method of supporting the roof by means of bridge-type prefabricated steel trusses is apparent in this picture, which also shows how fluorescent luminaires are supported from cables

Activities of Steel Users, Makers

■ EXECUTIVES of Link-Belt Co., Chicago, met recently to review and expedite the company's defense orders. Approximately 80 per cent of the company's business today consists of direct or indirect orders for defense materials, said Alfred Kauffman, president. Link-Belt's working force has been increased more than 60 per cent since the national emergency was first declared, it was pointed out. In many plants, three shifts are at work. All the company's plants and departments are reported engaged on vital defense parts.

Phelps Dodge Copper Products Corp., New York, has authorized another addition to its Habirshaw plant, Yonkers, N. Y. Employment at Habirshaw has nearly doubled in recent months. Contract for the addition has been let to Kraft & Murphy, 53 South Broadway, Yonkers.

American Can Co. has leased for a long term the large plant in Harvey, Ill., formerly occupied by Western-Austin Co., and will use it for making fiber sleeves to hold various types and sizes of shells. It is understood over \$1,000,000 will be spent in rehabilitating the 50 buildings on the 20-acre site and installing new machinery.

Production of carbide tool grades designed for machining of steel is 528 per cent ahead of last year, Carboloy Co. Inc., Detroit, reported last week. Total carbide production in the first half was about 300 per cent greater than in the period in 1940. Ratio of carbide grades designed for steel cutting increased 60 per cent in the period.

Diverted to defense channels last week was a 54,000-pound lot of aluminum, made available by Hotels Statler Co., New York. The aluminum purchased before the present shortage made rigid priorities necessary was to have been used for making windows for the new Hotel Statler in Washington.

Kinney & Askew Ltd., 415 Lexington avenue, New York, has been organized to specialize in management engineering and industrial public relations. Joseph Kinney Jr. is president and associated with him is Theodore J. Kauffeld who will serve on the board of directors. Dean Askew is treasurer.

Heekin Can Co., Cincinnati, will observe the fortieth anniversary of its founding this month. Albert E. Heekin, founder, is president.

Los Angeles branch of SKF Industries Inc., Philadelphia, is now

located in new offices and warehouse, 1419 South Flower street.

St. Louis Shipbuilding & Steel Co. has purchased 5.7 acres between Hurk and Catalan streets, St. Louis, from Missouri Pacific railroad for \$37,628. Included is 756 feet of industrial track. The company is building oil barges for the government.

Harris Calorific Co., Cleveland, manufacturer of oxyacetylene apparatus, recently was awarded a contract by the Navy Department for 25,500 regulators. Available records, according to Lorn Campbell Jr., president, indicate this is one of the largest single orders for gas welding apparatus ever to be delivered to an American consumer.

Tin Expert To Tell of New Uses in War Work

■ William H. Tait, technical development manager of the Tin Research Institute, London, states there is no shortage of tin in Great Britain. Normal consumption is maintained for solder, bearing metal, bronzes, electrodeposition and hot-tinning. Many special war industries are using tin for the first

time or in unfamiliar ways. An object of his visit to the United States is to give to American war industries technical information acquired by the institute.

International Tin Research and Development Council supports the tin research at Battelle Memorial Institute, Columbus, O., where Mr. Tait will make his headquarters until about Oct. 1.

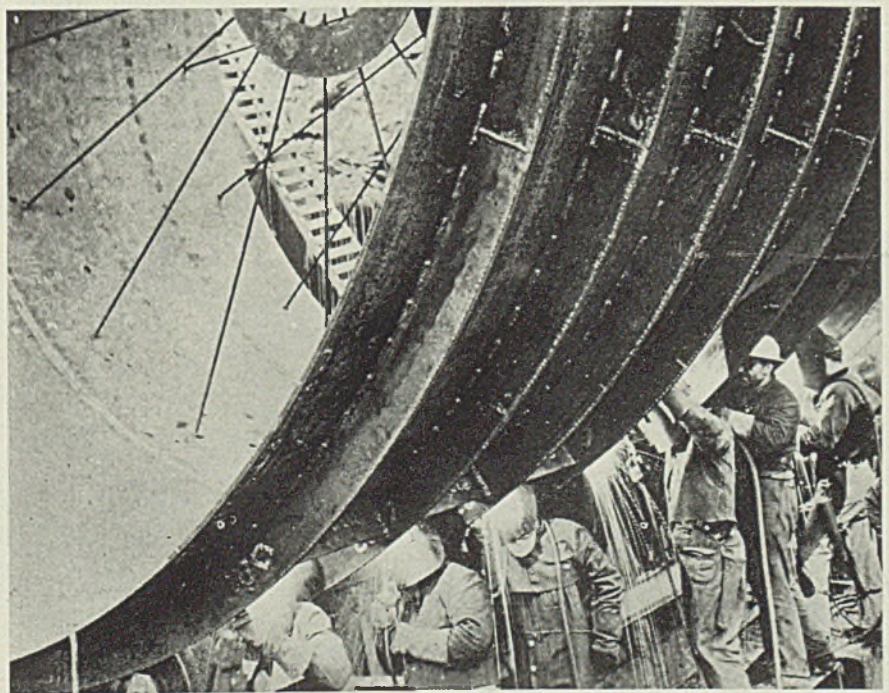
Mining Directory of Minnesota Is Issued

■ Institute of Technology, University of Minnesota, has issued the twenty-second edition of the *Mining Directory of Minnesota*. It contains maps giving names and locations of all operating mines, reserve properties, and mines that have been exhausted. It lists benefiting plants, mines that have shipped ore or are on tax records as containing ore.

Another section sets forth names of mining companies and holding organizations identified with Minnesota iron ranges, officials, subsidiaries, and properties in which they are interested.

The volume also contains general statistics of the iron ore industry. Several pages are devoted to names, addresses and business connections of men associated with mining in Minnesota.

Seven Operators Weld Penstock Section



■ This penstock section is for the new Parker Dam power project, Parker Dam, Calif. Huge cylindrical segments were placed on power-driven rollers which turned them into position for welding, enabling seven operators to work simultaneously. Chicago Bridge & Iron Co., Chicago, fabricated and welded the penstock in the field, employing Lincoln Electric Co. equipment

Bullard's Three-Acre Assembly Plant, Completed in 78 Days, Is Dedicated

■ **RECOGNITION** of a record-breaking achievement in machine tool plant construction for national defense was given Monday, July 28. Nearly 100 representatives of the Army and Navy, city, state and national governments, trade associations and the machine tool industry, were guests of the Bullard Co., Bridgeport, Conn., at the dedication of its new \$4,000,000 assembly building, for which the first load of structural steel was delivered April 28.

Bullard took possession of the completed building July 4, equipment was installed between that date and July 14, and within 24 hours thereafter finished machine tools were being shipped out.

Designed by A. D. Crossett and built by Turner Construction Co., the structure measures 180 x 540 feet, and rises to a one-story height of 60 feet. The basement extends half the length of the building.

Largest of Six Additions

The 3-acre building is surrounded by walls whose area is largely of glass—that on the sunny sides being of heat-absorbing, glare-eliminating type. The roof is of gypsum. Three 60-foot craneways have been arranged to tie in with an assembly plan which speeds up the work. Twenty-four-hour per day operating schedules have necessitated elaborate lighting and power distribution facilities, and emergency equipment is provided to forestall interruptions if regular service fails.

The new structure is the largest of six additions made by Bullard to an already extensive plant since the

beginning of the defense emergency. Other additions have included a foundry, bar stock building, boiler room, a north wing on the main plant and an auxiliary office building.

The company's shipments during 1940 were double those of 1939, and it appears that in 1941 they will be twice those of 1940.

Last year 1600 were employed; today 3200. The Bullard apprenticeship system operated in conjunction with the State Trade School in Bridgeport, has played a major part in making possible this increase in personnel.

Visitors were greeted by Bullard officials and after luncheon in the company's cafeteria they were conducted through the entire plant. Manufacture of vertical turret lathes, Mult-Au-Matics and their attachments and tools was followed through from foundry to testing floor. Many examples of defense products were shown in the "sample room."

Climaxing the interesting day came a genuine New England clam bake on the estate of E. P. Bullard, president of the company. While this was informal, tributes were paid by several of the guests—including Jasper McLevy, mayor of Bridgeport, and Lt. Col. A. B. Johnson, Ordnance Department, Washington, to outstanding industrial achievements of the Bullard family, and to the vigor with which the company has tackled its tasks.

■ Shipments of steel office furniture reached a 1941 high during May,

according to reports of the Census Bureau, Department of Commerce. Shipments were valued at \$4,297,530. The previous highest monthly total this year was reached in April when shipments were valued at \$4,010,066. Shipments during the first five months of this year were valued at \$18,649,003, compared with \$11,062,756 in the 1940 period.

GE To Build \$20,000,000 Factory "Far Inland"

■ Plans for constructing a \$20,000,000 factory in Fort Wayne, Ind., to manufacture turbo-superchargers for airplanes were announced last week by Charles E. Wilson, president, General Electric Co.

The company now is manufacturing this vital part for high-flying fighting planes and bombers at Lynn, Mass., and a \$5,000,000 factory is nearing completion at Everett, Mass.

Fort Wayne was selected in line with War Department policy to locate new factories for defense production far inland. The building will cost \$5,000,000 and machinery and equipment \$15,000,000. About 6000 employes will be required at peak production.

Westinghouse's Turbine Works To Cost \$22,000,000

■ Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will build a \$22,000,000 plant to manufacture steam turbines and gears for merchant ships for the United States Maritime Commission under a lease agreement with the Defense Plant Corp. R. A. McCarty, vice president, reported last week that the new plant will adjoin the company's South Philadelphia Steam Works. More than 1500 will be employed.

Industrial Research Strong Defense Factor

■ Industrial research is one of America's greatest resources, asserted E. R. Williams, manager of Johns-Manville's research laboratory, addressing the seventy-fifth anniversary science meeting of the University of New Hampshire, recently. If such research is supported properly the United States will not have to accept government regimentation, as Germany did.

He cited the petroleum field as an example, saying that the yield of gasoline from crude oil and production of lubricating oil have doubled. "Stocks of gasoline are eight times as large as in 1917 and unused refinery capacity of about 1,000,000 barrels daily is greater and more efficient than was our entire capacity in 1918."



■ New machine tool assembly building of Bullard Co., Bridgeport, Conn., is largest of several additions built by the company during the past year to meet expanding defense requirements

Funds Authorized for Defense, and Arms Orders Total \$50,785,000

■ **CONTRACT** authorizations and government appropriations for defense, plus funds made available for that purpose to the Reconstruction Finance Corp., totaled \$47,116,000,000 as of June 15. British orders totaled \$3,669,000,000, and the combined amount was \$50,785,000,000.

Breakdown for the commitments shows \$11,957,000,000 for airplanes; \$8,483,000,000 for naval vessels, merchant ships and transportation equipment; \$8,081,000,000 for guns and ammunition; \$5,530,000,000 for industrial facilities; \$4,353,000,000 for posts, depots and other non-industrial construction; and \$4,000,000,000 for miscellaneous items.

Defense contracts reported by the War Department last week totaled \$87,535,909. Air Corps and Ordnance Department purchases were heaviest. Contracts included:

Dunning, Charles M., Construction Co., and Guy H. James, Oklahoma City, Okla., and Patterson Steel Co., Tulsa, Okla., midwest air depot at Oklahoma City, \$14,270,000. Contractor is to construct a completely integrated air corps supply and repair depot, including airfield, night lighting, gasoline storage, railroad siding, hangars, hospital, repair buildings and shops, magazines, quarters and all necessary utilities.

Hardaway Contracting Co., Columbus, Ga., air corps flying school at Albany, Ga., at estimated cost of \$1,194,820. Contract includes construction of about 50 additional miscellaneous buildings, utilities and auxiliary landing field.

Turner Construction Co., New York, and Louis Mayerson, Albany, N. Y., estimated \$10,000,000 for greater part of an air corps supply and repair depot at Rome, N. Y. Depot is to comprise an industrial area, permanent housing, temporary quarters, air field, accessory

works, utilities and all necessary appurtenances. Architectural and engineering services contract was awarded to Air Depot Engineers, New York.

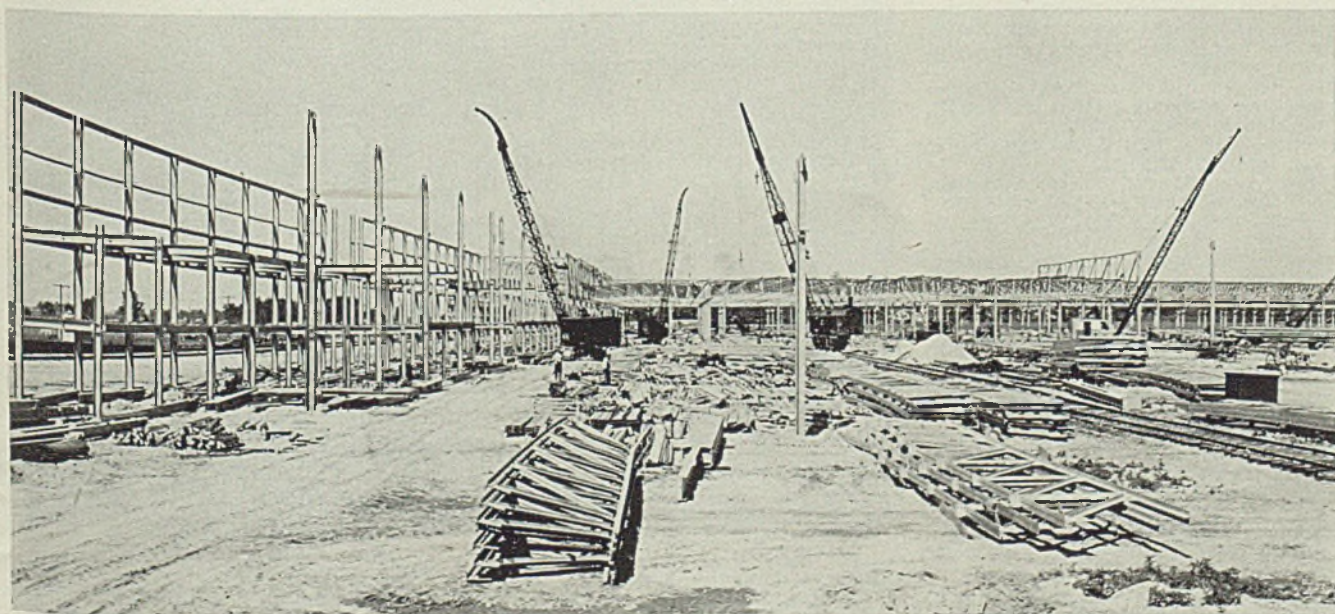
Air Corps Awards

Aerial Machine & Tool Corp., New York, mount assemblies, \$124,920.
 Ainsworth Mfg. Corp., Detroit, shackle assemblies, \$179,982.
 Air Cruisers Inc., Clifton, N. J., cylinder and valve assemblies, \$143,652.50.
 American Gas Accumulator Co., Elizabeth, N. J., field lighting trucks, \$422,300.50.
 American Rolling Mill Co., Middletown, O., iron and steel sheet, \$87,903.21.
 American Type Founders Sales Corp., Elizabeth, N. J., cameras, \$189,200.
 Aviation Mfg. Corp., Lycoming Division, Williamsport, Pa., aircraft engines, \$1,048,453.54.
 Beech Aircraft Corp., Wichita, Kans., maintenance parts, \$164,303.32.
 Bell & Howell Co., Chicago, film splicers and printer assemblies, \$258,862.
 Bendix Aviation Corp., Eclipse Aviation Division, Bendix, N. J., supercharger

regulator assemblies, \$928,329.50; Bendix Products Division, South Bend, Ind., pumps and control assemblies, \$78,650.
 Binks Mfg. Co., Chicago, engine cleaners, \$20,150.
 Boeing Aircraft Co., Seattle, maintenance parts, \$2,872,679.89.
 Case, J. I., Co., Racine, Wis., tractor-mowers, \$144,666.
 Chandler-Evans Corp., South Meriden, Conn., fuel pumps, \$921,500.40.
 Chandler-Hill Corp., Detroit, fuel pumps, \$535,750.
 Consolidated Aircraft Corp., San Diego, Calif., spare parts, maintenance parts, \$4,572,028.22.
 Continental Motors Corp., Muskegon, Mich., cylinders and piston rings, \$106,827.60.
 Crescent Insulated Wire & Cable Co. Inc., Trenton, N. J., cable, \$148,437.
 Curtiss-Wright Corp., Airplane Division, Buffalo Plants, Buffalo, maintenance parts, \$113,784.30; Airplane Division, St. Louis, Robertson, Mo., maintenance parts, \$390,201.10; Curtis Propeller Division, Caldwell, N. J., propeller assemblies and governor assemblies, \$1,194,820.50.
 Douglas Aircraft Co. Inc., Santa Monica, Calif., spare parts, \$1,524,863.01.
 Elastic Stop Nut Corp., Union, N. J., assembly nuts, \$147,608.25.
 Electric Storage Battery Co., Philadelphia, batteries, \$388,341.75.
 Federal Motor Truck Co., Detroit, trucks, \$824,670.
 General Engineering Co., Buffalo, washers, \$10,080.
 General Motors Corp., Allison Division, Indianapolis, aeronautical engines and parts for engines and repair kits, \$930,017.33.
 Harrisburg Steel Corp., Harrisburg, Pa., gas cylinders, \$964,500.
 Independent Engineering Co., O'Fallon, Ill., portable generators, \$618,000.
 Kelsey-Hayes Wheel Co., Detroit, oxygen cylinders, \$531,318.83.
 Link Aviation Devices Inc., Binghamton, N. Y., maintenance parts, \$52,122.51.
 Lockheed Aircraft Corp., Burbank, Calif., spare parts, \$694,477.54.
 Lord Mfg. Co., Erie, Pa., maintenance parts, \$695,599.39.
 Martin, Glenn L., Co., Baltimore, spare parts, turret assemblies, \$4,206,907.34.
 Nichols Electric Co., Dayton, O., cable, \$287,316.40.
 North American Aviation Inc., Inglewood, Calif., maintenance parts, \$1,360,505.52.
 Pheol Mfg. Co., Chicago, screws, \$62,972.55.
 Republic Aviation Corp., Farmingdale, L.

25,000 Tons of Steel Going Up for Ford Bomber Plant

■ **Construction** crews are working at top speed on this new defense project—\$47,000,000 bombing plane factory the Ford Motor Co. is building at Willow Run, near Dearborn, Mich. The structural framework of the L-shaped plant will contain 25,000 tons of steel. When completed next year it will produce giant four-engine Consolidated B-24D bombers and subassemblies. The plant will include its own airport, hangars, machine shop and assembly building nearly a mile in length. Total floor space, including hangars, will be nearly 3,700,000 square feet. Factory floor area alone will be 2,547,000 square feet



I. N. Y., maintenance parts, \$781,946.32.
 Rolls-Royce Inc., Detroit, ball and roller bearings, \$772,287.90.
 Ryan Aeronautical Co., San Diego, Calif., maintenance parts, \$146,834.53.
 Sperry Gyroscope Co. Inc., Brooklyn, N. Y., spare parts for automatic pilots, maintenance parts, \$1,238,196.54.
 Spriesch Tool & Mfg. Co. Inc., Buffalo, shackle assemblies, \$372,100.
 Standard Steel Works, North Kansas City, Mo., semi and tank trailers and dollies, \$965,448.
 Superior Specialty Co., Canton, O., washer assemblies, \$20,330.
 Thompson Products Inc., Cleveland, fuel pumps, \$861,000.
 Trailer Co. of America, Cincinnati, semi-trailers, \$80,340.
 United Aircraft Corp., Pratt & Whitney Aircraft Division, East Hartford, Conn., engine and maintenance parts, \$1,645,769.05.
 Vultee Aircraft Inc., Vultee Field, Calif., maintenance parts, \$1,374,115.09.
 Wright Aeronautical Corp., Paterson, N. J., parts for engines, tools, engines, \$5,210,775.79.

Ordnance Department Awards

Abel, Robert, Inc., Boston, electric hoist crane, \$1782.
 Aerial Machine & Tool Corp., New York, connectors, retaining pins and springs, \$11,800.
 Ajax Electric Co., Philadelphia, bath furnace, \$3127.
 All Tool Co., Hillside, N. J., gages, \$1948.
 Allegheny Forging Co., Pittsburgh, steel drop forgings, \$4270.
 Allis-Chalmers Mfg. Co., Milwaukee, parts for tractors, \$1166.29.
 American Car & Foundry Co., Berwick, Pa., armor plate, parts for tanks, \$15,461,816.99.
 American Locomotive Co., New York, parts for tanks, helical springs, \$1,427,895.48.
 American Petrometal Corp., Long Island City, N. Y., carbon steel bars, \$1609.31.
 American Steel & Wire Co., Cleveland, cement coated nails and sinkers, coil springs, \$8389.90.
 Atlantic Screw Works Inc., Hartford, Conn., wood and steel screws, \$1278.
 Autocar Co., Ardmore, Pa., half track carriers, \$4,519,531.80.
 Barber-Colman Co., Rockford, Ill., cutters and keys, \$2338.77.
 Bendix Aviation Corp., Bendix Products Division, South Bend, Ind., charger cylinder assembly and parts, pilot turret assemblies, \$304,392; Eclipse Aviation Division, Bendix, N. J., tools, \$1198.34.
 Bethlehem Steel Co., Bethlehem, Pa., guard rail blocks, bolts, track, switch plates and spikes, other track equipment, \$9700.53.
 Bohn Aluminum & Brass Corp., Michigan Smelting & Refining Division, Detroit, manganese bronze, \$3190.
 Bonney Forge & Tool Works, Allentown, Pa., forgings, \$2211.82.
 Brower, Roy L., Corp., New York, cement coated nails and sinkers, \$2685.
 Brown, Wilson, Co., New York, drilling machines, \$13,733.
 Buckeye Traction Ditcher Co., Findlay, O., transmissions, \$2,348,000.
 Bucyrus-Erie Co., South Milwaukee, Wis., gun carriages, \$2,807,900.
 Butterworth, H. W., & Sons, Philadelphia, tripod mounts, \$3,003,000.
 Carboly Co., Detroit, bullet cores and caps, \$5100.
 Carnegie-Illinois Steel Corp., Boston, nickel steel bars, \$2402.44.
 Central Steel Tube Co. Inc., Clinton, Iowa, tripod mounts, \$746,502.73.
 Chrysler Corp., Detroit, tanks and spare parts, \$74,567,761.60.
 Cincinnati Milling Machine Co., Cincinnati, tools and cutters, grinders, \$1931.06.
 Circle Wire & Cable Corp., Long Island, N. Y., lead encased cable, \$3920.

Clearing Machine Corp., Chicago, dials and bushings, \$3400.
 Cleaver-Brooks Co., Milwaukee, steam boilers and equipment, \$31,446.
 Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., depressors and rods, trigger mechanisms and collapsible tripods, small arms materiel, \$1,095,135.04.
 Continental Motors Corp., Muskegon, Mich., recondition cylinder and head assemblies, engines, exhaust pipe flanges, tank parts, \$4,075,700.88.
 Continental Roll & Steel Foundry Co., East Chicago, Ind., castings, \$3,252,000.
 Crown Cork & Seal Co., Baltimore, tripod mounts, \$2,713,926.40.
 Crucible Steel Co. of America, New York, steel, \$7822.12.
 Cummings Machine Works, Boston, per-estal for design division, \$20,962.
 Denison Engineering Co., Columbus, O., hydraulic presses, \$14,948.
 Detroit Tap & Tool Co., Detroit, gages, \$1783.47.
 Diamond T Motor Car Co., Chicago, carriers and parts, \$4,498,706.16.
 Duplex Mfg. Corp., Sherman, N. Y., steel chests, \$3271.95.
 Edgewater Steel Co., Pittsburgh, nickel steel forgings, \$4556.55.
 Electrical Motors Inc., Milford, Conn., electric motors, \$7135.04.
 EX-Cell-O Corp., Continental Tool Works Division, Detroit, cutting tools, \$1005.40.
 Falstrom Co., Passaic, N. J., exhaust and piping, hoods, \$2250.
 Federal Machinery Sales Co., Chicago, presses, \$1959.
 Felt & Tarrant Mfg. Co., Boston, comp-tometers, \$1360.
 Firestone Tire & Rubber Co., Akron, O., gun carriages and band tracks, \$38,898,210.
 Firth-Sterling Steel Co., McKeesport, Pa., blanks for tool tips, \$1620.
 Foster, Miller & Blerly Inc., Philadelphia, semi-steel wheels, \$1069.
 Foxboro Co., Foxboro, Mass., pyrometers, \$1188.
 General Box Co., Winchester, Mass., crates for cartridge clips, \$1315.10.
 General Motors Corp., Detroit, diesel engines, \$1,137,800.
 General Steel Castings Corp., Eddystone, Pa., castings, \$3,450,000.
 Gisholt Machine Co., Madison, Wis., turret lathes, \$10,202.
 Goodrich, B. F. Co., Akron, O., band tracks, \$3,168,876.
 Goodyear Tire & Rubber Co. Inc., Akron, O., band tracks, \$868,689.24.
 Gries Reproducer Corp., New York, gages, \$4031.40.
 Guiberson Diesel Engine Co., Chicago, parts for tanks, engines, \$1,336,791.33.
 Gurley, W. & L. E., Troy, N. Y., telescopes, \$8415.
 Hadley Special Tool Co. Inc., Boston, carbon removing tools, \$7150.
 Hanssen's, Louis, Sons, Davenport, Iowa, cross-cut saws, \$2436.75.
 Hardinge Mfg. Co., Elgin Tool Works Division, Chicago, optical glass polishing machines, \$74,025.
 Hartford Electric Steel Corp., Roxbury, Mass., steel castings, \$2881.58.
 Hesse Machine & Mfg. Co., Boston, gages, \$22,671.
 Holden, A. F. Co., New Haven, Conn., electric furnaces, \$8397.32.
 Industrial Tool & Die Works, St. Paul, gages, \$1130.
 Ingersoll-Rand Co., Chicago, portable air compressor, \$2650.
 Ingraham Co., Bristol, Conn., escapement gears, \$1335.
 International Business Machines, Boston, billing machines, \$1670.10.
 International Harvester Co., Chicago, tractors, \$2,126,899.25.
 Ithaca Gun Co. Inc., Ithaca, N. Y., small arms materiel, \$52,582.50.
 Jahn Mfg. Co., New Britain, Conn., gages, \$1829.
 Johnson-Claffin Corp., Marlboro, Mass., gages, \$1210.
 Jones & Laughlin Steel Corp., Gilmore Wire Rope Division, Pittsburgh, steel cables, \$15,312.

Jones & Lamson Machine Co., Springfield, Vt., lathe tools, \$1272.
 Kelsey-Hayes Wheel Co., Plymouth, Mich., small arms materiel, \$24,334,286.
 Kent Aircraft Machine Tool Co., Camden, N. J., gages, \$29,768.50.
 Kerlow Steel Flooring Co., Jersey City, N. J., angles, \$2547.49.
 Landis Machine Co., Waynesboro, Pa., threading machines and equipment, \$3499.34.
 Leeds & Northrup Co., Philadelphia, equipment for light intensity measurements, electric furnace, \$3617.20.
 Lincoln Tool & Die Co., Detroit, fixtures, \$2784.
 Lloyd & Arms Machine Co., Philadelphia, lathes, \$24,061.
 Mack International Motor Truck Corp., Albany, N. Y., tractor and trailer, \$11,200.
 Mack Mfg. Corp., Long Island City, N. Y., tank assemblies, \$6,419,481.10.
 McCord Radiator & Mfg. Co., Detroit, helmet liners, suspension and helmet bodies, \$3,215,370.
 McKiernan-Terry Corp., Dover, N. J., pneumatic staking machines, \$2715.
 Meehan-Johnson Machine Co., North Minneapolis, Minn., automatic machine, \$2705.
 Mills, H. W., & Co., Paterson, N. J., screws, \$4891.54.
 National Lock Washer Co., Newark, N. J., drop forgings, \$1041.30.
 National Stamping Co., Detroit, metallic belt links, \$1,037,275.
 Niles-Bement-Pond Co., Pratt & Whitney Division, West Hartford, Conn., drilling machines, rifling and chambering machines, gages, micrometers, \$93,283.79.
 Norton Co., Worcester, Mass., grinders, \$12,743.21.
 Ollgear Co., Milwaukee, parts for tanks, \$2,105,469.20.
 Pancoast, Henry B. Co., Philadelphia, plumbing supplies, \$1142.71.
 Penn Instrument Works Inc., Philadelphia, gages, \$6155.
 Pennsylvania Tool & Mfg. Co., York, Pa., gages, \$23,720.20.
 Pettibone Mulliken Co., Chicago, gun carriages, \$1,846,000.
 Poor & Co., Canton Forge & Axle Works, Canton, O., forgings, \$6682.
 Precise Tool & Mfg. Co., Farmington, Mich., templates and flush pins, gages, \$4890.
 Prentiss, Henry, & Co., New York, drilling machines, \$2387.
 Rahaim Machine & Tool Co., Boston, gages, \$1636.
 Republic Steel Corp., Buffalo, pig iron and carbon steel bars, \$6300.55.
 Reverse Copper & Brass Inc., New York, brass cups, \$11,151,950.99.
 Revolver Co., North Bergen, N. J., electric elevator, \$2565.
 Riverside Metal Co., Riverside, N. J., brass cartridge discs, \$507,017.50.
 Rock Island Metal Foundry, Rock Island, Ill., castings, \$33,098.13.
 Rockwood Sprinkler Co., Boston, automatic sprinkler systems, \$16,334.
 Sager-Spuck Supply Co. Inc., Albany, N. Y., track scale, \$2882.75.
 Schmidt, George T., Inc., Chicago, marking machine, \$1445.
 Seng Co., Chicago, links and assemblies, \$2952.60.
 Sheffield Corp., Dayton, O., gages, \$7529.71.
 Singer Mfg. Co., New York, directors, \$3,432,000.
 Sinko Tool & Mfg. Co., Chicago, gages, \$1140.
 Smith, A. O., Corp., Milwaukee, bomb bodies with drawings and specifications, \$81,000.
 Stokes, F. J., Machine Co., Philadelphia, tablet machine with hopper and motor drive, \$2989.
 Swind Machinery Co., Philadelphia, drills, lathes, grinders and milling machine, \$19,916.80.
 Thorrez & Maes Mfg. Co., Jackson, Mich., assembly for bombs, \$131,502.
 Thurston Mfg. Co., Providence, R. I., end

mills, \$1900.
 Tools & Gages Inc., Cleveland, gages, \$7772.
 Trackson Co., Milwaukee, truck mounts, \$942,114.75.
 True Alloys Inc., Detroit, castings, \$3957.50.
 Utica Drop Forge & Tool Corp., Utica, N. Y., wrenches, \$1845.
 Vilter Mfg. Co., Milwaukee, guns, \$1-446,518.32.
 Vinco Corp., Detroit, plugs, snaps, pins and templates, gages, \$5256.05.
 Waltham Machine Works, Waltham, Mass., thread miller, \$1958.66.
 Ward La France Truck Corp., Elmira, N. Y., heavy wrecking trucks, \$1-658,519.85.
 Weaver, Frank M., & Co. Inc., Lansdale, Pa., erection of steel gallery, \$6583.
 Western Cartridge Co., East Alton, Ill., cartridges, \$68,388.85.
 Westinghouse Electric & Mfg. Co., Springfield, Mass., oil gears, \$710,133.50; Westinghouse Lamp Division, Boston, lamps for lighting purposes, \$1706.68; Albany, N. Y., electric furnace, \$1476.
 White Motor Co., Cleveland, half track cars, \$5,476,926.60.
 Wiedemann Machine Co., Philadelphia, gages, \$1562.50.
 Winchester Repeating Arms Co., New Haven, Conn., ignition cartridges, shot-guns and attachments, \$50,961.80.
 York Safe & Lock Co., York, Pa., gun mounts, \$872,800.
 Youngstown Sheet & Tube Co., Youngstown, O., sheet steel, \$5724.78.

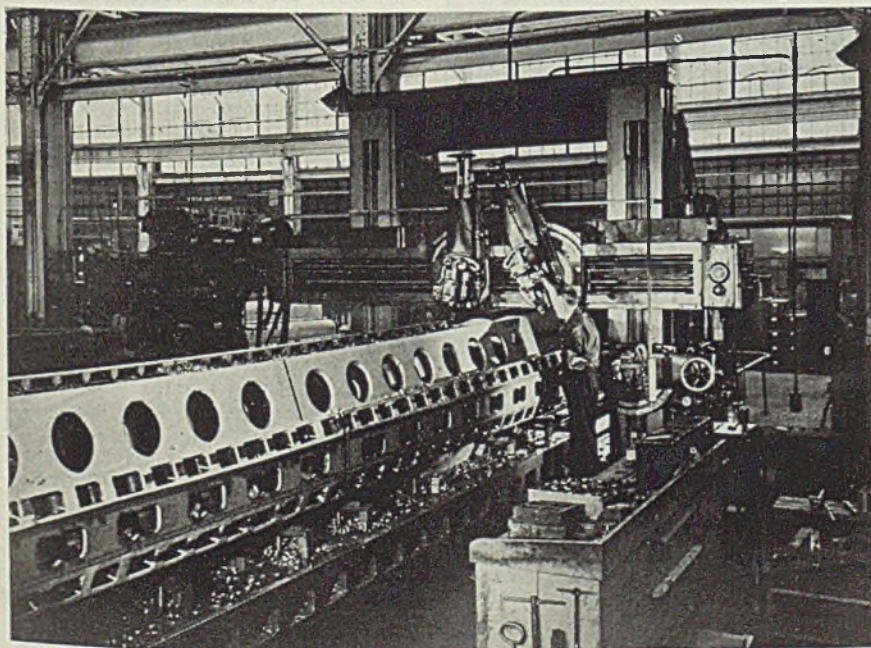
Quartermaster Corps Awards

Ahlborg, O., & Sons Inc., Boston, installation of water and sewage system in additional buildings, portable water supply connections and sanitary and storm sewage connections to theatres and field house, Camp Edwards, Massachusetts, \$41,100.
 American Chain Fence Co., Medford, Mass., fencing of critical areas at Ft. Ethan Allen, Vermont, \$9680.
 Anchor Post Fence Co. of Texas, Houston, Tex., chain link fence and gate with all appurtenances at Camp Polk, Louisiana, \$88,357.
 Andrus, B. S., St. Paul, water supply

line and distribution system for warehouses at Savanna Ordnance depot, Illinois, \$25,783.
 Bowen, R. A., Macon, Ga., guest house, motor repair shops, recreation buildings, hospital barracks, day rooms and magazines at Camp Wheeler, Macon, \$225,760.
 Brown & Hand Construction Co. Inc., Syracuse, N. Y., barrack buildings, chapels, administration building, officers' day rooms and mess, recreation building and garage at Pine Camp, New York, \$278,161.
 Buford Bracy, Little Rock, Ark., motor repair shops, tent frames, at Camp Joseph T. Robinson, Arkansas, \$314,000.
 Busboom & Rauh, Salina, Kans., recreational facilities, consisting of service club, theater and guest house at Ft. Riley, Kansas, \$83,090; general administration facilities including utilities and appurtenances at Ft. Omaha, Nebraska, \$26,984.
 Carilli Construction Co., Dorchester, Mass., construction of motor repair shops, grease and inspection rack, oil storage house and concrete wash rack at Ft. Ethan Allen, Vermont, \$85,792.
 Casper Ranger Construction Co., Holyoke, Mass., field service building at Springfield armory, Springfield, Mass., \$262,013.
 Cyclone Fence Co., Waukegan, Ill., critical fencing at Ft. Crook, Nebraska, \$12,643.
 Di Sandro Bros., Providence, R. I., day rooms and officers' mess at Camp Edwards, Massachusetts, \$126,384.
 Fruehauf Traller Co., Warren, Pa., gasoline tank semitrailers, \$16,368.
 Gilmore Co., Omaha, Nebr., regimental chapel, induction building, motor repair shop with classroom addition and building utilities and approaches, Ft. Crook, Nebraska, \$102,352.
 Hoffman, George, & Sons Inc., New York, administration building at Ft. Slocum, New York, \$10,408; boiler house, steam distribution system and miscellaneous buildings at Ft. Tilden, New Jersey, \$100,703; temporary housing, administration building and radio shelter at Ft. Wadsworth, New York, \$14,250; administration buildings and

radio shelter at Ft. Totten, New York, \$28,380.
 Hoskins, Charles L., San Diego, Calif., theaters, chapels, post office, post exchange, fire station, guard house and recreation building at Ft. Rosecrans and Camp Callan, California, \$161,000.
 Johnson, Adolph G., Galveston, Tex., motor repair shops and closed shed at Ft. Crockett, Texas, \$82,000.
 Johnson, Al, Construction Co. and James Leek Co., Minneapolis, warehouses, closed sheds, with all utilities at Utah General Depot, Ogden, Utah, \$992,950.
 Knox Bros. Lumber Co., Thompson, Ga., theater, regimental chapels, and warehouse at Camp Wheeler, Macon, Ga., \$126,120.
 LaBlanc Bros., Baton Rouge, La., bays of open and closed sheds, day rooms, officers' mess, hospital administration building, and red cross building, at Camp Polk, Louisiana, \$361,746.
 Layne-Texas Co., Houston, Tex., installing deep well turbine pump and electric motor, constructing pump house and installing pipe line at Ft. Bliss, Texas, \$56,939.
 Lippert Co., Boone, Iowa, sewage pumping station and force main from Ft. Des Moines to Des Moines, Iowa, \$42,887.
 Little, W. Frank, Construction Co., Amarillo, Tex., buildings for cantonment, station hospital areas including walks and steam distribution buildings, wash rack, grease and inspection rack, and roads at Ft. Sill, Oklahoma, \$495,293.
 Miller Davis, Kalamazoo, Mich., field house at Ft. Custer, Michigan, \$64,000.
 Miller, Henry W., Electric Co., Omaha, Nebr., flood lighting system at Ft. Crook, Nebraska, \$4673.
 Morgan, J. E., & Sons, El Paso, Tex., reception center buildings and tents, post exchange office, storehouse, and motor vehicle housing at Ft. Bliss, Texas, \$493,568.
 Ohlen-Bishop Co., Lawrenceburg, Ind., butcher saws, \$3952.
 Olson Construction Co., Dobson & Robinson, Ogden, Utah, boiler and air compressor and receiver in boiler house of fuse loading plant at Ogden Ordnance depot, Utah, \$14,753.
 Parsons Construction Co., Omaha, Nebr., building utilities and appurtenances for motor repair shop at Ft. Crook, Nebraska, \$90,062.
 Plowden & Roberts Co., Columbia, S. C., chain link fences with gates, corner posts, end posts, at Camp Croft, South Carolina, \$10,386.
 Porter, Leslie R., Beverly, Mass., field house and sixteen motor sheds at Camp Edwards, Massachusetts, \$85,989.
 Rhelner, A. P., & Son, San Antonio, Tex., emergency construction of project No. 3 at Normoyle Quartermaster depot, San Antonio, Tex., \$205,369.
 Rose Construction Co., Abilene, Tex., bakery, utilities, motor repair shops, grease and inspection rack, oil house and concrete wash rack at Camp Barkeley, Texas, \$81,000.
 Security Fence Co., Somerville, Mass., standard chain link fence at Camp Edwards, Massachusetts, \$62,629.10.
 Skinner & Ruddock, Charleston, S. C., red cross building, barrack and hospital administration building, and ambulance garage at Stark General Hospital, Charleston, S. C., \$46,950.
 Stewart, George, Newark, N. J., steam distribution system and pump return system, piping, pipe conduits, drainage, plumbing, electric excavation, concrete work, etc., at Raritan Arsenal, New Jersey, \$124,900.
 Stillwell, A. W., Co., Macon, Ga., service club, red cross recreation building, administration building, \$43,210.
 Tulsa Rlg, Reel & Mfg. Co., Tulsa, Okla., service clubs, theatre and guest house at Ft. Leonard Wood, Missouri, \$160,300.
 Watson Automotive Equipment Co., York, Pa., refrigerator semitrailers, \$20,550.
 Wheatley & Mobley, Augusta, Ga., additions and alterations to shop building, Augusta arsenal, Georgia, \$57,690.

Planing Diesel Engine Cylinder Blocks



■ Experienced men and new machines work together at General Motors, Cleveland Diesel Engine Division, building engines for the United States Navy. Here an operator is putting a pair of 16-cylinder blocks through a planer. NEA photo

Vital Trade in Tin, Rubber, Quinine Periled by Japan in Indo-China

■ ESTABLISHMENT of bases in French Indo-China by Japan, and commercial reprisals by the United States government, are causing some fear in this country that trade with the Netherlands East Indies and the Straits Settlement of Malaya may be interrupted. These countries are leading sources of tin, rubber, and quinine.

Tin production in the Malay peninsula in 1940 amounted to 85,854 gross tons; in the Netherlands East Indies 44,447 tons, and in Thailand (Siam) 17,405 tons. This totals 147,706 tons, well over half the estimated world production of 236,600 tons. In 1939 these three sources produced 104,222 tons, of a total of 183,067 tons.

In 1940 about 77 per cent of the value of imports into the United States from the Netherlands Indies consisted of crude materials, of which rubber, to the value of \$112,166,000, was the most important.

Tin was the second most important commodity imported from the Netherlands Indies in 1940 and amounted to 27,000,000 pounds, 10

per cent of total tin imports during the year, with an equivalent quantity of Netherlands Indies tin reaching the United States by way of smelters in the Straits Settlement.

Total tin imports by the United States in 1940 were 115,497 gross tons, the greater portion coming from Straits Settlement. Total consumption in 1940 in the United States was 74,050 tons, the remain-

STEEL Index Is Ready

■ *The index to Volume 108, STEEL, for the first six months of 1941, now is ready for distribution. Copies will be sent to all subscribers requesting them.*

der of imports going into stocks, consumers having built up reserves heavily in preparation for possible interruption of shipments.

Purchases of all products from the Netherlands Indies by the United States in 1940 were valued at \$169,

074,000, compared with \$92,971,000 in 1939. Sales of American products to the Netherlands Indies were valued at \$53,781,000, against \$35,420,000 the preceding year.

Defense activity in the United States and accumulation of stock piles were primarily responsible for increased purchases.

As part of the program of mobilizing economic resources of the islands, all essential industries were operated at capacity, requiring more raw and semimanufactured materials. As a result the United States exported much larger quantities to the Netherlands Indies in 1940, especially iron and steel manufactures.

Much of the gain in exports resulted from purchases of tin by the United States Metals Reserve Co. and most of the tin produced in the islands since June, 1940, has come to the United States.

Shifts in foreign trade because of the war caused this country to become in 1940 the leading source of imports into the Netherlands Indies, as well as the chief destination of its exports.

Imports from the United States increased approximately 70 per cent over 1939, and exports to this country advanced 100 per cent. European trade declined about 25 per cent in imports, and 35 per cent in exports.

In 1939, the latest year for which the Department of Commerce has complete tabulations, United States exports to the Netherlands constituted 1.1 per cent of total exports, and imports were 4 per cent of total United States imports.

American-Built Planes in Far East Service



■ These Curtiss interceptor-fighter planes stand ready for action with the Royal Netherlands East Indies air force at its great air base in Bandoeng, Java. This picture, one of the first to show that the Netherlands East Indies government is using the latest interceptor-fighters, shows 27 of these fast-climbing craft. Service marking on the fuselage is an orange triangle with a black edge. NEA photo

Machine Tools Imported From South America

■ First shipment of South American machine tools imported by Lemco Products Inc., Bedford, O., (see STEEL, July 21, p. 29) arrived July 28. It included three 24-inch shapers; 5, 10 and 15-ton presses; hand-feed drill press; power file. Examination disclosed the equipment to be of excellent workmanship. Scales are graduated in inches and thousandths. These units were made in Buenos Aires.

Contracts provide for importation of ten 18-inch and ten 24-inch shapers monthly to start. This will be increased as plant expansions are made by suppliers. One plant, already employing about 500 workmen, is expected to more than double this figure by end of the year.

Imports will include vertical and radial drills, and presses up to 100 tons capacity. Presses have a unique cam-within-a-cam which allows length of stroke to be adjusted in fine steps over entire range.

The company plans to keep samples of the various units on its display floor.

Salute Inventor as 25,000th Grinding Machine Is Built

■ TO SIGNALIZE completion of the 25,000th Norton grinding machine recently, Norton Co. published a brochure entitled *Salute! Mr. Norton*, dedicated to Charles H., who invented the Norton grinding machine in 1900. Pamphlet traces the machine division's development over four decades.

Norton grinding machine No. 1—an 18 x 96-inch unit—was sold to R. Hoe & Co., New York, and was in continuous service for more than 20 years. Repurchased by the Norton Co. in 1928, it now is in the Edison Institute of Technology, Dearborn, Mich.

Assisted Early Automobiles

"The Norton grinding machine found its place in the automotive industry when automobile manufacture was in its infancy," the booklet points out in illustrating the grinding machine's part in mass production. "About 85,000,000 cars and trucks have been produced in this country in the past 40 years. That number of crankshafts have been ground—indicating six or eight times as many crankpins. A like number of camshafts have been finished, each cam ground to a high standard of accuracy. There have been several hundreds of millions of valve stems and similar units finished on grinding machines.

"On a modern automobile there are upwards of 300 different grinding operations. . . . It is of equal importance to the production of aircraft, tanks, tractors, trucks, diesel engines, agricultural implements."

Norton Co.'s response to the request for more defense production also is set forth. Prior to 1940, the machine division's peak employment was 958. By February, 1941, the number employed had passed 2100.

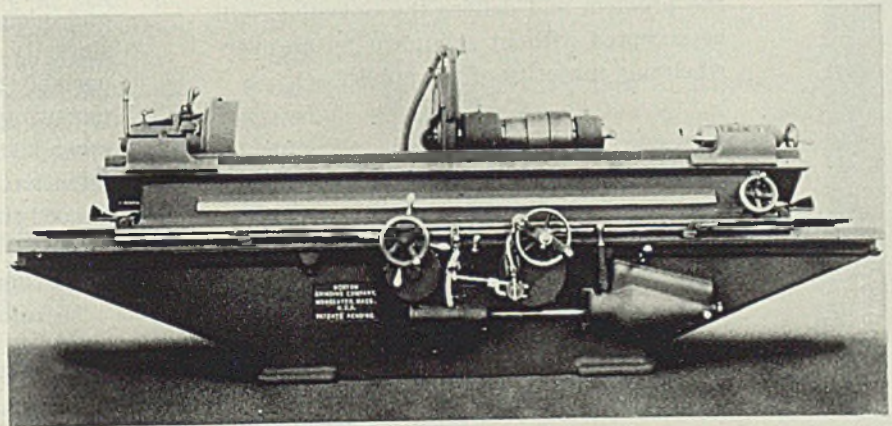
Before 1940 peak production was in 1937. Last year's output was 2.3 times that of 1937 and it is estimated the output in 1941 will be four times 1937 production, an increase of 300 per cent.

Last week the company announced adoption of a retirement income plan to provide employes with a regular monthly income in addition to benefits under the Social Security Act.

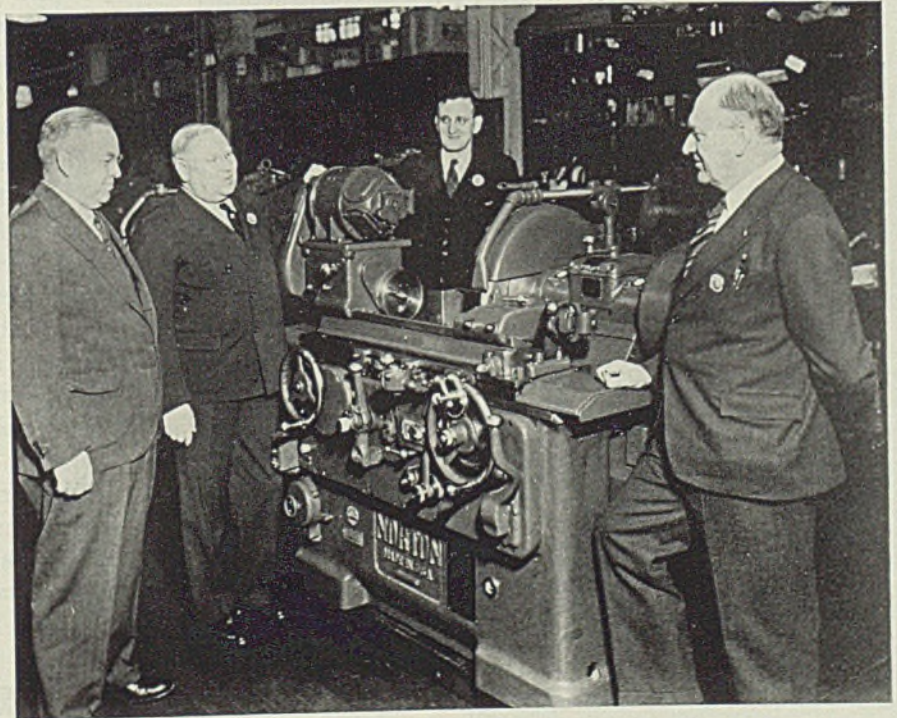
The plan will affect all those of the 6000 Norton employes who are between the ages of 30 and 65 and who have had five years' service. It is also being adopted by two subsidiary corporations, Behr-Manning Corp., Troy, N. Y., and Norton Pike Co., Littleton, N. H.



■ Charles H. Norton, Plainville, Conn., the "father of cylindrical grinding," inventor of the Norton grinding machine introduced in 1900; born in Plainville Nov. 23, 1851; now residing in Plainville at the age of 89



■ Norton grinding machine No. 1—18 x 96 inch, sold to R. Hoe & Co. in 1900



■ Machine No. 25,000 as it came off the assembly line March 15, 1941. This machine was assigned to Wright Aeronautical Corp. to be used in production of aircraft engines. Machine Division executives photographed with this machine are, left to right: Frank W. Smith, sales manager; Howard W. Dunbar, manager; Ivar Freeman, superintendent; A. G. Belden, works manager and chief engineer

Price Control a Two-Edged Sword

■ ALMOST everybody knows the result of runaway inflation, realizes that inflationary tendencies are at work in this nation now, and favors measures which will deal with this threat effectively.

Therefore, President Roosevelt's message on price control, insofar as it states the problem and defines the objective, will be accepted without argument by an overwhelming majority of the public.

• • •

Unfortunately, however, the experience of the last 9 years has demonstrated that legislation enacted by congress to meet a specific objective often is administered to accomplish ends not originally contemplated—sometimes to the extent of actually defeating the original purpose of the act.

For this reason, the bill to authorize price controls should receive most careful attention. Every provision should be scrutinized closely and every possible construction of it analyzed thoroughly to the end that the bill when finally enacted will be adapted primarily to the prevention of inflation and not to the latest whim in economic or social experiment.

Some persons will say that it is unfair to suggest that the President wants this legislation for any other purpose than the one he outlined.

Undoubtedly he is sincere. We believe he meant every word when he said that "our objective, therefore, must be to see that inflation, arising from the abuse of power to increase prices because the supply is limited and the demand inflexible, does not occur during the present emergency."

Again, we think he was sincere when

he declared that price control legislation, "like other defense legislation, should expire with the passing of the need within a limited time after the end of the emergency."

It is fair, however, to point out that on numerous previous occasions, statements and pledges uttered with equally solemn sincerity have not been kept. Almost invariably some new emergency or some extenuating circumstance has arisen to seemingly justify a departure from the original intention. Unfortunately, each departure has led the nation deeper and deeper in the maze of restriction, regulation and regimentation.

Therefore, congress cannot be too careful in its phrasing of the bill. Nor can it afford to take chances on the provisions governing the administration of the bill. Everybody knows from recent painful experience the disastrous results of biased and incompetent administration of good or bad legislation.

• • •

The need for extraordinary caution in connection with price control is two-fold.

First, the power to control prices is more dangerous, if abused, than any powers which heretofore have been granted to the government.

Secondly, the government already has clamped restrictions on certain inflationary movements at the same time it has openly encouraged inflation in other directions.

Congress should make sure it is legislating against *all* improper inflation and not solely against cases of inflation which the administration does not like.

E. L. Shaner

EDITOR-IN-CHIEF

The BUSINESS TREND

Industrial Production in July Shows Decrease



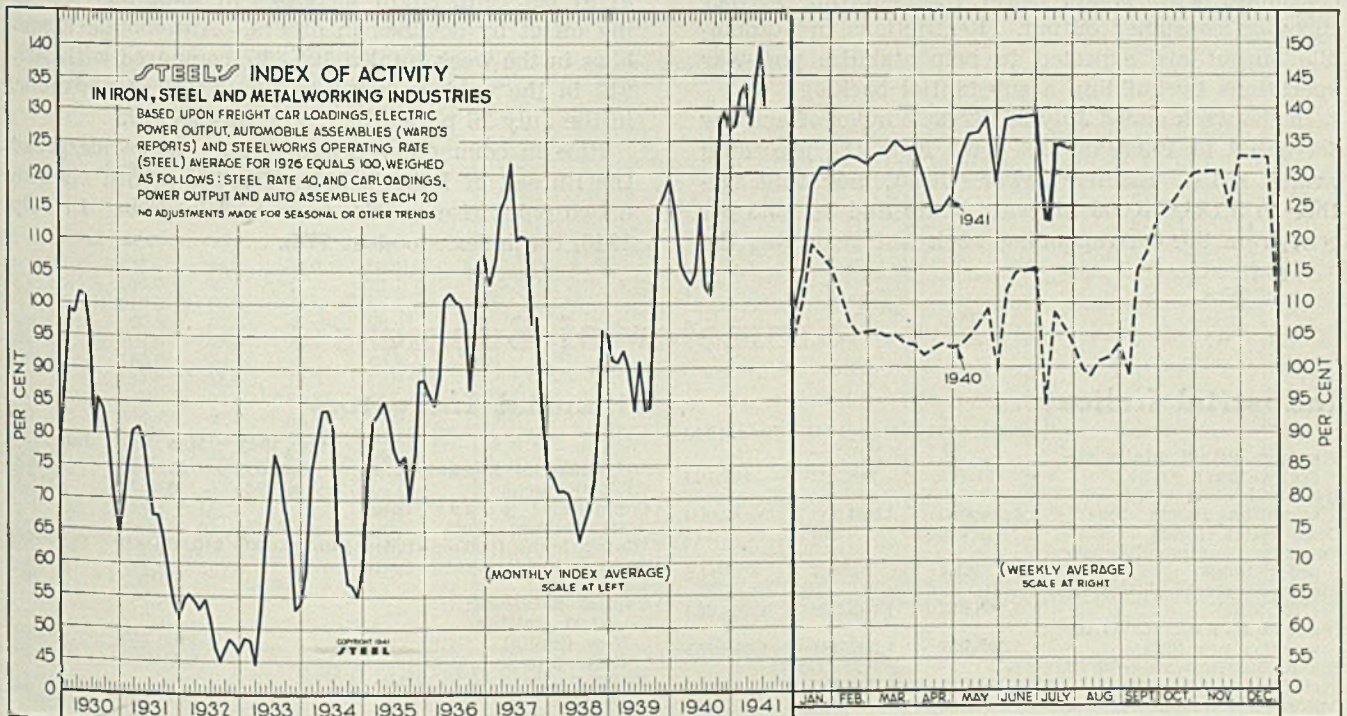
INDUSTRIAL activity in July, as measured by STEEL'S index, showed a moderate decline from peak operations of the preceding month, the decrease being due in large part to a mild easing in steel operating rate and tapering off in automobile production. Weekly index of activity in the month averaged 131.2, compared with 138.7 in June, but was substantially above the 102.4 average in July, 1940.

However, further increases in output were reported in July for a considerable number of industries, particularly those associated closely with the defense program. Activity in aircraft, shipbuilding, machine

tool and machinery, and railroad equipment industries showed continued gain. Because of this, growing concern has been noted over shortages of numerous materials, as metals producers have been unable to keep pace with increased consumption.

Impetus of armament expenditures, nearing the \$1,000,000,000-per-month rate, is also increasingly reflected in demand for consumers' goods. Continued changeover from peacetime to war production, coupled with growing shortage of materials, threatens soon to reduce civilian output materially.

Automobile builders, keeping in mind proposed cur-



STEEL'S index of activity declined 0.8 point to 133.3 in the week ended July 26:

Week Ended	1941	1940	Mo. Data	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930
May 10.....	135.9	104.8	Jan.	127.3	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6
May 17.....	136.1	106.8	Feb.	132.3	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2
May 24.....	138.6	109.1	March	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2	80.4	98.6
May 31.....	128.4	99.2	April	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7
June 7.....	138.4	111.9	May	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2
June 14.....	138.7	114.6	June	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8
June 21.....	138.7	114.8	July	131.2	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9
June 28.....	138.8	115.3	Aug.	.....	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4
July 5.....	122.9	94.2	Sept.	.....	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7
July 12.....	134.5	108.5	Oct.	.....	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8
July 19.....	134.1	106.0	Nov.	.....	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.6
July 26.....	133.3	103.4	Dec.	.....	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3

THE BUSINESS TREND—Continued

tailment of production, are engaged in active preparation for the 1942 model cars. Several are already in the process of changeover, and all are expected to complete production of the 1941 models this month.

The steel industry, maintaining its high operating rate, is faced with need for more pig iron to continue operations, in lieu of diminishing visible scrap supplies. Rehabilitation of several blast furnaces long idle, and construction of several new stacks, is

Where Business Stands

Monthly Averages, 1940 = 100

	June 1941	May 1941	June 1940
Steel Ingot Output	123.8	125.1	102.9
Pig Iron Output	118.5	115.1	99.2
Building Construction	161.5	164.4	97.3
Auto Output	138.1	141.2	92.8
Freight Movement	125.6	120.4	103.5
Wholesale Prices	110.7	108.2	98.7

expected to relieve the situation somewhat, although tightness in supply for some time is anticipated.

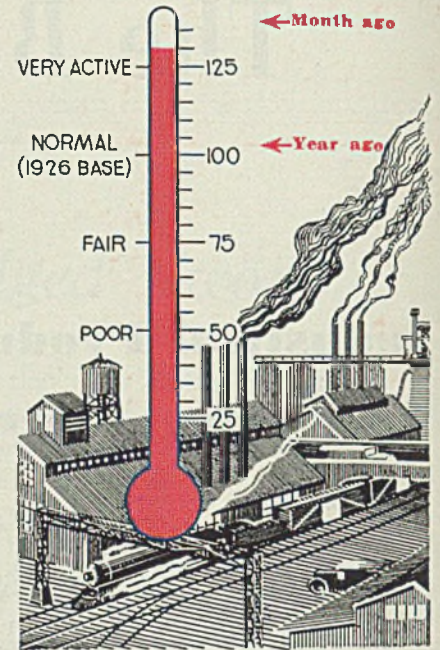
Steel bookings, more distinctly for defense purposes than in earlier months, still reflect considerable tonnage for nondefense manufacture. Armament demands, so long as the preparedness program continues, will remain heavy, necessitating further curbs on consumer output. Restrictions in automobile output are expected to help stabilize post-war operations by building a substantial backlog.

In the week ended July 26, STEEL's index of activity decreased to 133.3, off 0.8 point from the preceding week's 134.1. Electric power output, mounting further to 3,183,925,000 kilowatt hours and up 15.3 per cent from the corresponding week last year, was the

Industrial Weather

TREND:

Downward



only one of four industrial indicators to show a rise. Car loadings were off slightly from the preceding week, totaling 897,399, against 899,370, but were well above 708,489 cars loaded in the comparable week in 1940.

National steel operating rate remained unchanged at 97 per cent, slight increases in some districts being offset by declines in others. Automobile assemblies in the week totaled 105,635, compared with 109,912 in the week ended July 19. Total of assemblies in the July 26 period last year was 34,822.

Rise in commodity prices in July was widespread, the Bureau of Labor's index for the month showing a two point rise to 86.9 from 84.9 in June. In July, 1940, the index stood at 77.5.

The Barometer of Business

Industrial Indicators

	June, 1941	May, 1941	June, 1940
Pig iron output (daily average, tons)	151,701	148,262	127,103
Iron and steel scrap consumption (gross tons)	4,406,000	4,609,000	3,482,000
Gear Sales Index	299	273	129
Foundry equipment new order index	281.1	298.7	164.9
Finished steel shipments (Net tons)	1,668,637	1,745,295	1,209,684
Ingot output (average weekly; net tons)	1,585,252	1,592,581	1,318,751
Dodge bldg. awards in 37 states (\$ Valuation) ..	\$539,100,000	\$548,700,000	\$324,700,000
Automobile output	540,000*	545,321	362,566
Coal output, tons	43,090,000	43,400,000	32,400,000
Business failures; number	970	1,119	1,114
Business failures; liabilities	\$9,449,000	\$10,065,000	\$13,734,000
†Cement production, bbls.	14.73	12.20	12.63
Cotton consumption, bales	875,100	918,902	565,400
Car loadings (weekly av.)	878,000	841,557	724,000

*Preliminary. †May, April and May respectively.

Financial Indicators

	June, 1941	May, 1941	June, 1940
30 Industrial Stocks†	\$123.03	\$116.44	\$156.33
20 Rail stocks	\$28.34	\$28.25	\$18.29
Commercial paper rate (N. Y., per cent)	½-¾	½-¾	½-¾
*Com'l. loans (000 omitted)	\$10,250,000	\$10,030,000	\$8,450,000
Federal Reserve ratio (per cent)	91.2	91.3	88.2
Capital flotations: (000 omitted)			
New Capital		\$106,750	\$81,861
Refunding		\$299,089	\$144,596
Federal Gross debt (millions of dollars)		\$47,721	\$42,968
Railroad earnings (\$1,000,000)		\$88.63	\$47.42
Stock sales, New York stock exchange (1,000,000)	10.45	9.66	15.57
Bond sales, par value (\$1,000,000)	\$149.6	\$169.3	\$102.7

*Leading member banks Federal Reserve System.
†Dow-Jones Averages.

Commodity Prices

	June, 1941	May, 1941	June, 1940
STEEL's composite average of 25 iron & steel prices	\$38.15	\$38.15	\$37.69
U. S. Bureau of Labor's index	86.9	84.9	77.5
Wheat, cash (bushel)	\$1.043	\$1.038	\$1.118
Corn, cash (bushel)	\$0.863	\$0.83	\$0.748

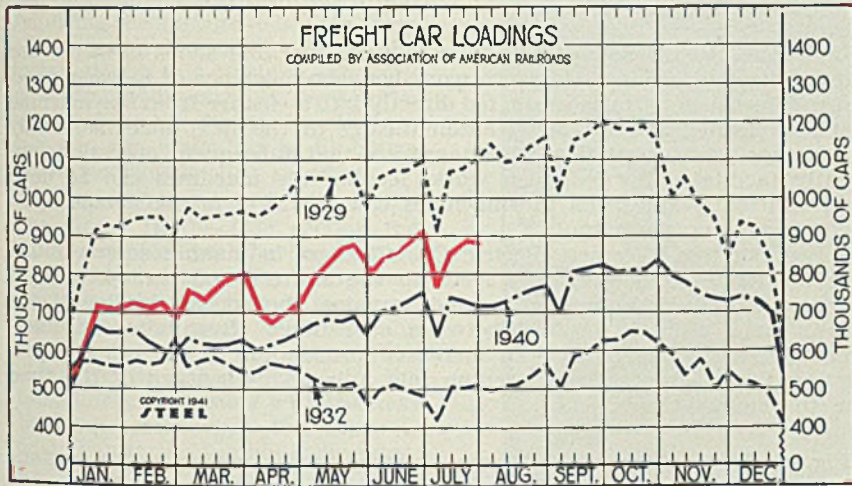
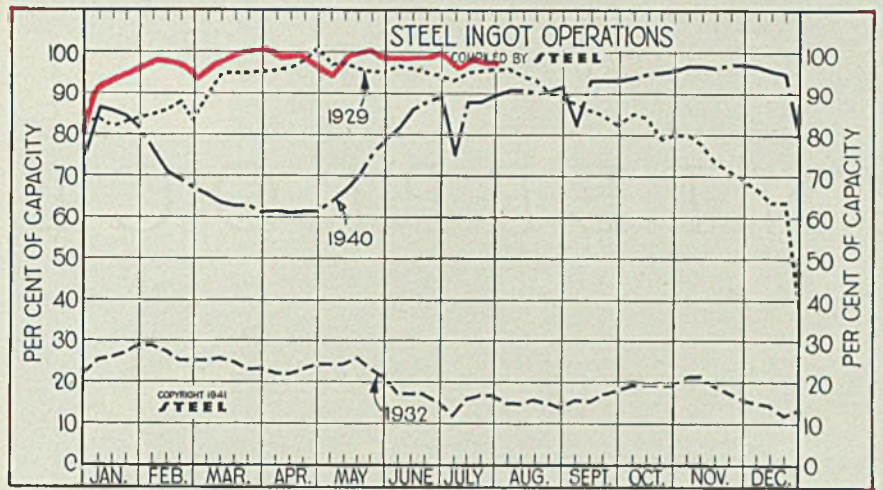
Foreign Trade

	May, 1941	April, 1941	May, 1940
Exports	\$384,636,000	\$385,454,000	\$325,306,000
Imports	\$296,930,000	\$287,550,000	\$211,382,000
Gold exports	\$5,000	\$2,000	\$3,563,000
Gold imports	\$34,835,000	\$171,994,000	\$438,695,000

Steel Ingot Operations

(Per Cent)

Week ended	1941	1940	1939	1938
July 26	97.0	89.5	60.0	37.0
July 19	97.0	88.0	56.5	76.0
July 12	97.5	88.0	50.5	32.0
July 5	96.5	75.0	42.0	24.0
June 28	99.5	89.0	54.0	28.0
June 21	99.0	88.0	54.5	28.0
June 14	99.0	86.0	52.5	27.0
June 7	99.0	81.5	53.5	25.5
May 31	99.0	78.5	52.0	25.5
May 24	100.0	75.0	48.0	28.5
May 17	99.5	70.0	45.5	30.0
May 10	97.5	66.5	47.0	30.0
May 3	95.0	63.5	49.0	31.0
April 26	96.0	61.5	49.0	32.0
April 19	98.0	61.5	50.5	32.5
April 12	98.0	61.0	51.5	32.0
April 5	98.0	61.5	53.5	32.0



Freight Car Loadings

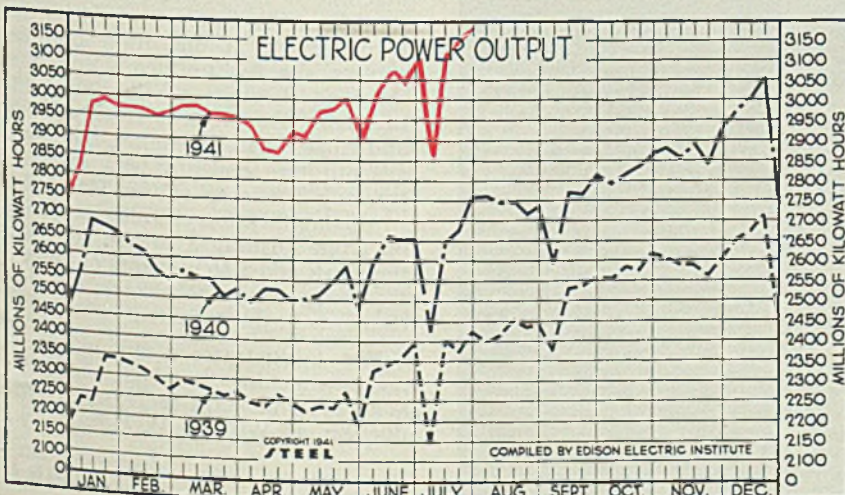
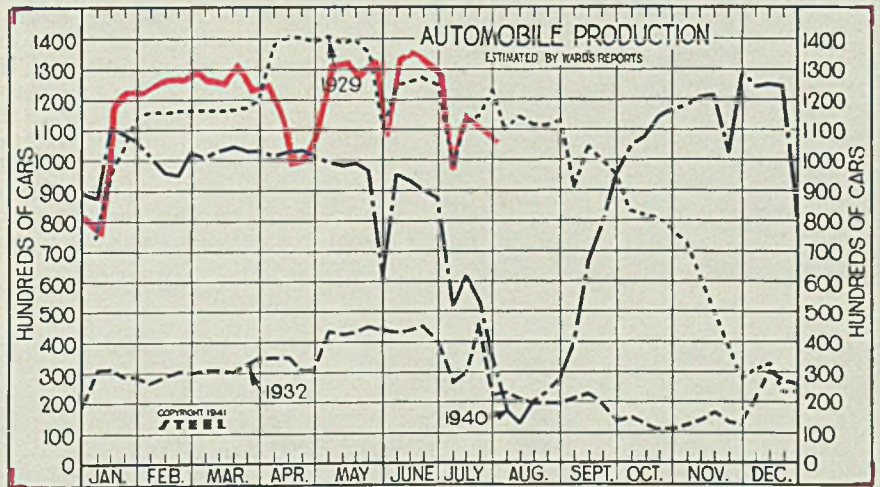
(1000 Cars)

Week ended	1941	1940	1939	1938
July 26	897	708	660	589
July 19	899	730	656	581
July 12	876	740	674	602
July 5	740	636	559	501
June 28	909	752	666	589
June 21	886	728	643	559
June 14	863	712	638	556
June 7	853	703	635	554
May 31	802	639	568	503
May 24	886	687	628	562
May 17	864	679	616	546
May 10	837	681	555	542
May 3	794	666	573	536
April 26	722	645	586	543
April 19	698	628	559	524
April 12	680	619	548	538
April 5	682	603	535	322

Auto Production

(1000 Units)

Week ended	1941	1940	1939	1938
July 26	105.6	34.8	40.6	30.4
July 19	109.9	53.0	47.4	32.1
July 12	114.3	65.2	61.6	42.0
July 5	96.5	52.0	42.8	25.4
June 28	127.9	87.6	70.7	40.9
June 21	133.6	90.1	81.1	40.9
June 14	134.7	93.6	78.3	41.8
June 7	133.6	95.6	65.3	40.2
May 31	106.4	61.3	32.4	27.0
May 24	133.6	96.8	67.7	45.1
May 17	127.3	99.0	80.1	46.8
May 10	132.6	98.5	72.4	47.4
May 3	130.6	99.3	71.4	53.4
April 26	108.2	101.4	86.6	50.8
April 19	99.9	103.7	90.3	60.6
April 12	99.3	101.9	88.1	62.0
April 5	116.3	101.7	87.0	61.0



Electric Power Output

(Million KWH)

Week ended	1941	1940	1939	1938
July 26	3,184	2,761	2,427	2,160
July 19	3,163	2,681	2,295	2,085
July 12	3,141	2,652	2,403	2,154
July 5	2,870	2,425	2,145	1,937
June 28	3,121	2,660	2,396	2,074
June 21	3,056	2,654	2,362	2,082
June 14	3,057	2,665	2,341	2,051
June 7	3,042	2,599	2,329	2,057
May 31	2,924	2,478	2,186	1,937
May 24	3,012	2,589	2,278	2,031
May 17	2,983	2,550	2,235	2,024
May 10	2,975	2,516	2,239	2,019
May 3	2,915	2,504	2,225	1,992

†New series: Includes additional governmental and power generation not previously reported.

INTERPROCESS CLEANING

for increased production
and better quality

■ A RELATIVELY new development in metal-working shops is in the use of cleaning equipment to clean the work between machines or between processes. Thus such parts as gears, fed directly into a cleaner from one machine tool are cleaned and delivered automatically to the next machine, ready for further processing. The advantages are that subsequent operations are greatly facilitated by the clean work, feeding the machines can be done more efficiently and often the machines can be run at a higher speed, directly increasing the output.

For example, Western Electric Co., Chicago, in making screws found that the chutes and automatic feeds to the slotters and threaders could be prevented from gumming up and stopping the screws feeding if the screws were properly cleaned between operations. Installation of inter-process cleaning machines here increased production 75 per cent by preventing the machines from running idle a large percentage of the time due to jammed feeds.

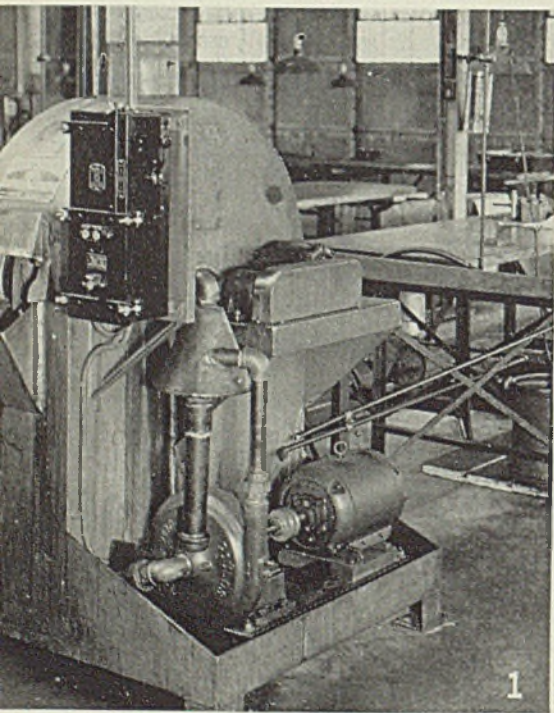


Fig. 1 shows a ferris-wheel type cleaning machine at Wagner Electric Corp., St. Louis, where a number of these machines clean hydraulic brake cylinders and parts between machining operations. The operator of one machine tool places the work in a carrier leading to the small ferris wheel in the machine. After being cleaned, the work is discharged onto the feeding table of the next succeeding machine tool. Machining of these brake cylinders is exceptionally precise work. It was found that cleaning between

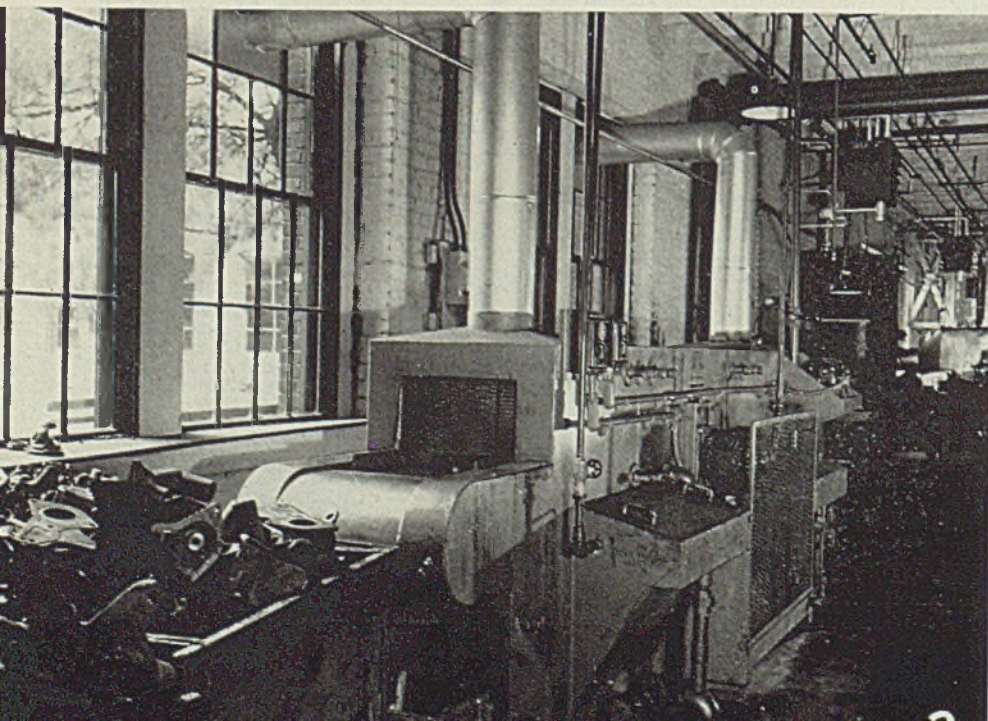
each two machining operations greatly improves the quality.

Fig. 2 shows a washing machine of the continuous conveyor type used by Warner Machine Products Inc., Muncie, Ind. According to A. L. Johnson, vice president and general manager, this unit cut their washing costs to one-third of the former figure and yet gives completely satisfactory results.

These examples illustrate a few of the applications in which inter-process cleaning already is being used to increase production, assure high quality and cut costs. Cleaning machines shown were made by N. Ransohoff Inc., Cincinnati.

Fig. 3 shows interprocess cleaning machine installed at Triplex Screw Co., Cleveland. Screws come to the machine in 800-pound lots from the threaders. A power loader lifts the whole batch at one time and the screws are fed uniformly into the machine through a vibrating feeding pan. The work is given a wash and rinse. After cleaning, the parts are put into one of a row of heat-treating furnaces shown alongside. In this application cleaning prevents oil from forming a carbon scale on the work and also prevents oil fumes from attacking the electric heating elements in the furnaces.

Fig. 4 illustrates a unique combination machine that has made possible an important increase in production at William D. Gibson Co.,



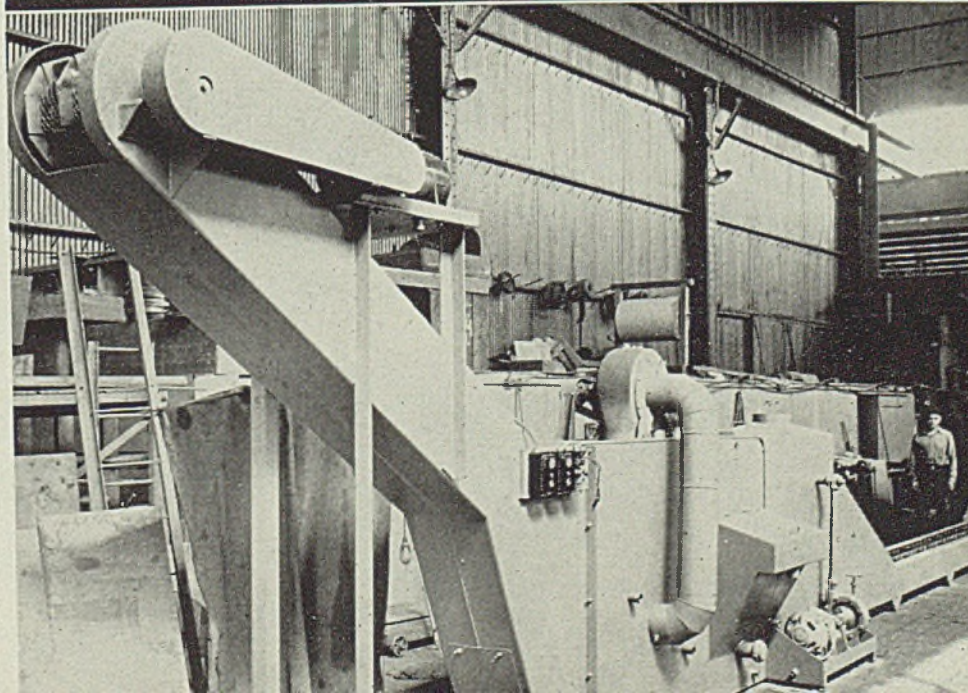
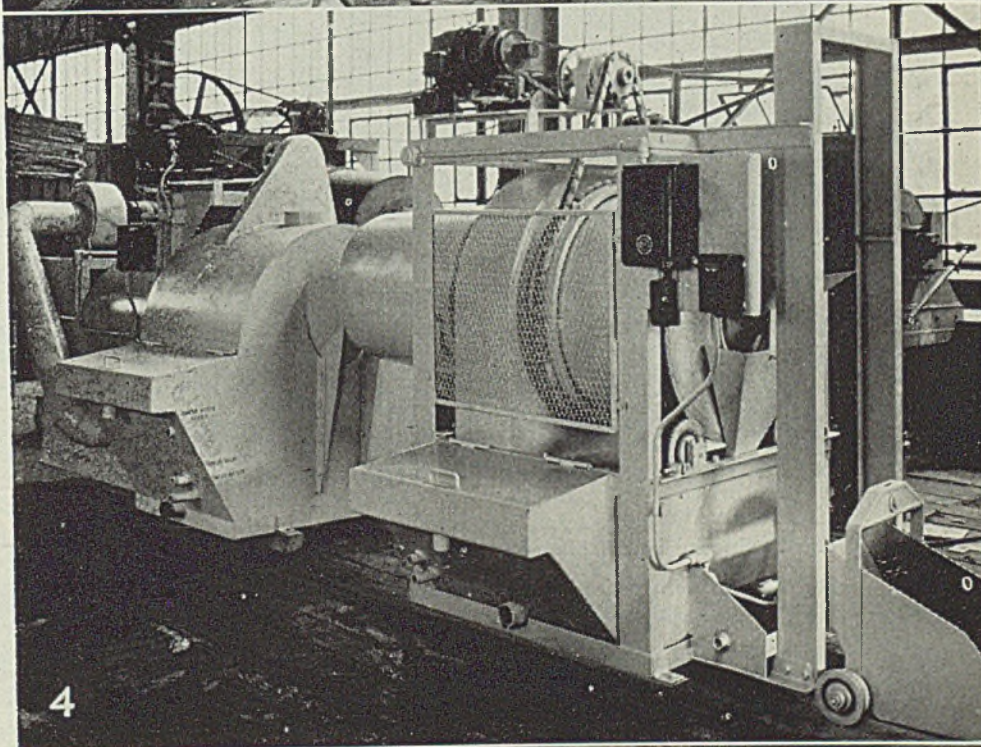
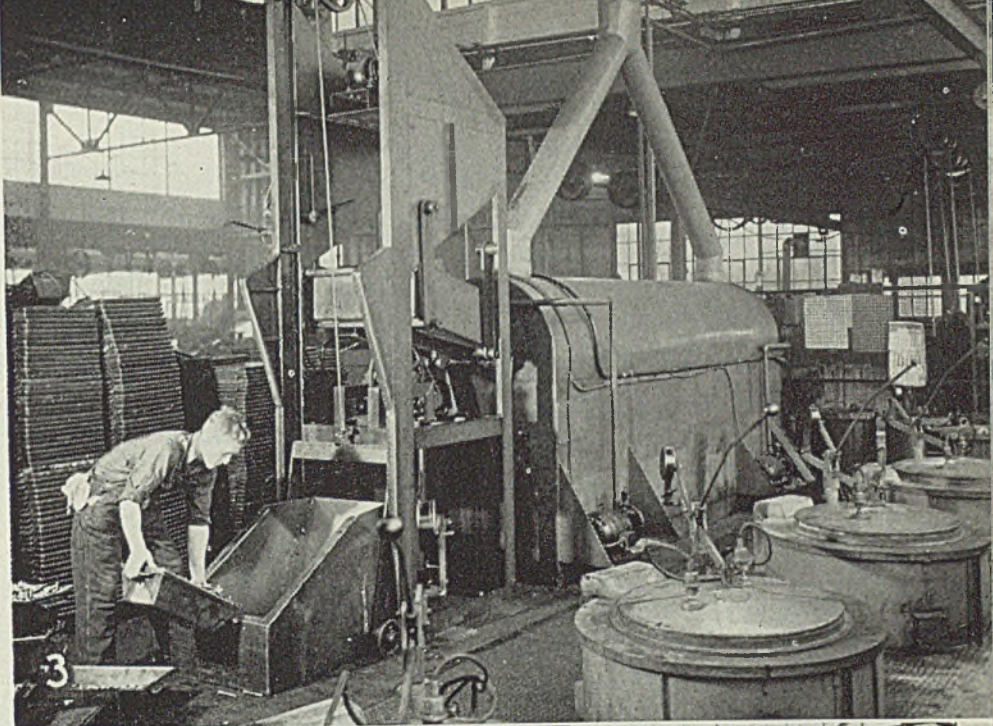
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Chicago. The work consists of flat truck springs which come to the machine with burrs and oil from punch presses. The next operation is waving in a coining press, an operation requiring the springs to be free from all burrs and dirt or oil. Before the installation of this machine, the work was tumbled in sawdust for 45 minutes to take off the burrs. Following this, the work had to be blown off to remove the fine sawdust.

The machine shown in Fig. 4 is a dual unit. In the first section the work is tumbled with hardened slugs in flowing hot cleaning compound. Reversing the direction of the drum discharges the work automatically and separates out the slugs. The slugs return automatically to the tumbling compartment with the next batch of work when the drum is again run in the tumbling direction. From the first section, the work is fed automatically and continuously into the rinse and drying section and comes out ready for the next press operation.

The entire cleaning operation now is done in 20 minutes as against 45 previously required, which does not take into account the time previously required for blowing off the sawdust—which means that the production through this operation has practically been tripled. Further, production on the coining presses has increased 8 per cent merely because the dies do not have to be cleaned as often as when the work was tumbled in sawdust.

Fig. 5 shows an excellent example of interprocess cleaning. Here a conveyor runs along at low level, just a foot above the floor. Parts are fed from a number of drilling machines onto this conveyor through chutes. Work is carried through a washing and drying sequence and elevated to fall into the feeding hoppers of the next succeeding machining operation—all continuously and automatically. Cleaning and drying the work between these operations makes it easier for the operator of the succeeding machines to handle the work and consequently increase production. Note that the conveyor is divided into two lanes so two different kinds of work can be run through the cleaning equipment at the same time. This unit is installed at Delco-Remy, Anderson, Ind.



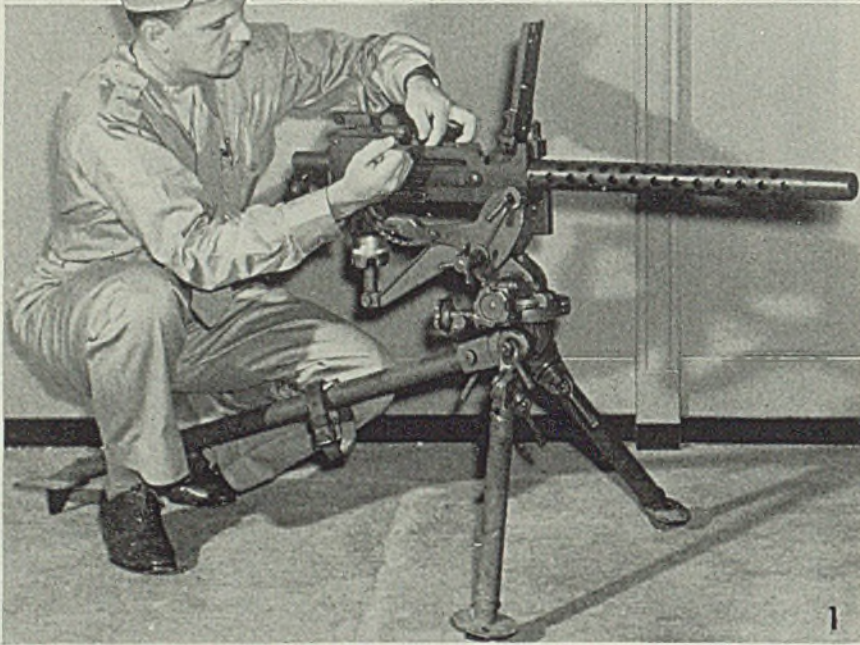
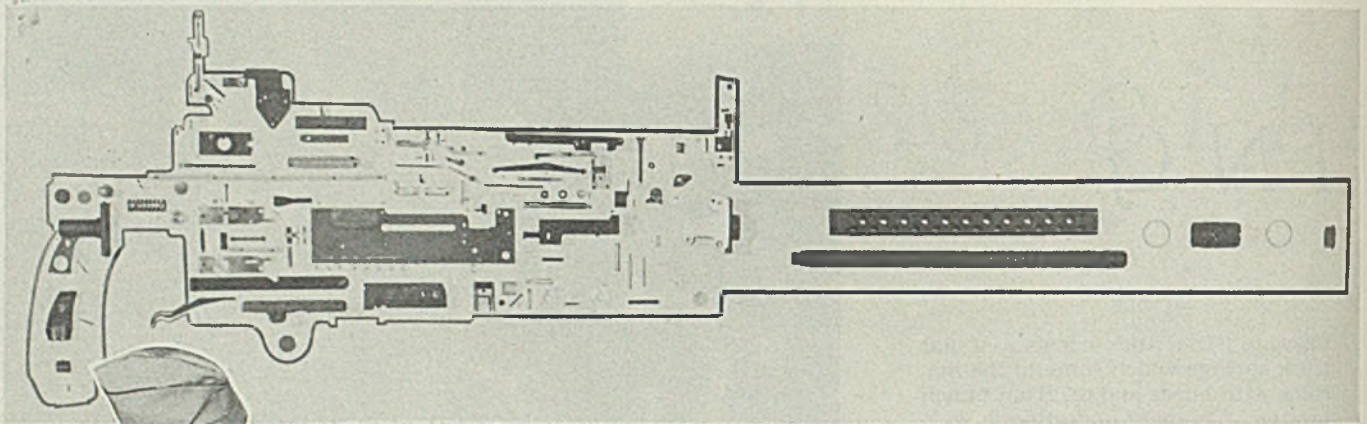
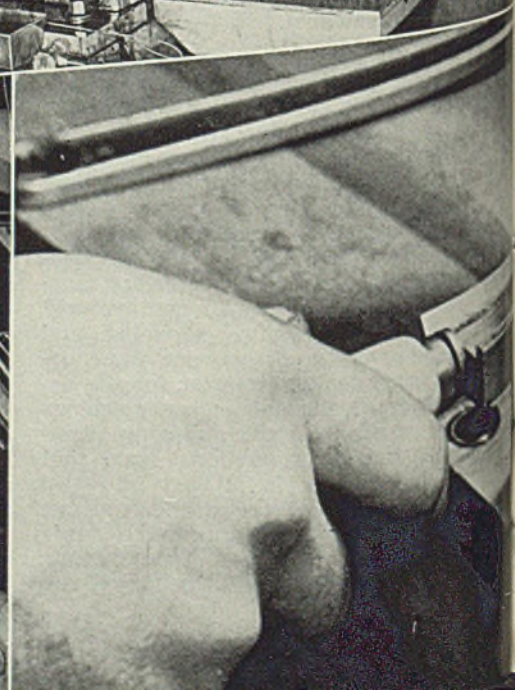
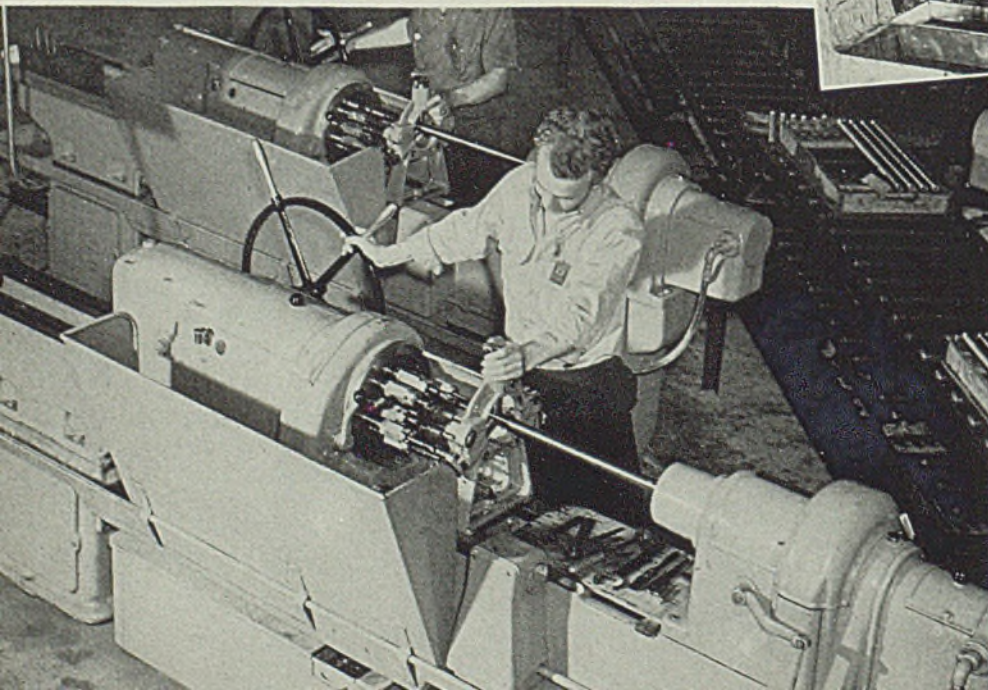
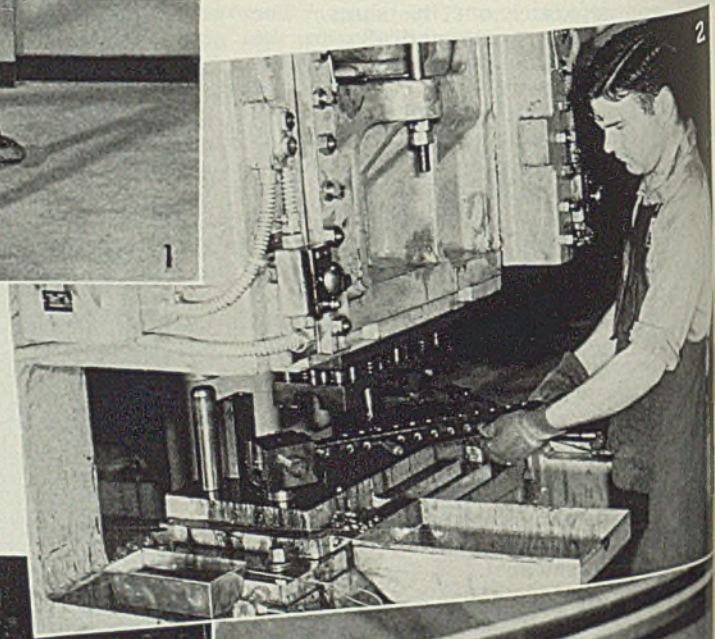


Fig. 1—Disassembled view of the 189 parts of the Browning .30-caliber machine gun, each in its approximate position with relation to the enlarged outline of the gun. Operator below has raised top plate preparatory to feeding in a belt of cartridges

Fig. 2—Special bench filing fixture

Fig. 3—Chamfering end of barrel bore. Each gun is supplied with six spare barrels

Fig. 4—Some of 84 profile milling machines used in forming many gun parts



Production of

.30-Caliber Browning Air-Cooled

Machine Guns

By A. H. ALLEN
Detroit Editor

■ FOUR plants of General Motors Corp. are engaged in manufacture of .30 and .50-caliber air-cooled Browning machine guns, collaborating on an order involving \$61,399,171 for guns and \$26,583,306 for facilities. Additional gun contracts totaling \$27,823,000 have just recently been awarded. The plants are the AC Spark Plug Division at Flint, Mich.; Frigidaire Division at Dayton, O.; Guide Lamp Division's Brown-Lipe-Chapin plant at Syracuse, N. Y., and the No. 2 plant of Saginaw Steering Gear Division at Saginaw, Mich.

Because it is new from the ground up, was built in record time and has been designed for manufacture of machine guns exclusively, the Saginaw plant is particularly noteworthy. But how did GM become active in machine gun production and how did it receive the first order for machine guns ever placed outside the small arms industries in New

York and New England?

Engineering studies on the manufacture of machine guns were begun at the Saginaw Steering Gear Division in April, 1938, following a request from the War Department to explore production possibilities. Two years later an educational order for 500 tons was placed with the division which promptly sent engineers to eastern plants to dig into production operations there. Within four months the 88-million dollar assignment was given to GM, and at that time C. E. Wilson, then acting president of the corporation, said:

"I feel that we were selected for this important undertaking because our manufacture of precision automobile parts on a large scale has developed engineering and technical talent that can readily and efficiently be turned to producing such equipment."

On Oct. 15, 1940, ground was broken at the No. 2 plant of the

steering gear company for a 360 x 660-foot single-story manufacturing plant with better than 5 acres of floor space immediately adjacent to the Saginaw Malleable Iron Division of the corporation.

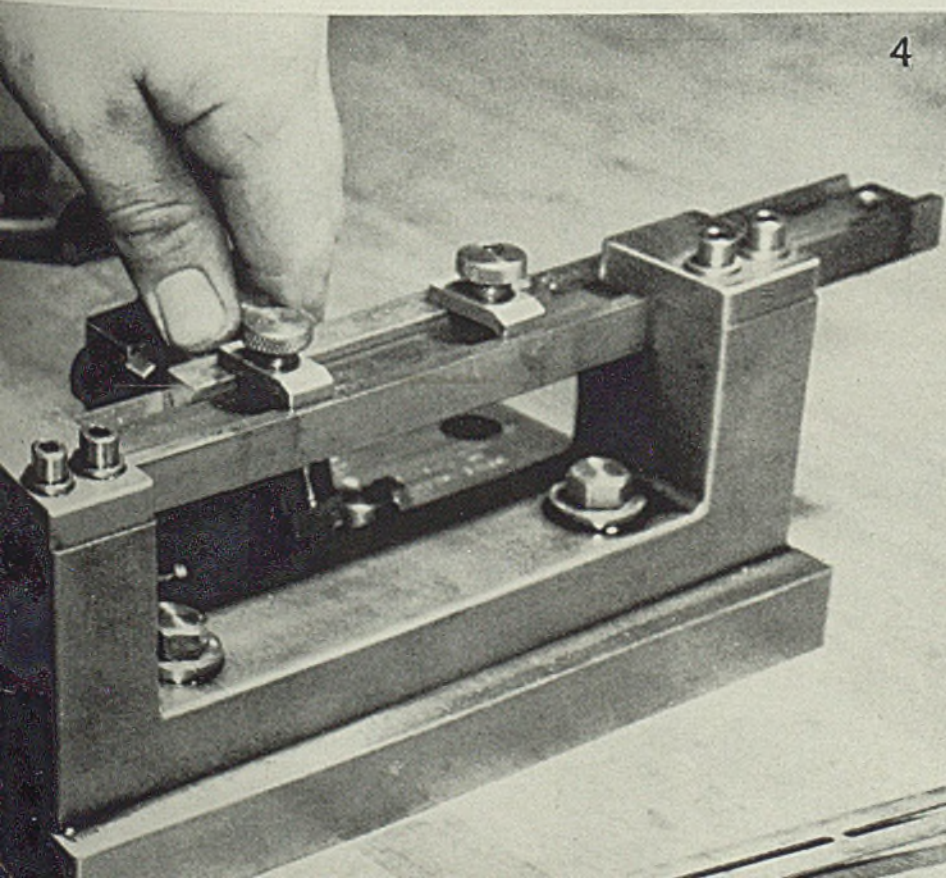
Six months and eight days after ground was broken, the plant was opened officially and now is approaching full production. While construction of the new building was under way, an old building alongside it was used to train a supervisory staff and nucleus of machine operators to build up a bank of various gun parts and to smooth out production kinks.

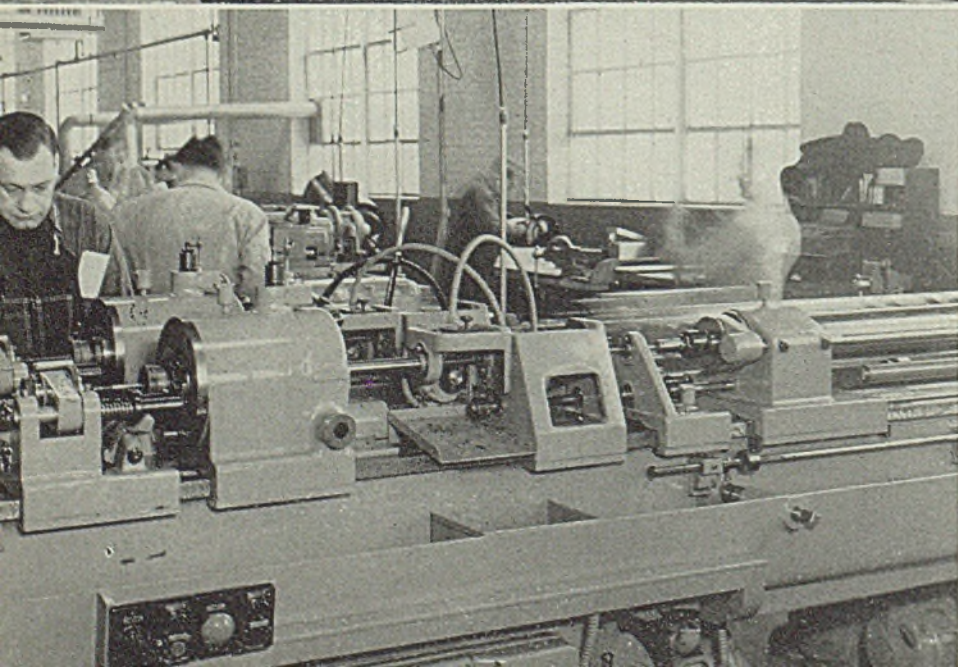
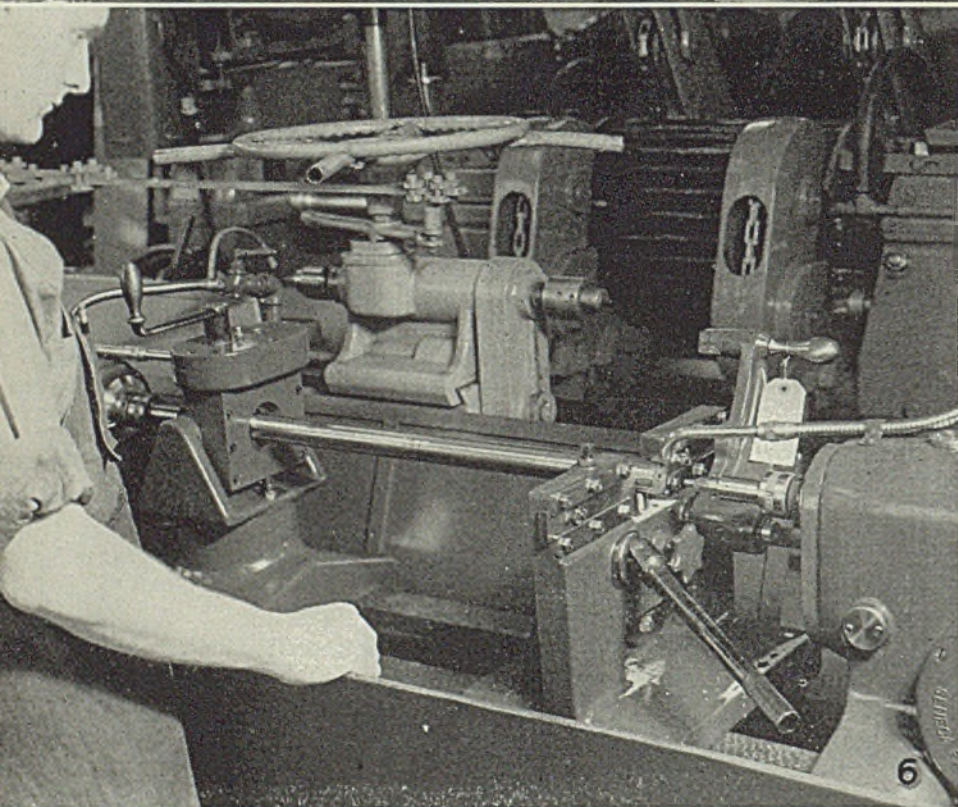
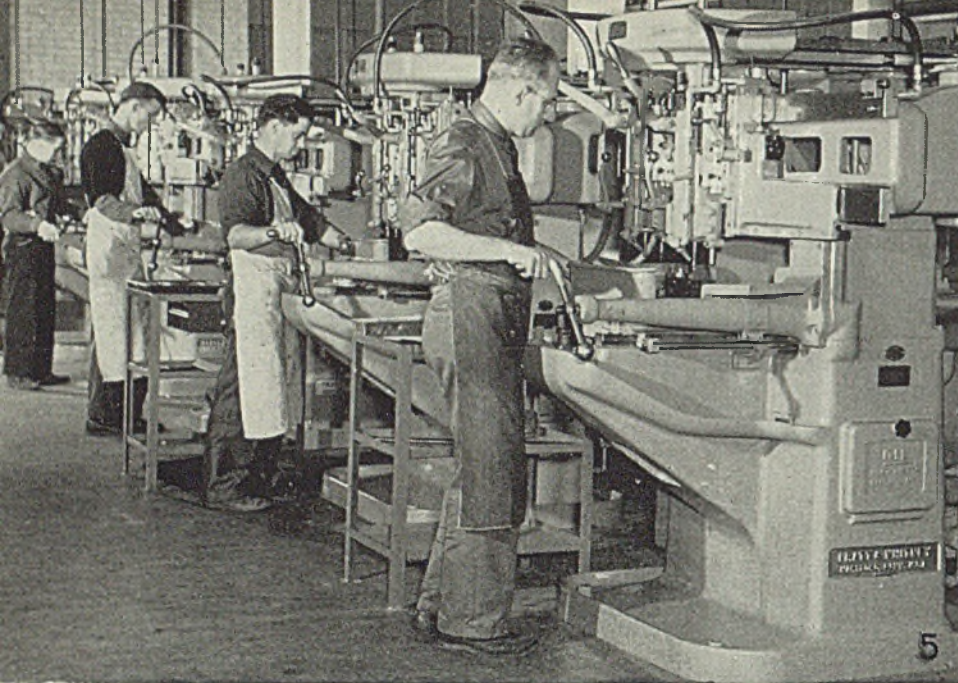
Prior to this spring, the .30-caliber Browning had existed only in blueprints and in a few hand-made models at Rock Island Arsenal. Known as model 1919A4, the gun was redesigned in 1919 from the water-cooled model used in 1914-18 but was never placed in production. It weighs 30 pounds, fires up to 550 rounds a minute, minimum specifications calling for 480 rounds, and has a range of 3½ miles.

Tool Engineers Take Over

So the tool engineers, the tool designers and the layout men descended onto the job while the plant was going up and literally took the project to pieces. Hundreds of 20-year old tools from the shelves of Rock Island Arsenal were brought to Saginaw and tool experts were consulted to determine their utility in the light of 1941 methods of manufacture.

A few figures indicate the enormity of the task: A .30-caliber gun of this type contains 189 separate parts, all steel except two. Machining these parts from rough forgings, bar stock, tubing and flat material involves a total of 1800 separate operations—304 in the case of the 18 parts going into the bolt alone, and an average of nearly 10 each for all other parts. Each machine operation requires its own separate tools, jigs, fixtures and gages. In some cases, one machine is used exclusively for one operation; in others the same machine can be fitted with several tools to perform several opera-





tions. At full production the plant will have 1300 tools in all.

Machinery requirements bulk to about 800, breaking down approximately as follows: 422 milling machines, 118 drill presses, 84 profilers, 49 grinders, 36 lathes, 14 automatic screw machines, 12 hand screw machines, 10 shaving machines, 9 punch presses, 7 marking machines, 6 honing machines, 3 broaches, 3 power saws, 27 miscellaneous.

Before production tools could be made, more than 8000 drawings were completed, most of them in the company's own design department. Draftsmen and tool engineers put in 62,000 man-hours of work on this job alone. Making the tools, a task that was performed in the division's toolroom and in some two dozen other shops, consumed another 231,000 man-hours of work. Thus before a single chip curled off a lathe or a profiler, 100 men had to work 13 weeks over drawing boards and 400 machinists had to labor 14 weeks in toolrooms.

Barrel Line Off to Quick Start

Without delay, orders were dispatched to machine tool builders throughout the country. Meanwhile the War Department turned over 132 machines stored at the arsenal since 1919, many of them old and grease-encrusted but still capable of being put to use. Saginaw engineers had them rebuilt, changed from belt to motor drive, completely retooled and tuned up to modern machine shop tempo.

As fast as machine tools were received at Saginaw, they were set up in the temporary building and placed in operation, weeks before the present building was ready. One of the first departments to get under way was the barrel line. Because the machine gun barrel tends to overheat and wear out with heavy-duty service, resulting in improper firing, barrels have to be discarded after a certain number of rounds. So each completed gun must be accompanied by several spare barrels as well as spare bolts, the latter being that part of the gun through which the cartridges move and in which the firing pin and other mechanism are centered.

Thus it was held advisable to build up a backlog of finished barrels, and at the present time some 5000 spare

Fig. 5—Eight rows of holes are punched in the steel jacket which supports the barrel. Note special die fixture, checking gage and hopper for scrap slugs
Fig. 6—Chambering gun barrels on horizontal hand-indexed machines with 10 reaming tools on the cutting head. This operation enlarges rear end of bore to fit cartridge case
Fig. 7—Dual spindle rifling machines cut rifling grooves in barrels



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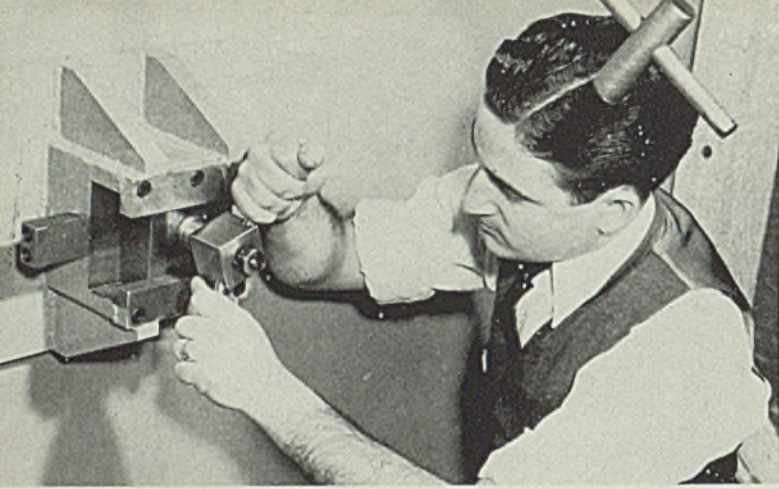


Fig. 8 — Setting up finished barrel for proof firing to determine quality of machine work before installation in gun. Note firing hammer suspended in front of operator's head

ment. Other 33 parts of the gun are subcontracted to ten outside suppliers.

Fifteen springs are used in the gun assembly, most of them SAE 1085, special, with a few SAE 6150. Two are flat, the rest coil type. Eight are made in the plant, the rest bought.

Only nonferrous part in the gun is a diecast aluminum protecting handle over the forged steel grip. This casting is given a black nickel plate to match the color of the rest of the gun.

All outer parts of the gun are given a chemical treatment by dipping to produce a dark, dull finish which will not reflect light. This treatment, while producing some corrosion resistance, is designed principally to reduce reflectivity, since the guns are kept oiled in service and hence are not subject to excessive corrosion.

Trainees To Specialize

The plant currently is on a limited production basis, although it is operating three shifts a day, six days a week and guns are being assembled and tested. It is estimated that about 70 per cent of production material and machinery, together with around 80 per cent of tools, gages and fixtures on order have been delivered. Machine guns being well up the list on priorities for equipment, the balance of the machinery should be on hand by mid-summer, and production will reach its peak by fall.

As of July 1 about 900 men were on the payroll which may be expanded to as many as 4300 when production hits its stride. Of this number, two-thirds will be skilled workmen, a few drawn from the No. 1 Saginaw plant, others from the local labor market. The balance of this skilled force will be made up of trainees, young men from 18 to 24 with no previous experience.

The company works closely with General Motors Institute at Flint, Mich., and had two men there to take a 2-week's course in training as job analysts and in the administration of training programs. Six other key men were sent to the small arms plants in Springfield, Mass., and Hartford, Conn., to study methods there, and 120 foremen and assistant foremen have completed foremen training courses at the GM Institute.

The training program will concentrate on equipping men to do a specific job rather than turning out all-round machinists or operators. Under the plan, the trainees are organized into groups—milling machine operators in one group, drill press operators in another, profilers in a third. Classes are

(Please turn to Page 87)

barrels are completed. Machining and finishing these barrels provides a good indication of a fairly complicated machine gun production line. Thirty-eight operations are involved after receipt of the solid, heat treated SAE 4150 electric-furnace steel rounds. First step is a hardness test to insure that the steel is within the limits of 277 to 321 brinell. One per cent of all bars is given physical tests, army specifications calling for the following minimums: Tensile strength 130,000 pounds per square inch; yield strength, 110,000 pounds per square inch; reduction of area, 50 per cent; elongation, 18 per cent. The finished barrel is 1 $\frac{3}{4}$ inches in diameter, weighs about 10 pounds.

After hardness testing, the bars are cut to length on saws, centered, straightened and spot ground. One-half the length is rough turned and chamfered, then the other half goes through the same operations—this to prevent undue warping or twisting during these steps. The barrel then is straightened, drilled to within 0.010-inch of its finished diameter and straightened again. Three separate reaming operations now bring it to exact caliber, after which it is recentered, spot ground again, finish turned, one half at a time, and restraightened.

This last straightening only brings the job up to operation No. 16, with the two most important operations, rifling and chambering, yet to be done. Chambering is done on a multiple-head machine especially designed for the work, with 10 cutting tools, reamers, and the like. Sixteen separate gages must be applied to check correct taper of the chamber. Rifling machines also are specially designed equipment, the cutting head having a single-point tool which is pulled slowly through the barrel, turning axially as it moves.

After the barrel is completed, it is proof fired and the empty cartridge case, shell and barrel all are examined for markings which may be possible fore-runners of jamming in service. Rifling is inspected by trained operators who peer through the barrel against a strong light. Their trained eyes can quickly spot any irregularities in the inner surface.

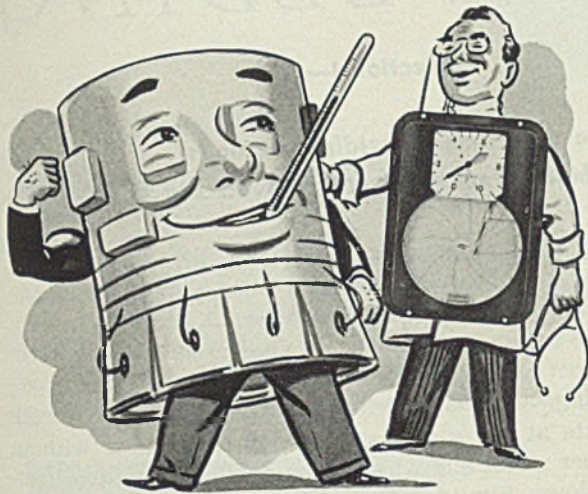
The gun barrel is mounted so it actually floats in a perforated outer steel jacket, with bearings front and rear, the jacket being of SAE 1020 seamless steel tubing with eight rows of 1-inch punched holes. Breech end of the barrel fits into what is called a barrel extension, of SAE 1050 steel, modified with additions of nickel and chromium. This part is bought in the form of a forging and is milled carefully to final shape, 57 operations being required in all. Heat treatment brings finished pieces within a hardness of 57 to 58 rockwell C.

Bolt of the gun, machined from SAE 1050 modified bar stock, requires 66 operations in finishing. Sideplates are of SAE 4640 flat stock, purchased in thickness of 0.228 to 0.241-inch and are machined and ground to a final thickness of about 0.1-inch. Grinding is done on surface grinders with magnetic chucks mounting eight pieces at a time. Other small flat parts and blocks are ground on similar machines, some of which accommodate as many as 216 pieces for a single grinding.

Trunnion block, main support for the barrel and bolt assembly, is SAE 1050 steel forging. Movable plate on top of the bolt is SAE 4615. Grip forging for the back plate is SAE 1020. Rear sight windage plunger is SAE 1035, heat treated. Trigger pin is SAE 1095, heat treated, as is the driving spring rod firing pin. Use of SAE 1095 for the pins is dictated by the ease of obtaining drill rod sizes for small pins, this analysis being drill rod steel. High-speed steel is used generally throughout the plant for various types of cutting tools.

Heat treatment is carried out in both cyanide furnaces and gas-fired toolroom hardening furnaces with atmosphere control. Hardening treatment involves heating to 1450 degrees Fahr., quenching in oil and tempering at 600 to 800 degrees. Carburizing is done in activated carburizing baths and by the pack method in 50-50 charcoal-bone mixtures. Light cases are applied, using comparatively low temperatures in the region of 1550 degrees Fahr. Of the 156 parts produced in the Saginaw plant, 60 require heat treat-

PYROMASTER HOLDS ANNEALING TEMPERATURE CONSTANT FOR HIGHER OUTPUT



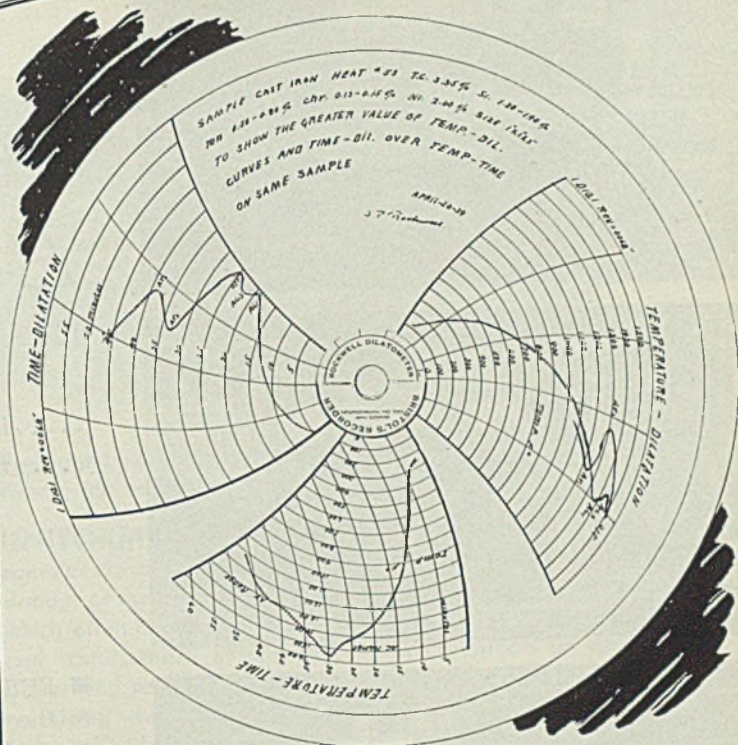
To maintain most efficient temperature for bright annealing stainless steel sheets, a large steel manufacturer in the Pittsburgh area uses Bristol Pyromasters and Wide-Strip Recorder Controllers.

On two electric bell-type furnaces, separate Pyromasters control temperatures as desired at different points in the furnaces. Two gas-fired furnaces of the same type and two rectangular type employ Wide-Strip Recorder Controllers which operate from the heating tubes until desired temperature is reached, then switch over to Pyromasters which control from Thermocouples in the work.

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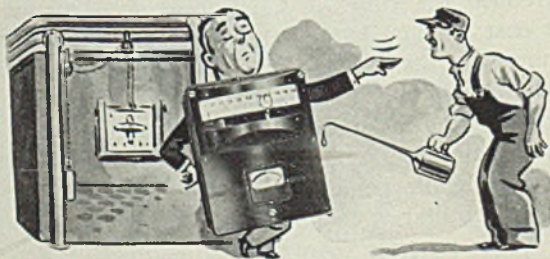
The ROCKWELL-BRISTOL DILATOMETER — for steel and other materials plots dilatation against both time and temperature on *one* conventional chart, (without photographing) — rather than the usual time-temperature method of depicting transformations or criticals — the point where under intense heat they contract for a while after first expanding.

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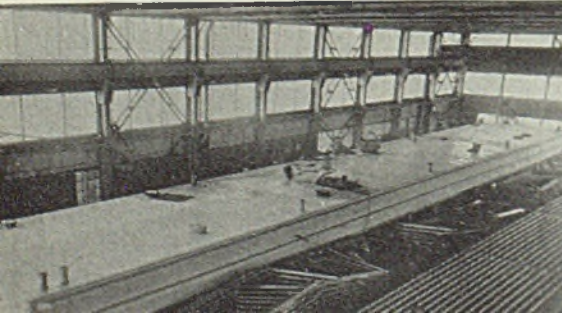
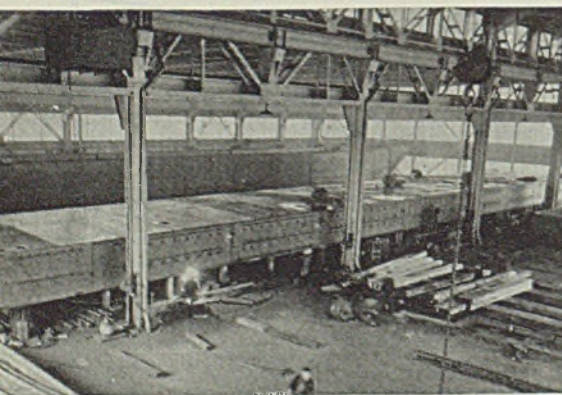
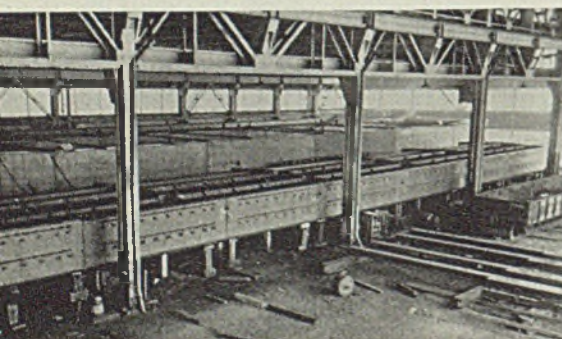
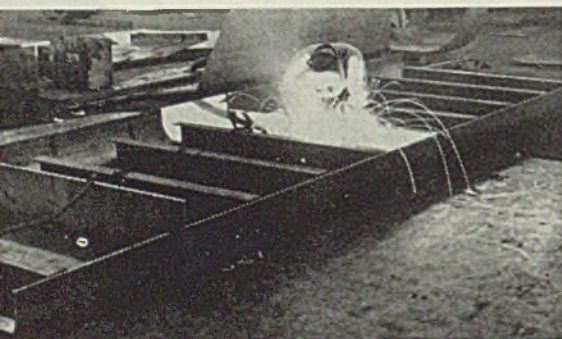
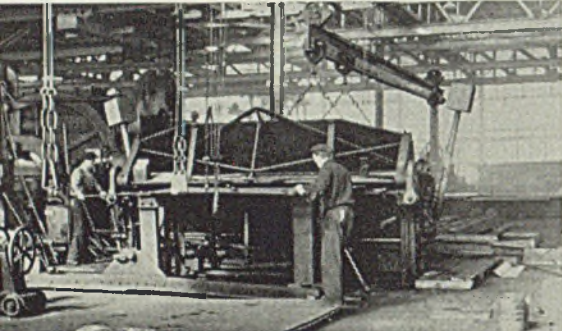
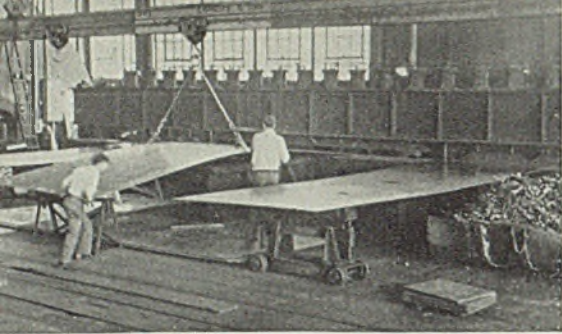
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AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS



How To Get the Most from ARC WELDING

—Section I—

-importance of efficient welding methods
-factors which affect production speed and cost

By E. W. P. SMITH
Consulting Engineer
The Lincoln Electric Co.
Cleveland

■ FUSION welding, as usually defined, is the bringing of metals to the molten state at the surfaces to be joined, with or without the addition of filler metal and without the application of mechanical pressure or blows. Similarly, a weld is defined as a localized consolidation of metals by a welding process, and a welded joint is a localized union of two or more parts by welding.

A weldment is an assembly whose component parts are joined by welding. It is the weldment that performs or does a service, that carries the load and it is this completed whole that is the object of our final attention. Necessarily the component parts, elements or constituents must be considered not only as single items but *also in their relation to each other in the completed whole*. This idea must be kept in mind at all times and definitely applied if maximum economic results are to be obtained from the welding processes.

Costs are and must be taken to mean costs of all items entering into the construction of the completed assembly and the performance. Costs also must take into account the service or performance to be had from the weldment as the time to fabricate or make the part and the resultant performance should all be measured in relation to each other. Too much emphasis cannot be placed on that last phrase—"All measured in relation to each other".

For example, as in the present national emergency, time may be of such great importance that all other factors are manipulated so as to reduce the time of fabrication even though the dollars-and-cents cost may be higher than usually would be warranted. When, however, the time of fabrication may be reduced and the dollars-and-cents cost too, then the details that make this possible are worthy of the most serious and complete study.

The ease, accuracy, simplicity and effectiveness with which costs may be reduced while performance is bettered often is astounding to one not familiar with the process. Thus in this series of discussions it is the purpose to present to those who are now users of welding and to those who should properly consider welding as a method of fabrication, information, data, methods and suggestions which will enable them to use welding more efficiently to increase production, reduce time of fabrication and lower costs.

(Please turn to Page 88)

This series of six illustrations shows various steps in making all-welded steel barges at Dravo Corp., Pittsburgh. Top, plate is being sheared; next it is bent in a heavy brake. Then welding of subassemblies and final assemblies proceeds at a fast pace to complete the barge in only 14 days —an example of efficient high-speed fabrication by welding

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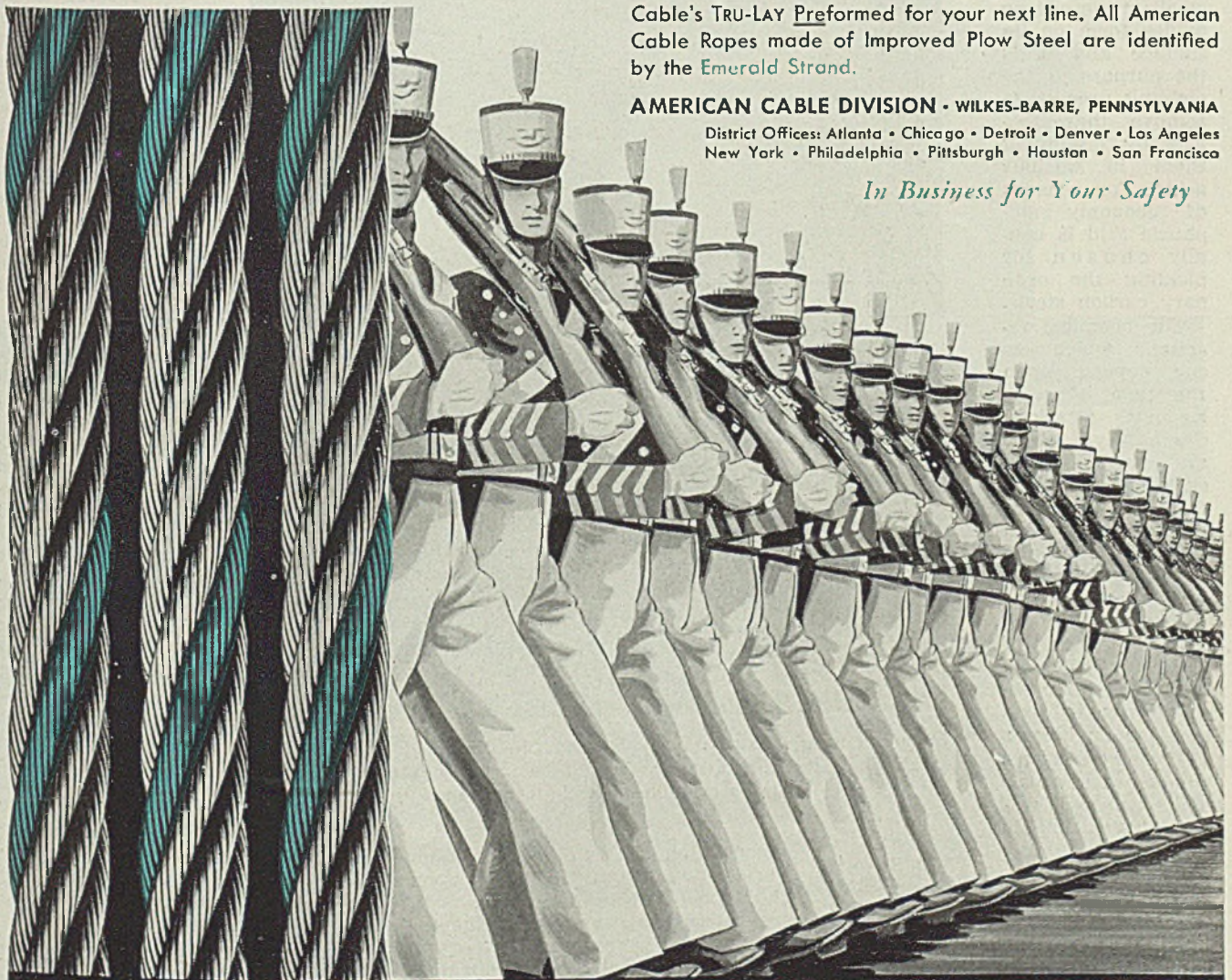
Preformed Rope does a job unusually well, the second or twenty-second TRU-LAY Rope will do equally well.

UNIFORM IN SAFETY TRU-LAY Preformed is a safer rope. Its crown wires lie flat and in place so that there is less danger of their wickering out and jabbing workmen's hands, which often causes blood-poisoning. TRU-LAY handles easier and faster, resists kinking and whipping, spools on drums better and rotates less in sheave grooves. TRU-LAY requires no seizing when cut and will not fly apart. Specify American Cable's TRU-LAY Preformed for your next line. All American Cable Ropes made of Improved Plow Steel are identified by the Emerald Strand.

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Treatment of SPENT PICKLE LIQUOR

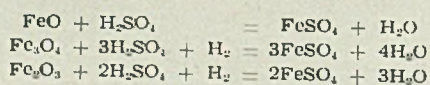
By J. H. G. WILLAN

Disposal of used acid from pickling tanks always has been a problem to steel producers. Discharging the liquor into rivers and streams is forbidden in many states. In the accompanying article the author discusses three base methods of reclaiming the discarded liquor

■ WASTE ACID from the pickling process of the iron and steel industry is composed of sulphuric acid and ferrous sulphate. During the manufacture of iron and steel unwanted iron oxides form on its surface and it is the purpose of the pickling process to remove these oxides by dissolving them in various acids. For reasons of economy sulphuric acid is usually chosen for pickling the ordinary carbon steels.

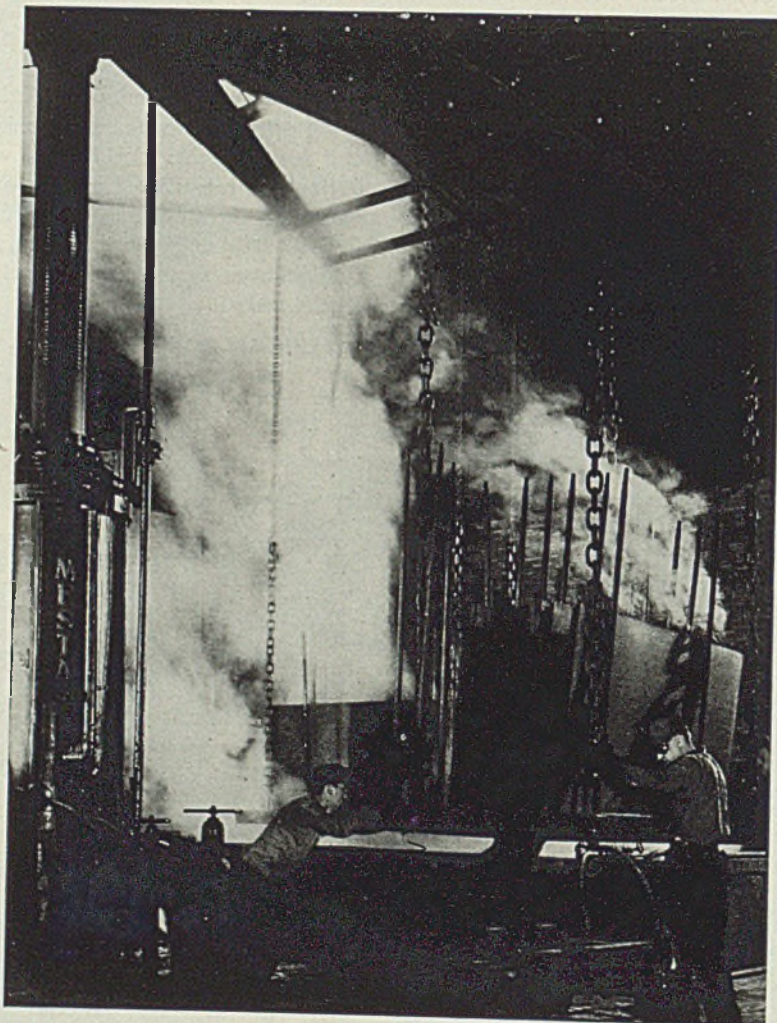
The chemical reactions which occur depend upon the type of scale being attacked. Chemically, there are only three scales: Fe_2O_3 , which composes the outer layer; Fe_3O_4 , which composes the middle layer; FeO which is attached to the base metal. The reactions of the three scales in their successive enrichments in oxygen are as below:

The reactions produce ferrous sulphate and water. This salt builds



up in the pickling bath and, to counteract the retarding effect and also the fall in acidity, fresh acid is added. Eventually a point is reached where the remaining acid in the bath has lost its power to dissolve any more of the oxides.

The discharged solution contains a certain percentage of free acid and ferrous sulphate. The average



Many thousands of tons of spent acid are discarded annually from pickling tanks such as this in order that the surface of steel commodities may be conditioned for further processing

composition of this discarded liquor varies and is mainly dependent upon the type of pickling process.

An examination made of the liquor coming from several American mills showed that the concentration of free acid varied from 1 to 9 per cent sulphuric acid (H_2SO_4) and from 16 to 22 per cent ferrous sulphate ($FeSO_4$), the average being about 6 per cent sulphuric acid and 18 per cent ferrous sulphate. In con-

From a paper presented in the April issue of *Sheet Metal Industries*.

tinuous pickling the sulphuric acid is high and the ferrous sulphate low when the bath is dumped, whereas in batch pickling and wire pickling the reverse is the case. In England the average sulphuric acid concentration appears to be lower and the ferrous sulphate higher than that in the United States. Such conditions tend to slow down production, but this is partly balanced by reduced acid consumption.

In most countries laws have been enacted which control the disposal of waste acid. Almost daily these laws are redrafted and the manufacturer is confronted with a long list of prohibitions, but seldom is assistance given. Those responsible are therefore left with the problem of treating their waste in such a way that it is rendered inactive. Economic considerations dictate the adoption of a process in which a return may be expected on the capital outlay. The greater this return the more attractive is the proposition.

Three base methods are available. Each may be divided into two or more processes, but not all can be operated commercially.

No. 1 METHOD.—All of the discarded liquor which includes the free acid and the sulphate, is converted into sulphur dioxide gas and then by suitable treatment into sulphuric acid. There are two meth-



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ods for achieving this reclamation.

(a) The free acid may be neutralized and the resulting liquor is then evaporated in a dehydrator to a point where it can be introduced with pyrites into a kiln where it is roasted. For reasons of fuel economy and for the production of a gas high in sulphur dioxide content but comparatively free from SO_2 , the sulphates and sulphides are roasted under reducing conditions at relatively low temperature. Such a process greatly simplifies the subsequent conversion of the gas into sulphuric acid which takes place in a contact plant. The iron oxide formed may be used for neutralizing the free acid in the initial part of the process.

(b) A French concern proposed neutralizing all the free acid with steel scrap and then concentrating

the resulting neutral liquor by heat. Eventually all the iron sulphates crystallize out in the form of copperas ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$). This is recovered from the mother liquor in centrifuges and the mother liquor is then returned to the evaporators. Calcining follows, resulting in the breaking down of the iron sulphate radical into iron oxide and SO_2 . This gas, by combining with water, is converted into sulphuric acid. The iron oxides are slightly contaminated with sulphur, but this is of little consequence since it is a loose compound and may easily be removed by sintering, after which the oxides may be charged into blast furnaces.

It will be noted that in the foregoing treatments of waste liquor all the free acid is destroyed and is eventually converted into new

acid. The cycle is complete—sulphuric acid to sulphuric acid. Impurities, such as inhibitors, which have accumulated in the bath, are discarded with the iron oxides.

No. 2 METHOD.—This method consists of separating the ferrous sulphate from the mother liquor and by suitable treatment converting it into sulphuric acid. The mother liquor, after enrichment with fresh acid, is returned to the pickling tanks.

(a) The Mantius process of the National Lead Corp., New York, which reclaims the free acid and returns it enriched with fresh acid for re-using. The ferrous sulphate is separated out into monohydrates and sulphates with four molecules of water or seven molecules of water of crystallization. This product is suitable for the manufacture of new acid.

The spent liquor is first allowed to settle and is then concentrated in two stages.

In the first step the waste acid, to which has been added the monohydrates coming from the second stage, is evaporated in double effect evaporators under vacuum to about 28 per cent sulphuric acid. About 80 per cent of the ferrous sulphate crystallizes out in the form of copperas and is separated from the mother liquor in centrifuges.

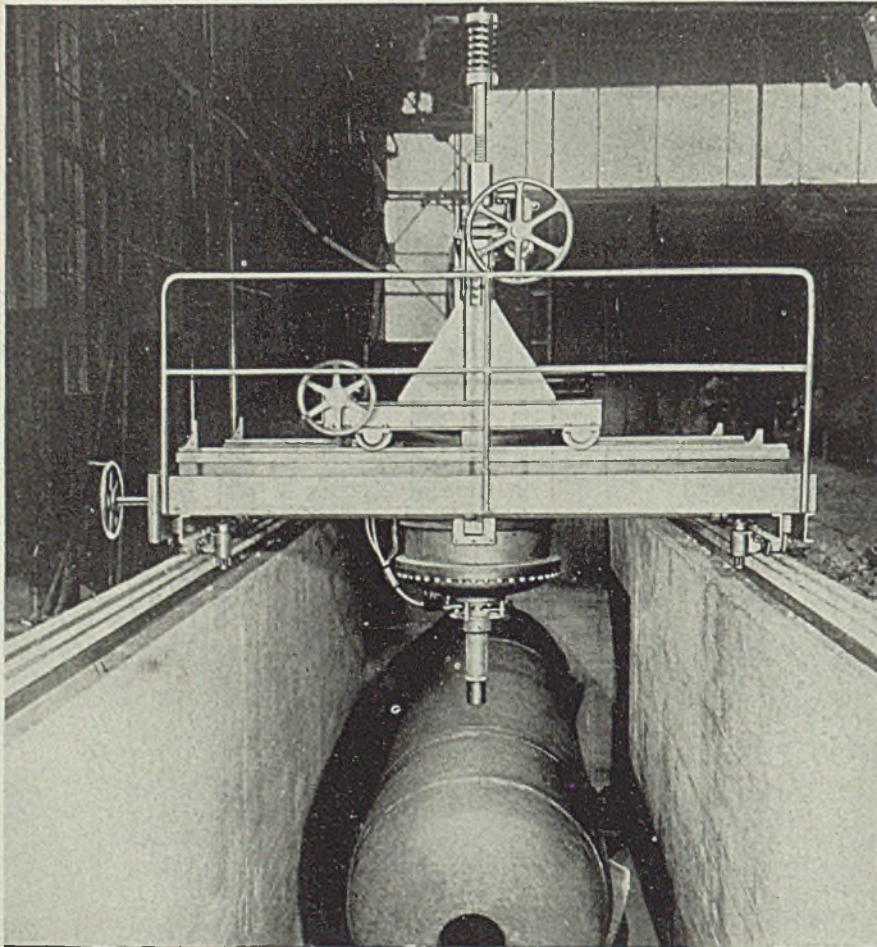
This treatment is followed by further concentration resulting in a 54° Baume (68 per cent acidity) liquor. The ferrous sulphate contained in the liquor is then separated out in centrifuges together with any impurities which, at this concentration, are almost insoluble in the acid. The remaining liquor is returned to the pickling tanks.

Any further disposal of the separated ferrous sulphate is not part of the Mantius process.

The elimination of the second stage of the foregoing process is a modification which can be adopted. It is cheaper but not as efficient. Its main drawback is that impurities accumulate in the liquor until a point is reached where they become detrimental to pickling and the mother liquor can no longer be used and must be discarded. The normal practice is to neutralize with scrap. This latter process of neutralization is considerably cheaper than is usually the case since the volume of liquor has been considerably reduced by evaporation. The neutralized solution is then evaporated and the ferrous sulphate and impurities separated out; any remaining liquor is returned to the neutralizing vats.

(b) The Marsh Cochran process of the American Copperas Co. makes use of artificial refrigeration for cooling the waste liquor as it leaves the pickling tanks to a point where between 50 and 70 per cent

Million-Volt X-Ray Machine "in Action"

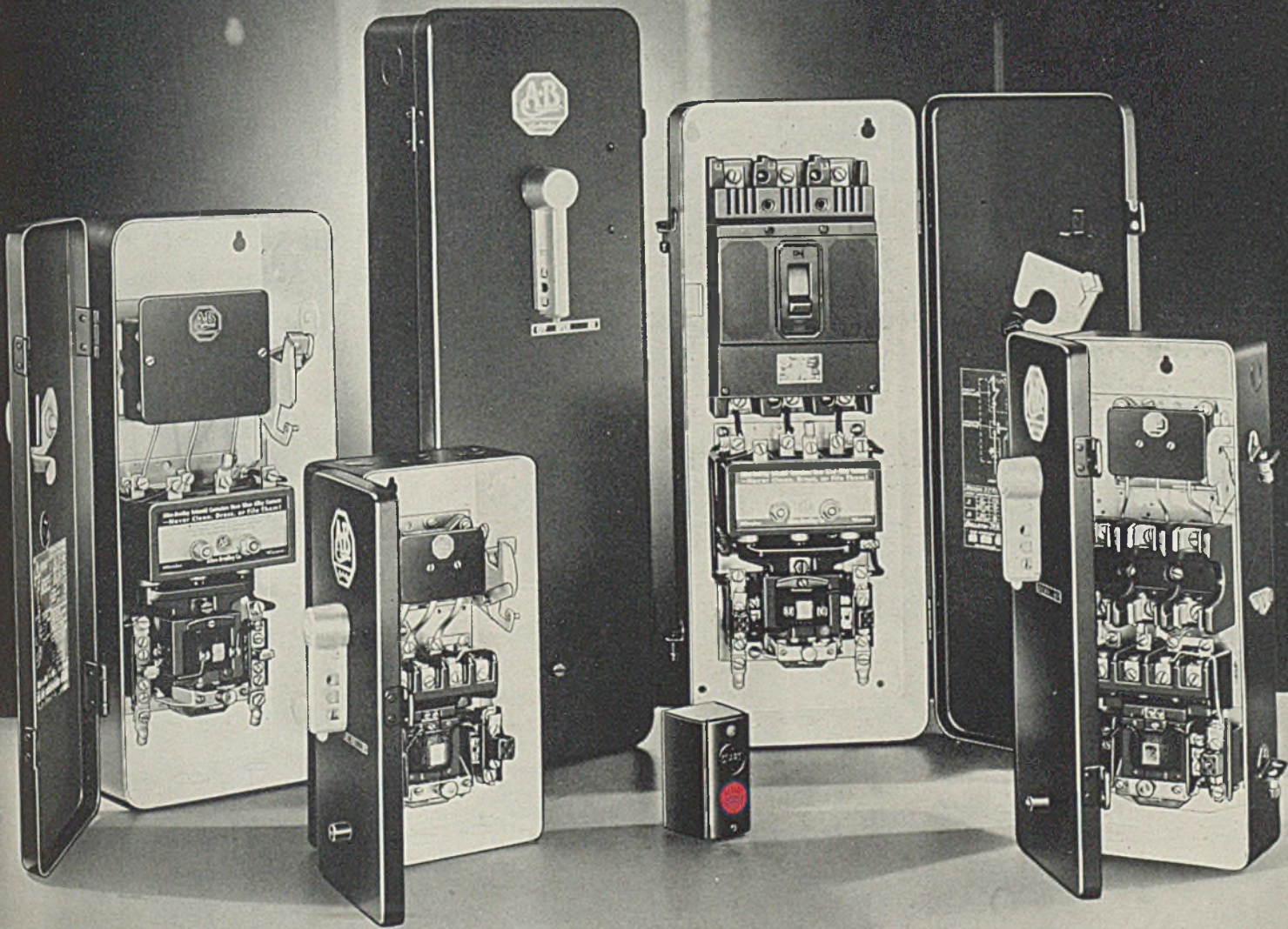


■ Illustrated above is the first one million-volt X-ray machine in action—inspecting a boiler drum in the Barberton plant of the Babcock & Wilcox Co. It is capable of radiographing welds in pressure vessels up to 8 inches thick at a great reduction of time. The previously highest voltage machine required 3½ hours per foot of weld inspected in 4½-inch plate, while the new machine reduces this time to 3 minutes. Placed in service by General Electric X-Ray Corp., the unit is shockproof and self contained. It travels on a specially constructed carriage which is adjustable vertically, horizontally and laterally. Its controls are grouped in a separate concrete-walled room. A motor generator which supplies 180-cycle single-phase current to the transformer excites the X-ray tube

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(Across-the-Line Starting Switch + Disconnect Unit)

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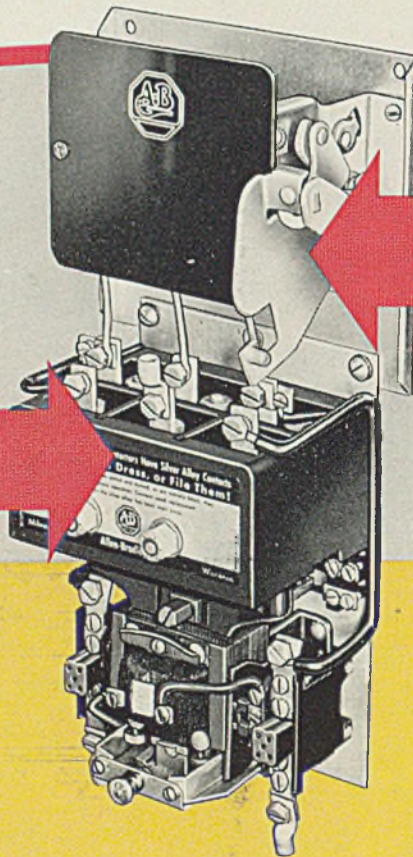
BULLETIN 712-713 COMBINATION STARTERS

QUALITY

What every electrician should know about COMBINATION STARTERS

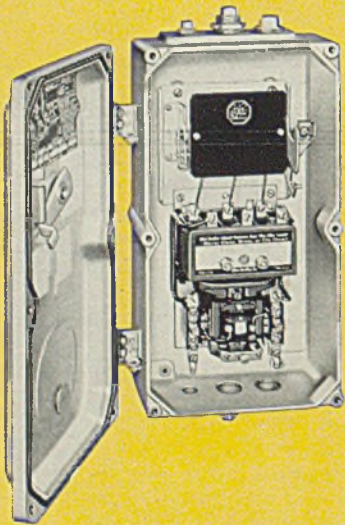
STARTING SWITCH

All Allen-Bradley Combination Starters are equipped with Bulletin 709 solenoid starting switches. Double break, silver alloy contacts eliminate contact maintenance and assure millions of trouble-free operations. Dependable thermal relays give accurate overload protection. The overload relays can be reset by workmen without opening starter cabinet.



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The most popular type of Allen-Bradley Combination Starter is equipped with a manually operated disconnect switch. For short circuit protection, fuses can be furnished. Where momentary current peaks may occur frequently, the Bulletin 713 Combination Starter with ITE instantaneous circuit breaker (shown below) will most economically handle the job.



WATERPROOF ENCLOSURE

This NEMA Type 4 enclosure is typical of the variety of combination starter cabinets available for every service. The general purpose enclosure is of sheet metal with white interior. There is generous wiring space in all Allen-Bradley starter cabinets.

Allen-Bradley Combination Starters are a combination of a manually operated disconnect unit and a solenoid operated motor starting switch. They offer many advantages in industrial service.

It takes less time to install a combination starter than two separate switches. It also takes less space. When changes are made in plant layouts, machines equipped with combination starters can be moved with minimum disturbance to motor wiring, because disconnect unit and starting switch are in one cabinet.

Allen-Bradley Combination Starters make neater installations. And they are safer, too, because the switch lever is interlocked with the disconnect unit so that the cover cannot be opened unless the starter is disconnected from the line.

Write for Bulletin 712-713 giving complete information on Allen-Bradley Combination Starters.

Allen-Bradley Company, 1320 S. Second St., Milwaukee, Wis.



CIRCUIT BREAKER IN COMBINATION STARTER

Allen-Bradley Combination Starter with Instantaneous Circuit Breaker is used for installations where the high fuse replacement costs make circuit breaker protection more economical.



If two or three departments are responsible for plant safety, each department may attach its own padlock to the disconnect lever. Machine cannot be started until all padlocks are removed.



ALLEN-BRADLEY COMBINATION STARTERS

QUALITY

of the ferrous sulphate crystallizes out in centrifuges as copperas in a finely-divided condition. The mother liquor, comparatively free of salts, is returned to the pickling tanks.

Hankes, of Germany, suggested that cold water should be used as a cooling agent. Still another modification consists of circulating cold air against the flow of acid in a cooling tower.

The process recovers ferrous sulphate with seven molecules of water of crystallization and dilute sulphuric acid. This acid is, however, slightly contaminated with ferrous sulphate in solution. It also carries with it impurities, mainly metallic sulphates, and any inhibitor which may have been in the waste liquor.

Operate Under Vacuum

Many of the foregoing processes with their modifications operate under vacuum since this eliminates fumes, leakage, and also requires lower working temperature and consequently less fuel.

No. 3 METHOD.—Two main processes may be adopted—the second being capable of many variations.

(a) All of the free acid is neutralized with steel scrap. The resultant liquor is then evaporated in double or triple effect evaporators to remove excess water and the ferrous sulphate is recovered by crystallization. Any liquor remaining after the crystallization process is returned and enters the system immediately before the evaporators.

(b) The waste liquor is treated with an alkaline to neutralize all of the free acid.

(1) Lime, sulphurized lime stone, marl, soda ash, etc., may be used as neutralizers. Sufficient quantities of the alkali are added to the waste to react with and to destroy all the free acid present. The resultant liquor is neutral and may be discharged into river, stream, or sewer.

(2) Precipitation of the iron is obtained after complete neutralization of all of the free acid. Providing that a high calcium lime is used, the resulting sludge will carry in solids 50 per cent iron hydrates and 50 per cent calcium sulphates.

The cheapest alkali available is calcium lime made from dolomite. Neutralization by this alkali, low in calcium, will give a sludge rich in iron hydrates, calcium sulphate, and a certain amount of magnesium sulphate. This latter product is soluble in water, thus giving a smaller volume of sludge than if a high calcium is used.

Products of neutralization with soda ash are iron hydrates in suspension and sodium sulphate in solution.

(3) In this variation, the waste

liquor is discharged on to waste ground, which contains some neutralizing agent such as slag. A serious objection to this is that the ground soon becomes saturated.

All of the processes and the modifications mentioned with the exception of that of neutralization by an alkali, depend for their success upon concentration and crystallization and these two processes are of a complex nature.

A study of the solubility curves of iron sulphate in sulphuric acid shows that under certain circumstances a salt is formed which contains seven molecules of water—commonly known as copperas—while under slightly different conditions salts with one, two or four molecules of water are obtained. It will be seen that temperature and concentration are the two factors determining the position of the breaking-point between the different types of crystals and a low temperature with low concentration are favorable to the formation of heptahydrate, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, whereas monohydrates and dehydrate are formed with a high temperature and high concentration.

The breaking-points are critical and the controlling of the plants to obtain exact conditions is by no means an easy matter. The reason for wishing to obtain a monohydrate or a salt with two or even four molecules of water, instead of the seven molecules of water of crystallization is that such a substance is free flowing and not hygroscopic like copperas. In addition, it is much lighter, and freight charges are considerably reduced.

Process Is Satisfactory

The efficiency of the recirculating process mentioned can generally only be considered as satisfactory when the free acid content of the spent liquor is low and the ferrous sulphate content high. When the reverse is the case the removal of sulphates is low. This results in the mother liquor from the precipitated heptahydrate containing a relatively high percentage of ferrous sulphate. Since this liquor is returned to the pickling tanks there is a possibility of trouble arising during pickling. Some find that the recovered acid has little deleterious effect on pickling, although others state that the bath is less efficient than when fresh acid is used. On occasions when this recovered acid has been added to the pickling tanks, stains have marred the surface of the steel being cleaned and it has been suggested that the acid should be used for benzol washing or some other such operation.

Many plants have been built all

*For a detailed description of the process see STEEL, July 25, 1938, page 35, and May 22, 1939, page 58.

over the world using as a basis for operation one of the processes described, but the vast majority of manufacturers have adopted the simpler and cheaper method of neutralizing with an alkali. Such a practice has serious drawbacks and it is being realized more and more by those concerned who have large volumes of waste acid to dispose of daily, that before long steps will have to be taken to install suitable plant to deal with their waste liquors in some other way.

This "killing" of waste acid is frequently done in a haphazard manner and complete neutralization does not occur, but even when the greatest care is taken to see that the neutralizing agent effectively reduces the immediate acidity, it is found that soon after the "killed" liquor is discharged into the river the ferrous sulphate hydrolyses and forms large volumes of weak sulphuric acid.

Problem Remains Unsolved

With a limited volume of water to carry away the effluent this hydrolysis can become a serious problem. In addition, the hydroxide formed by the neutralization of the ferrous sulphate will appear as a dirty scum on the surface. Costs are incurred for the alkali and for labor and no return is forthcoming; therefore the process is uneconomical and incomplete, but most important of all the problem of stream pollution, which the process sets out to eliminate, still remains unsolved.

Recently a new plant has been built in which a new substance is recovered known as Ferron. The process is one which has been evolved by the Allied Development Corp., Cleveland, and a plant is now operating at the Sharon Steel Corp., Sharon, Pa.*

The chemical and engineering difficulties involved in nearly all of the foregoing processes, as well as the high capital and operational charges, have proved to be serious obstacles to their development.

The presence of free acid circulating through the plant introduces corrosion problems which call for special equipment which is both expensive to purchase and maintain. Comparatively large quantities of steam must be used and valuable scrap steel is consumed, but nevertheless, many plants have been built to reclaim waste liquors. Most of them have shown that they can be run economically and give a moderate return on the capital invested, but generally speaking such plants are only suitable for the treating of large volumes of waste liquor. This is a more attractive proposition than one in which the capital and operational charges are

(Please turn to Page 87)

T O O L M A I N T E N A N C E

An Extremely Important Part of Tool Engineering

■ WHEN The Lamson & Sessions Co. began making bolts, nuts and kindred products some 50 years ago, the manufacture and maintenance of special tools such as heading and other dies was not a serious problem. As the company grew, however, constantly increasing its business and adding more items to its manufactured line, tool making and maintenance became a major problem so that today this work involves 11 departments as follows:

First, there is the tool room office where all tool orders are checked and issued. Here is also located the tool designing department where all new tools are accurately drawn and carefully checked before the jobs are turned over to the tool manufacturing department.

Like many other manufacturers, a bolt and nut maker must provide and maintain a large number of dies. Doing a volume of such work, it is only natural that procedures have been rather highly developed. A number of the most interesting are detailed here by Mr. Buelow

By A. E. BUELOW

Chief Engineer
Lamson & Sessions Co.
Cleveland

Next comes the so-called master tool section, part of which is shown in Fig. 1. Here all master tools are

made, a large number of which are necessary for making the regular tools used on production work. In this department all gages used on regular production work are carefully checked by means of supermicrometers and comparators. The operator in Fig. 1 is using a supermicrometer. Note also the other equipment such as special plug gages, Jo blocks, the dial indicator and the 18 x 24-inch surface plate.

The space occupied by the regular production of tools is larger than would be imagined. As many of the heading and other dies are comparatively small, the shaper is an ideal machine tool to utilize on this

Fig. 1—Part of the master tool section. Note special plug gages, Jo blocks, and other equipment. The operator is using a supermicrometer



work so a battery of these units are employed. Milling machines are also used to advantage on many jobs. In Fig. 2 is shown a plain milling machine set up for milling thread rolling dies. As the illustration shows, the stock to be milled is located in a substantial adjustable shoe which is bolted to the milling machine platen. This shoe is adjustable radially so that various angles on the dies can be generated to correspond with the desired helix angle on the finished rolled thread. Milling is done with ground hobs. Note the exceptionally rigid support for the milling machine arbor in Fig. 2, for aside from the conventional outer support, as commonly used in any milling operation, the arbor is further supported by two swing arm brackets, one on either side of the cutter. This precaution is necessary to eliminate chattering for this evil would ruin the work. Thread rolling dies must be smooth and free from chatter if they are to roll smooth threads.

Special Tools Also Maintained

There also is maintained a heat treating department especially equipped for handling tools as distinguished from regular production work. In addition to usual equipment, certain special units such as the one shown in Fig. 3 are used. This is a hardening jig for solid cold header dies. Here dies are quenched by clamping between two pressure plates and forcing coolant through the hole in the die. In the background of Fig. 3 are several hardening furnaces with quenching tanks in the center. Special selective quenching arrangements are used in some of the tanks to obtain hardness only where desired.

Many dies must of course be finish ground after heat treatment. The grinding department is equipped for cylindrical, internal and surface grinding work. Fig. 4 is a typical internal grinding job where it is necessary to grind the hole in a small die. This die is 1½ inches in diameter with a 3/16-inch hole. As the illustration shows, the work is clamped in a 3-jaw chuck in an internal grinding machine. After the work is clamped in place, it is trued up carefully with the dial indicator shown on the machine headstock. The diminutive grinding wheel is driven by a special high-speed spindle. This is, of course, necessary as these compara-

tively small wheels should be run at a speed of approx. 50,000 revolutions per minute to cause them to cut effectively. A large number of small dies are finished in this manner.

Fig. 5 is a grinding operation of more than usual interest as it consists of finishing accurately five holes in a die holder. These holes must be spaced accurately so that the dies will align correctly when in use. The machine is a cylinder grinder of the type developed for finishing automotive engine cylinders. The work is strapped directly to the machine platen while the correct center-to-center hole distance is assured by spacing off the work with the longitudinal feed screw. The size of the hole and the depth of cut of the wheel are controlled by means of the planetary spindle adjustment.

Many tools must, of course, be surface ground to insure accuracy with means supplied for carrying away the abrasive dust to insure clean grinding conditions as a large variety of surface grinding operations cannot be done on machines arranged for wet grinding. Since many magnetic chucks are used, means must be provided for removing residual magnetism after the work is ground. There are a number of ways to accomplish this, but here the ground pieces are passed through the coil of wire shown at the extreme right in Fig. 6. All that is necessary is to slide the work through this coil while it is energized with alternating current.

Prepared for Any Emergency

Other important departments devoted to tool maintenance include the special department where all carbide tools are ground and re-ground, the machine repair department and the tool stock department where finished tools are kept ready for distribution in the various plant departments; an acetylene welding department for maintenance of machines and parts and a department where parts are held in stock such as used for repairing production machines. The foregoing departments cover an area of about 24,700 square feet of floor space of which the tool section requires 24,400 square feet and the machine repair department approximately 4300 square feet.

Both standard and special tools
(Please turn to Page 86)

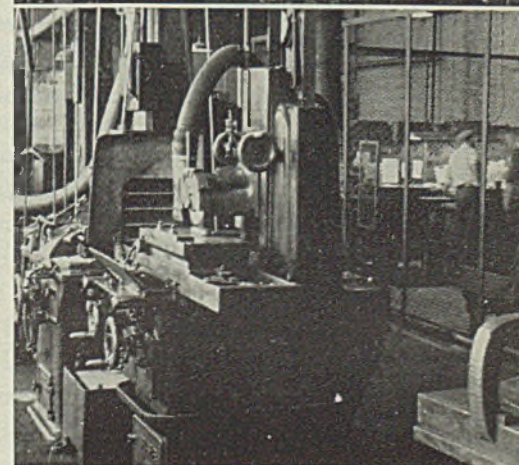
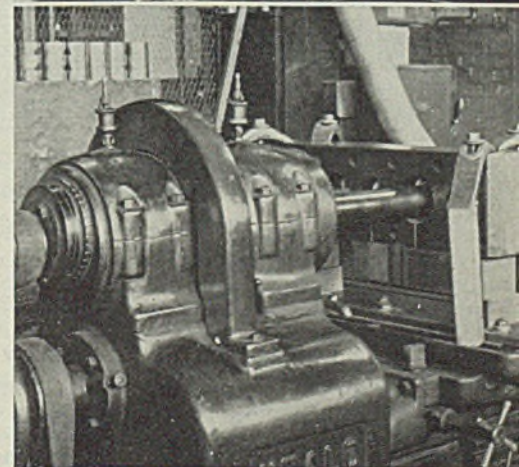
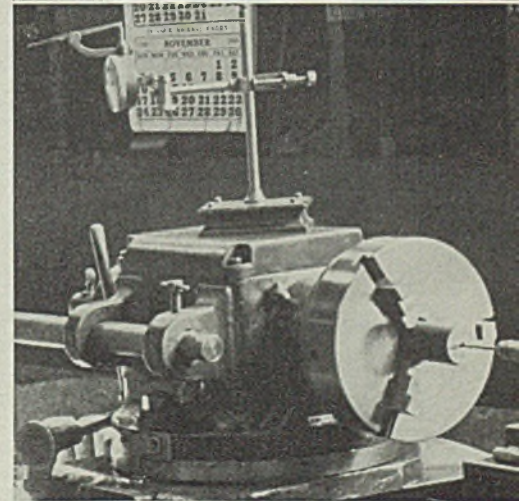
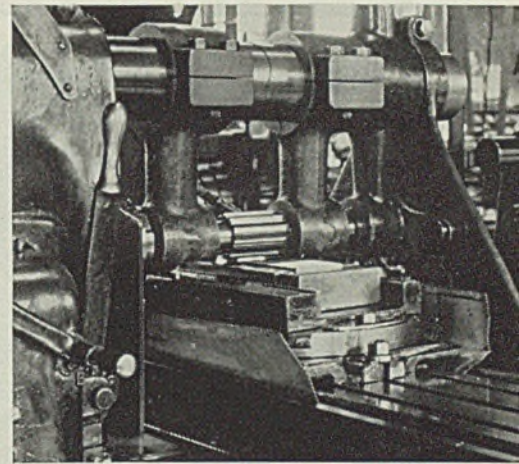
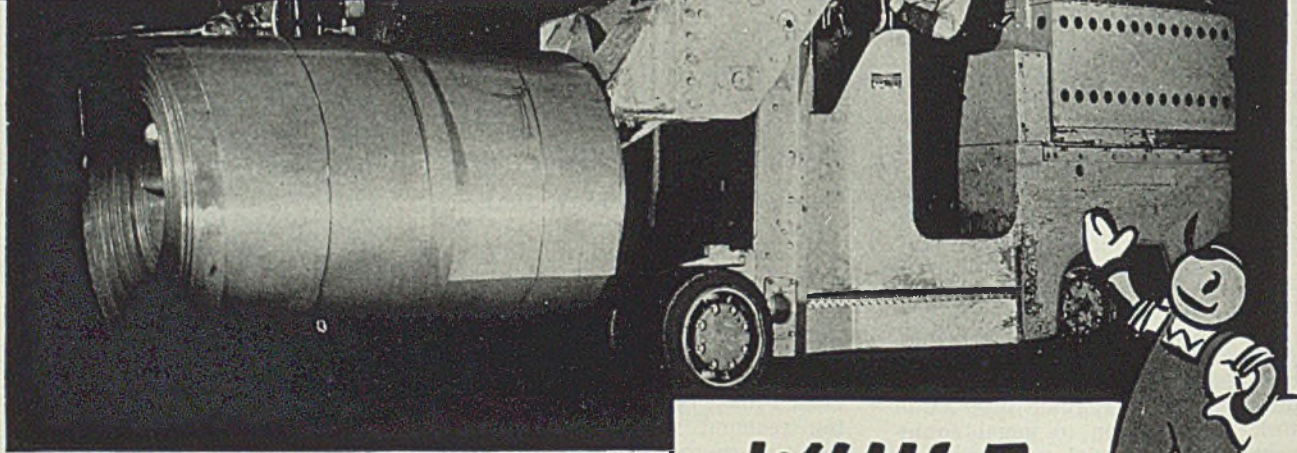
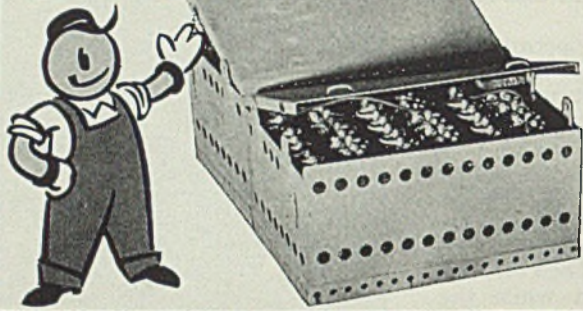


Fig. 2—Plain milling machine set up for milling thread-rolling dies which are held in a radially adjustable shoe to permit generation of any desired helix angle. Fig. 4—A typical internal grinding job—grinding a 3/16-inch hole in a 1½-inch diameter die. Fig. 5—Finish grinding five holes simultaneously to close tolerances. These holes are being made in a die holder and accuracy is essential if the dies are to align correctly after insertion. Fig. 6—Left is a surface grinder using a magnetic chuck to hold the work. Demagnetizing the work afterwards is done in the solenoid at extreme lower right

CHARGE THIS BATTERY



THIS PHOTOGRAPH illustrates a major reason why *battery* industrial trucks are so successful in delivering continuous 24-hour-a-day service.

The storage batteries work in relays, one being charged and flushed while the other is powering the truck. Except for two or three minutes needed to exchange batteries (at intervals of 8 to 12 hours) the truck does not need to stop work for servicing of its power unit.

This helps explain why *battery* industrial trucks are first choice in industries that must have continuous operation 24 hours a day, day after day, year after year. They are first choice, too, in industries that know, and watch, operating costs. They use low-cost electric power, and their entire operating mechanism is inherently simple and trouble-free.

They are extra dependable and extra economical when powered by Edison Alkaline Storage Batteries. With all-*steel* cell construction, a solution that is a natural preservative of *steel*, and plates in which all active materials are retained by perforated *steel* tubes and pockets, they are the most durable, lightest, most trouble-free of all storage batteries. Alkaline batteries provide ample power for the largest trucks yet built, for trucks operating within

WHILE THIS ONE WORKS

limited clearances, and for any daily schedule up to 24 hours.

For more detailed information send for our bulletin MODERN MATERIAL HANDLING. New edition, just off the press, describes the various industrial-truck handling systems; illustrates the latest methods; gives detailed data on alkaline batteries. EDISON

STORAGE BATTERY DIVISION OF *Thomas A Edison* INC.,
WEST ORANGE •• NEW JERSEY •• U. S. A.

Edison

STEEL
Alkaline
BATTERIES

■ AT THE plant of the Wheeling Steel Corp., Steubenville, O., great care had always been taken in weighing out all of the material which was fed into the blast furnaces with the exception of coke. That is, all the material was carefully weighed so that the proper proportions would be obtained. The coke, however, had always been measured out volumetrically. The officials of the company felt that this coke should also be weighed out in order to be more certain of a product which would always conform to their rigid specifications.

With this thought in mind, they asked the Toledo Scale Co., Toledo, O., how this might be done most efficiently. The result was an unusual type of Toledo scale designed with a special lever system and made to receive a hopper with a capacity of about 200 cubic feet. This lever mechanism was connected to a standard Toledo cabinet-type head with a 10,000-pound indicating dial upon it.

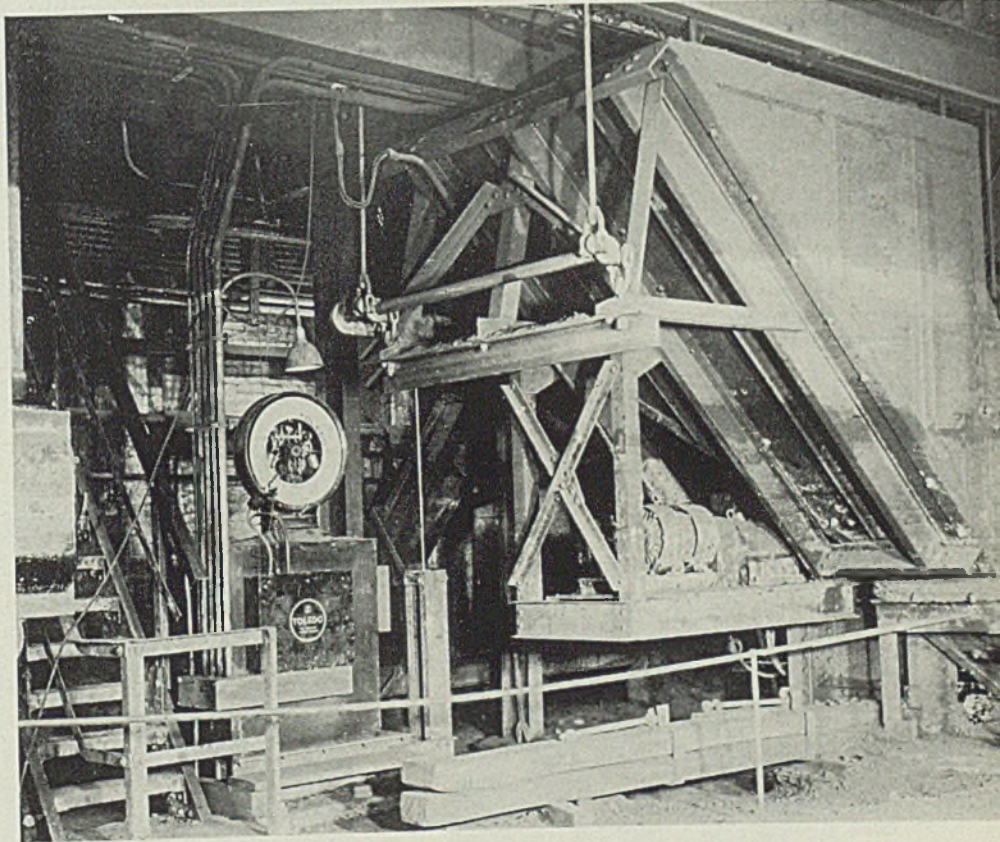
Errors Can Be Detected Easily

An adjustable interceptor cut-off photo-electric attachment was included with the equipment. This attachment consists of a photo-electric cell mounted behind a narrow slit in the chart and in front of the slit is mounted a special light source which produces a slit of concentrated light. This light normally falls upon the photo-electric cell. The slit is adjustable from the outside of the scale so that any slight error in the final cut-off can be easily corrected.

There is mounted on the indicator shaft a second adjustable indicator on the back of the scale which can be set to any desired weight of material. The movement of this indicator is such that when a load is added to the scale, the indicator retrogresses toward zero and when the right amount is in the weigh hopper, the indicator will register zero. A section of this indicator consists of an interceptor which cuts off the light from the source to the photo-electric cell when this indicator reaches zero. At the same time, the indicator on the front side of the scale has moved from its zero position and indicates the weight which has been placed in the hopper.

The weigh hopper is equipped with motor-operated discharge gates. The hopper is fed by a motor-driven main feeder which also removes the "breeze" in the coke. This motor is equipped with a magnetic brake. There are two of these automatic coke weighing devices, situated one on either side of the skip car pit. The other materials which enter into the feeding of the blast furnace are collected in the usual gathering car equipped with the

Automatic Coke Weighing and Charging SPEEDS HANDLING Of Materials to Blast Furnace



This is the automatic equipment which fills the skip car with coke on each fourth and fifth trip to the top of the blast furnace. Charge is weighed automatically and an actual weight record also made. This, with a counter record showing number of times dump gate doors open, provides a double check on the system

scabs.

The Wheeling Steel installation has the automatic coke charging devices so interlocked that when a skip car reaches the loading position in its pit, a charge of material is placed within it and it travels to the top of the furnace automatically. When it returns to the loading pit, a second load of material is placed in it and likewise a third load. When the skip car reaches the loading pit for the fourth load, the dump gate is automatically opened by its motor and the skip car receives a charge of coke. As soon as the operator sends the skip car up, the motor automatically shuts the dump gate and the feeding operation automatically starts. The material is fed into the weigh hopper at such a rate that before the skip car can make its trip to the top and return,

the load will have been placed into the weigh hopper and the photo-electric cell will have shut the current off to the feeder motor and applied its brake so that a complete load will be ready for discharge. When the skip car reaches the loading pit for its fifth load, the dump gate is again automatically opened and a second charge of coke is placed in the skip car. As soon as the skip car leaves the loading pit, the dump gate closes on the weigh hopper and the feeder again starts to weigh out its load.

The skip car now comes down and receives its first three loads of other materials without affecting in any way the automatic coke weighing unit, but upon its fourth and fifth trips, it again automatically receives charges of coke.

This automatic coke weigher is

equipped with Toledo Printweigh, which automatically prints the amount of coke weighed on each draft. This record is printed on a strip which is wound up inside of the machine. The machine is also equipped with a Veeder-type counter which operates every time the dump gate is open. The number of printed records must, therefore, correspond with the number of times the dump gate is opened. This makes a positive check.

These records also show the number of charges of all equipment which the furnace has received. This is a fact since the skip car must make the proper number of trips in order to have the sequence of operations take place for each complete charge. The sum of the weights of the different drafts as recorded furnishes an accurate record of the amount of coke used over any period of time.

It is regarded as a significant improvement in materials handling systems for blast furnaces.

Alcoa Issues Two Booklets on Aluminum

■ Two new booklets—one dealing with the fabrication methods of aluminum, and the other with aluminum in the aircraft industry, were recently issued by the Aluminum Company of America, Pittsburgh.

The former details methods of drawing, spinning and embossing of aluminum, presenting considerable data on these operations. Entitled "Forming Aluminum," it covers these operations both descriptively and pictorially in 53 pages.

"Aluminum in Aircraft," the second 103-page booklet, provides a general picture of the use of aluminum in aircraft. It is intended primarily for newcomers, supporting such subjects as airplane fabrication, materials and processes with tables and illustrations.

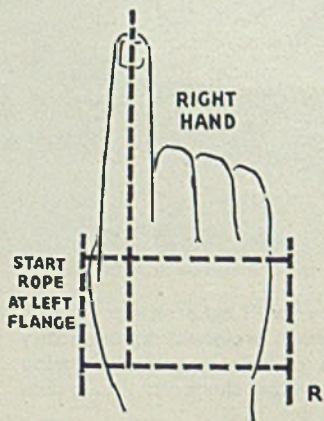
Copies of either one or both of these booklets are available upon request.

Develops Flame-Proof Insulation Material

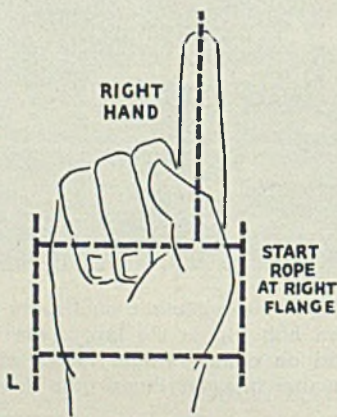
■ Reynolds Metals Co., Richmond, Va., reports a new water-repellent flame-proof and fire-resistant cotton insulation which has been approved by federal, state and municipal bureaus and users. Called Reyn-O-Cell, it is an effective sound deadening material, adaptable for partitions, floors and ceilings where sound isolation is desired. Its fire-resistant qualities extend far beyond the danger point—withstanding temperatures of over 1500 degrees Fahr. without flaming.

Laboratory tests indicate the material is free from attack by rats, vermin and destructive fungi. It is not subject to decay, is odorless and free from dust.

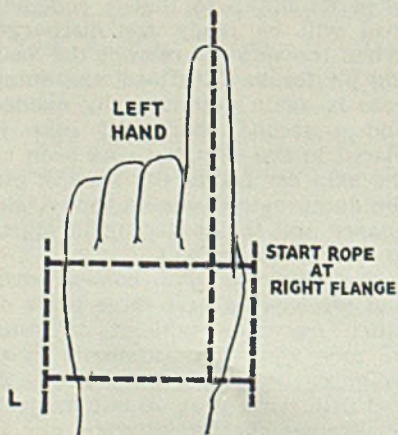
How To Simplify Drum Reeving



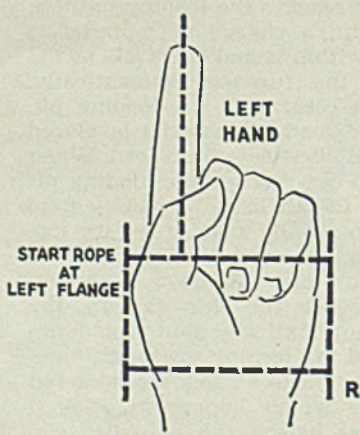
RIGHT LAY-OVERWIND



RIGHT LAY-UNDERWIND



LEFT LAY-OVERWIND



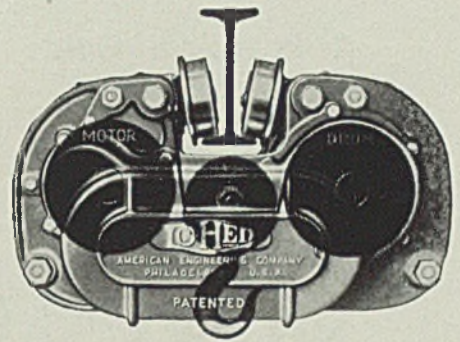
LEFT LAY-UNDERWIND

■ There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum. If started at the proper flange, the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from the layer above might squeeze and cause serious scrubbing, scarfing or binding. If a rope is not to damage itself prematurely, the wraps must lie close together. All ropes should be started on the drum properly. The rule is complicated to remember, and often, according to American Cable Division, American Chain & Cable Co., Bridgeport, Conn., quick reference to it is not available at the machine. A far simpler rule is this—using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left-lay rope use the left fist; for overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.

A BOY ON A BIKE KNOWS WHAT

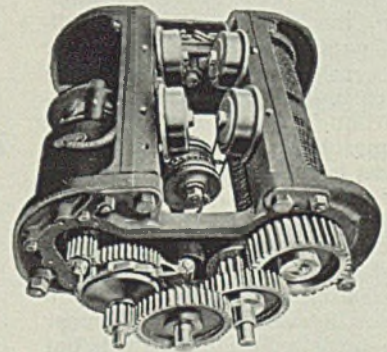
Balance

MEANS



BALANCE COUNTS IN A HOIST

LO-HED, the *Balanced Hoist*. You can readily see that there is a difference in appearance between a Lo-Hed and other electric hoists. But do you know what this difference means to you? The motor and drum of a Lo-Hed hoist are placed on opposite sides of the beam. This unique, balanced arrangement, combined with efficient spur gearing, provides low headroom, low maintenance, maximum accessibility and great structural strength. A Lo-Hed hoist costs less per lift. Write for Lo-Hed catalog today.



LOOK AT THE BALANCED LO-HEDI

It Costs Less To Operate—All gears are efficient stub-tooth spur gears running in a sealed oil bath . . . gear shafts and trolley wheels are equipped with heavy-duty ball or roller bearings.

It Costs Less To Maintain—Sturdy construction . . . seldom, if ever, requires removal from trolley . . . covers of controller, motor, drum and gearing are easily removed.

It's Safe—Factor of safety of over 5 at full capacity . . . 100% Positive Automatic Stop when load reaches upper limit . . . Automatic Holding Brake prevents load from drifting when current is shut off . . . short, strong shafts minimize torsional stresses.

It's Protected—Controller is fire, dust and moisture proof . . . motor totally enclosed . . . gearing sealed in . . . motor and drum covered by easily removable covers.

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The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

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(Please print plainly)

A Practical Guide to the HEAT TREATMENT of STAINLESS STEELS

For a quick and handy reference to recommended practice on heat treating stainless steels, this material by a practical heat treater may be just the type of data you want

By G. B. BERLIEN
Lindberg Steel Treating Co.
Chicago

■ STAINLESS, or better termed, corrosion-resistant steels can cover a wide field of applications by changes in composition. We find them now almost indispensable for decorative purposes, high-tensile properties at elevated temperatures, cutlery, valves, tanks, pipe lines, tools and many machine parts.

Thus it will be found that the corrosive medium as well as the hardness and tensile strength required have a decided influence on just what type to use. Valves operating at high temperatures in exhaust gases require silicon additions to the regular alloys. Addition of copper to about 1 per cent aids corrosion resistance to dilute sulphuric acid. The straight chromium carbon types are very resistant to atmospheric corrosion where hardness is required and 18-8 types can be used where hardness is not required.

Stainless steel can be distinguished from other types both by spark testing and immersion in a copper sulphate solution. Copper will be deposited on other steels but not on stainless.

Heat treatment is an important factor in fitting stainless steel for use. The higher carbon stainless steels must be hardened for maximum physical properties and the low-carbon high-chromium nickel steels must be annealed after heating for working if maximum stainless properties are to be obtained, unless additions of an alloy such as columbium is used to prevent intergranular corrosion.

The hardenable varieties are generally the straight chromium carbon steels with carbon ranging from 0.12 to 1.10 per cent. Chromium may range from 12 to 19 per cent. Stainless steels are specifically identified by the American Iron and Steel Institute by number. The most common are given in Table I. This list is by no means complete but is meant to give a few representative types.

Heat treatment of these steels

must be followed by careful surface conditioning such as grinding or polishing. Any small pits or surface irregularities will be centers of electrolytic corrosion.

Maximum stainless properties are acquired only by hardening so as to obtain thorough solid solution. The fact that high-chromium steels have a low heat conductivity and that chromium carbides go into solution very slowly must be considered. By extending the heating cycle of both preheat and high heat sufficiently we can obtain the combination of hardness, silky structure and high anticorrosive properties that make these steels so valuable to industry.

Hardening of stainless steel seldom presents difficult hardening problems. However, a few precautions will help getting all that can be expected from the steel. The practice of preheating is important. Large sections should have a first preheat of approximately 1000 degrees Fahr. After ample time for soaking, the temperature should be raised to between 1450 and 1525 degrees. Small sections may be started at the 1450 degrees heat. Soaking at this temperature is very beneficial, and the time at heat should be from two to ten times as long, depending on size, as one would heat a piece of tool steel at this temperature. Preheats of 4 to 5 hours are sometimes used where a maximum impact hardness combination is desired. Thus a 1-inch section may be soaked at the preheating temperature of 1450 degrees for as long as 4 hours before transferring to the high heat. Preheating long enough to form a

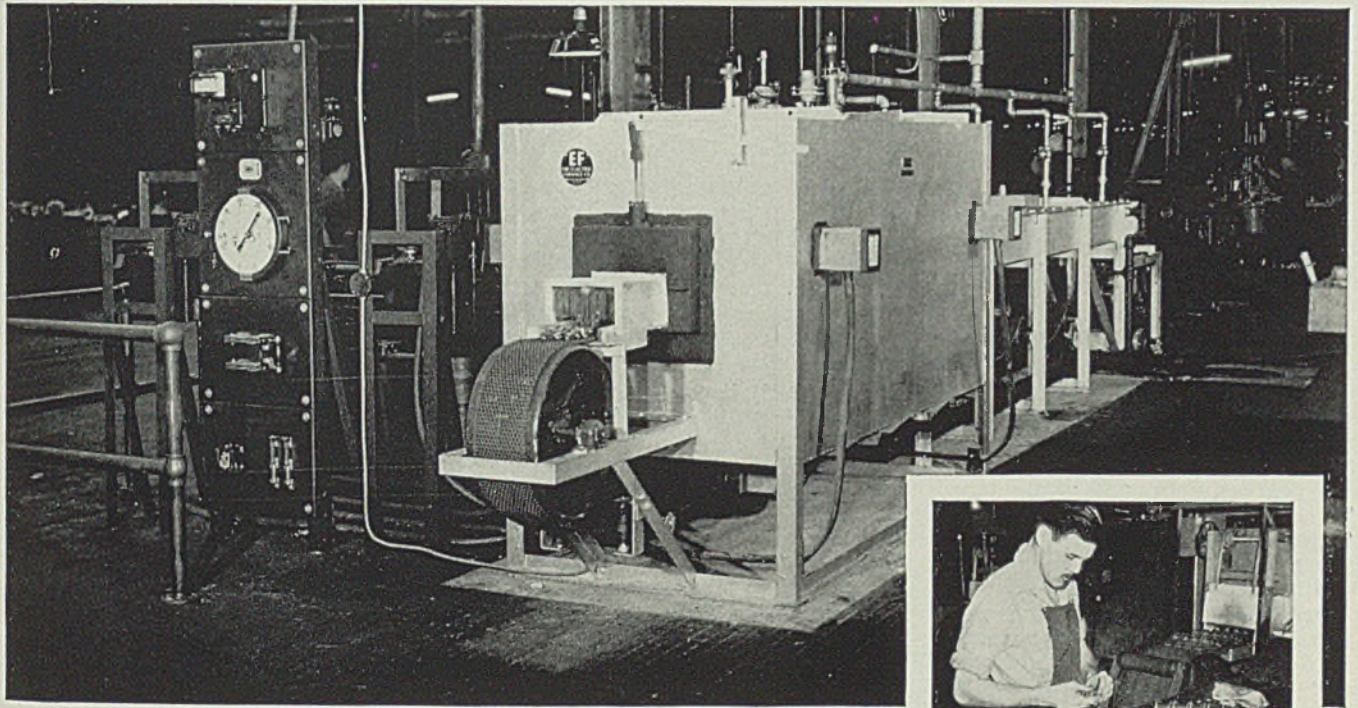
thin film of oxide will help protect the steel at high temperature and a better after-hardening surface condition will result. Transferring to the hardening temperature in another furnace is preferable to raising the temperature of the preheat to hardening temperature. Here the soak at heat on light sections should be at least 3 minutes after temperature is reached. Sections of 0.5-inch generally require 10 to 15 minutes at heat. Sections of 3 to 4 inches may require an hour at heat.

Stainless can be hardened in either oxidizing or reducing atmospheres. But due to the long heating cycles used, reducing atmospheres are preferable for both the preheat and the high heat. If a so-called open fire or reverberatory furnace is used, a reducing condition can be obtained by adjusting the gas-air mixture so a blue-yellow flame burns out of the ports of the furnace. If controlled atmosphere furnaces are used, the carbon monoxide content should be held to 10 per cent minimum with the carbon dioxide as low as possible.

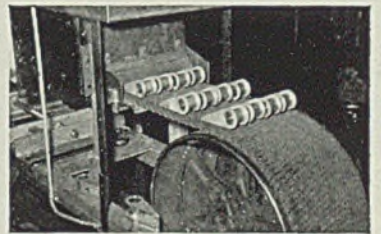
Hardening temperatures range from 1800 degrees Fahr. for the 0.12 per cent carbon types to between 1925 and 1950 degrees Fahr. for 1.10 per cent carbon range. It will be noticed that stainless steels differ from other steels in this respect—that the hardening temperatures rise with the carbon content. Thus the proper heat for the forementioned types will be as given in Table II.

Oil quenching is recommended for hardening all carbon ranges. Air cooling can be resorted to where difficult sections or warpage require it. Hardness values may be slightly lower than with an oil quench but usually not more than two or three points on the rockwell C scale on average sections.

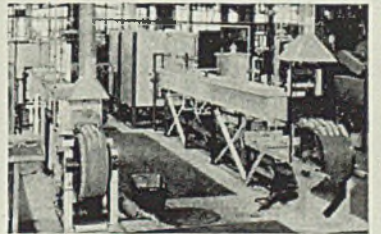
Parts made of the 0.12 per cent carbon types can be straightened cold, but straightening should be done before drawing. Parts made



The operator assembles the parts and places them on the furnace conveyors.



The assemblies are discharged at the other end... all units securely and neatly joined.



The satisfactory results from the first furnace at left sold the larger furnace at right.

MAKING STRONGER, NEATER JOINTS 60 to 75% FASTER At 1/4 the Former Labor Cost by using EF Copper Brazing Furnaces

A large automobile plant installed the above E.F. furnace for joining some of their intricate assemblies. The results proved so satisfactory that within a month after the first furnace was erected they had ordered a second similar but larger unit for handling other parts. The illustration below shows both furnaces, operating side by side—copper brazing all kinds of automobile assemblies, including such parts as clutch throw-out shafts, remote control shift levers, steering knuckle support arm brackets and many other parts.

The Management reports "greatly improved results—neater, stronger joints—60 to 75% faster at about 1/4th the former labor cost."

The above continuous conveyor furnace is one of the numerous types we build for the copper brazing process. Other types are handling miscellaneous other large and small assemblies ranging in size from small metal radio tube parts up to large assemblies weighing 50 lbs. or more.

Investigate the copper brazing process. We will be glad to give you complete information, put samples of your products through one of these furnaces to show you the results you can expect, give you an estimate on the cost of equipment to handle your production, together with operating costs, etc. Many prominent manufacturers are now joining their metal parts by the copper brazing process much faster, neater, cheaper and getting stronger joints than they formerly considered possible.

Investigate the Copper Brazing Process for Joining Your Metal Parts.



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A Practical Guide to the HEAT TREATMENT of STAINLESS STEELS

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Thus it will be found that the corrosive medium as well as the hardness and tensile strength required have a decided influence on just what type to use. Valves operating at high temperatures in exhaust gases require silicon additions to the regular alloys. Addition of copper to about 1 per cent aids corrosion resistance to dilute sulphuric acid. The straight chromium carbon types are very resistant to atmospheric corrosion where hardness is required and 18-8 types can be used where hardness is not required.

Stainless steel can be distinguished from other types both by spark testing and immersion in a copper sulphate solution. Copper will be deposited on other steels but not on stainless.

Heat treatment is an important factor in fitting stainless steel for use. The higher carbon stainless steels must be hardened for maximum physical properties and the low-carbon high-chromium nickel steels must be annealed after heating for working if maximum stainless properties are to be obtained, unless additions of an alloy such as columbium is used to prevent intergranular corrosion.

The hardenable varieties are generally the straight chromium carbon steels with carbon ranging from 0.12 to 1.10 per cent. Chromium may range from 12 to 19 per cent. Stainless steels are specifically identified by the American Iron and Steel Institute by number. The most common are given in Table I. This list is by no means complete but is meant to give a few representative types.

Heat treatment of these steels

must be followed by careful surface conditioning such as grinding or polishing. Any small pits or surface irregularities will be centers of electrolytic corrosion.

Maximum stainless properties are acquired only by hardening so as to obtain thorough solid solution. The fact that high-chromium steels have a low heat conductivity and that chromium carbides go into solution very slowly must be considered. By extending the heating cycle of both preheat and high heat sufficiently we can obtain the combination of hardness, silky structure and high anticorrosive properties that make these steels so valuable to industry.

Hardening of stainless steel seldom presents difficult hardening problems. However, a few precautions will help getting all that can be expected from the steel. The practice of preheating is important. Large sections should have a first preheat of approximately 1000 degrees Fahr. After ample time for soaking, the temperature should be raised to between 1450 and 1525 degrees. Small sections may be started at the 1450 degrees heat. Soaking at this temperature is very beneficial, and the time at heat should be from two to ten times as long, depending on size, as one would heat a piece of tool steel at this temperature. Preheats of 4 to 5 hours are sometimes used where a maximum impact hardness combination is desired. Thus a 1-inch section may be soaked at the preheating temperature of 1450 degrees for as long as 4 hours before transferring to the high heat. Preheating long enough to form a

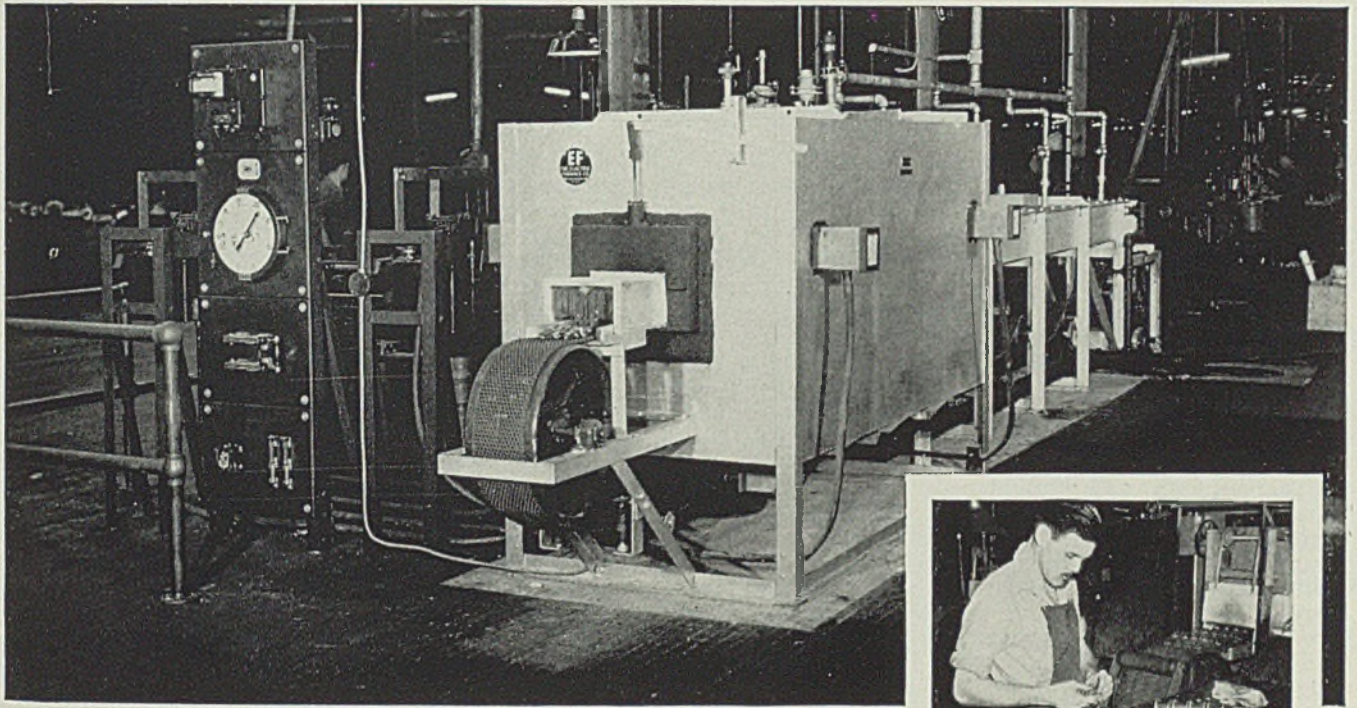
thin film of oxide will help protect the steel at high temperature and a better after-hardening surface condition will result. Transferring to the hardening temperature in another furnace is preferable to raising the temperature of the preheat to hardening temperature. Here the soak at heat on light sections should be at least 3 minutes after temperature is reached. Sections of 0.5-inch generally require 10 to 15 minutes at heat. Sections of 3 to 4 inches may require an hour at heat.

Stainless can be hardened in either oxidizing or reducing atmospheres. But due to the long heating cycles used, reducing atmospheres are preferable for both the preheat and the high heat. If a so-called open fire or reverberatory furnace is used, a reducing condition can be obtained by adjusting the gas-air mixture so a blue-yellow flame burns out of the ports of the furnace. If controlled atmosphere furnaces are used, the carbon monoxide content should be held to 10 per cent minimum with the carbon dioxide as low as possible.

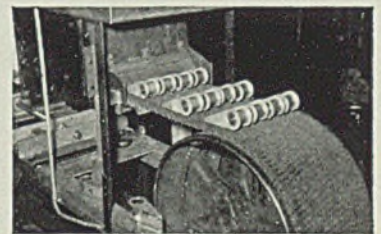
Hardening temperatures range from 1800 degrees Fahr. for the 0.12 per cent carbon types to between 1925 and 1950 degrees Fahr. for 1.10 per cent carbon range. It will be noticed that stainless steels differ from other steels in this respect—that the hardening temperatures rise with the carbon content. Thus the proper heat for the forementioned types will be as given in Table II.

Oil quenching is recommended for hardening all carbon ranges. Air cooling can be resorted to where difficult sections or warpage require it. Hardness values may be slightly lower than with an oil quench but usually not more than two or three points on the rockwell C scale on average sections.

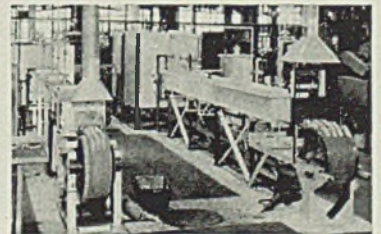
Parts made of the 0.12 per cent carbon types can be straightened cold, but straightening should be done before drawing. Parts made



The operator assembles the parts and places them on the furnace conveyors.



The assemblies are discharged at the other end... all units securely and neatly joined.



The satisfactory results from the first furnace at left sold the larger furnace at right.

MAKING STRONGER, NEATER JOINTS 60 to 75% FASTER At 1/4 the Former Labor Cost by using EF Copper Brazing Furnaces

A large automobile plant installed the above E.F. furnace for joining some of their intricate assemblies. The results proved so satisfactory that within a month after the first furnace was erected they had ordered a second similar but larger unit for handling other parts. The illustration below shows both furnaces, operating side by side—copper brazing all kinds of automobile assemblies, including such parts as clutch throw-out shafts, remote control shift levers, steering knuckle support arm brackets and many other parts.

The Management reports "greatly improved results—neater, stronger joints—60 to 75% faster at about 1/4th the former labor cost."

The above continuous conveyor furnace is one of the numerous types we build for the copper brazing process. Other types are handling miscellaneous other large and small assemblies ranging in size from small metal radio tube parts up to large assemblies weighing 50 lbs. or more.

Investigate the copper brazing process. We will be glad to give you complete information, put samples of your products through one of these furnaces to show you the results you can expect, give you an estimate on the cost of equipment to handle your production, together with operating costs, etc. Many prominent manufacturers are now joining their metal parts by the copper brazing process much faster, neater, cheaper and getting stronger joints than they formerly considered possible.

Investigate the Copper Brazing Process for Joining Your Metal Parts.



The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

TABLE I—Stainless Types As Designated by American Iron & Steel Institute

I.S.I. 403—carbon 0.12 max., chromium 11.50-13.
I.S.I. 410—carbon 0.12 max., chromium 10-13.50.
I.S.I. 416—carbon 0.12 max., chromium 12-14, sulphur or selenium 0.07 min., molybdenum 0.60 max.
I.S.I. 420—carbon 0.30-0.40, chromium 12-14.
I.S.I. 440—carbon 0.60-1.10, chromium 14-15.

of the higher carbon ranges from 0.30 to 1.10 per cent carbon can be removed from the quench at 400 to 500 degrees Fahr. and straightened by press while they air cool to room temperature. If further straightening is required, it can be done by heating with a torch to about 500 degrees Fahr. and applying pressure with a press. Another method is to clamp parts to a straight block and drawing from 500 to 600 degrees Fahr. When flat shapes are hardened, the quenching and straightening can sometimes be combined by placing the steel between two heavy flat plates direct from the hardening furnace.

Drawing: As with other steels, stainless should always be drawn or tempered after hardening. The low carbon ranges will show little loss in hardness up to 700 degrees Fahr. However, as high drawing temperatures may impair stainless properties, a draw of 300 degrees Fahr. for 3 to 6 hours is usually used.

The higher carbon ranges tend to drop in hardness as the drawing temperature is raised. The 1.0 per cent carbon steels will hold their as-quenched hardness at 300 degrees. A drop of two to three points rockwell C will result from a 400 to 500-degree Fahr. draw. The range of 800 to 900 degrees Fahr. is avoided by many as being a brittle range. A loss of stainless properties is noticed at draw temperatures over 800 degrees Fahr.

The as-quenched hardness values will be approximately 40 to 44 rockwell C for a 0.12 per cent carbon steel. The 0.30 to 0.40 carbon range will quench to between 50 and 54 rockwell C. The 0.60 to 1.10 per cent carbon range will quench to between 56 and 61 rockwell C.

Stainless steels resist oxidation to such a degree that tempering by color as is often practiced with low carbon steel is impractical and should not be attempted.

Selective hardening by the electric induction method can be done by using slightly higher hardening temperatures to compensate for the shorter time cycle used.

Selective hardening also can be accomplished by heating a carbon or graphite block with a torch. The carbon block should be drilled to ac-

commodate the section to be hardened. With the block at heat the part is inserted into the block and allowed to heat until color begins to show above the block. It should then be removed and quenched.

Annealing is an important part of the heat treating of stainless steel. This subject may be properly divided into two sections—the first to cover the annealing of the hardenable varieties of stainless and the second to cover the so-called 18-8 or austenitic varieties.

Previously it was pointed out that all stainless that can be hardened by heat treatment has decided air-hardening properties. Therefore parts that have been forged should always be annealed or normalized before final hardening to remove forging and hardening strains. If re-machining is necessary after parts are hardened, they can be annealed and later hardened. Annealing to too low a hardness should be avoided. This may result in two undesired properties. The first is poor machinability, and the second is a low maximum hardness on re-hardening. When either normalizing or annealing, longer heating cycles than with other steels should be used as pointed out in heating for hardening.

Now let us discuss the first group or hardenable stainless steels. Normalizing after forging can be carried out by heating to between 1600 and 1650 degrees Fahr. and the work buried in any suitable insulating substance such as pitch coke, sand or lime.

Annealing may be carried out by slow heating to 1550 Fahr. in a non-carburizing pack and cooled in the pot. Some applications require an anneal at 1550 degrees Fahr., slow cool to 1000 degrees Fahr., re-heat to between 1400 and 1425 degrees Fahr. and a final air cool. This will result in a tougher structure that will withstand more deformation without fracture than the simple 1550 degrees anneal.

Where machinability is the prime factor, a hardness of 225 to 250 brinell usually gives the best results, particularly for drilling. When the structure as forged, or rolled and annealed, machines poorly, it may often be improved by full hardening, followed by a long draw at 1425 degrees Fahr.

In all cases of annealing, carburizing pack materials or highly carburizing atmospheres should be avoided. The reason for this is easily seen on examination of stainless steel analysis. The examination will reveal the close relationship of stainless steel to the so-called high-production or high-carbon high-chromium steels. Though full conversion of one type of steel to the other may never be reached, any unbalancing of analysis is to be avoided.

TABLE II—Hardening Temperatures for Steel Types Listed in Table I

I.S.I. 403-410-416, 1800°-1825° Fahr.
I.S.I. 420, 1850° Fahr.
I.S.I. 440, 0.60 carbon, 0.80 carbon, 1875°-1900° Fahr.
I.S.I. 440, 0.80 carbon, 1.10 carbon, 1900°-1950° Fahr.

The second group of stainless roughly called 18-8 may have in addition to the approximate 17 to 26 per cent chromium and 7 to 21 per cent nickel such alloys as molybdenum, manganese, silicon and columbium.

These steels have cold work hardening properties, and the term "annealing" here means to restore solid solution of carbides in the matrix. Slow cooling from elevated temperatures allows carbide precipitation resulting in brittleness and intergranular corrosion so a rapid quench from 1850 degrees Fahr. or over is required for an anneal.

A water quench is used whenever the danger of warpage is slight. If the section is fairly light, an oil quench is satisfactory. If the section is very thin, an air cool will be sufficiently rapid.

When welding has been done with steels that do not contain columbium, it may be found that the metal adjacent to the weld will be more susceptible to corrosion than the metal that was not heated. This is a case of carbide precipitation and corrosion resistance can be restored by reheating the entire part to between 1950 and 2050 degrees Fahr., followed by quenching.

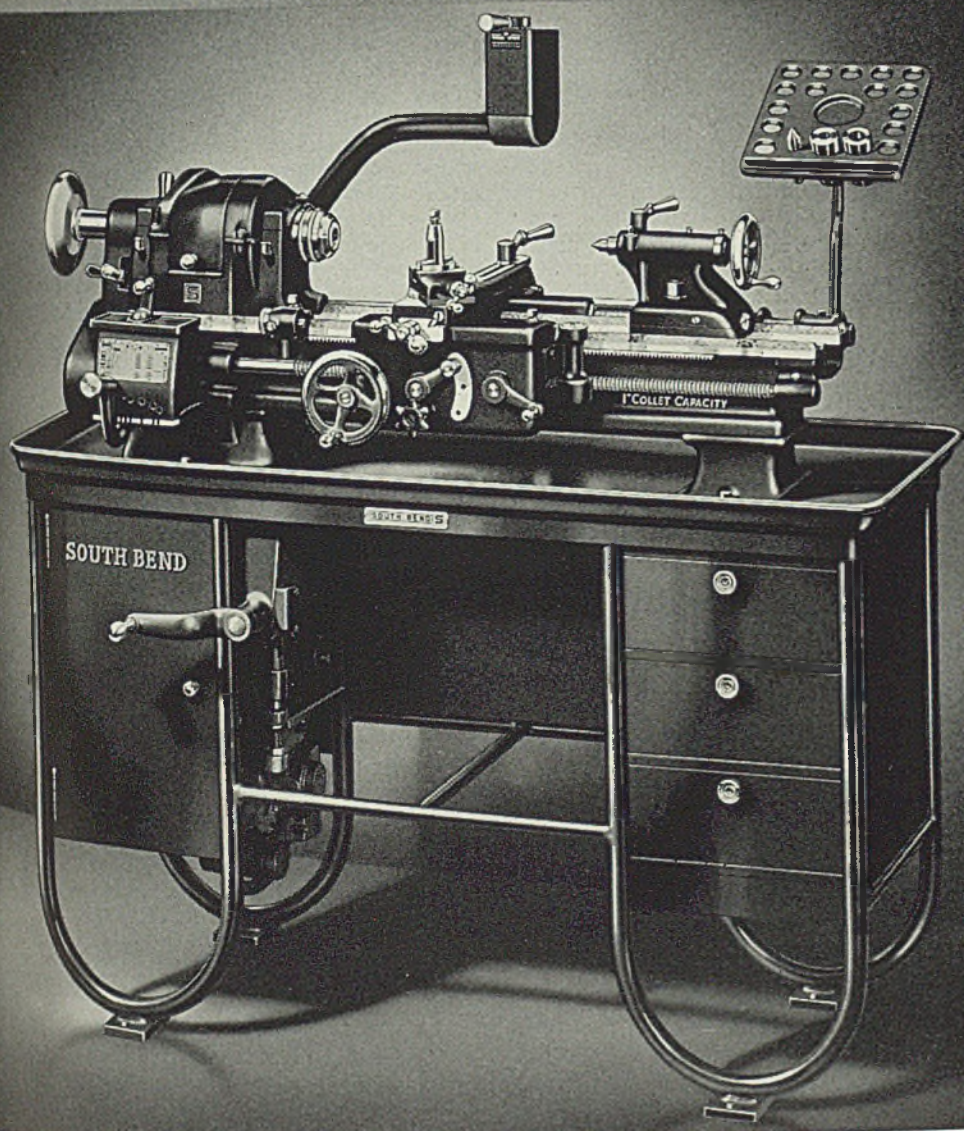
When the chromium is near the 17 per cent side of the range and the nickel near the 8 per cent side, the temperature for annealing is 1900 to 1950 degrees Fahr., followed by a quench. If the chromium and nickel are near the high side of the range, the temperature may be raised as high as 2050 degrees Fahr.

Intergranular corrosion may exhibit itself in other ways than just lower corrosion resistance. The condition may arise from a prolonged heat just under the annealing temperature or from a heat over the annealing temperature such as 2200 to 2400 degrees Fahr. Such metal will sound dead when struck; that is, it will not ring. Bending operations may develop many hair-line cracks, or in extreme cases the piece will break without any set taking place at all. Reheating to between 1900 and 1950 degree Fahr. and quenching will overcome these conditions.

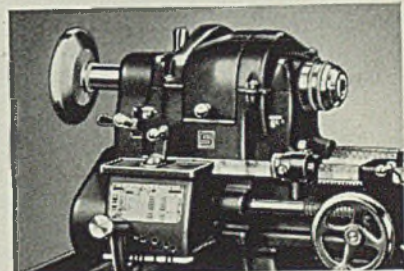
In deep drawing of stainless sheet, annealing after each pass will reduce splitting or tearing. Cold heading should be followed by an anneal. Annealing after any drastic deformation not only restores softness but increases corrosion resistance.

PRECISION

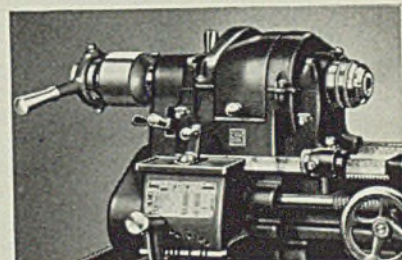
PLUS SPEED AND VERSATILITY



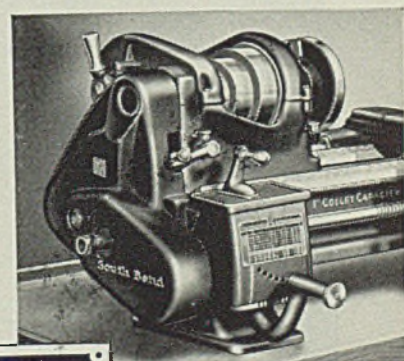
South Bend 10" Swing 1" Collet Capacity Precision Bench Lathe



Hand wheel type draw-in collet chuck for precision tool room work. Maximum collet capacity 1".



Hand lever draw-in collet chuck for rapid production operations. Maximum collet capacity 1".



Above, Headstock end of lathe showing Quick Change Gear Box. ★

Left, Index chart showing threads and feeds available through Gear Box.

PRECISION is the first essential in modern metal working industries. But speed is necessary also, for the efficient use of fast-cutting carbide tools—and versatility, to reduce set-up time to minimum. Precision, speed, and versatility are three of the many qualities responsible for the popularity of South Bend Lathes.

The 10" Swing, 1" Collet Capacity Precision Bench Lathe shown here is engineered for the most exacting classes of close-tolerance machine work. Direct belt drive to the carefully balanced spindle assembly provides a series of smooth, vibration-free speeds ranging from 50 to 1357 R.P.M. The full quick change gear makes any of 48 different threads and 48 different feeds instantly available.

10-INCH SOUTH BEND QUICK CHANGE GEAR LATHE									
SLIDING GEAR	TOP LEVER	THREADS PER INCH—FEEDS IN THOUSANDTHS							
IN	LEFT	4	4½	5	5½	6	6½	7	7½
	CENTER	8	9	10	11	11½	12	13	14
	RIGHT	16	18	20	22	23	24	26	28
OUT	LEFT	32	36	40	44	46	48	52	56
	CENTER	64	72	80	88	92	96	104	112
	RIGHT	128	144	160	176	184	192	208	224
		.0026	.0023	.0021	.0019	.0018	.0017	.0016	.0015

This combination of precision, speed and versatility assures an efficient output on tool room or manufacturing work—makes this lathe ideal for defense programs demanding top speed production. South Bend Lathes are made in 9", 10", 13", 14½", and 16" swing, manufacturing or tool room type, motor drive or countershaft drive. Write for catalog and name of nearest dealer.



SOUTH BEND LATHE WORKS

889 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

L A T H E B U I L D E R S S I N C E 1 9 0 6

SALT BATH FURNACE

uses new principle

■ "ELECTROTHERMIC - permeation" is said to improve a new internally heated electric salt bath furnace for any heating operation requiring temperatures between 300 and 2500 degrees Fahr. More uniform heat, reduced fuel costs, lower consumption of carburizing salts and a ceramic pot guaranteed for at least one year's operation are features, according to the Upton Electric Furnace Co., 2211 Grand River, Detroit.

Units are now available for carburizing, cyaniding, hardening of molybdenum and tungsten high speed steels, selective hardening, brazing, heating for forging, treating aluminum alloys, tool tipping, etc., in a range of sizes suitable for either batch or continuous operation.

Electrothermic-permeation principle takes its name from the fact the heat for the bath is generated throughout all the effective working space. Electrodes are installed outside of the normal working area in opposite corners but are so in-

clined that their lower ends tend to converge. The resulting concentration of current generates the greater amount of heat at the bottom of the pot, thus creating active thermal circulation throughout entire bath. Since the electrodes are inclined outward, the amount of heat generated decreases toward the top of the pot, because of the increasing distance between the electrodes. However, this diminishing value of current creates a carefully distributed volume of heat for maximum uniformity of heating.

Thus, even though a basket of small screw machine parts, for instance, may interfere with full circulation of heated salt from the bottom of the pot, evenly distributed current will generate compensating heat in the salt *among the parts*.

Approximately 80 per cent of the heat is generated at the bottom of the pot, where the electrode ends are close together. In the design, it will be noted, there is nothing

that endeavors to force the circulation of heated salt against its natural upward movement. This, together with wide electrode spacing eliminates the possibility of "super heated" areas which hasten deterioration of carburizing salts especially, so insuring more evenly distributed temperature.

As the basket must be suspended, this automatically prevents the work from being placed on the floor of the pot which would cut off the proper circulation of heated salt.

Ceramic brick pots are standard. This type increases pot life to such an extent that the company guarantees them for one year even on high speed steel and similar work requiring extreme temperatures. Two styles are furnished. The high temperature type has an inner lining of special alloy steel insulated on both sides with the interior of the pot itself being lined with two kinds of ceramic brick to withstand abrasion, thermal shock and corrosion, respectively. The exterior of the pot assembly is welded plate.

The low temperature pot, also guaranteed for at least one year, follows the same general design, but does not require the special alloy lining. Both types are built with the walls at such an angle as to best withstand the effects of expansion and contraction due to the range of temperatures involved.

The high thermal efficiency improves working conditions. Water cooled electrode bus bars and connectors increase efficiency by providing better conductivity and are so designed that the time required for electrode replacement does not exceed 5 minutes.

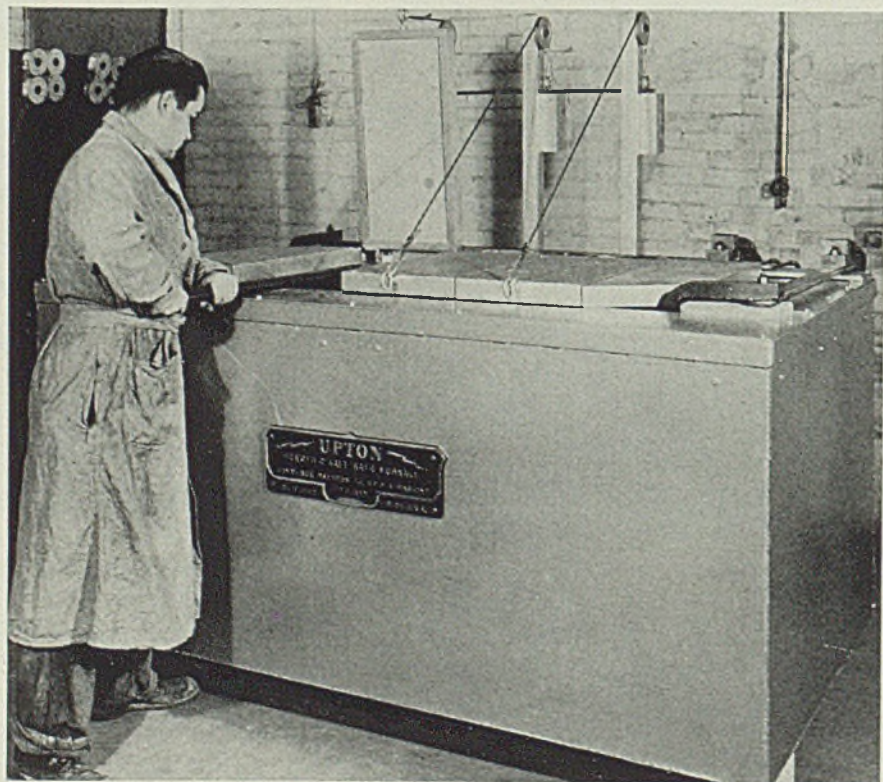
Substitutes Cone-Drive For "Worm" Designation

■ In the future, to eliminate misunderstandings, the designation of "worm gears" in connection with its double-enveloping cone-drive type of gearing is being dropped, by Michigan Tool Co., 7171 East McNicholas road, Detroit.

Technically, while the normally driving member of a cone-drive gear set has the same general shape, usually, as an hourglass worm, the gearing itself differs from worm gearing in the same proportion as worm gearing is differentiated from helical gears, the company states.

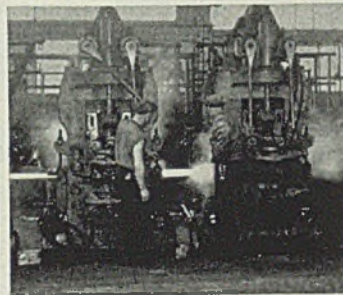
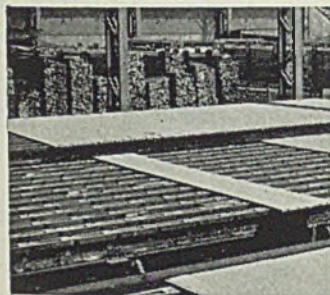
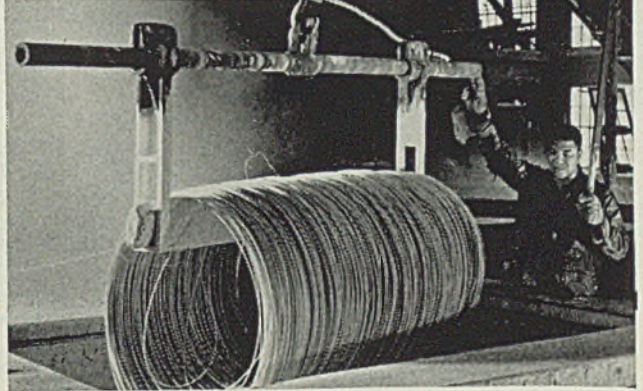
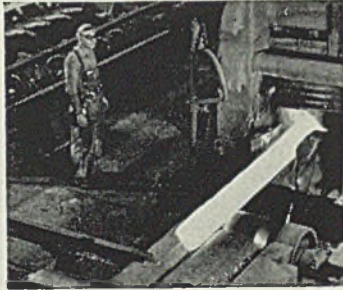
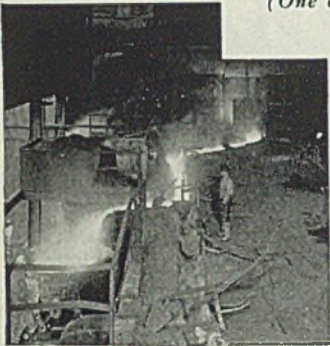
The differentiation, basically, it says, is helical gearing is "non-enveloping", worm gearing is "single-enveloping", while a cone-drive gear set is "double-enveloping"—both driving and driven members enveloping each other. Also in the future the "Cone Worm Gear Division" of Michigan Tool Co. will be known as the "Cone-Drive Division".

Single pot furnace for carburizing utilizes "electrothermic-permeation" principle



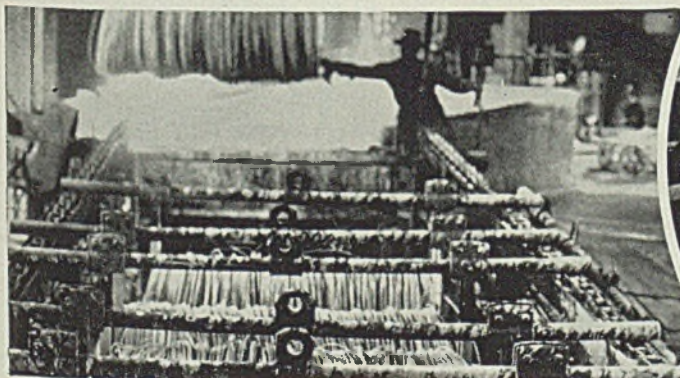
IT TAKES *"knowing how"* TO MAKE GOOD WIRE

(One of a series of advertisements illustrating the importance of quality control in the manufacture of American Quality Wires.)

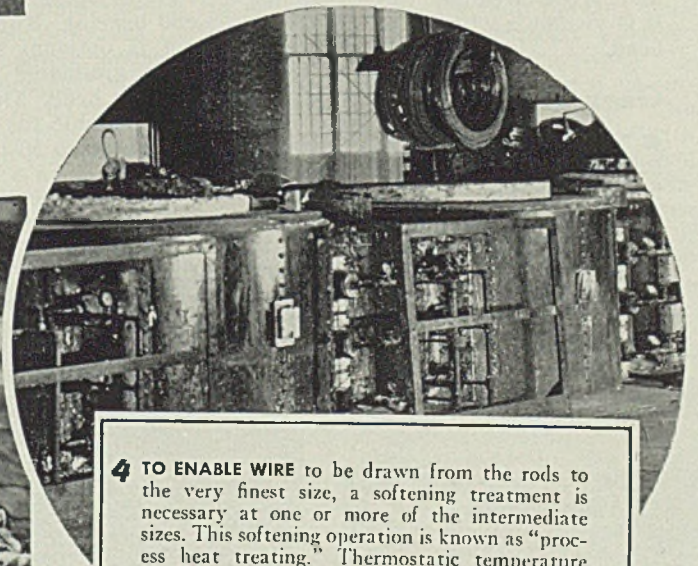


3 TO PROTECT and prepare the surface for subsequent drawing, the cleaned steel rods are coated with a solution of the best quality lime. Specially designed, modern bakers bake the lime on the rods, giving them the soft, silky coating which aids in the drafting of the wire. Exact temperatures in the bakers and careful control throughout this process are highly important.

1 BEGINNING WITH THE CAREFUL SELECTION of ores and other basic materials, the quality of American Wire is rigidly controlled in every processing and manufacturing step. "Knowing How" combines the knowledge of specially trained technical men, and the skill of experienced workers with the most modern equipment available.



2 ONE OF THE MANY IMPORTANT STEPS in wire manufacture is the cleaning of the hot rolled rods. At this stage, the dark oxide or natural protective coating of the rods must be carefully removed without injuring the metallic surface underneath. Careful control is exercised to guard against over-cleaning. "Knowing How" is your protection.



4 TO ENABLE WIRE to be drawn from the rods to the very finest size, a softening treatment is necessary at one or more of the intermediate sizes. This softening operation is known as "process heat treating." Thermostatic temperature regulation and control are necessary to secure the uniform softness required. American Quality Wire is heat treated under the guidance of experienced technical men, in the most modern equipment in the industry.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, Pacific Coast Distributors

United States Steel Export Company, New York

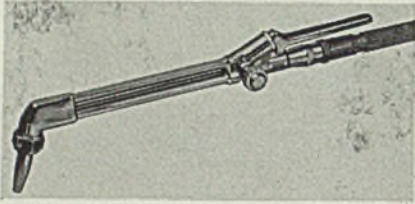
AMERICAN *Quality* WIRES
FOR MANUFACTURING PURPOSES



**UNITED
STATES
STEEL**

Cutting Attachment

■ National Cylinder Gas Co., 205 West Wacker drive, Chicago, has placed on the market a Rego KXA cutting attachment which because of its increased body length of 12 inches, plus an extra long high-pressure lever, provides better operating control and balance. It features a hard, nonwarping, forged alloy head which withstands terrific

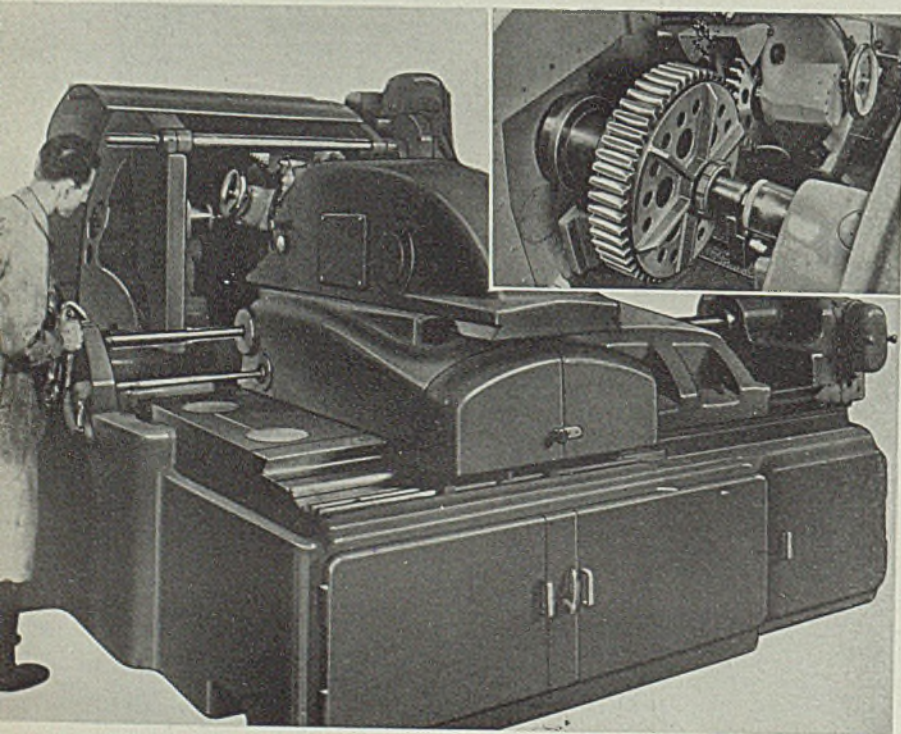


heat developed in heavy cutting. In addition, its oversize high-pressure oxygen tube maintains unrestricted flow of cutting gas stream. An easy-grip valve wheel is pressure fitted to the attachment's stem, the conical valve stem and seat design permitting accurate pre-heat flame adjustment. The attachment utilizes standard cutting tips and fits Rego SX, GX, LGX and XGX welding torch handles. It is available with a 75 or 90-degree head.

Gear Shaving Machine

■ National Broach & Machine Co., 5600 St. Jean avenue, Detroit, announces a new horizontal 36,000-pound Red Ring gear shaving machine for gears up to 36 inches in diameter, 2-inch pitch and having face widths up to 36 inches. Contrary to general practice, the cutting tool of this machine is driven

by the work gear. With the heavy work gear driving the cutter, the torque load between the cutter and the work gear is both constant and small. The cutter head is built for crossed axis settings and is provided with a sine bar adjustment. Reciprocation of cutter and work gear spindle speed is varied by changing pick off gears in the work head drive. An important feature of this machine is its ability to develop the eliptoid tooth form. Vehicle gears and aircraft gears, because of the high torque they transmit and the unavoidable flexibility of their mountings, are extremely vulnerable to the effects of end bearing. The amount of crowning is optional and can be varied by a graduated adjustment in the slidable head. The cutter head slide is adjustable for various center distances up to 50 inches. Its housing is mounted on a slide which carries it in a reciprocating motion parallel with the normal work gear axis. The head itself accommodates cutting tools of 7, 9 and 12 inches in diameter. The shaving machine is entirely automatic. Its action is under control of microflex timing

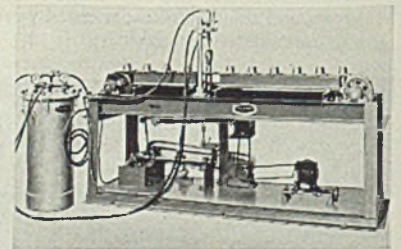


Industrial

units which, in turn, are controlled by elements on the electrical panel board in the base of the machine. When desired, the automatic feed can readily be disengaged and the machine operated manually. All sliding elements are force feed lubricated. A push-button control motor with limit switches opens and closes the splash plate.

Spray Equipment

■ Eclipse Air Brush Co., 400 Park avenue, Newark, N. J., has placed on the market spray equipment for coating the inside of trench mortar shell or other objects having a conical interior. The machine is entirely automatic except that the



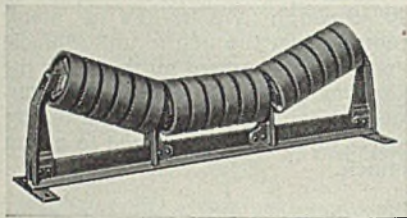
shell are put on and removed manually. The shell is placed in a holder on a chain belt; it is carried along until it comes up to an automatic spray gun where it is elevated on a special device that spins it as it fits over an extension nozzle attached to the automatic spray gun. The timing of the machine is arranged so that an even coating is obtained on the cone-like interior. The machine will not spray unless there is a shell in the holder. Rate of operation is 1000 per hour, using only 15 pounds pressure on the material and 20 pounds on the air.

Belt Conveyor Idler

■ Link-Belt Co., 307 North Michigan avenue, Chicago, announces a new, troughing type rubber-tread impact idler designed to absorb the shock of receiving heavy, lumpy, rough materials at the loading point. The cushioning effect of the rubber-to-rubber contact between belt and idler is said to prevent

Equipment

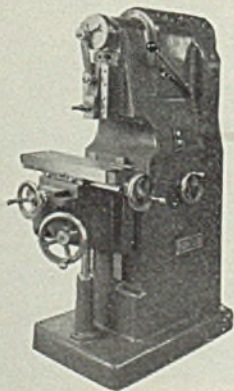
cutting, bruising, scuffing of belt; and protect the bearings and framework from shock. The idler also prevents less breakage of fragile material such as coke and friable



coal. It keeps the belt clean and prevents building up of material. It also withstands corrosion and abrasion. Molded rubber-tread rolls, 6 inches in diameter cushion the blows. These are firmly secured to a roller-bearing-equipped tube by set screws through malleable iron spacers. The idlers are available for belt widths of 14 to 48 inches. Larger diameter rolls can be supplied also, as well as rubber-tread impact rolls for flat-belt conveyor idlers.

Vertical Slotter

■ Hunter Engineering Co., Riverside, Calif., announces a new variable speed vertical slotter for die shop, tool room and general repair shop operation. It incorporates a

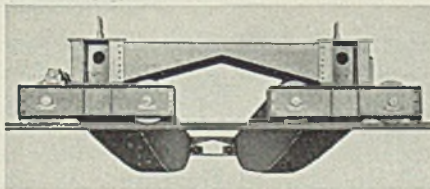


number of features that make it adaptable to a wide variety of machining operations. The work table is provided with longitudinal T-slots and is adjustable by hand feed in longitudinal and transverse direc-

tions and vertically. Maximum stroke of the ram which may be tilted either right or left through a 10-degree angle for cutting of tapered key-ways, etc., is 4½ inches. Its number of strokes per minute can be varied from 90 to 180. The clutch may be operated from either side of the machine. This makes it possible to stop the ram at any point. The machine measures only 63¾ x 38 x 48 inches.

Crane End Tie

■ Cleveland Crane & Engineering Co., Wickliffe, O., has developed a crane end tie of simple design for large heavy-capacity cranes of the type used for power houses and other services, requiring eight bridge track wheels. It is made of one heavy-rolled steel plate that is first cut to shape and then bent to form a box section. Welded reinforcing

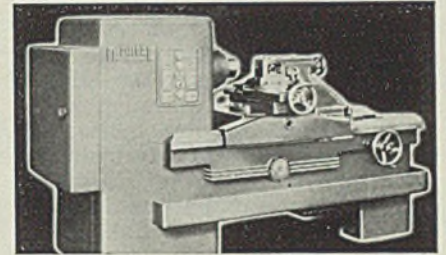


diaphragms are included in the box section to effect the rigidity required. Known as a "spring type" the end tie has sufficient give or spring to allow all wheels to bear properly on the track at all times, despite runway irregularities.

Cutter Relieving Machine

■ Michigan Tool Co., 7171 East McNichols road, Detroit, announces a new universal cutter relieving machine to speed the manufacture of rotary cutting tools. It is suitable for relieving form, gear and rack cutting tools, end milling cutters and spot facers with radial or side relief or both. It features a multiple range of forward and reverse speeds, turntable for cam slide, universal adjustable tool box for quick set-up, quick-interchangeable cams and provides lubrication from reservoirs equipped with inspection port-holes. The machine will handle work up to 8 inches in diameter,

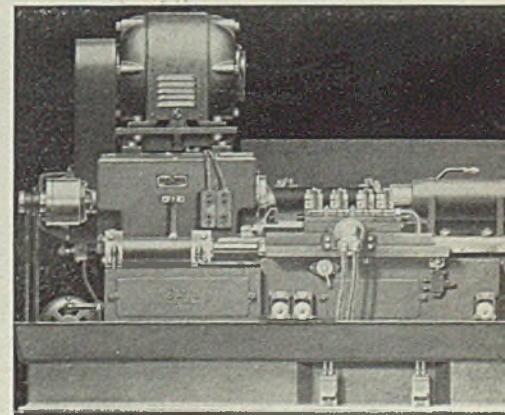
with a maximum length between centers of 24 inches. The number of teeth that can be relieved ranges from 1 to 24. Maximum relieving



stroke is ¾-inch. Speed changes are obtained through an electrical control. Two coupled reversible motors provide seven spindle speeds—four forward and three reverse.

Hydra-Feed Lathe for Finishing Shell

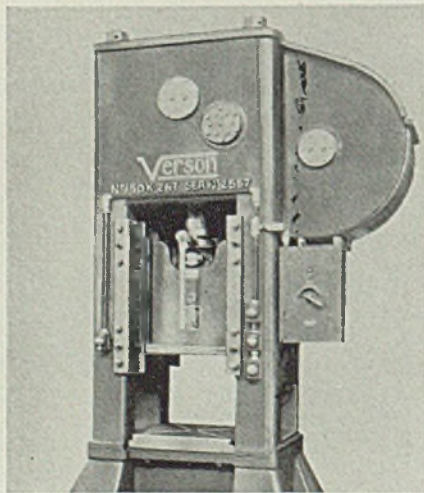
■ Sparks Machine Tool Corp., Norwalk, Conn., announces a semi-automatic hydra-feed lathe for rough and finish turning operations on 75 to 155 millimeter shell. It features a triple geared 4-speed headstock, the gear ratios of which obtain the cutting speed limits of the best quality tungsten-carbide tools. Further, the lathe can be equipped with a 3-speed motor through which 12 cutting speeds can be obtained. The lathe headstock is equipped with a hydraulically operated multiple disk clutch and brake which is synchronized with stop movements of the tools mounted on the carriage. It is controlled through hand-operated levers. Of conventional design, the lathe bed is V-shaped on the front, but has a flat way upon which the tailstock is mounted. The bed is 7 feet 6 inches long—of sufficient length to take between centers all sizes of shell from 75 to 155 millimeter inclusive and the new 8-inch shell. The lathe is supported by a heavy one piece reinforced welded steel base running the length of the bed. At the headstock it is extended to carry the hydraulic pump and motor in the pan. The deep chip pan also runs the length of lathe bed. The machine's carriage is held



down firmly to the Vs by a tapered brass gib—the latter being adjustable. Carriage slide takes slotted cams for contour and taper turning. The main cross slide on the carriage is moved transversely by a fluid motor attached to the front face of the carriage. The longitudinal movement is through a hydraulic cylinder mounted near the headstock. The back tool slide is adjustable for height and for parallel alignment through the center of the lathe. It enables full length work to be turned by longitudinal hydraulic feed the full length of the slide. Attached on the back of the tailstock is an integral outrigger bracket with adjustable slides. The tailstock spindle is of the live roller bearing center type with removable No. 5 Morse taper center. The clamping device here has a cam clamping movement. The lathe uses standard Vickers hydraulic feed, pump, motor and control mechanisms. All types of shell can be handled by the lathe's Logansport shell holding equipment. It includes both the chucks and expanding mandrels, and are attached to the spindle of the lathe. The chuck is operated by a rotating hydraulic cylinder connected to the main spindle and controlled by a foot treadle valve located on the floor in front of the lathe.

Knuckle Joint Press

■ Verson Allsteel Press Co., 1355 East Ninety-third street, Chicago, has placed on the market a new type knuckle joint press which provides long stroke and long adjustment without sacrificing the knuckle action. Available in a full range of tonnage, its frame is of fabricat-

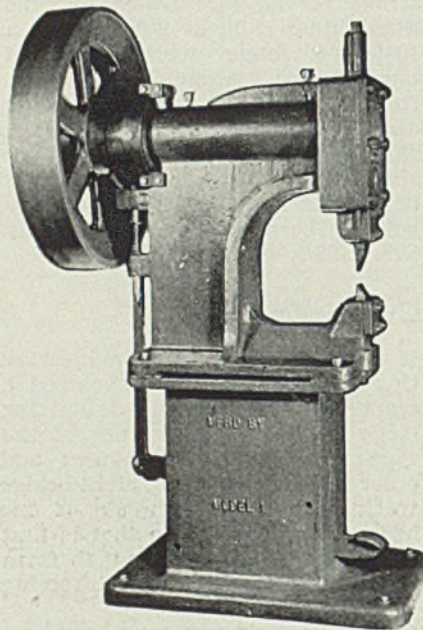


ed steel construction providing maximum stiffness with a high factor of safety. The unit illustrated has a capacity of 150 tons; a 5-inch stroke and a 5½-inch adjustment. Its bed area is 26 x 26 inches. The press operates at a speed of 50

strokes per minute. According to the company, various types of feeds can be adapted to this machine.

Power Sprue Cutters

■ Scully-Jones & Co., Foundry Division, 1901 South Rockwell street, Chicago, announces a new line of power sprue cutters as formerly supplied by Tessmer Machine & Tool Co., Detroit. The cutters are offered in the same size range as previously supplied, i.e., model H having

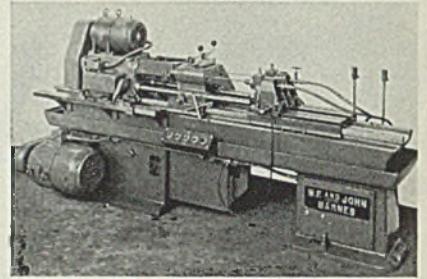


¾-inch capacity and model I 1¼-inch capacity. Quick deliveries can readily be made.

Rifle Barrel Driller

■ W. F. & John Barnes Co., Rockford, Ill., has placed on the market a new No. 410 driller for rifle barrel drilling and deep hole drilling of any parts which are diametrically balanced, such as cam and crankshafts, printing press rolls and boring bars. It features hydraulic actuation which enables the drill to feed through the last fraction of the cut instead of breaking through. This prevents excessive tool marks from vibration set up in gears and other mechanical feed actuations. The machine also has a thorough filtration system, preventing pump breakdowns. The tool shank is received by individual tool holders mounted on a common saddle. Each holder can be moved on individual ways to accommodate variations in tool length. Also the saddle carrying the two holders can be locked to the ways at different positions along the ways. The tool holder has a torque overload protector which automatically returns headstock to starting position should

torque pass a predetermined maximum safe value. A pilot-light on



the pushbutton panel indicates which tool is overloaded. The 2-spindle hydraulically actuated headstock is mounted on 10-inch ways. Each spindle is mounted in anti-friction bearings and driven directly through V-belts by a motor mounted on top of the unit. Spindle speeds are changed by replacing the sheaves and belts. Spindles are furnished with cup center to receive parts directly or arranged to mount chuck.

Tool Grinder

■ Carboloy Co. Inc., 11177 East Eight Mile road, Detroit, reports a new and larger carbide tool grinder of the double end type, designed so two operators can grind tools simultaneously. It is the largest in the company's line, and is designed for using two 14-inch disk wheels—one at either end. Each end also has its individually adjustable tool rest table. The grinder may thus be used for rough and finish grinding, or for rough and semifinish grinding before lapping. To facilitate handling large tools, tool rest tables are exceptionally large—9 x 22 inches. They are adjustable individually by screws operated through detachable crank handles, graduations being provided on the side of the table



to assure accurate setting. The tables also can be adjusted toward or away from the wheel through similar screws. Wheel guards move with the table brackets. Suction spouts are provided for connection to individual or centralized suction

COPPER ALLOY BULLETIN

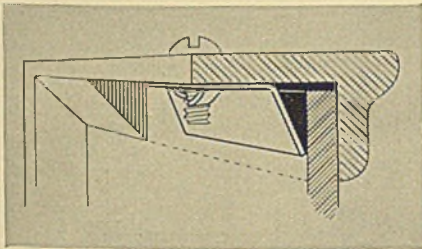
REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" Headquarters for BRASS, BRONZE and COPPER

Bridgeport Phosphor Bronze Gives Lasting Spring to Speed Nuts

Tinnerman "Speed Nuts" and "Speed Clips" grip bolts, screws, rivets and studs in a two-fold spring tension lock. Over a billion of them are in use because they prevent loosening from vibration and they often permit important savings in assembly time.

Several shapes and sizes of these highly useful fasteners are fabricated from Bridgeport New Phosphor Bronze. This unusually tough, resilient and corrosion-resistant Bridgeport alloy assures a lasting liveliness and very high tensile strength in these and many other spring parts used by hundreds of industries.



"Speed Nuts," made of strong, resilient and corrosion-resistant Bridgeport New Phosphor Bronze, are used (above) as one-piece wedges for gripping panel against frame.

Memos on Brass—No. 21

Brass is used so extensively not only because of its corrosion resistance, ductility and admirable beauty, but also for its great strength. High brass sheet, for example, when annealed has an average tensile strength of 45,000 lbs. per sq. inch; and as 4 Nos. B & S Hard, it possesses an average tensile strength of 87,000 lbs. per sq. inch.

Bridgeport Offers New Welding Rod Handbook



Practical, up-to-the-minute information on selection and use of bronze welding alloys is offered to anyone who wishes a copy of "Bronze Welding Alloys." This useful, illustrated handbook may be had without charge by addressing Bridgeport Brass Company.

Skilled Metallurgical Assistance Aids Fabricators in Defense Work

Bridgeport's Research Facilities and Experience Helpful in Change-Over to Different Alloys or Production Processes

Under conditions of defense production, many fabricators are confronted with the problem of converting normal production materials and methods to meet the demands of the new type of work. Such a change-over frequently introduces manufacturing problems that the fabricator may not have previously encountered. For example, special articles, cartridge cases, time fuses and ammunition require the use of different alloys with physical characteristics of a nature that may not be familiar to most manufacturers. The desired shapes may require a different sequence of manufacturing operations, and may make special precautions necessary in fabrication. A different temper may be needed in the alloy as supplied by the brass mill. If severe cold working is involved, additional anneals may be necessary in the fabricator's plant, in order to restore the ductility of the metal for subsequent forming operations.

Specialized Metallurgical Knowledge

In order to solve these new problems as efficiently and economically as possible, the fabricator often finds it desirable to supplement his own experience by availing himself of the specialized metallurgical knowledge of his brass supplier. This expert assistance—always an important phase of Bridgeport's service to fabricators—is of special value at the present time to fabricators who are

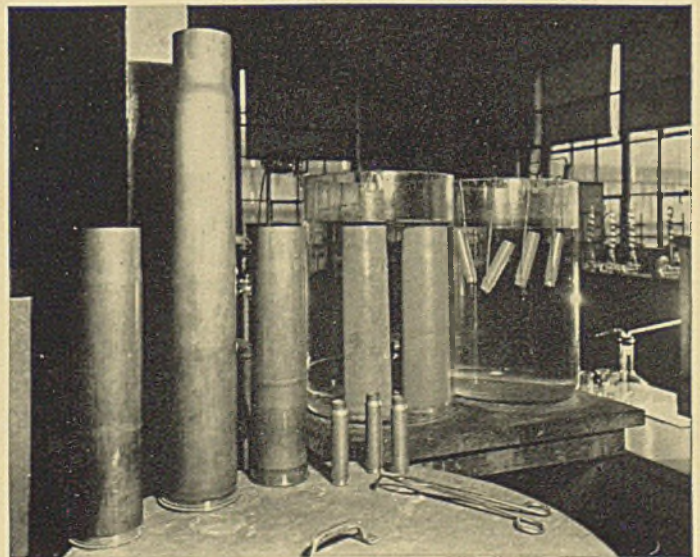
planning to undertake the production of defense parts.

With their broad knowledge of the characteristics of the various copper alloys, and of their suitability for different types of forming operations, Bridgeport metallurgists can offer valuable assistance to customers in the selection of the correct alloy and temper for fast, accurate production. Careful control of temper at the brass mill is especially important to assure the best balance between ease of forming and other necessary properties. At Bridgeport, precision manufacturing processes permit extremely close control of composition, dimensions, and temper of copper alloys. Moreover, the metallurgical laboratories exercise close supervision of production, and check each run for adherence to original specifications.

Research Facilities

In addition to assisting in the correct selection of the alloy and temper, Bridgeport can frequently assist customers in determining desirable sequences of forming operations, necessity of intermediate anneals, and other factors essential in successful production control and for research in new alloys and fabrication problems, and the services of the research staff are equipped to assist customers. Customers undertaking defense production requiring brass or copper are invited to discuss their requirements with Bridgeport.

"Mercury testing" of the metal in cartridge and shell cases at the laboratories of Bridgeport Brass Company.



COPPER ALLOY BULLETIN

THINGS TO KNOW ABOUT DEFENSE PRODUCTION

(The Alloys of Copper column is omitted this month in order to present this helpful information on factors involved in defense production.)

With more and more brass and copper being diverted for defense use, many manufacturers of brass goods are rapidly turning their plants over to the manufacture of defense items. Fabricators who contemplate taking on contracts for defense work should first contact the local OPM office, if there is one at hand, for information on the kind of items needed by the government, specifications, types of equipment, etc.

The local Army Ordnance Department should also be contacted for information as to methods of manufacture, specifications, and other relevant points. Both the local Ordnance Department and any of the arsenals are in a position to supply layouts showing the various manufacturing steps. This, of course, applies to standard items, but not to new developments. If there are no local OPM or Army Ordnance offices, manufacturers should write to Service and Information Office, Room 1060, Department of Commerce, Washington, D. C., for the necessary information on defense work.

Information on Navy requirements may be obtained from the Bureau of Accounts and Supplies in Washington.

Higher Standard of Manufacture

Manufacturers are cautioned that standards for government items are usually higher than for civilian use. Each part must meet definite specifications for gage, physical properties, and in some cases actual service tests, before acceptance by the government. Samples for test purposes should be included in the estimate, as they are part of the cost. Employees should be impressed with the need for higher standards.

Since articles made for the government are accepted only after approval by an inspector, it is naturally to be expected that a certain percentage will not pass. Since it is possible to reclaim material that does not pass inspection, the best practice is to run full gage, so that there is a possibility of repairing products to pass a second inspection. If the material is under-gage, it is generally impossible to reclaim it.

Estimates and Quotations

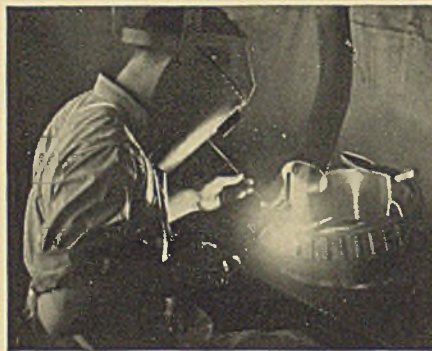
Before making definite commitments on price and delivery, the manufacturer should

High-Strength Joints With Bronze Welding

When joints of high strength must be made in copper and copper alloys, bronze welding offers an ideal solution.

Copper and silicon bronze are adaptable to the bronze welding process. In the case of copper, it is advisable to use deoxidized copper and to employ a welding rod that includes a deoxidizing agent, such as Bridgeport's No. 1232 Silicon Bronze, No. 813 Silicon Bronze, and Phosphor Bronze.

For welding silicon bronzes such as Duronze*, Bridgeport's No. 1232 Silicon Bronze Rod has the advantage of being of the same composition as the alloy being welded.



A typical application of bronze welding is the fabrication of the bronze cages for roller bearings at the plant of Bantam Bearings Corporation.

make sure that he can (1) obtain raw materials; (2) purchase the equipment; (3) build the tools. Many suppliers of raw materials are over-sold, and are not in a position to fill orders promptly, as high priority ratings are essential for satisfactory deliveries. Delays may be encountered in purchasing machinery, and many tool shops are also over-sold. Moreover, operations are sometimes so severe that tools do not stand up as long as expected. It is therefore necessary to allow more than normal time in making promises for delivery.

Before the material can be passed for payment, several weeks generally elapse during testing, with the result that a large inventory is built up and large storage facilities are needed. Capital is tied up also, as payment is withheld until the material passes all tests. Since labor and material costs may change during the filling of the order, the contracts should contain an escalator clause to provide for necessary adjustments.

NEW DEVELOPMENTS

A welding gas economizer, made especially for use with light torches, shuts off the gas-supply lines when the torch is suspended from the lever arm. Flow is said to resume at pre-adjusted rates when torch is removed from the arm. A pilot light re-ignites the flame. (No. 220)

Felt for machine ways is impregnated with a synthetic material that is reported to make the felt tear-resistant, to add to tensile strength and hardness, and to prevent linting. (No. 221)

A marking machine for tubes, couplings, shells and other cylindrical work has capacity of 10 to 40 pieces per minute and handles 1/4 to 6 inch diameters, it is stated. (No. 222)

A foot switch with phosphor bronze spring is reported to be guaranteed by the maker for 40,000 operations per year. It is said to break the circuit instantly when the foot is raised; is moisture and dust proof, and oil resistant; and is adaptable to all types of machines. (No. 223)

A plating solution filter has wide spacer rings between throw-away filter discs. Designed with one purpose in view, the purification of plating liquids, the apparatus is said to have improved construction. It comes in a variety of sizes. (No. 224)

Plating controls of temperature in plating baths have been developed, with direct control of water circulated through pipe coils or water jackets. This is reported to be an improvement over the method of indirect control of the circulating water from the temperature of the plating solution. (No. 225)

A vertical optical comparator is said to give highly accurate checking of small objects which can be laid directly on the glass stage. The enlarged shadow of the contour can be compared with an outline on the screen. (No. 226)

A releasing-type tap holder for hand screw machines and turret lathes is reported to have effected savings in set-up time, to eliminate bushings and to require only one wrench. (No. 227)

Industrial telescopes to inspect internal surfaces, recesses and hidden contours, are now available with highly corrected lenses and excellent lighting systems for varied needs, it is announced. (No. 228)

A portable carriage is reported to ease and speed the transportation of motors, tools and machines within the plant. Its construction enables workmen to wheel awkward equipment, not previously considered portable, direct to the location of a job. (No. 229)

Coating lacquer to protect natural or plated metal surfaces is announced. Colorless, the new material is said to dry quickly to a high luster and provide excellent adhesion, flexibility and abrasion-resistance qualities. It is reported to resist sulphur dioxide, sunlight, moisture, oil, grease, gasoline and fumes. (No. 230)

This column lists items manufactured or developed by many different sources. Further information on any of them may be obtained by writing Bridgeport Brass Company, which will gladly refer readers to the manufacturer or other source.

PRODUCTS OF THE BRIDGEPORT BRASS COMPANY

Executive Offices: BRIDGEPORT, CONN.—Branch Offices and Warehouses in Principal Cities

SHEETS, ROLLS, STRIPS—Brass, bronze, copper, Duronze,* for stamping, deep drawing, forming and spinning.

CONDENSER, HEAT EXCHANGER, SUGAR TUBES—For steam surface condensers, heat exchangers, oil refineries, and process industries.

PHONO-ELECTRIC* ALLOYS—High-strength bronze trolley, messenger wire and cable.

WELDING ROD—For repairing cast iron and steel, fabricating silicon bronze tanks.

LEDRITE ROD*—For making automatic screw machine products.

COPPER WATER TUBE—For plumbing, heating, underground piping.

DURONZE ALLOYS—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware; hot rolled sheets for tanks, boilers, heaters, flues, ducts, flashings.

BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite" for plumbing, underground and industrial services.



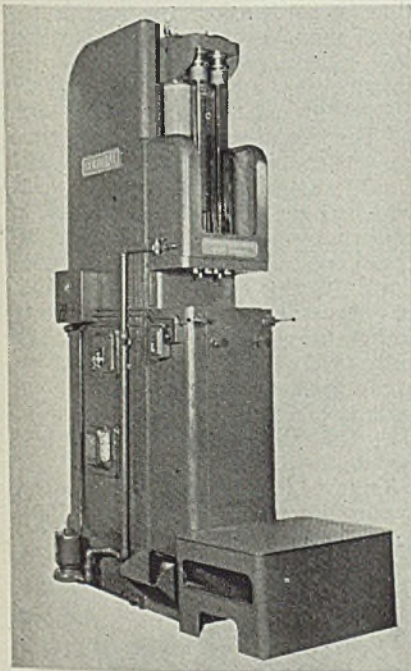
Established 1865

BRIDGEPORT BRASS

systems. Buttons for interlocking start, stop and reversing switches are located on the front of the base, being accessible from either side. The grinder is powered by an enclosed 2-horsepower fan-cooled motor. Drive belt adjustment to the 1350-revolution per minute spindle is made by positioning the motor hinge plate. The machine's spindle height is 42 inches.

Broaching Machines

■ Colonial Broach Co., 147 Jos. Campau, Detroit, is offering a complete new standard line of pull-up broaching machines in models ranging from 6 to 25 tons capacity and from 36 to 60-inch stroke. Each machine in the line provides completely automatic handling of the broach. The machine platen and



puller brackets on all units are unusually large, providing ample space for pulling two or more broaches at one time. Provision also is made for mounting spiral broach drive heads when mechanical means of rotating the broach is required to machine spiral splines. Automatic handling is obtained through use of hydraulic handling mechanisms. All machines also are equipped with heavy duty, large volume coolant pumps and suitable oil level gages.

Aircraft Arc Welder

■ Lincoln Electric Co., 12818 Coit road, Cleveland, has introduced a new arc welding machine designed particularly for airplane welding. Feature which adapts it specifically for aircraft work is its system of welding current and voltage control, permitting settings essential for

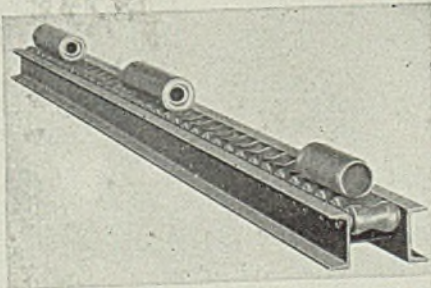
welding the particular analyses and gages of metal employed. The control, "Dual continuous control," permits independent adjustment of both welding current and voltage



to obtain just the right type and intensity of welding arc for the particular application. Adjustable in a continuous sequence of fine increments, it avoids the compromise settings of conventional controls which sacrifice welding speed or weld quality. The unit delivers 10 amperes at the arc without extra attachments—its range also adapts it for heavy materials. The new welder is of motor-generator single-operator variable-voltage type with laminated pole pieces. Connections are readily accessible for either 220 or 440 volts, (also supplied for 550 volts or special voltages) 3 or 2-phase. Occupying less than 4 square feet of floor space, it is of arc welded steel drip-proof construction, and is fitted with four steel feet welded to the base and drilled for bolting. The welder is available in two models, 150 and 200-ampere sizes, either portable or stationary. Current range for the 150-ampere model is 10 to 200 amperes and for the 200-ampere model 10 to 250 amperes.

Concave Roller Conveyor

■ Standard Conveyor Co., North St. Paul, Minn., announces a concave roller conveyor for handling shell between machine operations or cylindrical objects up to 6 inches

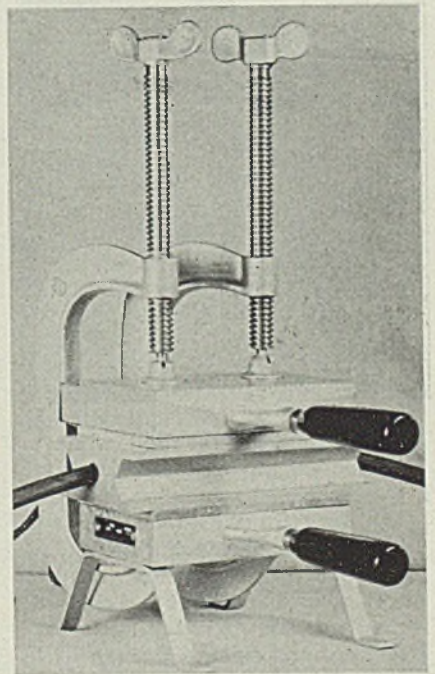


in diameter. Its rollers are formed from 2¼-inch No. 10 gage tubing and their ends are reduced in size and reamed to form a seat for

the bearings without any separate hubs or cages. Hexagon through shafts serve to lock the bearing to the shaft and the shaft in the frame. This prevents turning and undue wear and insures uniformity at roller carrying surface even after long service.

Industrial Vulcanizer

■ Shaler Co., Waupun, Wis., has introduced an improved industrial vulcanizer for use in replacing rubber insulation where cables are spliced or where insulation has become damaged. It has interchangeable mold blocks to accommodate various size cables, and models are available for splicing round or flat rubber belts (up to 5 inches) all being electrically heated and furnished with appropriate attaching



cord and plug for connection to ordinary 110-120-volt electrical circuits.

Drafting Machine

■ Frederick Post Co., Box 803, Chicago, Ill., has developed a new True Line drafting machine which prevents smudging and blurring caused by moving instruments over the drawing. It embodies a protractor, vernier, T-square, scales and flat angles in addition to "Quick Flick" controls. The latter enables a flick of the thumb to release location of scales to desired position.

Design of the machine permits the use of the instrument with the elbow to the left or right. The protractor may be used at any angle in the complete circle so that the total area of the board is made accessible. All parts subject to wear are of hardened steel.



Major benefits resulted when this lumber yard made the simple, practical hoist installation shown. The problem was moving cut lengths and mill lengths into and out of second story storage. At first, an ordinary hoist and chain sling was considered to replace former hand method. But it was feared stock damage and danger from poorly balanced loads would increase.

This device eliminated those factors and still met requirements. Fewer men were needed and stock reached customers faster and in better condition than ever before.

Because low cost, tailored, installations like this are a specialty of ours, we would enjoy suggesting answers to some of your materials handling problems.

READING CHAIN & BLOCK CORP.
DEPT. 38 READING, PA.

READING

Chain Hoists, Electric Hoists,
Cranes and Monorails

Tool Maintenance

(Concluded from Page 69)

are made in the tool section. Records are kept of the standard tool designs and blueprints in book form are available at all times in the toolmaking sections. Special tools are designed from which master tools are made and then scheduled to the toolmaking departments.

All orders originate from the tool office and they pass along to the various operations in accordance to the work required. On standard tools, orders are placed for as many units as possible so that they can be made in groups and thus reduce the cost per tool.

The general sequence of operations in the toolmaking and maintenance departments is as follows:

Tool office for checking and issuing of department orders; tool steel stock room where parts are cut off and planed; planning bench where material is placed with order and released for the following operations: Solid dies; facing for length; drilling, reaming and countersinking; broaching in hydraulic press; miller and shaper work; bench for stamping; inspection; heat treating; grinding; inspection; open dies; squaring and shaping to length; drilling, reaming and countersinking; broaching; milling and shaping to form; bench for stamping; remainder of operations as on solid dies.

Miscellaneous dies, cutters and tools including special items are scheduled in accordance with the operations required. The operations listed above are on tools at the Lamson & Session Co.'s West Eighty-fifth street plant. However, many special tools also are made

at this plant for the company's Chicago and Birmingham, Ala., plants. Tools made for all three plants include such items as solid and open dies for cold headers, grip jaws for all types of machines, pointing tools, trimming dies and punches, roll threading dies, and the like.

Suggested Methods for Running a Machine Shop

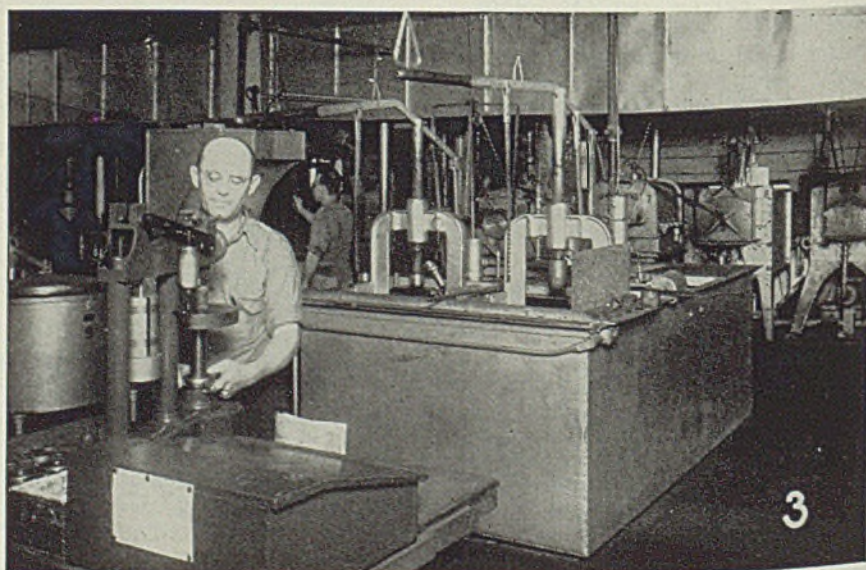
■ *Running a Machine Shop*, by Fred H. Colvin and Frank A. Stanley; cloth, 449 pages, 6 x 9 inches; published by McGraw-Hill Book Co., New York, for \$3.50.

Long experience both in the shop and in close contact with shops of many kinds and in many localities have made the authors familiar with problems that present themselves to shop managers in general. As a result they have gained the opinion that, regardless of the size of the shop, many problems that confront the manager are practically the same.

The information and suggestions in the volume have come from varied sources in both large and small shops. Plans and methods which have proved successful in one shop may fail in another because of entirely different conditions. In any case it will probably be necessary to adapt the ideas rather than to adopt them in their entirety. It is in the hope of assisting in the solution of the many problems involved in running a machine shop that the volume has been prepared.

Some of the chapters are devoted to planning a shop, equipment, transport and materials handling, toolrooms and cribs, estimating, apprenticeship and training, management, personnel relations and inspection systems.

Fig. 3—Tool work employs its own heat-treating department, part of which is shown here. At left is a special hardening jib for cold header dies



3

STEEL

Spent Pickle Liquor

(Concluded from Page 67)

low but for which no return is or can be expected as is the case of alkaline neutralization and then dumping; further, the former processes are complete, and they do, one and for all time, overcome the pollution problem.

If these reclamation processes were to be adopted by every manufacturer who had waste acid to dispose of then a problem of paramount importance would arise in connection with the economical disposal of the vast quantities of ferrous sulphate which would be produced. The steel industry alone could produce in a week or two sufficient copperas to supply the world's consumption for many years, providing the market remained as it is today.

Some, but only a minute fraction, could be disposed of to the photographic industry, for water purification and fertilizers. Some to the leather and textile industries and to the paint industries. Pigment bases would absorb a further small fraction, but a majority would have to be converted into fresh acid, for which a large market is already available.

Machine Guns

(Concluded from page 58)

conducted by instructors who devote one hour each day to classroom work and the rest of the time to supervision of the men in the shop.

In the classroom, the men learn machine construction and functions of controls, care of machines, use of tools and fixtures, relation of machine gun parts and of machining operations to each other, care and use of gages, and rules of safety. Maximum period of training is not expected to exceed three months, although it will vary according to individual aptitude.

Adopt Straight-Line System

As far as possible, departments are organized on a straight-line flow of material basis which is standard practice in automotive plants. Raw material—steel bars, rods, forgings, etc.—enters the plant at one side, traverses machine lines across the plant to assembly on the opposite side. In some departments this procedure cannot be followed since certain machines have to perform several operations. Practice in such cases is to operate the machine on one part for a period, then change over when a thousand or so partially machined pieces of a second part have accumulated. The changeover process, and in fact all special work and maintenance, is

done by set-up men or job-setters. All the operator needs to do is to keep the machine running, know how to use his gages on the finished piece, and keep the machine supplied with stock.

From the personnel standpoint, an interesting angle is that there are now on the payroll about a dozen young men from Father Flanagan's Boystown school in Nebraska, who were trained there and have proved to be excellent operators considering their age, so good in fact that another group of boys who will leave the school this summer has already been signed up for

jobs on machines at Saginaw.

In charge of the machine gun operations at Saginaw are Alva W. Phelps, general manager of the Steering Gear Division; O. W. Habel, factory manager; John C. Helveston, general superintendent, and R. V. Keck, superintendent of the machine gun plant.

Note:—Captions appearing on pages 54 and 56 of this article were inadvertently twisted. Illustration 2 is described in caption labeled "Fig. 5." Similarly, cut 3 is described in caption 6, cut 4 in caption 2, cut 5 in caption 4, cut 6 in caption 3. Other references are correct.

Effective Lubrication Guarantees Continuous Production

Oils all drip and leak, so escape from bearings. When bearings run dry, power is wasted and production slowed up.

NON-FLUID OIL furnishes constant, dependable lubrication at low cost, because it stays on the job instead of running off like oil.

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MODERN STEEL MILL LUBRICANT

Better Lubrication at Less Cost per Month

Arc Welding

(Concluded from Page 60)

As an economic factor such results are important and particularly so at the present time when production and above all speed of production are so vital. High-speed production involves numerous factors, none of which is complicated, all of which are important. Speeding up production and reducing costs requires study of the following factors:

1—The inherent position of a joint (flat, vertical, horizontal, overhead) where the part cannot be

moved about or rotated; the effect which position has on welding costs and speed of production.

2—Where work may be moved or rotated, the effect of such movement and of the selection of electrode for the particular position in which the welding is done. This is in addition to study of joints as outlined above.

3—Fitup, which is really joint assembly. This requires cutting to dimensions with an accuracy in line with performance requirements and costs. It is important that close, accurate fitup be obtained for economical welding.

4—Electrodes, number of beads,

types of electrodes. These are items of considerable importance in producing low-cost welded products.

5—To make a joint it is necessary that the edges of the plate be suitably prepared. What is the lowest cost joint in view of edge preparation?

6—Structures are made up of small parts, subassemblies, assemblies. What sequence of operations should be followed and what is the effect of these on layout of the work and the routing through the shop. This is largely production control. Here the flexibility of welding permits accurate and easy control of production because of ease of assembly of parts, yet there are certain principles that can be followed to advantage in setting up the working sequence.

7—The final checking of an assembly, or inspection as it is usually called, does not differ greatly in welded construction from other methods of fabrication. Welding is easily inspected and supervised. There is no excuse for a poor weld. The substantiation of this fact requires certain methods be devised and followed. These methods are simple and easy.

8—Welding is usually a manual process but there are cases where automatic welding should be used for most economical results. When to change to automatic requires study of several factors. These will be considered and discussed.

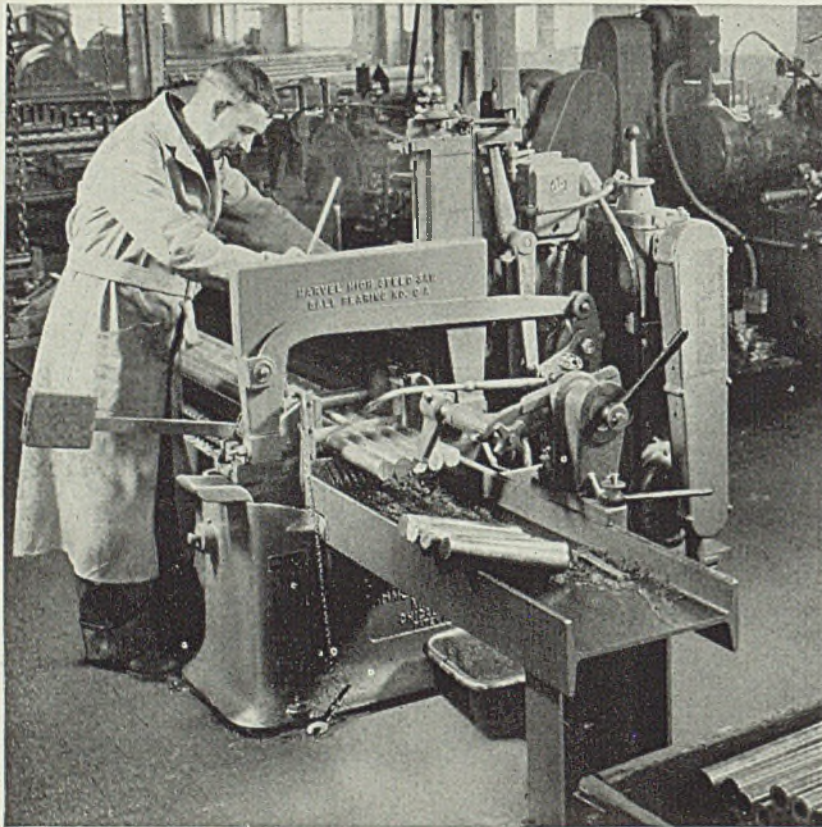
The series will indicate information, methods, data, along the outlines above to enable fabricators to obtain low-cost high-speed production in all types of arc welding operations. It is planned to have these articles appear in every other issue of STEEL during the next few months.

Atmosphere Control In Heat Treating

■ *Industrial Controlled Atmospheres*, by Norbert K. Koebel; cloth, 71 pages, 6¼ x 9¼ inches; published by Lindberg Engineering Co., Chicago, for \$1.

The basis of material in this volume was a study by the author of commercially available atmosphere control methods, covering more than a year, for the purpose of determining which type should be used in a new heat treating department. The author also has used some data obtained in his research at Battelle Memorial Institute.

The weight change method for checking for loss or gain of carbon has provided a useful method of quantitative appraisal. By this method it is possible to compare directly one atmosphere with another and obtain accurate information as to relative effects and efficiencies.



MARVEL 9A (capacity 10"x1C") Cutting-off shafts at the Monarch Machine Tool Co.

Fine Machine Tool Builders

Know their Machine Tools!

When the Monarch Machine Tool Co., builders of Monarch Precision Lathes, needed another cutting-off machine, they chose a MARVEL 9A Production Saw . . . one of MARVEL'S new heavy-duty, all-ball-bearing sawing machines with automatic bar push up. These are the fastest saws built—will cut-off more pieces, floor-to-floor, from single or nested bars than can be cut-off by any other method.



ARMSTRONG-BLUM MFG. CO. "The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N. Y.

Continuous Schedule

Revisions Hurt Steel

New priority rulings, unexpected orders for Britain and constant uncertainties handicap. Hot weather slows production. Scrap still acute.

■ FREQUENT revisions in rolling schedules, made necessary by the great growth of priority ratings, have become one of the great handicaps of steel manufacturers—that and lack of raw materials, notably scrap. Makers barely get launched on one course of action when a new ruling by a government body, or a flood of new priorities, causes revisions of order books and schedules and makes for loss of time. However it is recognized that this is unavoidable in view of the rapid changing of the world situation.

As one example of uneconomical rolling practices of the past week was the case of 17-inch strip being rolled on a 43-inch mill, whereas 30-inch strip would have been the more logical. Moreover the recent hot spell has interfered with orderly production, the number of heat prostrations among steelmakers having been exceptionally large, despite the modern precautions of salt tablets, shower baths and generally better working conditions.

New priority rulings and regulations come out each week, typical of which was one listing hospitals as among the favored in getting priorities. There still remain users of steel, obviously entitled to priority ratings, who are yet to receive them.

The industry expects further cuts in production because of shortage of scrap. Drastic measures will be taken to collect scrap, among the possibilities being scrapping of more "jalopies" and perhaps a public collection of ferrous materials in the style of aluminum collections. The latter may prove less practical than aluminum because of the greater bulk per value.

Many in the steel trade express desire for governmental allocations of steel to relieve steelmakers themselves of this onerous task. It is particularly distressing to refuse old customers merely because they do not possess priority ratings.

New unexpected demands for steel from Britain contribute to unsettling of production schedules. Last week another inquiry for 1,000,000 tons of semifinished steel arrived here and is being studied at Washington for allocation, this being in addition to a like quantity ordered within the past 30 days.

Cross movements in steel scrap are wide and varied, reflecting the unusual situation in that market. Though Detroit has been loud in complaint of shortage, cargoes

from there have been shipped to Buffalo. Moreover scrap from Duluth passed Detroit on way to Buffalo. Again scrap from the eastern end of the New York barge canal has gone through Buffalo for Canada.

Unofficial tests of public scrap collections have been made in a few instances. Employees of the American Rolling Mill Co. at Middletown, O., collected 260 tons of scrap in 48 hours.

Shortage of scrap last week was a contributing factor in causing at least two midwestern open hearth furnaces to be retired for repairs earlier than would otherwise be the case.

Purchasing of locomotives continues brisk, with at least 35 bought last week, of which 20 were for the Southern Railway and subsidiaries. One of the larger pending plate tonnages involves 3600 tons for six oil storage tanks at South Portland, Me., in connection with the new oil line from there to Montreal.

Makers of refractory bricks are quoting prices and naming possible deliveries for four new proposed blast furnaces in connection with the program for expanding pig iron capacity. However, refractory makers are booking orders faster than production or shipments and the supply is tight.

On top of heavy exports of tin plate and canned goods come reports of record crops in this country which will cause above normal plate consumption.

Prices of wrought washers are higher again and new extras on track bolts have been issued following the recent raise in price.

Scheduled automobile production for last week was 62,146, down 43,489, a seasonal decline, comparing with 17,373 for the corresponding 1940 week.

The general operating rate for the country has increased 1½ points to 98½ per cent. Advances were as follows: Chicago 1 point to 101 per cent, New England, 3 points to 88 and Cincinnati 6 points to 91½. Detroit declined 1 point to 87, Buffalo 2½ to 90½. Unchanged were the following: Pittsburgh at 100, eastern Pennsylvania at 95½, Wheeling at 93, Cleveland at 96, Birmingham at 90, St. Louis at 98 and Youngstown at 98.

STEEL'S three composite price groups for last week were unchanged: iron and steel at \$38.15, finished steel at \$56.60 and steelworks scrap at \$19.16.

Demand

Is now preponderantly for defense; for civilians less.

Prices

Wrought washers advance. New extras on track bolts.

Production

Up 1½ points to 98½.

COMPOSITE MARKET AVERAGES

	Aug. 2	July 26	July 19	One Month Ago July, 1941	Three Months Ago May, 1941	One Year Ago Aug., 1940	Five Years Ago Aug., 1936
Iron and Steel	\$38.15	\$38.15	\$38.15	\$38.15	\$38.15	\$37.70	\$33.88
Finished Steel	56.60	56.60	56.60	56.60	56.60	56.60	53.40
Steelworks Scrap	19.16	19.16	19.16	19.16	19.16	18.71	14.66

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material	Aug. 2,	July	May	Aug.	Pig Iron	Aug. 2,	July	May	Aug.
	1941	1941	1941	1940		1941	1941	1941	1940
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c	Bessemer, del. Pittsburgh	\$25.34	\$25.34	\$25.34	\$24.34
Steel bars, Chicago	2.15	2.15	2.15	2.15	Basic, Valley	23.50	23.50	23.50	22.50
Steel bars, Philadelphia	2.47	2.47	2.47	2.47	Basic, eastern, del. Philadelphia	25.34	25.34	25.34	24.34
Shapes, Pittsburgh	2.10	2.10	2.10	2.10	No. 2 fdry., del. Pgh., N.&S. Slides	24.69	24.69	24.69	23.69
Shapes, Philadelphia	2.215	2.215	2.215	2.215	No. 2 foundry, Chicago	24.00	24.00	24.00	23.00
Shapes, Chicago	2.10	2.10	2.10	2.10	Southern No. 2, Birmingham	20.38	20.38	20.38	19.38
Plates, Pittsburgh	2.10	2.10	2.10	2.10	Southern No. 2, del. Cincinnati	24.06	24.06	24.06	23.06
Plates, Philadelphia	2.15	2.15	2.15	2.15	No. 2X, del. Phila. (differ. av.)	26.215	26.215	26.215	25.215
Plates, Chicago	2.10	2.10	2.10	2.10	Malleable, Valley	24.00	24.00	24.00	23.00
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10	Malleable, Chicago	24.00	24.00	24.00	23.00
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05	Lake Sup., charcoal, del. Chicago	31.34	31.34	31.09	30.34
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50	Gray forge, del. Pittsburgh	24.19	24.19	24.19	23.17
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10	Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	125.33
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05					
Sheets, No. 24 galv. Gary	3.50	3.50	3.50	3.50	Scrap				
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60	Heavy melting steel, Pitts.	\$20.00	\$20.00	\$20.00	\$18.75
Tin plate, per base box, Pitts.	\$5.00	\$5.00	\$5.00	\$5.00	Heavy melt. steel, No. 2, E. Pa.	17.75	17.75	17.75	18.35
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55	Heavy melting steel, Chicago	18.75	18.75	18.75	18.10
					Rails for rolling, Chicago	22.25	22.25	22.25	22.00
					No. 1 Cast, Chicago	20.00	21.50	21.50	16.75
					Coke				
					Connellsville, furnace, ovens	\$6.25	\$6.25	\$5.70	\$4.75
					Connellsville, foundry, ovens	7.25	7.25	6.30	5.75
					Chicago, by-product fdry., del.	12.25	12.25	12.25	11.25

Semifinished Material

Sheet bars, Pittsburgh, Chicago	\$34.00	\$34.00	\$34.00	\$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to 2-inch, Pitts.	2.00	2.00	2.00	2.00

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheets, Strip

Hot-Rolled Sheets	
Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base	2.10c
Granite City base	2.20c
Detroit, del.	2.20c
Pacific ports	2.65c

Cold-Rolled Sheets	
Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base	3.05c
Granite City, base	3.15c
Detroit, del.	3.15c
Pacific ports	3.70c

Galvanized Sheets, No. 24	
Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base	3.50c
Granite City, base	3.60c
Pacific ports	4.05c

Corrugated Galv. Sheets	
Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square	3.31c

Culvert Sheets	
Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy	3.60c
Copper iron	3.90c
Pure iron	3.95c
Zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh	4.25c

Enameling Sheets	
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 10 gage, base	2.75c
Granite City, base	2.85c

Pacific ports	3.40c
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 20 gage, base	3.35c
Granite City, base	3.45c
Pacific ports	4.00c

Electrical Sheets, No. 24	
Base Deliv. Mahon	3.45c

Hot-Rolled Strip	
Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 1 ton and over, 12 inches wide and less	2.10c
Detroit, del.	2.20c
Pacific ports	2.75c

Cold-Rolled Strip	
Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less	2.80c
Chicago, base	2.90c
Worcester, base	3.00c
Detroit, del.	2.90c

Commodity C.R. Strip	
Pittsburgh, Cleveland, Youngstown, base 3 tons and over	2.95c
Chicago, base	3.05c
Worcester, base	3.35c

Chromium-Nickel Steels

Pittsburgh base, cents per lb.

	No.	302	303	304	20% Clad
Bars	24.00	26.00	25.00	18.00	19.00
Plates	27.00	29.00	29.00	18.00	19.00
Sheets	34.00	36.00	36.00	19.00	23.50
H. R. strip	21.50	27.00	23.50	28.00	33.00
C. R. strip	28.00	33.00	30.00		

Straight Chromium Steels

Pittsburgh base, cents per lb.

	No.	410	416	430	442	445
Bars	18.50	19.00	19.00	22.50	27.50	30.50
Plates	21.50	22.00	22.00	25.50	30.50	36.50
Sheets	26.50	27.00	29.00	32.50	35.00	35.00
H. R. Strip	17.00	18.25	17.50	24.00	22.00	22.50
C. R. strip	22.00	23.50	32.00	52.00		

*Includes annealing and pickling.

Cold-Finished Spring Steel	
Pittsburgh, Cleveland, base; add \$4 for Worcester	
.26-.50 Carbon	2.80c
.51-.75 Carbon	4.30c
.76-1.00 Carbon	6.15c
Over 1.00 Carbon	8.35c

Tin, Terne Plate	
Tin Plate	
Pittsburgh, Chicago, Gary, 100-lb. base box	\$5.00
Granite City	\$5.10
Tin Mill Black Plate	
Pittsburgh, Chicago, Gary, base 29 gage and lighter	3.05c
Granite City	3.15c
Pacific ports, boxed	4.05c

Long Ternes	
Pittsburgh, Chicago, Gary, No. 24 unassorted	3.80c

Manufacturing Ternes	
Pittsburgh, Chicago, Gary, 100-base box	\$4.30
Granite City	\$4.40

Roofing Ternes	
Pittsburgh base per package 112 sheets 20 x 28 in., coating I.C.	
8-lb.	\$12.00
15-lb.	14.00
20-lb.	15.00

Steel Plate	
Pittsburgh	2.10c
New York, del.	2.29c-2.54c
Philadelphia, del.	2.15c
Boston, delivered	2.42c-2.57c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c-2.35c

Sparrows Point, Md.	2.10c-2.35c
Claymont, Del.	2.10c-2.35c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast ports	2.65c
Steel Floor Plates	
Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	4.00c

Structural Shapes	
Pittsburgh	2.10c
Philadelphia, del.	2.21 1/2 c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast ports	2.75c

Bars	
Hot-Rolled Carbon Bars	
Pittsburgh, Chicago, Gary, Cleve., Birm., base 20 tons one size	2.15c
Detroit, del.	2.25c
New York, del.	2.49c
Duluth, base	2.25c
Philadelphia, del.	2.47c
Gulf ports, dock	2.50c
All-rail	2.59c
Pac. ports, dock	2.80c
All-rail	3.25c
Rail Steel Bars	
Pitts., Chicago, Gary, Cleveland, Birm., base 5 tons	2.15c
Detroit, del.	2.25c
New York, del.	2.49c
Philadelphia, del.	2.47c
Gulf ports, dock	2.50c
All-rail	2.59c
Pac. ports, dock	2.80c
All-rail	3.25c

Hot-Rolled Alloy Bars	
Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size	2.70c
Detroit	2.80c
Alloy	
S.A.E. Diff.	S.A.E. Diff.
2000	0.35 3100 0.70
2100	0.75 3200 1.35
2300	1.70 3300 3.80
2500	2.55 3400 3.20
4100	15-25 Mo. 0.55
4600	0.20-0.30 Mo.; 1.50-2.00 Ni. 1.20
5100	80-1.10 Cr. 0.45
5100	Spr. flats 0.15
6100	Bars 1.20
6100	Spr. flats 0.85
Carb., Van.	0.85
9200	Spr. flats 0.15
9200	Spr. rounds, squares 0.40
T 1300, Mn, mean 1.51-2.00	0.10
Do., carbon under 0.20 max.	0.35

Cold-Finished Carbon Bars	
Pitts., Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs.	2.65c
Detroit	2.70c
Cold-Finished Alloy Bars	
Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c	3.45c
Detroit	3.45c
Galveston, add \$0.25; Pacific Coast, \$0.50.	
Turned, Ground Shafting	
Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras)	2.65c
Detroit	2.70c

Reinforcing Bars (New Billet)	
Pittsburgh, Chicago, Gary, Cleveland, Birm., Sparrows Point, Buffalo, Youngstown, base	2.15c
Gulf ports, dock	2.59c
All-rail	2.59c
Pacific ports, dock	2.80c
All-rail	3.25c
Detroit, del.	2.25c
Philadelphia, com. del.	3.06-3.50c
Pittsburgh, muck bar	5.00c
Pittsburgh, staybolt	8.00c
Terre Haute com., f.o.b. mill	2.15c

rows Point, Buffalo, Youngstown, base	2.15c
Gulf ports, dock	2.59c
All-rail	2.59c
Pacific ports, dock	2.80c
All-rail	3.25c
Detroit, del.	2.25c
Reinforcing Bars (Rail Steel)	
Pittsburgh, Chicago, Gary, Cleveland, Birm., base	2.15c
Gulf ports, dock	2.59c
All-rail	2.59c
Pacific ports, dock	2.80c
All-rail	3.25c
Detroit, del.	2.25c
Iron Bars	
Philadelphia, com. del.	3.06-3.50c
Pittsburgh, muck bar	5.00c
Pittsburgh, staybolt	8.00c
Terre Haute com., f.o.b. mill	2.15c

Wire Products	
Pitts.-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads Standard and cement coated wire nails	
(Per Pound)	\$2.55
Polished fence staples	2.55c
Annealed fence wire	3.05c
Galv. fence wire	3.40c
Woven wire fencing (base C. L. column)	67
Single loop bale ties, (base C.L. column)	59
Galv. barbed wire, 80-rod spools, base column	70
Twisted barbless wire, column	70
To Manufacturing Trade	
Base, Pitts.-Cleve.-Chicago Birmingham (except spring wire)	
Bright bess., basic wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c
Worcester, Mass., \$2 higher on bright basic and spring wire.	

Cut Nails	
Carload, Pittsburgh, keg	\$3.85
Alloy Plates (Hot)	
Pittsburgh, Chicago, Coatesville, Pa.	3.50c

Rails, Fastenings	
(Gross Tons)	
Standard rails, mill	\$40.00
Relay rails, Pittsburgh 20-100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	\$40.00
Do., rerolling quality	39.00
Cents per pound	
Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.75c
Do., heat treated	5.00c
Car axles forged, Pitts., Chicago, Birmingham	3.15c
Tie plates, base	2.15c
Base, light rails 25 to 60 lbs., 20 lbs., up \$2; 16 lbs., up \$4; 12 lbs., up \$8; 8 lbs., up \$10. Base railroad spikes 200 kegs or more; base plates 20 tons.	

Bolts and Nuts	
F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.	
Carriage and Machine	
1/2 x 6 and smaller	65 1/2 off
Do., 3/4 and 1/2 x 6-in. and shorter	63 1/2 off
Do., 3/4 to 1 x 6-in. and shorter	61 off
1 1/2 and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Stove Bolts	
In packages with nuts separate	
71-10 off; with nuts attached	

71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.	
Step bolts	56 off
Plow bolts	65 off
Nuts	
Semifinished hex. U.S.S. S.A.E.	
1/2-inch and less	62 64
3/4-1-inch	59 60
1 1/4-1 1/2-inch	57 58
1 1/2 and larger	56
Hexagon Cap Screws	
Upset 1-in., smaller	64 off
Square Head Set Screws	
Upset, 1-in., smaller	71 off
Headless set screws	60 off

Piling	
Pitts., Chgo., Buffalo	2.40c

Rivets, Washers	
F.o.b. Pitts., Cleve., Chgo., Bham.	
Structural	3.75c
1/2 inch and under	65-5 off
Wrought washers, Pitts., Chl., Phila., to jobbers and large nut. bolt mfrs. l.c.l.	\$4.00 off

Tool Steels	
Pittsburgh base, cents per lb.	
Carb. Std. 10.50	Oil-hard- ening 24.00
Carb. Reg. 14.00	High car.-chr. 43.00
Carb. Ext. 18.00	
Carb. Spec. 22.00	
High Speed Tool Steels	
Tung. Chr. Van. Moly.	
18.00 4 1	67.00
18.00 4 2	77.00
18.00 4 3	87.00
1.50 4 1	8.50
..... 4 2	8
5.50-6.00 4	1.50 4-5.50 57.50

Boiler Tubes	
Carloads minimum wall seamless steel boiler tubes, cut-lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.	
Lap Welded	
Sizes	Gage Steel Char-coal Iron
1 1/2" O.D.	13 \$ 9.72 \$23.71
1 3/4" O.D.	13 11.06 22.93
2" O.D.	13 12.38 19.35
2 1/4" O.D.	13 13.79 21.68
2 1/2" O.D.	12 15.16
2 3/4" O.D.	12 16.58 26.57
3" O.D.	12 17.54 29.00
3 1/2" O.D.	11 18.35 31.36
4" O.D.	11 23.15 39.81
4 1/2" O.D.	10 28.66 49.90
5" O.D.	9 44.25 73.93
6" O.D.	7 68.14

Welded Iron, Steel, Pipe	
Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2 1/2 and 1 1/2 less, respectively. Wrought pipe, Pittsburgh base.	
Butt Weld Steel	
In.	Blk. Galv.
1/2	63 1/2 51
3/4	66 1/2 55
1-3	68 1/2 57 1/2
Iron	
3/4	30 10
1-1 1/2	34 16
1 1/2	38 18 1/2
2	37 1/2 18
Lap Weld Steel	
2	61 49 1/2
2 1/2-3	64 52 1/2
3 1/2-6	66 54 1/2
7 and 8	65 52 1/2
Iron	
2	30 1/2 12
2 1/2-3 1/2	31 1/2 14 1/2

4	33 1/2	18
4 1/2-8	32 1/2	17
9-12	28 1/2	12
Line Pipe, Plain Ends Steel		
1 to 3, butt weld	71 1/2	
2, lap weld	64	
2 1/2 to 3, lap weld	67	
3 1/2 to 6, lap weld	69	
7 and 8, lap weld	68	
Seamless, 3 pts. lower discount		

Cast Iron Pipe	
Class B Pipe—Per Net Ton	
6-in., & over, Birm.	\$45.00-46.00
4-in., Birmingham	48.00-49.00
4-in., Chicago	56.80-57.80
6-in. & over, Chicago	53.80-54.80
6-in. & over, east fdy.	49.00
Do., 4-in.	52.00
Class A Pipe \$3 over Class B Stnd. ftgs., Birm., base \$100.00.	

Semifinished Steel	
Rerolling Billets, Slabs (Gross Tons)	
Pittsburgh, Chicago, Gary, Cleve., Buffalo, Youngs., Birm., Sparrows Point	\$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00
Forging Quality Billets	
Pitts., Chl., Gary, Cleve., Young, Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars	
Pitts., Cleveland, Youngs., Sparrows Point Buffalo, Canton, Chicago	\$4.00
Detroit, delivered	36.00
Wire Rods	
Pitts., Cleveland, Chicago, Birmingham No. 5 to 1/2-inch incl. (per 100 lbs.)	\$2.00
Do., over 1/2 to 1 1/4-inch incl.	2.15
Worcester up \$0.10; Galveston up \$0.25; Pacific Coast up \$0.50.	

Skelp	
Pitts., Chl., Youngstown, Coatesville, Sparrows Pt.	1.90c
Shell Steel	
Pittsburgh, Chicago, base, 1000 tons of one size, open hearth	
3-12-inch	\$52.00
12-18-inch	54.00
18-inch and over	56.00

Coke	
Price Per Net Ton	
Beehive Ovens	
Connellsville, fur.	\$6.00- 6.25
Connellsville, fdry.	7.00- 7.50
Connell prem. fdry.	7.25- 7.60
New River fdry.	8.00- 8.25
Wise county fdry.	7.50
Wise county fur.	6.50

By-Product Foundry	
Newark, N. J., del.	12.60-13.05
Chicago, outside del.	11.50
Chicago, delivered	12.25
Terre Haute, del.	11.75
Millwaukee, ovens.	12.25
New England, del.	13.75
St. Louis, del.	12.25
Birmingham, ovens.	8.50
Indianapolis, del.	12.00
Cincinnati, del.	11.75
Cleveland, del.	12.30
Buffalo, del.	12.50
Detroit, del.	12.25
Philadelphia, del.	12.38

Coke By-Products	
Spot, gal., freight allowed east of Omaha	
Pure and 90% benzol	14.00c
Toluol, two degree	27.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c
Per lb. f.o.b. Frankford and St. Louis	
Phenol (less than 1000 lbs.)	14.25c
Do. (1000 lbs. or over)	13.25c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbis. to jobbers	7.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	\$30.00

Pig Iron

No. 2 foundry is 1.75-2.25 sil.; 50c diff. for each 0.25 sil. above 2.25 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	\$25.00	\$25.50	\$24.50	\$26.00
Birmingham, Ala.	20.38	.....	19.38	25.00
Birdsboro, Pa.	25.00	25.50	24.50	26.00
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.	25.00	25.50	24.50	26.00
Granite City, Ill.	24.00	24.00	23.50	24.50
Hamilton, O.	24.00	24.00	23.50	.....
Neville Island, Pa.	24.00	24.00	23.50	24.50
Provo, Utah	22.00	.....	.....	.....
Sharpsville, Pa.	24.00	24.00	23.50	24.50
Sparrow's 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
	24.50	24.50	24.50	25.00

Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:	25.39	25.39	24.89	25.89
Akron, O., from Cleveland	25.39	.....	25.11	.....
Baltimore from Birmingham	25.61	.....	.....	.....
Boston from Birmingham	25.12	.....	.....	.....
Boston from Everett, Mass.	25.50	26.00	25.00	26.50
Boston from Buffalo	25.50	26.00	25.00	26.50
Brooklyn, N. Y., from Bethlehem	27.50	28.00	.....	.....
Canton, O. from Cleveland	25.39	25.39	24.89	25.89
Chicago from Birmingham	24.22	.....	.....	.....
Cincinnati from Hamilton, O.	24.44	25.11	24.61	.....
Cincinnati from Birmingham	24.06	.....	23.06	.....
Cleveland from Birmingham	24.12	.....	23.12	.....
Mansfield, O., from Toledo, O.	25.94	25.94	25.44	.....
Milwaukee from Chicago	25.10	25.10	24.60	25.60
Muskegon, Mich., from Chicago, Toledo or Detroit	27.19	27.19	.....	.....
Newark, N. J., from Birmingham	26.15	.....	.....	.....
Newark, N. J., from Bethlehem	26.53	27.03	.....	.....
Philadelphia from Birmingham	25.46	.....	24.96	.....
Philadelphia from Swedeland, Pa.	25.84	26.34	25.34	.....
Pittsburgh dist.: Add to Neville Island base, North and South Sides, 69c; McKees Rocks, 55c; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, 84c; Monessen, Monongahela City, \$1.07; Oakmont, Verona, \$1.11; Brackenridge, \$1.24.	.....	.....	.....	.....

	No. 2 Fdry.	Malleable	Basic	Bessemer
Saginaw, Mich., from Detroit	26.31	26.31	25.81	26.81
St. Louis, northern	.....	24.50	24.00	.....
St. Louis from Birmingham	24.50	.....	23.62	.....
St. Paul from Duluth	26.63	26.63	.....	27.13
†Over 0.70 phos.	.....	.....	.....	.....

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., \$29.50, base; \$30.74 delivered Philadelphia.

Gray Forge	Charcoal
Valley furnace	\$23.50 Lake Superior fur. \$28.00
Pitts. dist. fur.	23.50 do., del. Chicago. 31.34
	Lyles, Tenn., high phos. 28.50

Silvery

Jackson county, O., base, 6.00 to 6.50 per cent \$29.50. Add 50 cents for each additional 0.25 per cent of silicon. Buffalo base \$1.25 higher.

Bessemer Ferrosilicon

Jackson county, O., base; Prices are the same as for silveries, plus \$1 a ton. Manganese differentials in silvery iron and ferrosilicon not to exceed 50 cents per 0.50 per cent manganese in excess of 1 per cent.

Refractories

Per 1000 f.o.b. Works, Net Prices	Ladle Brick (Pa., O., W. Va., Mo.)
	Dry press \$31.00
	Wire cut 29.00
	Magnesite
	Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk 22.00
	net ton, bags 26.00
	Basic Brick
	Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa. Chrome brick \$54.00
	Chem. bonded chrome... 54.00
	Magnesite brick 76.00
	Chem. bonded magnesite 65.00
	Fluorspar
	Washed gravel, duty pd., tide, net ton \$25.00-\$26.00
	Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail. 21.00
	Do. barge 21.00
	No. 2 lump 21.00
	Fire Clay Brick
	<i>Super Quality</i>
	Pa., Mo., Ky. \$64.60
	<i>First Quality</i>
	Pa., Ill., Md., Mo., Ky. 51.30
	Alabama, Georgia 51.30
	New Jersey 56.00
	<i>Second Quality</i>
	Pa., Ill., Ky., Md., Mo. 46.55
	Georgia, Alabama 38.00
	New Jersey 49.00
	Ohio
	First quality 43.00
	Intermediate 36.10
	Second quality 36.00
	Malleable Bung Brick
	All bases \$59.85
	Silica Brick
	Pennsylvania \$51.30
	Joliet, E. Chicago 58.90
	Birmingham, Ala. 51.30

Ferroalloy Prices

Ferromanganese, 78-82%,	Do., ton lots 11.75c	Ferro-carbon-titanium, 15-18%,	tl., 6-8% carb., carlots, contr., net ton. \$142.50	Silicon Metal, 1% iron,	contract, carlots, 2 x 1/4-in., lb. 14.50c
Carlots, duty paid, sbd. \$120.00	Do., less-ton lots 12.00c	Do., spot 145.00	Do., contract, ton lots 145.00	Do., 2% 13.00c	Spot 1/4c higher
Carlots, del. Pitts. 125.33	less than 200 lb. lots. 12.25c	Do., spot, ton lots ... 150.00	Do., spot, ton lots ... 150.00	Silicon Briquets, contract	carloads, bulk, freight allowed, ton \$74.50
Carlots, f.o.b. Southern furn. 145.00	67-72% low carbon:	Do., contract, ton lots 160.00	Do., contract, ton lots 160.00	Do., ton lots 84.50	Less-ton lots, lb. 4.00c
For ton lots add \$10, for less-than-ton lots \$13.50, for less than 200-lb. lots \$18.	2% carb. 17.50c 18.25c 18.75c	Do., spot, ton lots ... 165.00	Do., spot, ton lots ... 165.00	Less 200 lb. lots, lb. 4.25c	Spot 1/4-cent higher
Spiegelisen, 19-21% dom.	1% carb. 18.50c 19.25c 19.75c	Alsifer, contract carlots,	f.o.b. Niagara Falls, lb. 7.50c	Manganese Briquets, contract	carloads, bulk, freight allowed, lb. 5.50c
Palmerton, Pa., spot. 36.00	0.10% carb. 20.50c 21.25c 21.75c	Do., ton lots 8.00c	Do., less-ton lots 8.50c	Do., ton lots 6.00c	Less-ton lots 6.25c
Ferrosilicon, 50%, freight allowed, c.l. 74.50	0.20% carb. 19.50c 20.25c 20.75c	Spot 1/4c higher	Spot 1/4c lb. higher	Spot 1/4c higher	
Do., ton lot 87.00	Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95	Chromium Oxide, lb.	contract, freight allowed, lb. carlots, bulk 7.00c	Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton 102.50	Do., ton 108.00
Do., 75 per cent 135.00	Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80	Do., ton lots 7.50c	Do., less-ton lots 7.75c	Do., ton 108.00	
Do., ton lots 151.00	Spot 5c higher	Do., less-ton lots 8.00c	Do., less 200 lbs. 8.00c	35-40%, contract, carloads, lb., alloy 14.00c	Do., ton lots 15.00c
Silicomanganese, c.l., 2% per cent carbon 118.00	Molybdenum Oxide, lb.	Spot 1/4c lb. higher	Spot 1/4c lb. higher	Do., less-ton lots 16.00c	Spot 1/4c higher
1 1/2% carbon 128.00	Molyb. cont., 5-20-lb. containers, f. o. b., Washington, Pa., lb. 0.80	Chromium Pentoxide, contract, lb. contained \$1.10	Do., spot 1.15	Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. 2.75	Do., under 100-lb. lots 3.00
Contract ton price \$12.50 higher; spot \$5 over contract.	Ferrotitanium, 40-45%, lb., con. tl., f.o.b. Niagara Falls, ton lots ... \$1.23	Chromium Metal, 98% cr., contract, lb. con. chrome, ton lots 80.00c	Do., spot 85.00c	Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c	
Ferrotungsten, stand., lb. con. del. cars 1.90-2.00	Do., less-ton lots 1.25	Tungsten Metal Powder, 98-99 per cent, per lb., depending upon quantity \$2.50-2.60			
Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90	20-25% carbon, 0.10 max., ton lots, lb. 1.35				
Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, \$3 unitage, 58.50; electric furn., per ton, c. l., 23-26% f.o.b. Mt. Pleasant, Tenn., 24% \$3 unitage 75.00	Do., less-ton lots 1.40				
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c	Spot 5c higher				
	Ferrocolumbium, 50-60% contract, lb. con. col., f.o.b. Niagara Falls ... \$2.25				
	Do., less-ton lots 2.30				
	Spot is 10c higher				
	Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill. 0.80				

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets			Cold Rolled Strip	Cold Drawn Bars		
							Hot Rolled	Cold Rolled	Galv. No. 24		Carbon	S.A.E. 2300	S.A.E. 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.48	5.11	3.46	4.13	8.88	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	5.00	3.51	4.09	8.84	7.19
Philadelphia	3.85	3.95	4.45	3.55	3.55	5.25	3.55	4.05	5.26	3.31	4.06	8.56	7.16
Baltimore	3.85	4.00	4.35	3.70	3.70	5.25	3.50	...	5.05	...	4.05	...	...
Norfolk, Va.	4.00	4.10	...	4.05	4.05	5.45	3.85	...	5.40	...	4.15	...	...
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.25	4.30	4.75	3.52	3.75	8.40	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	...	4.65	...	3.65	8.40	6.75
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.62	3.20	3.75	8.40	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.30	4.84	3.40	3.80	8.70	7.05
Omaha	4.10	4.20	4.20	4.15	4.15	5.75	3.85	5.32	5.50	...	4.42	...	...
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.00	4.92	3.47	4.00	8.75	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.25	4.10	4.85	3.30	3.75	8.40	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.50	4.85	5.25	3.83	4.34	9.09	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.18	4.23	4.73	3.54	3.88	8.38	6.98
St. Louis	3.64	3.74	3.74	3.69	3.69	5.29	3.39	4.24	4.99	3.61	4.02	8.77	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	...	5.00	...	4.30	...	...
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	...	5.01	...	3.97	...	...
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	...	5.25	...	4.31	...	...
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.80	3.75	...	4.50	...	4.39	...	...
Tulsa, Okla.	4.44	4.34	4.34	4.49	4.49	6.09	4.19	...	5.79	...	4.69	...	...
Birmingham	3.50	3.70	3.70	3.55	3.55	5.93	3.45	...	4.75	...	4.43	...	...
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	...	4.80	5.00	4.60	...	...
Houston, Tex.	3.75	5.95	5.95	4.10	4.10	5.50	4.20	...	5.25	...	6.90	...	...
Seattle	4.00	4.00	5.20	4.75	4.75	6.50	4.75	7.25	6.00	...	5.75	...	...
Portland, Oreg.	4.25	4.50	6.10	4.00	4.00	5.75	3.95	6.50	5.00	...	5.75	...	...
Los Angeles	4.15	5.45	7.25	4.95	4.95	7.20	5.10	7.30	6.30	...	6.60	11.35	10.35
San Francisco	4.00	5.20	6.80	4.70	4.70	6.40	4.70	7.20	6.45	...	7.05	11.60	10.60

	S.A.E. Hot-rolled Bars (Unannealed)				
	1035-1050 Series	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.28	7.75	6.05	5.80	7.90
New York (Met.)	4.04	7.60	5.90	5.65	...
Philadelphia	4.10	7.56	5.86	5.61	8.56
Baltimore	4.45	...	...	...	...
Norfolk, Va.	...	...	...	...	...
Buffalo	3.55	7.35	5.65	5.40	7.50
Pittsburgh	3.40	7.45	5.75	5.50	7.60
Cleveland	3.30	7.55	5.85	5.85	7.70
Detroit	3.48	7.67	5.97	5.72	7.19
Cincinnati	3.65	7.69	5.99	5.74	7.84
Chicago	3.70	7.35	5.65	5.40	7.50
Twin Cities	3.95	7.70	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.84	7.72	6.02	5.77	7.87
Seattle	6.65	...	8.75	8.60	9.40
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	9.05
San Francisco	6.05	10.60	9.60	9.45	10.10

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300 pounds and over, Portland, Seattle; 400-14,999 Twin Cities; 400-3999 Birmingham; 400 pounds and over in Memphis; Los Angeles, bars over 4-in. wide, 1-in. thick, 4.95c.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Omaha, Kansas City, St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 750-4999 in San Francisco; 300-4999 in Portland, Seattle; any quantity in Twin Cities; 300-1999 Los Angeles.

Galvanized Sheets: Base, 150-1499 pounds, New York; 150-1499 in Cleveland, Pittsburgh, Baltimore, Norfolk; 1 to 10 bun. in Los Angeles; 300 and over in Portland, Seattle; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, Indianapolis, Milwaukee, Omaha, St. Louis, Tulsa; 3500 and over in Chattanooga; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis; any quantity in Philadelphia; 750-4999 in San Francisco.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle, 1 to 99 pounds in Los Angeles; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

EUROPEAN IRON, STEEL PRICES

Dollars at \$4.02½ per Pound Sterling
Export Prices f.o.b. Port of Dispatch—
By Cable or Radio

	BRITISH Gross Tons f.o.b. U.K. Ports	
	£	s d
Merchant bars, 3-inch and over	266.50	16 10 0
Merchant bars, small, under 3-inch, re-rolled	3.60c	20 0 0
Structural shapes	2.79c	15 10 0
Ship plates	2.90c	16 2 6
Boiler plates	3.17c	17 12 6
Sheets, black, 24 gage, corrugated, 21 gage	4.00c	22 5 0
Sheets, galvanized, corrugated, 21 gage	4.61c	25 12 6
Tin plate, base box, 20 x 14, 108 pounds	\$ 6.20	1 10 9

British ferromanganese \$120.00 delivered Atlantic seaboard duty-paid.

Domestic Prices Delivered at Works or Furnace—

	£	
	s	d
Foundry No. 3 Pig Iron, Silicon 2.50-3.00	\$25.79	6 8 0(a)
Basic pig iron	24.28	6 0 6(a)
Furnace coke, f.o.t. ovens	7.40	1 16 9
Billets, basic soft, 100-ton lots and over	49.37	12 5 0
Standard rails, 60 lbs. per yard, 500-ton lots & over	2.61c	14 10 6
Merchant bars, rounds and squares, under 3-inch	3.17c	17 12 0††
Shapes	2.77c	15 8 0††
Ship plates	2.91c	16 3 0††
Boiler plates	3.06c	17 0 6††
Sheets, black, 24 gage, 4-ton lots and over	4.10c	22 15 0
Sheets, galvanized 24 gage, corrugated, 4-ton lots & over	4.70c	26 2 6
Plain wire, mild drawn, catch weight coils, 2-ton lots and over	4.28c	23 15 0
Bands and strips, hot-rolled	3.30c	18 7 0

(a) del. Middlebrough 5% rebate to approved customers. ††Rebate 15% on certain conditions.

Ores

Lake Superior Iron Ore		Spanish, No. African basic, 50 to 60%	Nom.
Gross ton, 51½%		Chinese wolframite, net top, duty pd.	\$24.00-25.00
Lower Lake Ports		Brazil iron ore, 68-69%, ord.	7.50c
Old range bessemer	\$4.75	Low phos. (.02 max.)	8.00c
Mesabi nonbessemer	4.45	F.O.B. Rio Janeiro.	
High phosphorus	4.35	Scheelite, imp.	23.50-24.00
Mesabi bessemer	4.60	Chrome ore, Indian, 48% gross ton	...
Old range nonbessemer	4.60	Manganese Ore	
Eastern Local Ore		Including war risk but not duty, cents per unit cargo lots.	
Cents, unit, del. E. Pa.		Caucasian, 50-52%	...
Foundry and basic 56-63%, contract	10.00	So. African, 48%	70.00-72.00
Foreign Ore		Brazilian, 46%	69.00-71.00
Cents per unit, c.i.f. Atlantic ports		Chilean, 47%	65.00-70.00
Manganiferous ore, 45-55% Fe., 6-10%	...	Cuban, 50-51%, duty free	...
Mang.	...	Molybdenum	
N. African low phos.	...	Nom. Sulphide conc., lb.	...
		Nom. Mo. cont., mines	\$0.75

IRON AND STEEL SCRAP PRICES

Maximum Prices Announced June 18 by Office of Price Administration and Civilian Supply (Gross Tons)

	Pittsburgh, Weirton, Steubenville(a)	Youngs- town, Canton, Warren, Sharon	Chicago	Beth- lehem	*East. Pa.	Spar- rows Pt.	Cleve- land	Buffalo	Ashland, Ky., Portsmouth, Middle- town, O.	Kokomo, Ind.
No. 1 heavy melting	\$20.00	\$20.00	\$18.75	\$18.25	\$18.75	\$18.75	\$19.50	\$19.25	\$19.50	\$18.25
No. 1 hyd. comp. black sheets	20.00	20.00	18.75	18.25	18.75	18.75	19.50	19.25	19.50	18.25
No. 2 heavy melting	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50	17.25
Dealer No. 1 bundles	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50	17.25
Dealer No. 2 bundles	18.00	18.00	16.75	16.25	16.75	16.75	17.50	17.25	17.50	16.25
Mixed borings and turnings	15.25	15.25	14.00	13.50	14.00	14.00	14.75	14.50	14.75	14.25
Machine shop turnings**	15.50	15.50	14.25	13.75	14.25	14.25	15.00	14.75	15.00	14.50
Shovel turnings	16.50	16.50	15.25	14.75	15.25	15.25	16.00	15.75	16.00	15.50
No. 1 busheling	19.50	19.50	18.25	17.75	18.25	18.25	19.00	18.75	19.00	17.75
No. 2 busheling	15.50	15.50	14.25	13.75	14.25	14.25	15.00	14.75	15.00	13.75
Cast iron borings	15.75	15.75	14.50	14.00	14.50	14.50	15.25	15.00	15.25	14.00
Uncut structurals and plate	19.00	19.00	17.75	17.25	17.75	17.75	18.50	18.25	18.50	17.25
No. 1 cupola	21.00	21.00	20.00	22.50	23.00	22.00	22.00	20.00	21.00	20.00
Heavy breakable cast	19.50	19.50	18.50	21.00	21.50	21.00	20.50	18.50	19.50	18.50
Stove plate	19.00		17.00	18.00	18.50	18.00	18.00	19.00	17.50	16.00
Low phos. billet, bloom crops	25.00	25.00	23.75	23.25	23.75	23.75	24.50	24.25	23.50	23.75
Low phos. bar crops and smaller	23.00	23.00	21.75	21.25	21.75	21.75	22.50	22.25	21.50	21.75
Low phos. punch., plate scrap***	23.00	23.00	21.75	21.25	21.75	21.75	22.50	22.25	21.50	21.75
Machinery cast cupola size††	22.00	22.00	21.00	23.50	24.00	23.50	23.00	21.00	22.00	21.00
No. 1 machine cast, drop broken, 150 pounds and under	22.50	22.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50	21.50
Clean auto cast	22.50	22.50	21.50	24.00	24.50	24.00	23.50	21.50	22.50	21.50
Punchings and plate scrap†††	22.00	22.00	20.75	20.25	20.75	20.75	21.50	21.25	20.50	20.75
Punchings and plate scrap§§	21.00	21.00	19.75	19.25	19.75	19.75	20.50	20.25	19.50	19.75
Heavy axle and forge turnings	19.50	19.50	18.25	17.75	18.25	18.25	19.00	18.75	18.00	18.25
Med. heavy elec. furnace turnings	18.00	18.00	16.75	16.25	16.75	16.75	17.50	17.25	16.50	16.75

	St. Louis	Toledo, O.	Detroit	Duluth	Birming- ham	Chat- tanooga	Radford, Va.	New Eng- land†	Pacific Coast‡
No. 1 heavy melting	\$17.50	\$.....	\$17.85	\$18.00	\$17.00	\$.....	\$.....	\$16.50	\$14.50
No. 1 hyd. comp. black sheets	17.50	.....	17.85	18.00	17.00	.....	.....	.....	14.50
No. 2 heavy melting	16.50	.....	16.85	17.00	16.00	.....	.....	.....	13.50
Dealer No. 1 bundles	16.50	.....	16.85	17.00	16.00	.....	.....	.....	13.50
Dealer No. 2 bundles	15.50	.....	15.85	16.00	15.00	.....	.....	.....	12.50
Mixed borings and turnings	12.75	.....	13.10	.....	12.25	.....	.....	.....	9.75
Machine shop turnings	13.00	.....	13.35	15.50	15.00	.....	.....	.....	10.00
Shoveling turnings	14.00	.....	14.35	16.50	.....	.....	.....	.....	11.00
No. 1 busheling	17.00	.....	17.35	17.50	16.50	.....	.....	.....	14.00
No. 2 busheling	13.00	.....	13.35	13.50	12.50	.....	.....	.....	10.00
Cast iron borings	13.25	.....	13.60	13.75	12.75	.....	.....	.....	10.25
Uncut structurals and plate	18.50	.....	16.85	17.00	16.00	.....	.....	.....	13.50
No. 1 cupola	20.00	.....	20.35	18.00	20.00	20.50	21.00	22.00	18.00
Heavy breakable cast	18.50	.....	18.85	16.50	18.50	.....	.....	20.50	17.00
Stove plate	17.00	15.60	14.10	.....	17.00	17.50	18.00	14.00	14.00
Low phos. billet and bloom crops	22.50	.....	22.85	23.00	22.00	.....	.....	.....	.....
Low phos. bar crops and smaller	20.50	.....	20.85	21.00	20.00	.....	.....	.....	.....
Low phos. punch. and plate scrap***	20.50	.....	20.85	21.00	20.00	.....	.....	.....	.....
Machinery cast cupola size††	21.00	.....	21.35	19.00	21.00	21.50	22.00	23.00	19.00
No. 1 machine cast, drop broken, 150 pounds and under	21.50	.....	21.85	19.50	21.50	22.00	22.50	23.50	19.50
Clean auto cast	21.50	.....	21.85	19.50	21.50	22.00	22.50	23.50	19.50
Punchings and plate scrap†††	19.50	.....	19.85	20.00	19.00	.....	.....	.....	.....
Punchings and plate scrap§§	18.50	.....	18.85	19.00	18.00	.....	.....	.....	.....
Heavy axle and forge turnings	17.00	.....	17.35	17.50	16.50	.....	.....	.....	14.00
Medium heavy elec. furnace turnings	15.50	.....	15.85	16.00	15.00	.....	.....	.....	12.50

*Claymont, Del., Coatesville, Phoenixville, Harrisburg, Pa. †Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I. ‡Los Angeles, San Francisco, Seattle; *** $\frac{3}{4}$ -inch and heavier, cut 12 inches and under; ††may include clean agricultural cast; †††under $\frac{3}{4}$ -inch to $\frac{1}{4}$ -inch, cut 12 inches and under; §§under $\frac{1}{4}$ -inch to No. 12 gage, cut 12 inches and under. **Alloy, W. Va., base \$17.60. †Base price at Portsmouth; Middletown 25 cents less; no price at Ashland.

Maximum Prices for Iron and Steel Scrap Originating from Railroads

	Pittsburgh, Wheeling, Johnstown, Steubenville	Youngs- town, Canton, Sharon	Chicago	Kokomo, Ind.	*East. Pa.	Spar- rows Pt.	Cleve- land	Buffalo	Ash- land, Ky., Port- smouth, Middle- town, O.
No. 1 Railroad grade heavy melting steel	\$21.00	\$21.00	\$19.75	\$19.25	\$19.75	\$19.75	\$20.50	\$20.25	\$20.50
Scrap rails	22.00	22.00	20.75	20.25	20.75	20.75	21.50	21.25	21.50
Rerolling quality rails	23.50	23.50	22.25	21.75	22.25	22.25	23.00	22.75	23.00
Scrap rails 3 feet and under	24.00	24.00	22.75	22.25	22.75	22.75	23.50	23.25	23.50
Scrap rails 2 feet and under	24.25	24.25	23.00	22.50	23.00	23.00	23.75	23.50	23.75
Scrap rails 18 inches and under	24.50	24.50	23.25	22.75	23.25	23.25	24.00	23.75	24.00

	St. Louis	Kansas City	Detroit	Duluth	Birming- ham	Minne- sota, Colo.	Radford, Va.	New Eng- land†	Pacific Coast‡
No. 1 Railroad grade heavy melting steel	\$18.50	\$17.00	\$18.85	\$19.00	\$18.00	\$17.50	\$.....	\$.....	\$15.50
Scrap rails	19.50	18.00	19.85	20.00	19.00	18.50	.....	.....	16.50
Rerolling quality rails (a)	21.00	19.50	21.35	21.50	20.50	20.00	.....	.....	18.00
Scrap rails 3 feet and under	21.50	20.00	21.85	22.00	21.00	20.50	.....	.....	18.50
Scrap rails 2 feet and under	21.75	20.25	22.10	22.25	21.25	20.75	.....	.....	18.75
Scrap rails 18 inches and under	22.00	20.50	22.35	22.50	21.50	21.00	.....	.....	19.00

*Philadelphia, Wilmington, Del.; †Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I. ‡Los Angeles, San Francisco, Seattle.

NOTE: Where the railroad maker of scrap operates in two or more of the consuming points named above, the highest of the maximum prices set out above for such basing points shall be the maximum price at consumer's plant at any point on the railroad's line. (a) Re-laying quality \$5 higher.

Sheets, Strip

Sheet & Strip Prices, Page 90

A temporary lull in demand for automotive sheets is giving some mills opportunity to make slightly better delivery on miscellaneous orders. This condition is expected to end soon when delivery for 1942 models gets under way. The situation is uncertain until definite decision is made on the extent of the reduction in automobile output. Motor manufacturers are planning to turn out the maximum allowed but are buying lightly to avoid having excess steel in case of a drastic cut in their production. Sheet sellers are hesitant to make large shipments for automotive use for fear they may overship requirements under the final decision.

General inquiry shows some easing in certain instances though still strong. Jobbers, stove makers and manufacturers of food-handling equipment and drums are pressing for delivery but as most have no preference ratings they are unable to obtain much material. An exception is the recent placing of 1000 tons of sheets for aviation gasoline drums for defense outposts, which had an A-1-A preference. Steel shipments on this order are expected to start in 60 to 90 days.

Manufacturers of refrigerators and washing machines have continued their active season several weeks beyond the usual point, to build up inventory of manufactured products, but now are slowing up their activity. Stove makers have been pursuing the same policy but have not yet reduced their rate, except where material could not be obtained.

A southern Ohio sheetmaker has started allocation of sheets for fourth quarter and is allowing non-defense consumers about 50 per cent of normal tonnage, the remainder of its output being reserved for defense requirements. It is hoped this will assist consumers by giving a fairly definite quota on which production schedules can be based.

Galvanized sheet tonnage is declining steadily. Some progress has been made in substitute coatings but a satisfactory method for machine parts, particularly farm machinery, has not yet been developed.

Recent delivery schedules by important producers put wide strip at 11 to 12 months, formerly 10 to 11 months.

Plates

Plate Prices, Page 90

Priorities on steel plates, as well as all major steel products, are becoming increasingly numerous, making it difficult for non-defense buyers, and the method of administering the certificates causes much trouble to producers. Army, navy and ordnance departments, in particular, come into the market with tonnage carrying the same priority rating, each pressing for its needs. Producers would welcome appointment of a co-ordinating unit to referee these conflicting claims.

Some plate mills are able to con-

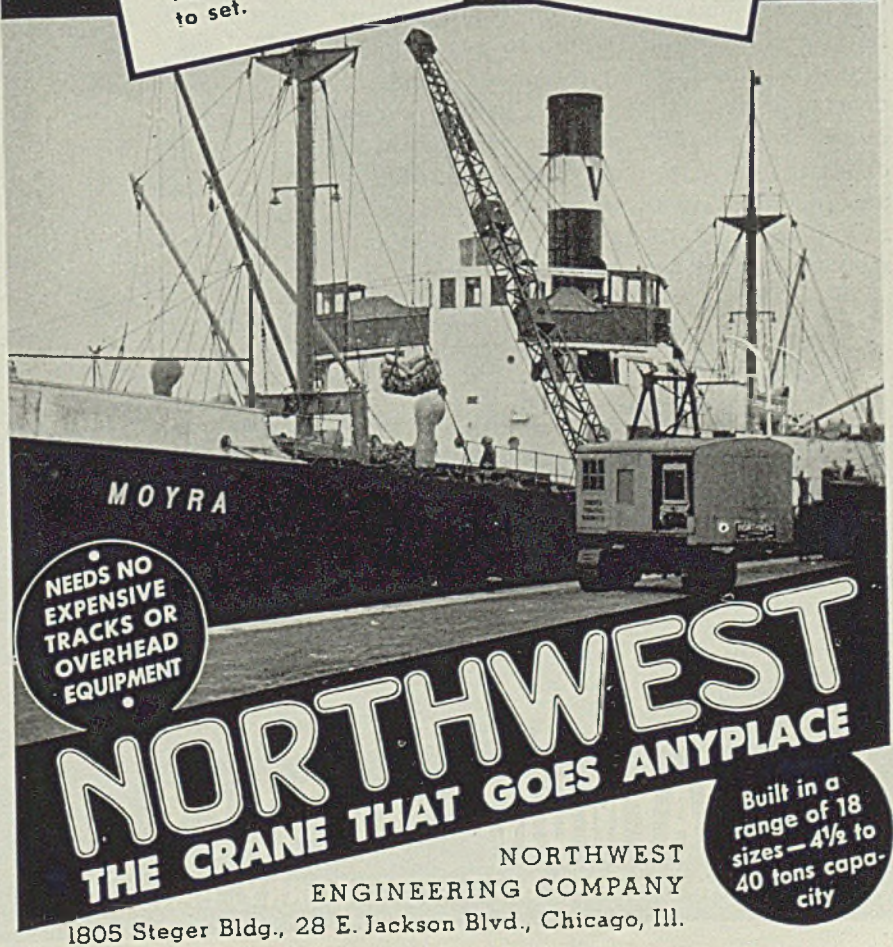
Getting the **JOB DONE** is what counts **TODAY!**

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- Cushion Clutch makes high power safe.
- Ball or roller bearings on all high speed shafts assure maximum transmission of power.
- Simplicity of design assures easy upkeep.
- No waiting for steam—no fires to bank—no outriggers or jacks to set.

NORTHWEST for versatility—

- Goes anywhere—needs no tracks.
 - Unloads from either side or end of cars.
 - Will operate inside plant with short booms.
 - Easily steered and maneuvered in narrow aisles.
 - Handles any kind of material.
 - Easily converted from hook block to clam-shell or magnet.
 - Universal application assures easy rental or resale.
- If you have a material handling problem we have a profitable answer. Why not ask for details before the problem sinks you?



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NEEDS NO EXPENSIVE TRACKS OR OVERHEAD EQUIPMENT

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sider nothing but priority work. In at least one or two instances in the East this applies to sheared plates, while other makers are close to the same position. The latter are booking non-defense orders from regular customers, limiting the tonnage and entering it without definite commitment as to delivery.

In the New England district emphasis is largely on shipbuilding requirements, with a relatively high proportion of floor plates. This is supplemented by more than 4000 tons for oil storage tanks, most being for the South Portland, Me., terminal of the Portland-Montreal pipe line. Chicago Bridge & Iron

Co., Chicago, will fabricate and erect these tanks. Requirements for small tanks in New England are substantial. Light plates are somewhat easier, not that deliveries are improved but prospects for earlier shipment from some sources are better. Mills are making deliveries for shipbuilding as needed. Fabricating shops have worked off inventories as a rule and are shopping for more.

Plate mills in the South are pressed for delivery for shipyard and carshop use, heavy contracts in both lines keeping consumers on the alert for all the tonnage they can obtain. Production is being

maintained at the highest point possible.

PLATE CONTRACTS PLACED

3600 tons, six oil storage tanks, 140,000-barrel capacity each, South Portland, Me. terminal, Portland-Montreal pipe line, to Chicago Bridge & Iron Co., Chicago.

PLATE CONTRACTS PENDING

8000 tons, estimated, 16 closed hopper barges, for sand and gravel, Panama sch. 5265; Dravo Corp., Pittsburgh, \$1,590,400 each.

900 tons, 9461 feet, 52-inch gravity water pipe for Tacoma, Wash.; Steel Tank & Pipe Co., Portland, low for steel; American Concrete & Steel Pipe Co., Tacoma, low for concrete.

375 tons, tanks, Southern Pacific railroad relocation, Kennett division, Central Valley project, California; bids in to bureau of reclamation, Sacramento.

250 tons or more, 2180 ft. 51½-inch supply pipe, for Seattle Cedar river line; project approved; bids soon.

200 tons, storage tank, naval depot, Melville, R. I.; Hammond Iron Works, Warren, Pa., low.

Bars

Bar Prices, Page 91

Bars constitute one of the most needed steel products for defense work, entering into the manufacture of so large a variety of projects. Priority slips are sufficient to cover all possible production and sales offices find difficulty in deciding which have precedence. Almost numberless consuming lines seek bar delivery to meet requirements of their defense contracts. So strong is this pressure that some mills are allocating semifinished steel to bar mills in preference to other finishing departments, to keep output at capacity.

In few cases can non-defense consumers obtain bookings with promise of delivery this year. In the Chicago district carbon bar deliveries on current sales run 14 to 16 months. Recently promises of 10 to 15 months were possible.

Buying has slackened somewhat because of inability to obtain delivery promise. Alloy bars for armament have been booked in large volume on high priority and backlogs extend well into next year. Specifications are heavy against these orders and releases are heavy.

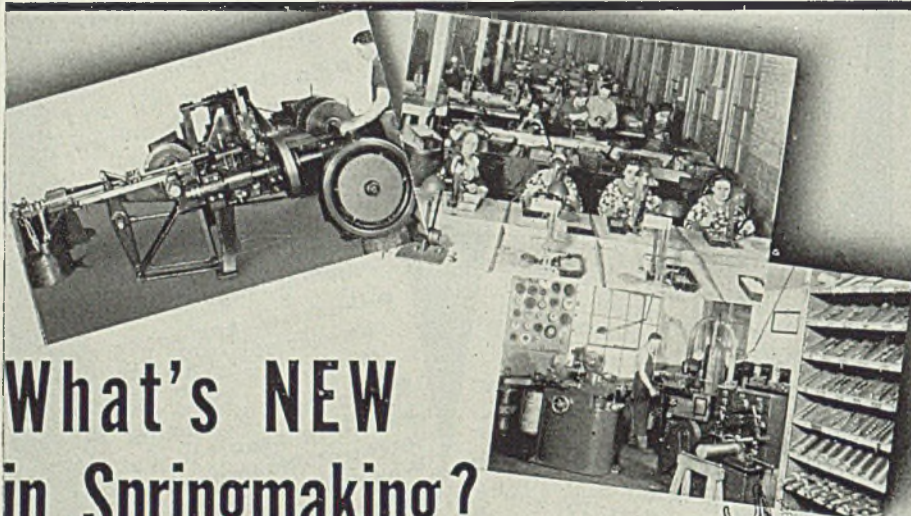
New England forging manufacturers are operating at full capacity and their product goes almost entirely into defense use.

Pipe

Pipe Prices, Page 91

Line pipe tonnage on mill books is heavy for long lines planned to carry oil formerly transported in tankers, and also for short feeder service. In this tonnage there is little duplication as the practice is to indicate the project involved. This business carries high priority and production is at a high rate.

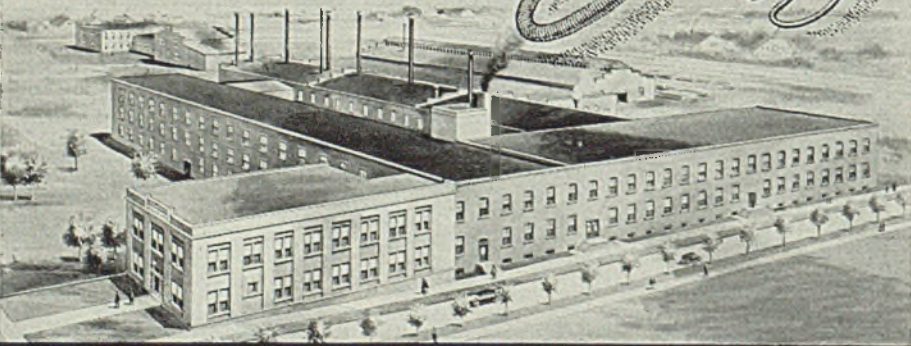
Other oil-country goods and standard pipe are handled through secondary distributors and in these cases considerable duplication probably exists as these buyers buy from several mills and thus are



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regular customers. For this reason it is possible for a warehouse to place its entire requirements with each mill. This practice probably has swelled standard pipe backlogs beyond actual requirements, but as only about half tonnage on order is being delivered a fair balance is maintained. Probably the apparent shortage is not as large as the low rate of shipment would indicate.

Pressure continues to increase on producers of cold-drawn mechanical tubing and practically no non-defense business is being accepted. Of material now on books 90 per cent or more is direct defense material, mainly aircraft tubing, with considerable also going into tanks and ships, all of which carry top priority. Current production is behind schedule on defense tonnage, largely because of shortage of alloys. Chromium is the chief bottleneck and chrome and chrome-nickel steel tubes are sought in excess of expanding production.

Cast iron pipe producers are operating at capacity, limited only by supply of pig iron, which is much less than requirements in some cases. Inquiries are numerous and tonnage is being booked in considerable volume, though in relatively small lots. It is estimated that fully one-third of present output is for defense purposes.

CAST PIPE PLACED

150 tons, 6 and 8-inch, Pasco, Wash., to United States Pipe & Foundry Co., Burlington, N. J.

CAST PIPE PENDING

3664 tons, 4 to 8-inch, Class 150, east bay municipal utility district, Oakland, Calif.; bids Aug. 6.

1000 tons, 4 to 12-inch, San Francisco; bids Aug. 4.

214 tons, 6-inch, Class 250, Burbank, Calif.; bids Aug. 5.

Rails, Cars

Track Material Prices, Page 91

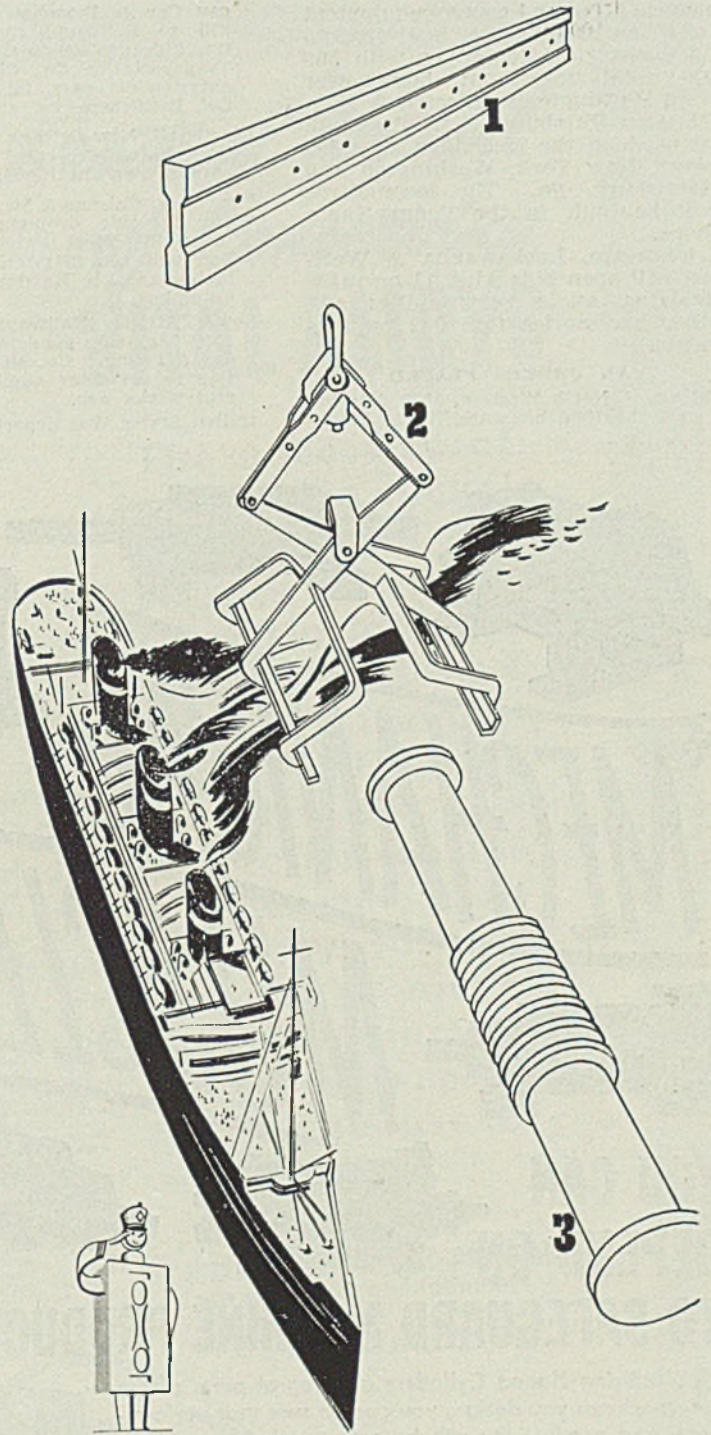
Freight car buying is subsiding after the recent heavy wave and demand for locomotives is now relatively heavier. Practically the only important list now pending is 2850 freight cars for the Missouri Pacific, which probably will be awarded soon. Chicago & North Western has placed its inquiry for 2125 cars.

Subsidence of demand for cars is attributed to difficulty met by builders in obtaining steel. Several tentative programs for freight cars have been discussed recently but have been held in abeyance until steel supply becomes more adequate. Practically all builders have more orders than they can turn out in several months on the present basis.

Steel for passenger cars is even more difficult to obtain as it has no priority rating. Association of American Railroads is studying possibilities of discontinuing duplicate and unnecessary train service and elimination of lightly patronized service.

Locomotive buying is led by 20 diesel-electric switchers by the Southern, with a number of smaller awards by other lines.

Pennsylvania railroad has ordered



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electric drive and control equipment for seven 100-miles per hour streamlined electric locomotives with 56,000 total maximum horsepower from Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. They will be used on the electrified zone between New York, Washington and Harrisburg, Pa. The locomotives will be built in the Pennsylvania shops.

Delaware, Lackawanna & Western will open bids Aug. 11 on rails, tieplates, angle bars, spikes and other accessories for 1942 requirements.

CAR ORDERS PLACED

Chicago & North Western, 1875 fifty-ton steel sheathed box cars, 700 to Ameri-

can Car & Foundry Co., New York; 675 to Pullman-Standard Car Mfg. Co., Chicago; 500 to General American Transportation Co., Chicago; 250 seventy-ton ore cars, to Bethlehem Steel Co., Bethlehem, Pa.

Cincinnati, New Orleans & Texas Pacific, two 90-ton depressed center hopper cars, to own Chattanooga, Tenn., shops.

New York, Chicago & St. Louis, 250 fifty-ton low-side drop-end gondolas, to Greenville Steel Car Co., Greenville, Pa., and 100 fifty-ton all-steel automobile cars, to Ralston Steel Car Co., Columbus, O.

South African Railways and Harbors, 1000 high-side gondolas, to Canadian Car & Foundry Co., Montreal; in addition to a similar number placed several weeks ago.

United States War department, 68 forty-

ton ammunition cars, to St. Louis Car Co., St. Louis.

CAR ORDERS PENDING

Fruit Growers Express Co., 900 refrigerator cars, contemplated for its own shops at Indiana Harbor, Ind.

LOCOMOTIVES PLACED

Central of Georgia, one 1000-horsepower and one 600-horsepower engine, to Electro-Motive Corp., La Grange, Ill.

Chilean State Railways, seven 68-ton electric switch engines, to Westinghouse Electric & Mfg. Co., Pittsburgh.

Mysore Iron & Steel Works, India, one 2-8-2 type steam locomotive to Baldwin Locomotive Works, Eddystone, Pa.

Norfolk & Western, ten 2-8-2 type Mallet locomotives, to own shops.

Patapasco & Black River, one 1000-horsepower and one 660-horsepower diesel-electric engine, to Baldwin Locomotive Works, Eddystone, Pa.

Southern Railway and subsidiary lines, 20 diesel-electric switch engines, placed as follows: eleven 1000-horsepower units to Electro-Motive Corp., La Grange, Ill., three 1000-horsepower units to American Locomotive Co., New York; and six 660-horsepower units to the American Locomotive Co.; these are in addition to one 1000-horsepower and one 660-horsepower engine noted recently as having gone to Baldwin Locomotive Works, Eddystone, Pa.

Union Railroad, four 1000-horsepower diesel-electric engines, to Baldwin Locomotive Works, Eddystone, Pa.

LOCOMOTIVES PENDING

Army, six to eight 2-8-2 locomotives; bids asked.

Richmond, Fredericksburg & Potomac, six 4-8-4 type steam engines; bids asked.

RAIL ORDERS PLACED

Reading, 200 tons, to Bethlehem Steel Co., Bethlehem, Pa.

Structural Shapes

Structural Shape Prices, Page 91

Fabricators increasingly confine bookings to holders of priority ratings. Many fabricators figure this is the only safe work to take since for non-defense work, even where steel is booked it is likely to be diverted. One leading fabricator notes that 95 per cent of business now on his books is defense.

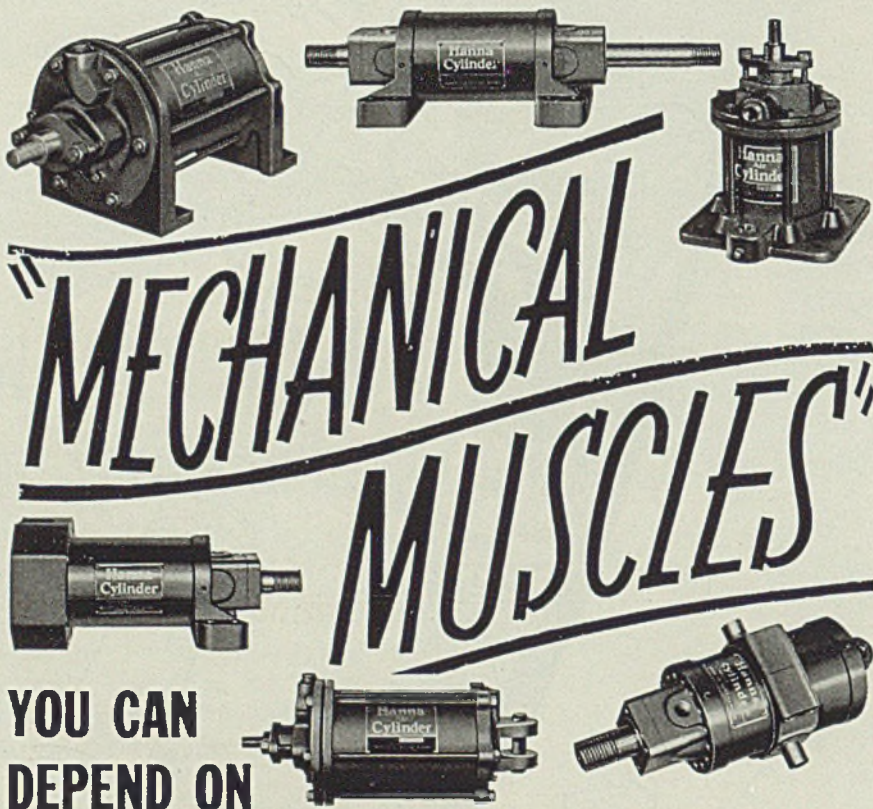
Delivery promises usually range from three to five months, depending on fabricator, customer, location and type of construction. There are reports of backlogs of orders sagging but the average fabricator is convinced he will be busy for many months. The East reports diversion of certain light structural mills to production of semifinished products for Great Britain.

Some fabricators who work their riveters normal hours complain

SHAPE AWARDS COMPARED

	Tons
Week ended Aug. 2	26,732
Week ended July 26	34,155
Week ended July 19	35,039
This week 1940	49,720
Weekly average, 1941	20,302
Weekly average, 1940	28,414
Weekly average, June, 1941	27,157
Total to date, 1940	657,684
Total to date, 1941	969,676

Includes awards of 100 tons or more.

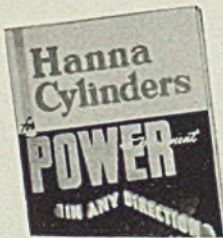


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they are losing them to those jobs where overtime is being paid.

Bookings of fabricated structurals during June totaled 245,255 tons, against 175,578 tons in May and 109,744 tons in June, 1940, according to the American Institute of Steel Construction, New York. These represented a 13 per cent gain over average monthly business during the first half of 1941. Bookings during the first six months were 1,298,432 tons, against 619,231 tons for the corresponding period of 1940.

Shipments in June were 184,095 tons, compared with 186,717 tons in May and 119,087 tons in June of last year. Shipments over the first half were 1,055,946 tons, compared with 655,012 tons for the same period of 1940. Shipments for the first half were 67 per cent of shipments in the like period of 1929. Orders on hand for fabricating during the next four months total 747,424 tons.

SHAPE CONTRACTS PLACED

- 18,400 tons, transmission towers, Coulee-Covington, Wash., line, Bonneville-Midway Coulee line, Coulee-Spokane Line and Covington-Chehalls, Wash., line, Bonneville dam, Oreg., to American Bridge Co., Pittsburgh.
- 1600 tons, plant, Emerson Electric Co., Ferguson, Mo., to Mississippi Valley Structural Steel Co., Decatur, Ill.; Austin Co., Chicago, contractor.
- 1480 tons, buildings for National Carbon Co. and subsidiaries, to Bethlehem Steel Co., Bethlehem, Pa.; 510 tons for Clarksburg, W. Va.; 885 tons for buildings at Niagara Falls and 85 tons for Republic Carbon Co.
- 1000 tons, sheet piling, quay wall, Hunters Point drydock, San Francisco, divided between Bethlehem Steel Co., San Francisco and Columbia Steel Co., San Francisco.
- 950 tons, outfitting building, Camden, N. J., for navy, to American Bridge Co., Pittsburgh.
- 750 tons, ventilation building, contract MHT-57, New York, for New York Port authority, to American Bridge Co., Pittsburgh.
- 650 tons, state highway overpass over Pennsylvania railroad, Florin, Pa., to American Bridge Co., Pittsburgh.
- 490 tons, tractor warehouse, J. I. Case Co., Racine, Wis., to Mississippi Valley Structural Steel Co., Decatur, Ill.; bids July 17.
- 468 tons, state highway bridge, El Reno, Okla., to Capitol Steel & Iron Co., Oklahoma City, Okla.; bids June 24.
- 240 tons, paint and dope shop, airport, Middletown, Pa., to Reading Steel Products Co., Reading, Pa.
- 240 tons, Mile Brook bridge, Winslow, Me., to American Bridge Co., Pittsburgh, with 44 tons of bars to Bancroft & Martin Rolling Mills, South Portland, Me., through Edgar Cyr, Waterville, Me., contractor.
- 234 tons, state highway bridge, Wyandotte, Okla., to Capitol Steel & Iron Co., Oklahoma City, Okla.
- 230 tons, heat treating building, Caterpillar Tractor Co., Peoria, Ill., to Mississippi Valley Structural Steel Co., Decatur, Ill.; Fred Harbers Sons Co., Peoria, Ill., contractor.
- 140 tons, building Ohio Bell Telephone Co., South Euclid, O., Evergree exchange, to Bethlehem Steel Co., Bethlehem, Pa.
- 135 tons, plant addition, John B. Stetson Co., Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.
- 125 tons, pattern shop, Worthington

A Practical Method of Conserving VITAL ALLOYS

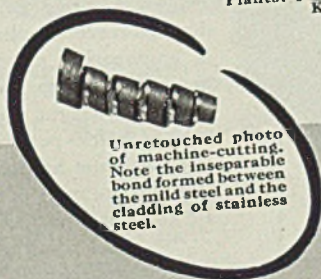
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E. I. DuPont de Nemours Co.
Greenville Steel & Foundry Co., Greenville, So. Car.
Graver Tank & Mfg. Co., Inc., E. Chicago, Ind.
Hercules Powder Co., Holliston Mills, Kingsport, Tenn.
Jeffrey Mfg. Co., Columbus, Ohio
Leader Iron Works, Decatur, Ill.
Monsanto Chemical Co.
Saviles Finishing Plants, Inc.
Sheet Metal Engineering Co., Chicago
Southern Bleachery & Print Works, Taylors, So. Car.
Stevens Metal Products Co., Niles, O.

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Plants: Chicago, Ill.; New Castle, Ind.; Kalamazoo, Mich.



Unretouched photo of machine-cutting. Note the inseparable bond formed between the mild steel and the cladding of stainless steel.

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STAINLESS-CLAD STEEL

"A Borg-Warner Product"

Pump & Machinery Co., Buffalo, to the Bliss mill, Austin Co., Cleveland.

100 tons, Puget Sound navy yard projects, to Pacific Car & Foundry Co., Seattle.

100 tons, bridge superstructures, railroad relocation, Kentucky project, TVA, to Bethlehem Steel Co., Bethlehem, Pa.; bids June 30.

Unstated, repair and shop buildings, quartermaster corps, Atlanta, Ga., to Bethlehem Steel Co. and Ingalls Iron Works, with bars going to Southern General Fireproofing Co., through Wheatley & Mobley, Augusta, Ga., contractors.

SHAPE CONTRACTS PENDING

4500 tons, airplane repair building, Rome, N. Y., for army.

1800 tons, temporary air corps hangars,

Presque Isle and Houlton, Me., for army engineers.

1100 tons, 14 units, McClelland Field, Sacramento Calif.; bids opened.

1000 tons, testing building, airplane engines, Chevrolet division, General Motors Corporation, Buffalo.

950 tons, Stephen Elliott Kramer school, Washington, D. C.; Ross Engineering Co., Washington, contractor; \$945,000; bids July 21.

800 tons, RCA laboratory, Princeton, N. J.; H. K. Ferguson Co., Cleveland, builder.

605 tons, shapes, and 145 tons, steel piling, Mill Creek pumping station, Ohio contract 2, Spencer White & Prentiss Inc., New York, low; bids to U. S. engineer, Cincinnati.

600 tons, manufacturing and storage

building, for Todd Shipyards Corp., Brooklyn, N. Y.

550 tons, state bridge 81 over Wisconsin river, Lone Rock, Richland and Iowa counties, Wisconsin; L. G. Arnold, Eau Claire, Wis., low; bids July 29.

490 tons, state bridge 5947, Sauk Rapids, St. Cloud, Minn.; bids Aug. 8.

450 tons, staging for shipways, navy yard, Norfolk, Va.

420 tons, state bridge FAP-307-B, over Little Missouri river, Medora, N. Dak.; Northwest Engineering Co., Rapid City, S. Dak., contractor.

350 tons, manufacturing building, Chevrolet Motor division, General Motors Corp., Bay City, Mich.

300 tons, bridge 100, Parkin, Ark., for Missouri Pacific railroad.

240 tons, state bridge, route 53, section 537-SF, Oak Forest, Ill.

220 tons, freight house, Marginal street, New York, for city.

215 tons, state bridge, route 53, section 537-SF, Oak Forest, Ill.; Bethlehem Steel Co., Bethlehem, Pa., low; bids July 29.

212 tons, state bridge, section 1F and 1VF, Oregon, Ogle county, Illinois; Clinton Bridge Works, Clinton, Iowa, low; bids July 29.

200 tons, 1941 addition, for Heald Machine Co., Worcester, Mass.

200 tons, 314-foot state bridge, Cut Bank, Mont.; Thomas Staunton, Great Falls, low.

184 tons, state bridge, Redfield, Spink county, South Dakota; J. C. Sorenson Co., Sioux Falls, S. Dak., contractor; bids July 8.

151 tons, state bridge 775, Eau Galle river, Spring Valley, Pierce county, Wisconsin; J. E. Hinman Co., contractor; bids July 29.

150 tons, two state bridges FAP-125 (4), one in Gunnison county, other in Washington and Logan counties, Sapinero, Colorado; bids July 29.

140 tons, three storehouses, ammunition depot, Fallbrook, Calif.; bids in.

140 tons, building, Caterpillar Tractor Co., Peoria, Ill.

130 tons, state bridge, Pond creek, Bullitt-Jefferson counties, Kentucky.

125 tons, state bridge FAP-125 (4), Sapinero, Colo.

115 tons, state bridge, route FA-12, section Y-2-VF, Mulberry Grove, Fayette county, Illinois; Bethlehem Steel Co., Bethlehem, Pa., low, bids July 29.

Unstated, 513-foot state bridge, Clearwater river, Idaho; bids in.

Unstated, 17 portable igloo-type magazines; bids opened at Fort Lewis, Wash., July 28.

Wire

Wire Prices, Page 91

Wire orders carrying preference ratings have become so numerous that merchant wire markets have become much disturbed, especially in nails, staples, fence wire and barbed wire. Warehouse orders are not being filled regularly but in many cases according to available material. Secondary suppliers are forced to take such types of fencing as is available regardless of the type ordered. Chain-link fence is virtually out of the market because of heavy demand for defense plant protection.

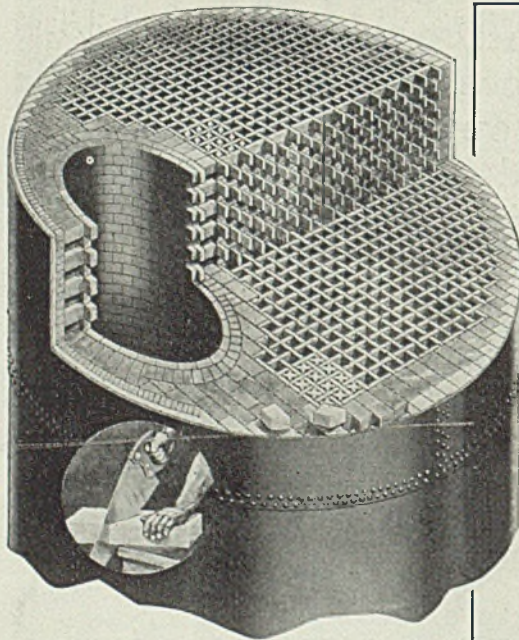
A more orderly condition exists in manufacturers' wire, though deliveries are much delayed and orders can be placed only by regular customers.

New England wiremakers find the

Maintain **PEAK** capacity...

WITH

BRASSERT CONSTRUCTION HOT BLAST STOVES



View of Brassert Hot Blast Stove, showing construction of checkers and checker walls.

Here are four definite advantages you get in Brassert Construction Hot Blast Stoves:

1. High blast temperature when needed.
2. Large capacity for heat storage.
3. High thermal efficiency.
4. Unequalled capacity in a given stove shell.

These advantages are assured because Brassert, through correct application of engineering principles, has been able to provide: maximum weight and surface of brick per unit of stove volume; heating surface close to mass of brick; air and gas passages close to heating surface; velocity of air and gas maintained uniform and at a maximum throughput of stove.

H.A. **BRASSERT** & CO.

Engineers and Contractors

FIRST NATIONAL BANK BUILDING, PITTSBURGH, PA.
60 EAST 42nd STREET, NEW YORK CITY

spread between incoming orders and shipments is narrowing in some instances though backlogs are not being reduced materially. Supplies of some types of wire rods are further reduced. Finishing equipment has been under a heavy strain for many months and repair needs are developing, tending to reduce production.

Reinforcing Bars

Reinforcing Bar Prices, Page 91

Typical of the situation of scarcity is that in the Philadelphia district at least two housing projects are being redesigned for wood. Moreover lumber dealers take advantage of the situation by promoting their wares. Close to 100 per cent of current bookings are for defense work. A recent exception were two highway jobs in Pennsylvania.

After weeks of futile attempts to place approximately 1800 tons of reinforcing bars for a housing project, Providence, R. I., the contractor has finally been successful in buying the material, but without any definite guarantee as to delivery.

REINFORCING STEEL AWARDS

- 9000 tons, arms plant, East Alton, Ill., Western Cartridge Co., divided between Sheffield Steel Corp. and Laclede Steel Co.; Fruco Construction Co., contractor.
- 6000 tons, defense work in Pacific Ocean, through Pacific Naval Contractors, Alameda, Calif., to Sheffield Steel Corp., Kansas City, Mo.
- 1600 tons, housing project, Providence, R. I., to Truscon Steel Co., Youngstown, O., through Psaty & Fuhrman Co., New York, contractors.
- 1000 tons, Plum Brook ordnance plant, Sandusky, O., to Truscon Steel Co., Youngstown, O.; E. B. Badger & Sons, contractors.
- 500 tons, navy yard power house and heating plant, Boston, to Joseph T. Ryerson & Son Inc.; Stone & Webster, engineers.
- 500 tons, metal ordnance storage depot, near Seneca Falls, N. Y., to Consolidated Expanded Metal Co., New York, through Polrier & McClane Corp., New York.
- 450 tons, warehouse and igloos, Ogden, Utah, for government, to Bethlehem Steel Co., Bethlehem, Pa.; Al Johnson Construction Co., & J. Leck, contractors.
- 300 tons, highway project, Dauphin county, Pennsylvania, to Bethlehem Steel Co., Bethlehem, Pa., through Kaufman Construction Co., Philadelphia.
- 275 tons, navy yard, Charlestown, Boston, to Youngstown Sheet & Tube Co., Youngstown, O.; Stone & Webster Engineering Corp., Boston, contractor.
- 250 tons, highway project, Berks county,

- Pennsylvania, to Bethlehem Steel Co., Bethlehem, Pa.
- 240 tons, engine test torque stand, Wright field, O. to Truscon Steel Co., Youngstown, O.; Simpson Construction Co., contractor.
- 175 tons, engineering building, Chrysler Corp., Highland Park, Mich., to Bethlehem Steel Co., Bethlehem, Pa.; W. E. Wood, contractor.
- 150 tons, Bureau of Reclamation, Invitation A-44,345-A-1, Earp, Calif., to Bethlehem Steel Co., San Francisco.
- 150 tons, plant, Michigan Alkali Co., Wyandotte, Mich., to Truscon Steel Co., Youngstown, O.
- 135 tons, two storage reservoirs, Fort Lewis and state viaduct, King county, Washington, to Northwest Steel Rolling Mills, Seattle; Standard Construction

- Co., Seattle, and Colonial Construction Co., Spokane, contractors.
- 130 tons, facilities, Camp Holabird, Baltimore, to Truscon Steel Co., Youngstown, O.; Henry W. Horst, contractor.
- 126 tons, state highway bridge FAGM-414C, Burlington, Iowa, to Bethlehem Steel Co., Bethlehem, Pa.; Jenson Construction Co., contractor.
- 107 tons, Coulee project, delivery Granger, Wash. for Reclamation Bureau, to Bethlehem Steel Co., Seattle.
- 104 tons, paving, Kemp, Minn., to Bethlehem Steel Co., Bethlehem, Pa.; Oakes Construction Co., contractor.
- 100 tons, marine barracks work, Quantico, Va., to Truscon Steel Co., Youngstown, O., through Harwood-Nebel.
- 100 tons, Kansas Power & Light Co., Kansas City, Mo., to Sheffield Steel Co.

STRONG - CAST



BETTER STEEL CASTINGS DEMAND BETTER STEEL MAKING

The high regard Strong Steel castings have won in so many industries reflects Strong's skill as steel makers as well as steel casters. The melt being poured above comes from a 25 ton, acid bottom, oil fired, open hearth furnace of special Strong design. It will pay you to know Strong steels well—write or wire for the facts.

STRONG STEEL FOUNDRY COMPANY, BUFFALO, N. Y.



CONCRETE BARS COMPARED

	Tons
Week ended Aug. 2	21,392
Week ended July 26	25,653
Week ended July 19	14,972
This week, 1940	18,521
Weekly average, 1941	12,081
Weekly average, 1940	9,661
Weekly average, June, 1941	11,277
Total to date, 1940	271,090
Total to date, 1941	386,594

Includes awards of 100 tons or more.

REINFORCING STEEL PENDING

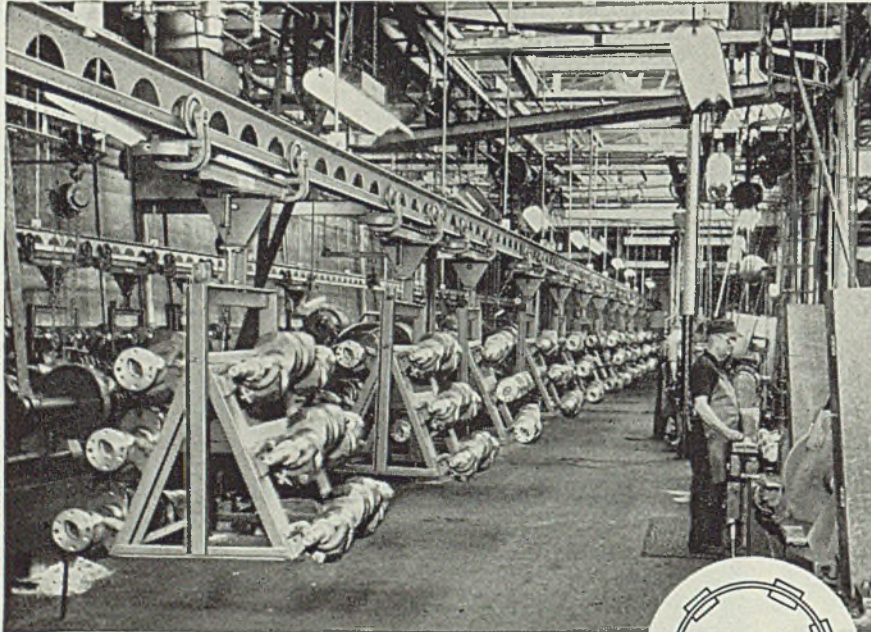
22,000 tons, office building, War Department, Washington; John McShain Inc., contractor.
 3600 tons, army fuze and detonator plant, Jacksonville, Ark.; Ford, Bacon & Davis, contractors.
 2650 tons, superstructure, naval base, pier 3, Norfolk, Va.; McLean Construction Co., contractor.
 2500 tons, Southwestern Proving Ground, Hope, Ark., for government; W. F. Callahan Construction Co., Dallas, Tex.; bids Aug. 1.
 2250 tons, Mill Creek pumping station, Ohio contract 2, Spencer White & Prentis Inc., New York, low; bids to U. S. engineer, Cincinnati.
 2000 tons, navy yard foundry, ordnance shop and test laboratory, Brooklyn, N. Y.; Thompson-Starrett Co., con-

tractor.

1700 tons, lock control, Jeffersonville, Ind.; Robert Anderson, Chicago, low.
 1000 tons, army and navy base requirements, Newfoundland; Newfoundland Base Contractors.
 550 tons, Jewel Food Stores, consisting of building at Barrington, Ill., 300 tons, and warehouse at Chicago 250 tons.
 500 tons, housing project, Fairfield, Conn.; bids of July 25 rejected, new estimates Aug. 8.
 500 tons, Booker T. Washington housing project, Jersey City, N. J.; Auf der Helde-Aragona Co., West New York, N. J., low.
 400 tons, addition, Maryland Dry Dock Co., Baltimore.
 400 tons, turbine plant, General Electric Co., Erie, Pa.; United Engineering

& Construction Co., Philadelphia, contractor.

400 tons, factory and office building, Allegheny Ludlum Steel Co., Dunkirk, N. Y.; Gilmore, Carmichael & Olson, contractors.
 350 tons, building reduction gear plant, General Electric Co., West Lynn, Mass.
 350 tons, naval operating base housing, Norfolk, Va.; Byrne Organizations, contractors.
 200 tons, defense housing project, Alexandria, La.; Tudor & Ratcliff, Alexandria, contractors.
 169 tons, Bureau of Reclamation, inv. C-42,210-A, Mecca, Calif.; bids opened.
 157 tons, State street subway, contract T-1, city of Chicago; Kil-Bar Electric Co., Chicago, low; bids July 24.
 100 tons, state viaduct, Fergus county, Montana; Fred B. Dudley, Great Falls, low.
 100 tons, state bridge, Blaine county, Montana; Walter Mackin, Billings, low.
 100 tons, army depot, Anchorage, Alaska; bids to U. S. engineer, Seattle, Aug. 1.
 Unstated tonnage, Frances Cabrini Homes, Illinois 2-2R, sometimes called 2-2A, Chicago,—586 dwelling units in 55 buildings and administration building, for Chicago Housing Authority; bids Aug. 29.

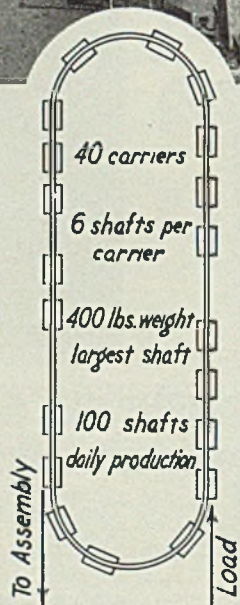


AN INEXPENSIVE OVERHEAD SYSTEM FOR STRAIGHT-LINE PRODUCTION

By replacing old floor-type handling equipment with a modern Cleveland Tramrail overhead-rack-carrier system, the many advantages of straight-line production were achieved recently in the manufacture of Diesel motor crankshafts.

The shafts are conveyed on hand-pushed turn-table type carriers to the various machine tools. Machining operations are performed in logical sequence. After traveling the Tramrail circuit, the shafts are ready for the assembly line.

This system has completely reorganized the department and the hard time-consuming juggling and tugging of heavy skid-loads of shafts from machine to machine is eliminated. Production has been stepped up and costs cut.



CLEVELAND TRAMRAIL DIVISION
 THE CLEVELAND CRANE & ENGINEERING CO.
 1125 East 283rd St. Wickliffe, Ohio

CLEVELAND TRAMRAIL
 OVERHEAD MATERIALS HANDLING EQUIPMENT

Other products: **CLEVELAND CRANES** and **STEELWELD MACHINERY**

Pig Iron

Pig Iron Prices, Page 92

Although pig iron supply is light and melters have little reserve, careful allocation and frequent shipments by producers have prevented shutdowns or serious curtailment for lack of iron. This has entailed close appraisal of customers' stocks, allotting of tonnage and scheduling of shipments to meet actual needs.

Consumer stocks are low in case of practically all melters and it is not possible to increase them under present conditions. Shipments from furnace are in excess of production and reserves are being drawn down steadily, pointing to a day when supplies will be less than requirements. This condition is expected to bring full priority control within a short time. This will tend to upset the balance of delivery now prevailing and foundries lacking defense work will be unable to obtain iron.

Consumers of southern iron at Ohio river points have been receiving supplies more freely the past few days, suppliers apparently having more tonnage to distribute.

Under present conditions foundrymen are more concerned over scrap than pig iron, as the latter is definitely short and in many cases local truck deliveries of small lots are resorted to in absence of tonnage shipments.

Tennessee Coal, Iron & Railroad Co. is pushing repairs on its blast furnace at Ensley, Ala., which will be returned to blast soon. Rehabilitation of the old Holt, Ala., furnace is proceeding satisfactorily and this will provide a further source.

Meanwhile pig iron is being shipped against a purchase of about 87,000 tons covered recently by the treasury department for Great Britain. This purchase is against an original inquiry for 240,000 tons of low phos and bessemer for second half delivery. Most of the tonnage

purchased so far, chiefly bessemer, because of acute shortage of low phos, will be moved by the end of third quarter, with only a small portion scheduled for October.

Scrap

Scrap Prices, Page 94

Laxity in grading scrap and leniency of melters in accepting upgraded material are reported from all sides. Apparently consumers are willing to take the lower grade material at the price of higher grades in order to obtain a supply. However, stimulation by this means has been slight and reserves are being lowered as melt exceeds receipts. As a rule melters find stockpiles steadily decreasing. Steelmakers have been accustomed to maintain heavy reserves in all cases and that these no longer are possible causes concern as to future supply. So far as known no serious interruption to production has resulted from lack of scrap for steel mills, but in a few instances foundries have curtailed because of shortage of cast grades. In cases foundry operation is maintained on a hand-to-mouth basis on material trucked from dealer yards in small lots.

Instances have been met of steelmakers making direct deals with scrap producers, earmarking scrap for handling through accepted brokers and, in other cases scrap is traded for finished steel on a differential basis.

Paradoxically, while Detroit consumers report difficulty in obtaining scrap, two cargoes moved by boat from that point to Buffalo last week and two others, making a total of 17,000 tons, came to Buffalo from Duluth. As a balance for this advantage Buffalo melters see barges loaded with scrap from the seaboard pass up the barge canal destined for Canadian delivery.

Experiments are being made in the effort to have old automobile hulks in the hands of scrap dealers dismantled and shipped to relieve the situation. Detroit interests are skeptical of much result from this process as scrap dealers prefer to sell used parts rather than scrap.

It has been suggested that many miles of street railway tracks could be removed in small towns where buses now run. These rails usually run about 50 tons to the mile. An official of American Rolling Mill Co., Middletown, O., instituted a scrap gathering campaign among employees which resulted in collection of 260 tons in 48 hours.

A cause for less tonnage being offered in railroad lists may be found in the practice of selling direct instead of offering accumulations for bids. Inasmuch as railroad scrap takes top prices this method is quicker and avoids competition.

New England foundries are in receipt of better supply of cupola grades. It appears that No. 2 cast and stove plate are mixed with so-called No. 1 cast on occasion. Although no cut rails are available foundries in that area are picking

up short steel scrap in better volume.

Pacific Coast

San Francisco—The problem of defense priorities becomes more serious as each week passes and many small industries working on private projects are faced with a complete shut-down. On top of that the situation is aggravated by the fact that local producers find it increasingly hard to obtain scrap.

The outstanding award of the week went to American Bridge Co. and called for 18,400 tons of transmission towers for the Bonneville dam in Oregon, connecting with

lines of the Coulee dam in Washington. Awards aggregated 19,765 tons bringing the total for the year to 410,011 tons as compared with 149,318 tons for the corresponding period in 1940.

Considerable plate tonnage is in sight and is expected to be placed within the next two or three weeks. Most awards were limited to lots of less than 100 tons and awards totaled only 270 tons, bringing the aggregate for the year to 424,098 tons, compared with 52,857 tons for the same period a year ago.

Several large inquiries for reinforcing bars are in the market and cast producers seem little inclined to bid. One inquiry calls for 6000 to 10,000 tons for defense work in



AMPCO

SUB-CONTRACTOR TO
AMERICAN INDUSTRY

Designers and builders of machine tools, aircraft and innumerable products where "Metal Failure" can be a problem, are turning in ever increasing numbers to the AMPCO foundries for outstanding alloys of the aluminum bronze class.

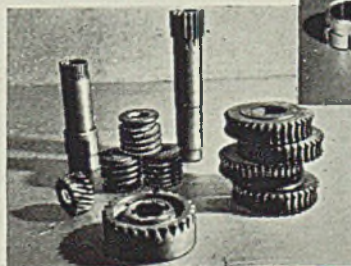
AMPCO METAL is without equal for its great strength—for its remarkable resistance to wear, impact, fatigue and corrosion. Government specifications in copper base alloys are met daily at AMPCO. It makes good where all other metals fail. Let us send you complete data suggesting possible applications of AMPCO METALS to your uses.

AMPCO METAL, INC.

Dept. S-84 MILWAUKEE, WISCONSIN

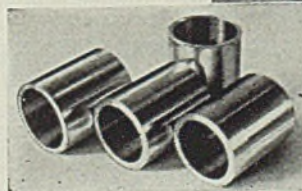
From FURNACE To Precision Finished Parts

AMPCO controls every step — alloying, centrifugal and sand casting, rough machining and finished machining to very close tolerances.



The ESSENTIAL Bronze Alloy

Six grades giving the following ranges: Hardness — 109 to 352 Brinell; Tensile strength — 60,000 to 105,000 p.s.i.; Compressive strength, 18,000 to 171,000 p.s.i.



AMPCO METAL

The Metal Without An Equal





A Production Chart on Every Worker Would Show How
HEAT-FAG
takes its Toll!

IF every plant executive could SEE how Heat-Fag cuts workers' efficiency and makes production sag — something would be done about it . . . QUICK!

Doctors know that the human body requires a constant balance of salt.

Sweating robs the body of salt. If this loss continues without replacement, it may eventually cause heat sickness and severe cramps. In a lesser degree it causes fatigue, lowered efficiency and a vague feeling of discomfort.

Thus, HEAT-FAG threatens EVERY worker who sweats. The remedy is obvious . . . replace the salt lost by sweating. The easy, inexpensive way to do this is to provide Morton's salt tablets in sanitary dispensers at all drinking fountains, so workers can help themselves.



Place Morton Dispensers At All Drinking Fountains

Morton's modern dispensers deliver salt tablets, one at a time, quickly, cleanly, and without crushing or waste. Sanitary, easily filled — durable and dependable.

Morton's salt tablets contain the most highly refined salt, pressed into convenient tablet form, easy to take with a drink of water. They dissolve in less than 40 sec. after swallowing. Order direct from this ad, or from your distributor.

- DISPENSERS**
- 500 Tablet size \$3.25
- 1000 Tablet size \$4.00
- TABLETS** — Case of 9000
- Salt Tablets \$2.60
- 10 grain
- Combination Salt-Dextrose Tablets, per case . . . \$3.15



FREE . . . write on your firm letterhead for a pocket size sample tube of MORTON'S SALT TABLETS, and new folder, "Heat-Fag and Salt Tablets."

MORTON SALT COMPANY
 CHICAGO, ILLINOIS

the Pacific ocean and as far as can be ascertained the business has not yet been placed. Awards aggregated 12,625 tons and brought the total to date to 70,068 tons as compared with 104,642 tons for the corresponding period in 1940.

Demand for cast iron pipe shows decided improvement and some large inquiries have recently come out for figures.

Seattle—Government supervision of shipping is providing space for heavy materials required by shipyards and other essential industries but jobbing houses and others are routing their needs by rail. Many private projects are being deferred, due to inability to obtain steel. Coast rolling mills and fabricating shops are struggling under a heavy backlog, contractors on other than defense jobs unable to obtain guarantee of delivery.

One of the largest contracts in recent weeks went to Westinghouse Electric & Mfg. Co., Pittsburgh, for furnishing three 108,000-kw. generators for Coulee dam, raising the capacity of that plant to 642,000 kilowatts.

Municipal water system projects are developing in this area. Vancouver, Wash., has approved a \$600,000 bond issue for distribution facilities and Portland, Ore., plans spending \$500,000 for expansion and equipment.

Todd Seattle Dry Docks Inc. has a \$1,000,000 government loan for construction of a 5700-ton capacity drydock to care for destroyers and other naval craft. Bids are expected within a month. Siems, Drake, Puget Sound has a supplementary naval contract for \$26,029,722 for Alaska air bases, bringing the total for this firm for projects at Sitka, Kodiak and Unalaska to \$65,000,000. Awards are expected soon for 12,000 tons of shapes and 2000 tons of concrete bars for the proposed Boeing Aircraft Co. plant. Awards of both shapes and concrete bars were confined to small lots this week but several sizeable tonnages are scheduled for early action.

Plate fabricators, complaining of difficulty in obtaining materials, report a steady volume of small jobs under 100 tons each. Tanks are particularly active and requirements of the merchant fleet under construction calls for items involving plates.

Jobbing houses are enjoying a steady run of sales, plate, bars and sheets being in particularly strong demand. Prices are unchanged. Stocks are low and replacements are slow and difficult.

Having accumulated large inventories prior to the present rush, rolling mills have experienced no shortage of steel scrap. However, as these stocks are being consumed and receipts from the interior failing to keep pace with the demand, there is a prospect of scarcity.

Tin Plate

Tin Plate Prices, Page 90

Tin mill output is unchanged, virtually all mills running at capacity with output at 94 per cent.

There is some doubt that the ac-

tion of OPACS in establishing priorities for tin plate used in canning the current food pack completely eliminates possibility of shortage. This business normally gets first call, and the real difficulty lies not so much in the ability of the tin plate mills to provide sufficient material as in the co-ordination of demand with production and stocks. Ordinarily, demands of the current pack far exceed productive capacity of the mills, and to offset this, stocks are built up before the canning season.

Canada

Toronto, Ont.—Further tightening of steel deliveries to non-war industries is reflected in an announcement from Ottawa that for 1942 production of automobiles will be reduced to about 40 per cent of the total of 1940, with reduction in the number of models of about 50 per cent. Increasing demands for finished and semifinished steel on war account show no indication of abatement and mills now are almost fully covered to the end of the year. Despite heavy demand for steel, prices show little variation from those established early in 1938.

As a result of increasing needs for ship plates, war tanks and other war consumption, it is reported that the government has taken over the entire production of plate from the new mill of the Steel Co. of Canada Ltd., Hamilton, Ont., and also that of Dominion Foundries & Steel, Ltd., in the same city, with the latter now confining output to armor plate. New orders continue to appear for plates in large lots, and inquiries indicate more extensive demand soon. However, there appears little prospect of Canadian mills taking additional contracts for the remainder of this year, and there is some doubt regarding deliveries to other than total war industry in the early part of 1942.

Orders for sheets are in large volume, but most Canadian mills are not interested and practically all new orders are going to the United States.

Merchant bar orders are gaining and while some mills are accepting business only for year-end delivery, consumers are pouring in contracts in the hope of having them accepted, even if delivery is carried into 1942. London Rolling Mills has resumed operations and has made some shipments of merchant steel to local warehouses and is said to have booked large tonnage for delivery up to the end of December.

Announcements of the past week or two indicate Canada is slated for a new period of plant construction and additions, as well as other large building projects, both government account and private enterprise. While most pending orders for structural steel involve lots of 200 to 300 tons, some contracts over 5000 tons also are in sight, mostly for war construction, with present total pending about 12,000 tons.

Practically no change has appeared in the merchant pig iron

market. Demand and inquiries for both foundry and malleable iron are large while priority schedules shut out all consumers other than those fully engaged in war work.

Interest is broadening in iron and steel scrap. Consumers show keen interest and orders are pending for practically all grades. Machinery cast and stove plate are in specially heavy demand and many melters are trying to cover for several weeks, but with only small success. Importers are reported to be making special efforts to obtain larger stocks from the United States before winter.

Steel in Europe

Foreign Steel Prices, Page 93

London—(By Cable)—The steel and iron situation in Great Britain is relatively easier and semifinished stocks are sufficient for some time. Delivery periods on war contracts for steel are satisfactory. Largest demand currently is for shipbuilding material and special steels. An investigation is being started to devise a plan for closing tin plate works which are not needed and operations may be reduced to one-third capacity. Demand for sheets and galvanized sheets is quieter.

Semifinished Steel

Semifinished Prices, Page 91

Requirements for approximately 1,000,000 tons of semifinished steel have been received from Great Britain and are being studied in Washington preparatory to presenting requisitions to the procurement division of the treasury for purchase under the lease-lend law.

These requirements are in addition to a similar tonnage placed in this country within the past 30 days, in lots of 375,000 and 625,000 tons. It is planned to have the new requirements set up so that deliveries can follow without interruption those now being made. This means probably that delivery will begin sometime during fourth quarter and the major portion will be delivered early next year. It was hoped originally to have shipments against the first orders concluded by the end of third quarter, but a carryover now appears probable.

Tool Steel Scrap

Cents per pound, to consumers
f.o.b. shipping point

Tungsten types

For each 1% tungsten contained
Solid scrap containing over 12% . . . 1.80c
Solid scrap containing 5 to 12% . . . 1.60c
Turnings, millings containing
over 12% 1.40c
Turnings, millings, solids under 5% . . 1.25c

Molybdenum Types

Solid scrap, not less than 7% molybdenum, 0.50 vanadium 12.50
Turnings, millings, same basis . . . 10.50
Solid scrap, not less than 3% molybdenum, 4% tungsten, 0.50 vanadium 13.50
Turnings, millings, same basis . . . 11.50

Metallurgical Coke

Coke Prices, Page 91

Although there has been no mention of expansion in coke oven facilities in connection with enlarged capacity for steel and pig iron, it is understood a program of commensurate size will be launched shortly. It is believed total capacity of new by-product ovens will roughly match that of Clairton works of Carnegie-Illinois Steel Corp., world's largest coke oven plant.

Because of the beehive reserve capacity, since the initial flurry of last fall there has been no grave fear of a coke shortage. However, with completion of the OPM plan to add 6,500,000 tons to annual pig iron pro-

ducing capacity there would unquestionably be a squeeze on coke facilities which could not be absorbed by the beehive ovens despite the fact that several thousand units are idle in the Connellsville district.

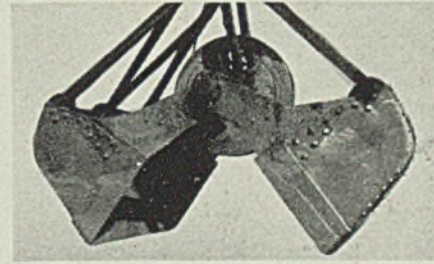
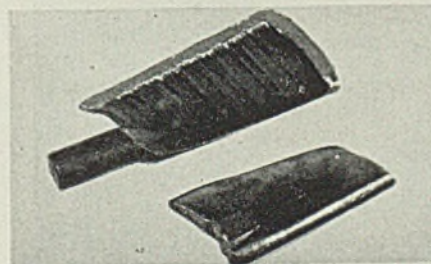
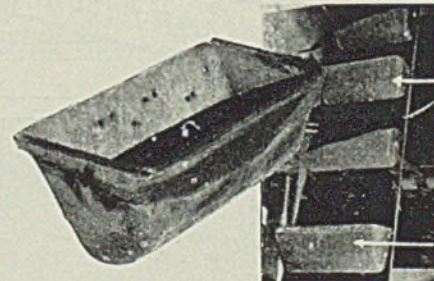
Steel for Farm Tools Not Given Priority

Chicago—Agricultural implement manufacturers are disturbed over unfavorable prospects for obtaining steel to maintain operations at or near current levels. The industry was included in the recent blanket order giving an A-10 rating for repair and maintenance parts. Shortly thereafter, there was reason to



Below: Tang bits made of .60-70 carbon steel with a semi high-speed steel core as a wearing surface last approximately one hour. Those faced with Stoodite give up to 20 hours' service without need for redressing.

Below: All the conveyor buckets in the illustration at right were in service the same length of time. Those indicated by the white arrows were hard-faced with Coated Stoodie Self-hardening. The others were not.



Above: Pug mill knives are used to mix wet clay and since the mixture is highly abrasive the average life of a set of pug mill knives is short. The knife pictured below is completely worn out after three months' service. The knife above was hard-faced with Stoodite. After seven months' service it is still just as long and as wide as the day it was placed in service.

Above: A cement manufacturer in the Midwest reports that hard-facing the lips of their clam shell buckets with Coated Stoodite increased their life 10 times. Unprotected manganese steel lips lasted only six months, while a set of lips hard-faced with Stoodite lasted five years. Since the lips are worth approximately \$300.00 a pair the saving over a period of five years amounts to around \$2500.00.

Stoodie Hard-Facing Alloys are being used to protect the wearing surfaces of all types of steel equipment—in all types of industries. If abrasion is one of your problems we will be glad to send descriptive literature or submit recommendations covering the correct hard-facing alloy and welding procedure to fit your particular problem. Stoodie Hard Facing Alloys are described in Catalog No. 106. Send for your copy now!

STOODY COMPANY—1134 West Slauson, Whittier, California



STOODY COMPANY
Hard Facing Alloys

3 FEATURES

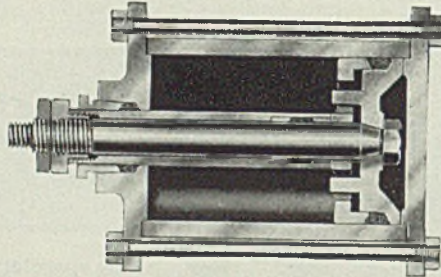
for better use of air power

Hannifin Pneumatic Cylinders, all sizes and lengths, are bored and then honed. The cylinder interior is straight, round, perfectly smooth.

Simple outside adjustment of piston packing, without disturbing any other parts, allows easy maintenance of high efficiency piston seal.

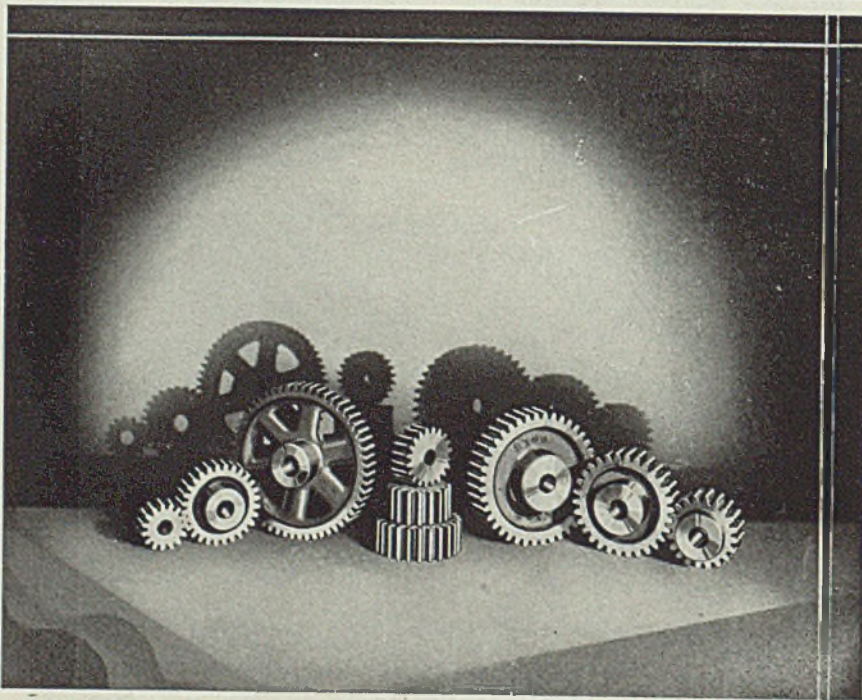
The soft-graphite treated piston packing can be renewed, if necessary, by applying ordinary graphited packing, always available. No special parts are needed.

Hannifin design prevents leakage and waste of air power, keeps friction loss at a minimum. For sustained high efficiency, use Hannifin cylinders. Write for Bulletin 34-S.



HANNIFIN MANUFACTURING COMPANY
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HANNIFIN "Leak-Proof" AIR CYLINDERS



GRANT

Means three things to gear users:
QUALITY — SPEED — ECONOMY

When your plans call for special gears—
Spur, Bevel, Mitre, Internal, Worms and
Worm Gears, Chain Drives, Reduction
Units—Try GRANT.

GRANT GEAR WORKS Corner Second & B Sts.
BOSTON, MASS.

believe a much higher rating would be granted for farm machinery, but thus far no action has been taken, in spite of the fact that the canning industry, which deals with the farm product, was placed high in priority. It is understood that a western sheetmaker has been instructed by OPACS to supply no steel except for defense. The sheetmaker informed a farm equipment maker that it would be unable to supply material already ordered, with the result that the manufacturer is taking his case to Washington.

Wrought Washers Higher

Wrought washers have been advanced again by lowering of discounts, the new price being \$4.00 off list, against \$4.25 previously. This is the third or fourth monthly advance in price due to scarcity and higher costs of raw materials, plate rejects and seconds. Demand for washers is extremely brisk, particularly for shipbuilding and other defense purposes.

New Track Bolt Extras

Following announcement of revisions in base prices on track bolts, a new extra list has been issued.

Size extras have been increased on a graduated scale, with no change in the base, which is 3/4-inch diameter or over, 3 1/2 inches long, or over, with square nut. Extras increase as sizes decrease. Design extra for cut threads is now 25 cents instead of 10 cents. Base quantity is now 200 kegs or over instead of 25 kegs or over, establishing two new extras, for the range 100 kegs to 199 kegs, 10 cents, and 25 kegs to 99 kegs, 25 cents. Extra remains unchanged for 24 kegs or less, at 50 cents. Packing extra for 100 pound kegs has been eliminated.

The former extra or heat treatment has been eliminated and heat-treated bolts are quoted at 5.00c base, while untreated bolts are 4.75c.

Park Chemical Expands

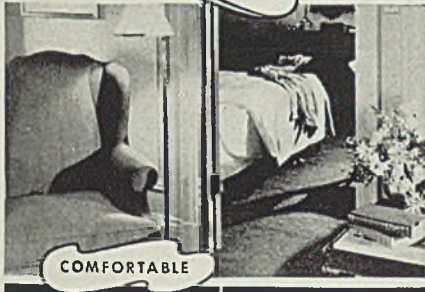
■ Park Chemical Co., Detroit, is increasing capacity for production of heat treating salts, chemicals and nonburning carburizer, by the addition of a new building adjacent to its present plant at 8074-8110 Military avenue.

The company has appointed the following sales representatives: New England, Ralph Hare, 716 Farmington avenue, West Hartford, Conn.; New York state, Manufacturers' Supply Co., 515 Chimes building, Syracuse, N. Y.; Canada, G. A. Kirtledge, 1450 West St. Catherine street, Montreal, Que.

Equipment

New York—Considerable revision in deliveries of machine tools now being built or awaiting shipment

This
IS HOTEL
CLEVELAND



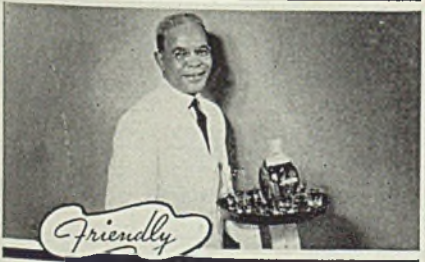
COMFORTABLE



Gay



OR QUIET



Friendly



CONVENIENT



ROOMS
from \$3

HOTEL CLEVELAND
Cleveland

is expected to follow an order due Aug. 15 making certain shop equipment subject to requisition or draft for defense after that date. A second order will follow Sept. 15 making additional machines subject to the ruling. Some tools originally destined for one type of fabrication will be rerouted with the importance of defense predominant. Meanwhile buying continues heavy and unabated, with ability to expedite orders by sub-contracting playing a more important part in allocating contracts. For equipment entering into three small arms plants, yet to be built, for which machinery orders have already been placed with 32 prime contracts, it is estimated 25,000 sub-contractors and suppliers in all sections of the country are sharing in some way. Government departments are also showing improvement in buying methods placing orders more in advance with fuller details as to design plans and requirements.

Machine tool builders are being well serviced by suppliers, including steel, small tools, fixtures and motors, and, while there are spots where temporary lags develop, steady and ample flow of materials to builders is a bright spot in a picture which is more confused in some defense work. Co-operation between machine builders themselves in the exchange of patterns, blue prints and parts is also a factor expediting tool assemblies. It is pointed out that for the three small arms plants to be erected by the ordnance department orders were placed for 7528 special items for machines, from hand tools to 20-ton presses, with much of the equipment allowing for smaller tolerances.

Seattle—Private buyers, aside from contractors on defense projects, are receiving little attention as machinery and equipment houses are taxed to the limit to supply airport, army, navy and other public agencies. Electrical items continue in strong demand while tractors, earth moving apparatus and shipyard equipment are moving in volume. Dealers report delay in supplying some needs.

Refractories

Refractories Prices, Page 92

Manufacturers of refractories report as live projects the possible building of four new blast furnaces, chiefly in Ohio and Alabama, under the plan of OPM to increase pig iron capacity. There is some doubt on the part of refractories manufacturers as to how soon they would be able to furnish bricks for lining these proposed stacks and stoves. Orders for refractories are increasing faster than manufacture and shipments and the situation as regards supply becomes more acute.

Ferroalloys

Ferroalloy Prices, Page 92

While movement of ferroalloys was increased substantially during first half, as compared with the corresponding period a year ago, due primarily to increased facilities, the peak of present expansion will



**It Takes WATER
TO WIN A WAR**



FOR MEN, machines and materials there is no substitute for water. Every factory, city, air field, army camp or munition plant engaged in defense work should have an abundance of water—preferably from its own Well Water System. A water shortage or failure would play havoc with any production program.

In selecting a Well Water System you would first look to a firm that had a dependable reputation. It should have proven itself over a long period of time. Next, their product should be of unquestionable merit. All of these basic factors and many more are enjoyed by Layne—"The World's Largest Water Producers." The Nation-wide Layne organization has the men, equipment and skill to undertake and promptly complete any size water producing project, anywhere in the United States or possessions.

If you would like to have facts concerning your water supply needs, write to Layne. Their engineers are ready to cooperate. They are specialists in the water producing field. They know water bearing formations, well drilling and pump installation. For bulletins on Layne Well Water Supplies and Turbine Pumps, write

LAYNE & BOWLER, INC.

Memphis, Tenn.

LAYNE
PUMPS & WELL
WATER SYSTEMS

AFFILIATED COMPANIES

Layne-Arkansas Co.	Stuttgart, Ark.
Layne-Atlantic Co.	Norfolk, Va.
Layne-Central Co.	Memphis, Tenn.
Layne-Northern Co.	Mishawaka, Ind.
Layne-Louisiana Co.	Lake Charles, La.
Layne-New York Co.	New York City, N.Y.
Layne-Northwest Co.	Millwaukee, Wis.
Layne-Ohio Co.	Columbus, Ohio.
Layne-Texas Co.	Houston, Texas.
Layne-Western Co.	Kansas City, Mo.
Layne-Western Co. of Minnesota	Minneapolis, Minn.
Layne-Bowler New England Corp.	Boston, Mass.
International Water Supply	London, Ont., Canada.

probably not be reached until some time next year. This expansion may in the end almost double the pre-emergency output.

At present, the movement is not as heavy as in June as electric power in the South has been curtailed by the dry season. This is expected to continue through August. Producers, however, are moving tonnage as fast as it is being produced, with demand for practically all types of ferroalloys well in excess of supply.

Prices are unchanged, with ferromanganese \$120, duty paid, Atlantic and gulf ports, and 19 to 21 per cent spiegeleisen, at \$36, Palmerton, Pa.

Nonferrous Metal Prices

July	Copper		Casting, refinery	Straits Tin, New York		Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Anti-mony Amer. Spot, N.Y.	Nickel Cathodes
	Electro, del. Conn.	Lake, del. Midwest		Spot	Futures						
26	12.00	12.00	12.25	55.25	54.50	5.85	5.70	7.25	17.00	14.00	35.00
28	12.00	12.00	12.25	55.25	54.25	5.85	5.70	7.25	17.00	14.00	35.00
29	12.00	12.00	12.25	54.00	53.25	5.85	5.70	7.25	17.00	14.00	35.00
30	12.00	12.00	12.25	53.25	52.25	5.85	5.70	7.25	17.00	14.00	35.00
31	12.00	12.00	12.25	52.50	51.50	5.85	5.70	7.25	17.00	14.00	35.00
Aug. 1	12.00	12.00	12.25	52.75	51.62½	5.85	5.70	7.25	17.00	14.00	35.00

F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 12.00c Conn. copper

Sheets	
Yellow brass (high)	19.48
Copper, hot rolled	20.87
Lead, cut to jobbers	9.10
Zinc, 100 lb. base	12.50

Tubes	
High yellow brass	22.23
Seamless copper	21.37
Rods	
High yellow brass	15.01
Copper, hot rolled	17.37
Anodes	
Copper, untrimmed	18.12
Wire	
Yellow brass (high)	19.73

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	10.00-10.25
Cleveland	10.50-10.75
Chicago	9.25-9.50
St. Louis	9.50

Heavy Copper and Wire

New York, No. 1	11.25-11.50
Cleveland, No. 1	11.00-11.50
Chicago, No. 1	10.50-10.75
St. Louis	10.00-10.50

Composition Brass Turnings

New York	9.75-10.00
----------	------------

Light Copper

New York	9.25-9.50
Cleveland	9.00-9.25
Chicago	8.50-8.75
St. Louis	8.00

Light Brass

Cleveland	6.00-6.50
Chicago	6.50-6.75
St. Louis	5.75-6.00

Lead

New York	5.00-5.25
Cleveland	4.75-5.00
Chicago	4.75-5.00
St. Louis	4.50

Old Zinc

New York	4.50
Cleveland	4.00-4.12½
St. Louis	5.00

Aluminum

Mls., cast	11.00
Borings, No. 12	9.50
Other than No. 12	10.00
Clips, pure	13.00

SECONDARY METALS

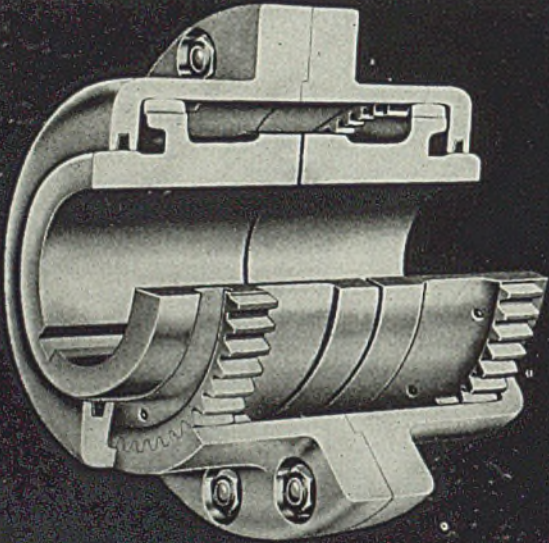
Brass ingot, 85-5-5-5, l. c. l.	13.25
Standard No. 12 aluminum	16.00

Nonferrous Metals

New York—Some brass mills have been forced to suspend or curtail production operations due to a shortage of copper, even though some have defense orders. Others have halted shipments to non-defense industries. Curtailment in production is attributed to delays in making allocations and to the uncertainties regarding supplies which will be available to various classes of users under the pending 100 per cent priority order which was expected to be placed in effect as of Aug. 1.

Copper—About 60 to 65 per cent of all copper goes to defense which has first call on supplies. Consumers await the OPM estimate of the actual amount of copper re-

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FLEXIBLE COUPLINGS

POOLE FOUNDRY & MACHINE COMPANY
WOODBERRY, BALTIMORE, MD.

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One of the few famous Hotels in

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... became famous through its unsurpassed facilities, its superb food, the unvarying graciousness of its service and its vigilant management. And you will also appreciate its reasonable rates.

BELLEVUE - STRATFORD

IN PHILADELPHIA

CLAUDE H. BENNETT, General Manager



quired in August for defense so they will know how much copper may be left for non-defense.

Lead—Metals Reserve Co.'s purchase of foreign lead for delivery by the end of this year seems to have assured consumers of enough lead for all needs. Needs are being covered in a satisfactory manner.

Tin—Following a sharp rise in prices to the basis of 55.25c for Straits spot, OPACS threatened to impose a price ceiling on the metal in the near future. Mr. Henderson, administrator, said the government

buying price of 50.00c is a fair one. OPM requested consumers to cease accumulating reserves and to reduce their present reserves by one-half before making new purchases. These two announcements produced a depressing effect on the market pricewise and spot dropped to around 52.75c.

Zinc—OPM has stipulated that an amount equal to 27 per cent of producers' June production, or approximately 19,000 tons, must be set aside for the August pool from which emergency needs are covered.

Rhode Island

PROVIDENCE, R. I.—Standard Machinery Co., 1475 Elmwood avenue, will build a one-story 80 x 120-foot addition and make alterations in its plant, at cost of more than \$40,000. General contract has been let to A. C. Beals Co., 63 Bassett street. (Noted July 21.)

New York

LOCKPORT, N. Y.—Harrison Radiator Corp., Washburn street, has let a contract for a plant addition to William B. Eaton Construction Co. Inc., Olson building, at about \$45,000.

NIAGARA FALLS, N. Y.—Frontier Bronze Corp., 818 Elmwood avenue, will build a two-story 72 x 173-foot foundry and warehouse, contract to Gaylord, Guenther & Co. Inc., 611 Eighth street, to cost about \$65,000. (Noted July 14.)

NORTH TONAWANDA, N. Y.—Buffalo Bolt Co., East avenue, Buffalo, will let contract soon for a plant addition costing over \$40,000. Bley & Lyman, 505 Delaware avenue, Buffalo, are architects and engineers.

SYRACUSE, N. Y.—Texas Co., 135 East Forty-second street, New York, plans a bulk oil storage plant to cost about \$85,000.

TONAWANDA, N. Y.—Chevrolet Motor & Axle division of General Motors Corp., Grand boulevard, Detroit, is having plans made by Albert Kahn & Associates, 345 New Center building, Detroit, for a motor testing building costing more than \$40,000.

New Jersey

ROSELLE PARK, N. J.—Pulverizing Machinery Co., Louis Ruprecht, propri-

Construction and Enterprise

Ohio

ALLIANCE, O.—Galanot Products Co., East Patterson street and North Park avenue, will increase production of traction device to convert trucks into tractors, stabilizer jacks, aviation training stands and track connector for armored tanks. Has bought six acres and former car barns which will be remodeled at cost of \$25,000 to provide 55,000 additional square feet.

CANTON, O.—Union Metal Mfg. Co., 1432 Maple avenue, is starting production of 1000-pound practice bombs for the navy and is making further additions to plant to accommodate enlarged defense work.

CLEVELAND—Viking Air Conditioning Corp., Marion Levy, president and treasurer, has leased three-story brick building with 35,000 square feet floor space

Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 100 and Reinforcing Bars Pending on page 102 in this issue.

at 5700 Walworth avenue, to replace plant at 9500 Richmond avenue, burned in June. Manufacture of fans, blowers, etc., will be resumed soon.

CLEVELAND—Aviation Metals Inc. is being formed by William H. Thomas Jr., of Kitchen Equipment Co., 1702 Chester avenue. Company may locate at Lorain, O.

CLEVELAND—Tinnerman Products Inc., 2079 Japan street, will build plant and warehouse addition of 10,000 square feet to increase production of speed nuts. Albert H. Tinnerman is president.

CLEVELAND—Peerless Automatic Machine Co., 1970 West Seventy-seventh street, Leon F. Schulze, president, is adding 3000 square feet manufacturing space to increase capacity for screw machine products.

CLEVELAND—Ohio Pipe Bending & Machine Co., 3910 Trent avenue, George Conley, president, will build a foundry addition 42 x 66 feet.

CLEVELAND—Cleveland Automatic Machine Co., 2269 Ashland road, will build an addition of 12,000 square feet for assembly department. Arthur L. Patrick is president. Albert M. Higley Co., 2036 East Twenty-second street, will build.

CUYAHOGA FALLS, O.—Falls Screw Products Co., D. W. Norman, president, will take bids soon for a one-story plant addition costing about \$40,000.

KENT, O.—Twin Coach Co., 850 West Main street, plans production of portable fire-fighting unit, after tests by war department officials. Recently bought 11-acre site for future expansion.

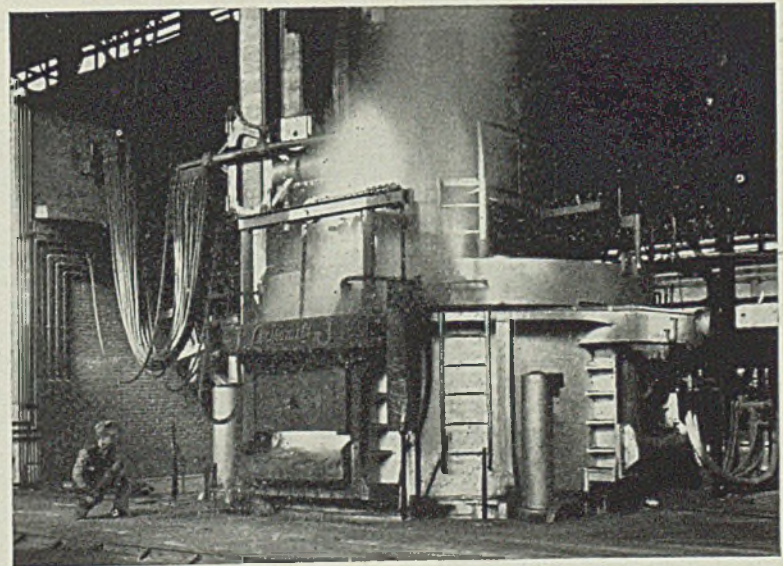
Connecticut

ANSONIA, CONN.—Farrel-Birmingham Co. Inc., 30 Main street, has let general contract for a two-story plant addition to H. G. Bengtson & Co., 303 Wakelee avenue, to cost about \$50,000.

Massachusetts

NORWOOD, MASS.—Norwood Stamping Co. Inc., 19 Press avenue, will build a one-story plant costing about \$40,000. H. Korslund, 153 Nanatau street, is architect.

71 Lectromelts SOLD IN 1940



ANOTHER 75 TON LECTROMELT ON ALLOY STEEL

LECTROMELT furnaces are built in sizes ranging from 100 tons to 25 pounds. Both door charge and top charge types are available. Rugged and durable construction. Rapid and economic operation.

PITTSBURGH LECTROMELT FURNACE CORP.
PITTSBURGH, PA.

etor, manufacturer of Mikro pulverizer, has let contract for a modern factory and office building 100 x 200 feet on six-acre tract recently bought at Summit, N. J.

Pennsylvania

ERIE, PA.—Hays Mfg. Co., W. H. Fors-ter, general manager, 801 West Twelfth street, will take bids soon on a one-story 58 x 200-foot plant costing about \$40,000. H. Nelson, 209 Hayes building, is engineer.

ERIE, PA.—J. A. Zurm Mfg. Co. Inc., M. A. Zurm, vice president, 1800 Pitts-burgh avenue, will build an addition to its plumbing supply manufacturing plant at cost of more than \$40,000.

HARMONY, PA.—F. x Grinders Inc., J. B. Balr, treasurer, 1704 Oliver build-ing, Pittsburgh, will build a one-story

50 x 80-foot plant, general contract to C. J. Lawrence, Trotwood Acres, Pitts-burgh.

Michigan

DETROIT—Welch Industries Inc., 19900 West Eight Mile road, has been incor-porated with \$100,000 capital to deal in steel tools, by Rodney R. Welch, 9975 Strathmoor avenue.

DETROIT—Wellward Tool Co. Inc., 2280 Penobscot building, has been in-corporated with \$5000 capital to manu-facture tow-bars, draw-bars and trailers, by Ronald S. Woodward, 1440 East Franklin street.

DETROIT—Bremace Corp., 2966 Penob-scot building, has been incorporated with \$350,000 capital to manufacture milling machines, by E. Bartlett Booth, 720 Whitmore road.

PONTIAC, MICH.—Oakland Tool & Die Co., 26 Paterson street, has been in-corporated with \$5500 capital to manu-facture tools, dies and jigs, by DeForest C. Inman, 495 Omar street.

Illinois

CHICAGO—Powers Regulator Co., 2720 Greenview avenue, has let general con-tract for a two-story plant addition to J. D. Froelich, 189 West Madison street, at about \$50,000. (Noted June 2.)

GLENARM, ILL.—Illinois Natural Gas Co., Glenarm, plans 43 miles of gas pipe line from Peoria to Galesburg, Ill. F. Hamilton, Illinois building, Springfield, Ill., is consulting engineer.

Alabama

MOBILE, ALA.—Alabama Dry Dock & Shipbuilding Co. has an allotment of \$5,010,000 for expansion.

Maryland

BALTIMORE—Baltimore Steel Co. has let contract to Cummins Construction Corp., 803 Cathedral street, for a two-story brick shop building at 1400 Eastern avenue.

BALTIMORE—Maryland Nut & Bolt Co. has let contract to Cummins Con-struction Corp., 803 Cathedral street, for a one-story manufacturing building at 1320 Smith avenue, to cost about \$40,000.

BALTIMORE—Maryland Dry Dock Co. has allotment of \$3,894,256 for plant expansion, including \$501,066 for ma-chinery and equipment.

Kentucky

DANVILLE, KY.—East Kentucky Rural Electric Co-operative Corp. plans con-struction of a \$2,500,000 steam-operated power generating plant near here. P. M. Sullivan, Gallatin, Tenn., is consulting engineer.

Louisiana

LAKE CHARLES, LA.—M. W. Kellogg Co., 225 Broadway, New York, has been given contract for erecting \$16,000,000 magnesium metal plant here for Mathle-son Alkali Co., 60 East Forty-second street, New York.

West Virginia

INSTITUTE, W. VA.—Carbide & Car-bon Chemical Corp., 437 McCorkle ave-nue, Charleston, W. Va., has bought 158 acres on which to build plant to manu-facture plastic bases.

Missouri

MARYVILLE, MO.—Nodaway-Worth County Rural Electric Co-operative Inc. will build 385 miles of rural electric lines with REA funds. Paulette & Wilson,

1006 Kansas avenue, Topeka, Kans., are consulting engineers.

ST. LOUIS—Federated Metals division of American Smelting & Refining Co., 4041 Park avenue, received bids August 2 for a one-story 82 x 120-foot addition to its warehouse. Murphy & Wischmeyer, 208 Board of Trade building, are archi-tects.

Oklahoma

MUSKOGEE, OKLA.—Federal Power Commission has recommended expendi-ture of \$20,000,000 for two electric power plants on Arkansas river, to develop 60,000 kilowatts by 1943. Locations are at Fort Gibson and Markhams Ferry.

Minnesota

MINNEAPOLIS — Federal Cartridge



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KRON

Dial Scales

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THE **KRON** CO.
BRIDGEPORT CONN.



Public preference

is won through ability to place
comfortable accommodations
at your disposal . . . serviced to
your satisfaction . . . priced
to fit your requirements . . . so
that you'll "tell the folks back
home."

DETROIT LELAND HOTEL

**800 OUTSIDE ROOMS ALL WITH
PRIVATE BATH . . . SINGLE FROM
\$2.75 . . . DOUBLE FROM \$4.50**

CHARLES H. LOTT
General Manager

Corp., Minneapolis and Anoka, Minn., will build and operate the \$30,000,000 small arms ammunition plant at New Brighton, a suburb. Charles L. Horn, president, has been made plant manager for the war department. Walbridge & Aldinger, Detroit, will construct buildings. Chicago ordinance office of War department has issued advance notices of calls for bids for machine tools and other equipment.

MINNEAPOLIS — Minneapolis-Moline Power Implement Co. has let general contract for a two-story 140 x 327-foot plant at 2854 Minnehaha avenue to E. M. Gauley Co., 2922 Oakland avenue, to cost about \$150,000. (Noted June 12.)

Texas

HOUSTON, TEX.—Wyatt Metal & Boiler Works, Washington street and MKT railroad, has bought 3½ acres adjoining plant to provide for future expansion.

Kansas

GORHAM, KANS.—City, Reuben Morgenster, mayor, is preparing plans for a waterworks system, including an elevated storage tank, subject to WPA approval. Paulette & Wilson, Public Utilities building, Salina, Kans., are engineers. Estimated cost is \$50,000.

IOLA, KANS.—Co-operative Power & Light Co. plans construction of 225 miles of rural transmission lines. Paulette & Wilson, 1006 Kansas avenue, Topeka, are consulting engineers.

MANHATTAN, KANS.—City is considering proposals for construction of sewage disposal plant to cost about \$200,000. Paulette & Wilson, Public Utility building, Salina, Kans., are engineers.

MCPHERSON, KANS.—Smoky Valley rural electric association plans 130 miles of rural electric lines. Paulette & Wilson, 1006 Kansas avenue, Topeka, Kans., are consulting engineers.

SENECA, KANS.—Marshall-Nemaha Electric Service Inc. plans construction of 229 miles of rural electric lines, Paulette & Wilson, 1006 Kansas avenue, Topeka, Kans., are consulting engineers.

South Dakota

BELLE FOURCHE, S. DAK.—City council, R. R. Bernard, auditor, plans to add chlorinator equipment to its water system. B. A. Nangle is city engineer.

SIoux FALLS, S. DAK.—City, C. M. Whitfield, auditor, takes bids to August 7 on sewage plant improvements, including settling tanks, sludge removers pumping equipment and meters. Greeley & Hansen, 6 North Michigan avenue, Chicago, are engineers.

Nebraska

BELLEVUE, NEBR.—WPA has approved project for sewage disposal plant and sewer system for 300 new homes near Fort Crook bomber assembly plant, to cost about \$175,000. H. H. Henningson, 626 Standard Oil building, Omaha, Nebr., is engineer.

HASTINGS, NEBR.—City plans installation of gas distribution system to cost about \$246,000. F. E. Devlin, W-K-H building, Wichita, Kans., is consulting engineer.

OMAHA, NEBR.—Nebraska state railway commission, has authorized Nebraska Power Co., Omaha, to build 270 miles of electric transmission line to connect with system of Kansas Gas & Electric Co. at Wichita, Kans., at cost of about \$4,000,000, work to be started soon.

Iowa

BATAVIA, ICWA—Town council has

plans under consideration for waterworks system to cost about \$22,000.

DAVENPORT, IOWA—City Water Co. is having plans prepared for improvements to waterworks, including three surface pumping units with daily capacity of 15,000,000 gallons and changing filter units from pressure to gravity operation. Estimated cost is \$60,000.

DUBUQUE, IOWA—Interstate Power Co., Dubuque, has awarded contract for substructure of new boiler house to E. L. Archibald Co., 11 South La Salle street, Chicago. Entire project will cost about \$100,000.

DURANT, ICWA—City has approved \$115,000 bond issue to partially finance

municipal light and power plant, which will cost an estimated \$155,000.

FORT DODGE, IOWA—City has awarded contract for grease removal unit at sewage disposal plant near Tobin packing plant, to Weldon Bros., Iowa Falls, Iowa, at \$53,005.

OSAGE, IOWA—City, F. J. Drommer, clerk, takes bids to August 11 on additions and alterations in electric distributing system. Hubbard Engineering Co., 415 North LaSalle street, Chicago, is consulting engineer.

SPENCER, IOWA—M. M. Moulton, mayor, will receive bids August 18 for reconstruction of municipal steam distribution system. Pillsbury Engineering Co., 100 Second avenue south, Minneapo-



It may not appear to be important, but it is an Industrial Essential.

LOYAL, conscientious workers, alertness sapped, bodily weakened, unwittingly become near-saboteurs through doggedly trying to keep on their feet after Heat Sickness has them hanging on the ropes.

Fairway Saltabs*, quite unobtrusive little tablets of pure sodium chloride, play a mighty important role in our National Defense in defending workers from Heat Sickness. Have you provided a supply of Fairway Saltabs to place about drinking fountains so that your workers can overcome Heat Sickness?

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lis, is consulting engineer.

WAVERLY, IOWA—City is preparing preliminary plans for improvements to municipal light plant to cost about \$87,000. Stanley Engineering Co., Muscatine, Iowa, is consulting engineer.

California

BENICIA, CALIF.—Government will build ordnance machine shop, cleaning and preserving materials building and inert materials warehouse at arsenal here, to cost about \$600,000.

BURBANK, CALIF.—Joan Castle will build a metal-manufacturing building 20 x 42 feet at 129 East Providencia

street, costing about \$4300.

COMPTON, CALIF.—Southern California Gas Co., 810 Flower street, Los Angeles, will build a concrete and steel operations building at 1401 East Elm street, 65 x 95 feet costing about \$90,000.

GLENDALE, CALIF.—Welch Tool Engineering Co. has been formed by Earl E. Welch to conduct business at 6046 San Fernando road, Glendale.

LOS ANGELES—Century Aircraft Corp., 5601 West Century boulevard, is building an addition 50 x 60 feet, costing about \$4500.

LOS ANGELES—Timm Aircraft Corp.,

8055 Woodley avenue, will build two additions, 15 x 120 feet and 30 x 60 feet, costing about \$4600.

LOS ANGELES—Kelman Electric & Mfg. Co., 1635 Naud street, is building a machine shop addition 50 x 50 feet costing about \$3000.

LOS ANGELES—Fisk Airplane & Engine Co. has been incorporated with \$100,000 capital by C. T. Gilliam, Los Angeles, and associates. Craig & Weller, 817 Board of Trade building, Los Angeles, are representatives.

LOS ANGELES—American Tool Products Inc. has been incorporated with \$25,000 capital by W. J. Head, M. E. Miller and R. C. Davis, all of Los Angeles. C. B. Stewart Jr., Stock Exchange building, is representative.

LOS ANGELES—Universal Steel Sash Corp., has been organized by Joseph Goldberg to manufacture metal sash and other steel specialties.

LOS ANGELES—Akwel Tool Engineering Co. has been organized by Edward G. Akridge to conduct business at 5630 1/2 Lankershim boulevard, Los Angeles.

NORTH HOLLYWOOD, CALIF.—Bendix Aviation Ltd. has let contract to Consolidated Steel Co., Los Angeles for furnishing and erecting structural steel for a new plant at 11600 Sherman Way, including two-story factory building 28 x 350 feet, manufacturing building 240 x 350 feet and two-story office building 46 x 170 feet, total cost to be about \$500,000.

LOS ANGELES—Steel products and portions of fixtures and furniture and all equipment except traveling cranes attached to warehouses in Oakland and Los Angeles, with a portion of automotive equipment, have been sold by Bergstrom Steel Co. Ltd., 3341 East Slauson avenue, Los Angeles, and Seventeenth and Willow streets, Oakland, to Earl M. Jorgenson Co.

LOS ANGELES—Marquis Smelting & Refining Co., 2448 Twenty-fifth street, has been sold by Albert Nelson to United American Metals Corp.

SIGNAL HILL, CALIF.—Crest Machine Shop, 2310 Orange street, has been sold by A. L. Prout to Milton J. Wershaw, including machine tools and heat-treating furnace.

Oregon

PORTLAND, OREG.—Western Foundry Co. has bought a site and will expand its production facilities, including cupola, two traveling cranes, core ovens and annealing equipment. R. E. Huffschildt is president.

PORTLAND, OREG.—B. S. Morrow, manager of city water system, has asked for \$500,000 bond issue to finance extensions, including standpipe, storage facilities, mains and pumps.

Washington

LONGVIEW, WASH.—City will call bids soon for a 3,000,000-gallon water filter plant for which a \$95,000 bond issue has been sold. Plans are by John W. Cunningham & Associates, Portland, Oreg.

PUGET SOUND NAVY YARD, WASH.—Navy plans expenditure of \$3,500,000 for underground fuel depots on Puget Sound where bases are under construction.

SEATTLE—Asbestos Supply Co. has bought a site at Portland, Oreg., and plans construction of a plant to process asbestos for shipbuilding construction.

SEATTLE—Northwest Metal Products Co. has increased its capital to \$250,000 and changed its name to Northwest Metal Products Inc.

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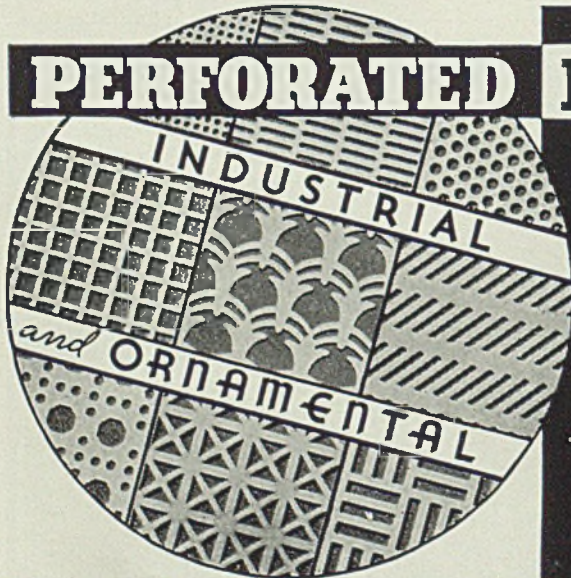
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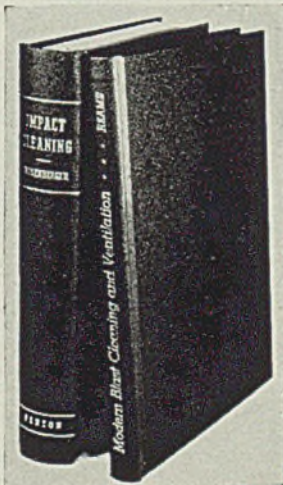
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Pittsburgh-Chicago.

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Columbia Steel Co.,
San Francisco, Calif.

Hanna Furnace Corp., The,
Ecorse, Detroit, Mich.

Koppers Co., Gas & Coke Div.,
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Pittsburgh, Pa.

Koppers Coal Co., 300 Koppers
Bldg., Pittsburgh, Pa.

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Boston, Mass.

Sherango Furnace Co.,
Oliver Bldg., Pittsburgh, Pa.

Snyder, W. P., & Co.,
Oliver Bldg., Pittsburgh, Pa.

Tennessee Coal, Iron & Railroad
Co., Brown-Marx Bldg.,
Birmingham, Ala.

Wieman & Ward Co., The,
Oliver Bldg., Pittsburgh, Pa.

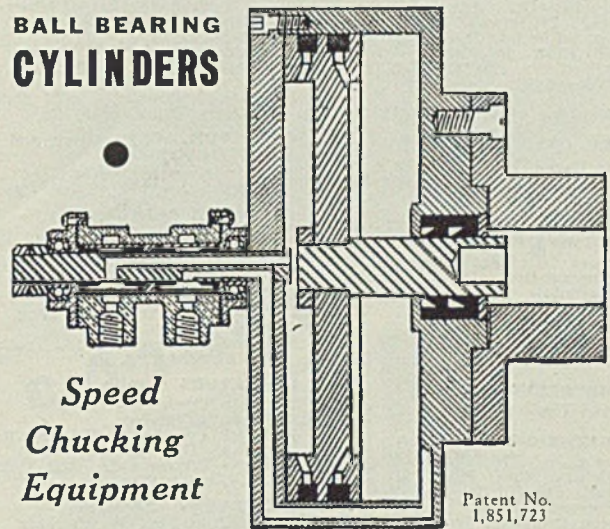
Youngstown Sheet & Tube Co., The,
Youngstown, O.

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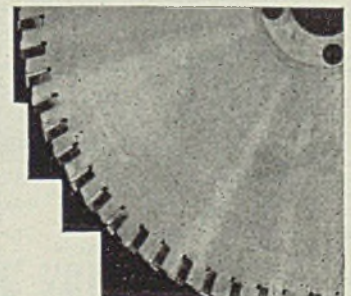
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Norton Company, Worcester, Mass.

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General Electric Co., Schenectady, N. Y.

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Western Gas Div., Koppers Co., Fort Wayne, Ind.

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Youngstown Sheet & Tube Co., The, Youngstown, O.

CONDUITS (Pressure-Treated Wood)

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Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

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Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

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Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Combustion)—See COMBUSTION CONTROLS**CONTROLS (Temperature)**

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Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

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Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Mathews Conveyor Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyor Co., 142 Tenth St., Ellwood City, Pa.

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Mathews Conveyor Co., 142 Tenth St., Ellwood City, Pa.

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Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
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Reading Chain & Block Corp., Dept. 36, Reading, Pa.

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Revere Copper & Brass, Inc., 230 Park Ave., New York City.

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International Correspondence Schools, Box 9375-B, Scranton, Pa.

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Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 434 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

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American Flexible Coupling Co., 18th & Pittsburgh Aves., Erie, Pa.

Bartlett-Hayward Div., Koppers Co., Baltimore, Md.

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Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

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National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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Dravo Corp. (Engineering Works Div.), Neville Island, Pittsburgh, Pa.
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Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
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Ohio Locomotive Crane Co., Bucyrus, O.

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Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. 36, Reading, Pa.
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Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
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Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)

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Reading Chain & Block Corp., Dept. 36, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

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Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

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National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

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Challenge Machinery Co., Grand Haven, Mich.

CUTTERS (Die Sinking & End Milling)

Brown & Sharpe Mfg. Co., Providence, R. I.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.

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Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

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Taylor-Wilson Mfg. Co., 15 Thomson Ave., McKees Rocks, Pa.

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Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, Chicago, Ill.
1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.

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Bissett Steel Co., The,
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Heppenstall Co., 47th and Hatfield
Sts., Pittsburgh, Pa.
National Forge & Ordnance Co.,
Irvin, Warren Co., Pa.
Standard Steel Works Div. of The
Baldwin Locomotive Works,
Philadelphia, Pa.

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McKenna Metals Co.,
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DIE CUSHIONS

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2830-13th Ave., So.,
Minneapolis, Minn.

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Springfield, Vt.
Lands Machine Co.,
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National Acme Co., The, 170 E.
131st St., Cleveland, O.

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and Cincinnati Grinders, Inc.,
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Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
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Zeh & Hahnemann Co., 56 Av-
enue A, Newark, N. J.

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Co., The, 3917 St. Clair Ave.,
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Co., 400 W. Madison St., Chi-
cago, Ill.

Cleereman Machine Tool Co.,
Green Bay, Wis.

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Simonds Gear & Mfg. Co., The,
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Mackintosh-Hemphill Co., 9th and
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Mesta Machine Co.,
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DRIVES (Reciprocating)

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Link-Belt Co., 300 W. Pershing
Rd., Chicago, Ill.

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ELECTRIC WIRING—See WIRE AND CABLE

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Electric Controller & Mfg. Co., The,
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Fairbanks, Morse & Co., Dept. H75,
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Chicago, Ill.

General Electric Co.,
Schenectady, N. Y.

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Wean Engineering Co., Warren, O.

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C. H. Hunt, 3213 First National
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Koppers Co., Engineering and Con-
struction Div., 901 Koppers Bldg.,
Pittsburgh, Pa.

Lindemuth, Lewis B.,
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Loftus Engineering Corp.,
747 Oliver Bldg., Pittsburgh, Pa.

McKee, Arthur G., & Co.,
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Wean Engineering Co., Warren, O.

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Chicago, Ill.

ENGINES (Gas, Oil)

Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave.,
Chicago, Ill.

ENGINES (Kerosene)

Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave.,
Chicago, Ill.

ENGINES (Steam)

Oil Well Supply Co., Dallas, Texas.

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Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.
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Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
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Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
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- FERROSILICON**
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Southern Ferro Alloys Co., 2108 Chestnut St., Chattanooga, Tenn.
- FERROVANADIUM**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
- FILES AND RASPS**
Simonds Saw & Steel Co., Fitchburg, Mass.
- FILTER CLOTH (Asbestos)**
Johns-Manville Corp., 22 E. 40th St., New York City.
- FIRE EXTINGUISHERS**
C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.
Kiddie, Walter & Co., Inc., 732 West St., Bloomfield, N. J.
- FIRE CLAY—See REFRACTORIES**
- FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS**
- FITTINGS (Electric Steel)**
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.
- FLAME HARDENING**
Air Reduction, 60 E. 42nd St., New York City.
- Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.
- FLANGES (Welded Steel)**
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
- FLOOR RESURFACING**
Flexrock Co., 2330 Manning St., Philadelphia, Pa.
- FLOORING (Monolithic)**
Johns-Manville Corp., 22 E. 40th St., New York City.
- FLOORING (Steel)**
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Open Steel Flooring Institute, Inc., Dept. E-519, American Bank Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.
- FLUE DUST CONDITIONERS**
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
- FLUE GAS ANALYZERS**
Hays Corp., The, 960 Elgth Ave., Michigan City, Ind.
- FLUORSPAR**
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
- FLUXES (Soldering, Welding & Tinning)**
American Chemical Paint Co., Dept. 310, Ambler, Pa.
American Solder & Flux Co., 2153 E. Norris St., Philadelphia, Pa.
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
- FORGING BILLETS—See BILLETS**
- FORGING MACHINERY**
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.
- FORGINGS (Brass, Bronze, Copper)**
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-84, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
- FORGINGS (Drop) (Also Stainless)**
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.
- FORGINGS (Hollow Bored)**
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- FORGINGS (Iron and Steel) (Also Stainless)**
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
- Standard Steel Works Div. of The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.
- FORGINGS (Upset)**
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
- FROGS AND SWITCHES**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
- FURNACE INSULATION—See INSULATION**
- FURNACES (Blast)**
Brasseri, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
- FURNACES (Brazing)**
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Upton Electric Furnace Div. of Commerce Pattern Mach. & Fdry. Co., 2213 Grand River Ave., Detroit, Mich.
- FURNACES (Electric Heating)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
- FURNACES (Electric Melting)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
- FURNACES (Forging)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.
- FURNACES (Galvanizing)**
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.
- FURNACES (Gas or Oil)**
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Sales Corp., 1368 Blount St., Cleveland, O.
- FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
- American Gas Furnace Co., Elizabeth, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Carborundum Co., The, Perth Amboy, N. J.
Despatch Oven Co., 922 Ninth St., S.E., Minneapolis, Minn.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
A. F. Holden Co., The, 200 Winchester Ave., New Haven, Conn.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stanton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Upton Electric Furnace Div. of Commerce Pattern Mach. & Fdry. Co., 2213 Grand River Ave., Detroit, Mich.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.
- FURNACES (Laboratory)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
- FURNACES (Non-Ferrous Melting)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.
- FURNACES (Open Hearth)**
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Brasseri, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 140 Cedar St., New York City.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
- FURNACES (Recuperative)**
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
- FURNACES (Rivet Heating)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
- FURNACES (Sheet and Tin Mill)**
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.
- FURNACES (Steel Mill)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Sales Corp., 1370 Blount St., Cleveland, O.

WHERE-TO-BUY

GAGE BLOCKS

Dearborn Gage Co.,
22086 Beech St., Dearborn, Mich.

GAGES

Brown & Sharpe Mfg. Co.,
Providence, R. I.
Greenfield Tap & Die Corp.,
Greenfield, Mass.
McKenna Metals Co.,
200 Lloyd Ave., Latrobe, Pa.
Sheffield Corp., The,
Gage Div., Dayton, O.

GAGES (Automatic Control & Recording)
Bristol Co., The, 112 Bristol Rd.,
Waterbury, Conn.

GAGES (Indicating and Recording)
Bristol Co., The, 112 Bristol Rd.,
Waterbury, Conn.
General Electric Co.,
Schenectady, N. Y.
Sheffield Corp., The,
Gage Div., Dayton, O.

GAGES (Pressure & Vacuum Recording)
Bristol Co., The,
112 Bristol Rd., Waterbury, Conn.

GALVANIZING (Hot Dip)

Acme Galvanizing, Inc.,
Milwaukee, Wis.
Acme Steel & Malleable Iron
Works, Buffalo, N. Y.
American Hot Dip Galvanizers
Assoc., Inc., 903 American Bank
Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing
Co., Erie, Pa.
Atlantic Steel Co., Atlanta, Ga.
Buffalo Galvanizing & Tinning
Works, Inc., Buffalo, N. Y.
Cattle, Jos. P., & Bros., Gaul and
Liberty Sts., Philadelphia, Pa.
Commercial Metals Treating, Inc.,
Toledo, O.

Diamond Expansion Bolt Co., Inc.,
Garwood, N. J.
Enterprise Galvanizing Co.,
2507 E. Cumberland St.,
Philadelphia, Pa.

Fanner Mfg. Co., The,
Cleveland, O.
Finn, John, Metal Works,
San Francisco, Calif.
Gregory, Thomas, Galvanizing
Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co.,
5515 Butler St., Pittsburgh, Pa.
Hill, James, Mfg. Co., Providence,
R. I.

Hubbard & Co., Oakland, Calif.
Independent Galvanizing Co.,
Newark, N. J.
International-Stacey Corp.,
Columbus, O.

Isaacson Iron Works, Seattle, Wash.
Joslyn Co. of California,
Los Angeles, Calif.
Joslyn Mfg. & Supply Co.,
Chicago, Ill.

Koven, L. O., & Bro., Inc.,
Jersey City, N. J.
Lehigh Structural Steel Co.,
Allentown, Pa.

Lewis Bolt & Nut Co.,
Minneapolis, Minn.
Missouri Rolling Mill Corp.,
St. Louis, Mo.

National Telephone Supply Co.,
The, Cleveland, O.
Penn Galvanizing Co.,
Philadelphia, Pa.

Riverside Foundry & Galvanizing
Co., Kalamazoo, Mich.
San Francisco Galvanizing Works,
San Francisco, Calif.
Sanitary Tinning Co., The,
Cleveland, O.

Standard Galvanizing Co.,
Chicago, Ill.
Wilcox, Crittenden & Co., Inc.,
Middletown, Conn.
Witt Cornice Co., The,
Cincinnati, O.

GALVANIZING COMPOUNDS
American Solder & Flux Co.,
2153 E. Norris St.,
Philadelphia, Pa.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GALVANIZING PRODUCTS
Enterprise Galvanizing Co., 2525
E. Cumberland St., Philadelphia,
Pa.

GAS HOLDERS
Bartlett-Hayward Div., Koppers
Co., Baltimore, Md.
Bethlehem Steel Co.,
Bethlehem, Pa.

Western Gas Div., Koppers Co.,
Fort Wayne, Ind.
GAS PRODUCER PLANTS
Koppers Co., Engineering and Con-
struction Div., 901 Koppers
Bldg., Pittsburgh, Pa.

Morgan Construction Co.,
Worcester, Mass.
Wood, R. D. Co., 400 Chestnut
St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS

Bartlett-Hayward Div., Koppers
Co., Baltimore, Md.
Koppers Co., Engineering and Con-
struction Div., 901 Koppers
Bldg., Pittsburgh, Pa.

GAS SCRUBBERS

Bartlett-Hayward Div., Koppers
Co., Baltimore, Md.
Brassert, H. A., & Co.,
First National Bank Bldg.,
Pittsburgh, Pa.
Western Gas Div., Koppers Co.,
Fort Wayne, Ind.
GASKETS (Asbestos, Metal or Rubber)
Johns-Manville Corp.,
22 E. 40th St., New York City.

GEAR BLANKS

Ampco Metal, Inc., Dept. S-84,
3830 W. Burnham St.,
Milwaukee, Wis.
Bay City Forge Co., W. 19th and
Cranberry Sts., Erie, Pa.
Bethlehem Steel Co.,
Bethlehem, Pa.

King Fifth Wheel Co., 2915 No.
Second St., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Standard Steel Works Div. of The
Baldwin Locomotive Works,
Philadelphia, Pa.
Waldron, John, Corp.,
New Brunswick, N. J.

GEAR MACHINERY (Generating)

Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
National Broach & Machine Co.,
5600 St. Jean, Detroit, Mich.

GEAR MACHINERY (Lapping, Finishing, Checking)

Michigan Tool Co., 7171 E.
McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)

Chicago Rawhide Mfg. Co.,
1308 Elston Ave., Chicago, Ill.
Pittsburgh Gear & Machine Co.,
2680-2700 Smallman St.,
Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The,
25th St., Pittsburgh, Pa.

GEARS (Steel Laminated)

Simonds Gear & Mfg. Co., The,
25th St., Pittsburgh, Pa.
Waldron, John, Corp.,
New Brunswick, N. J.

GEARS (Worm)

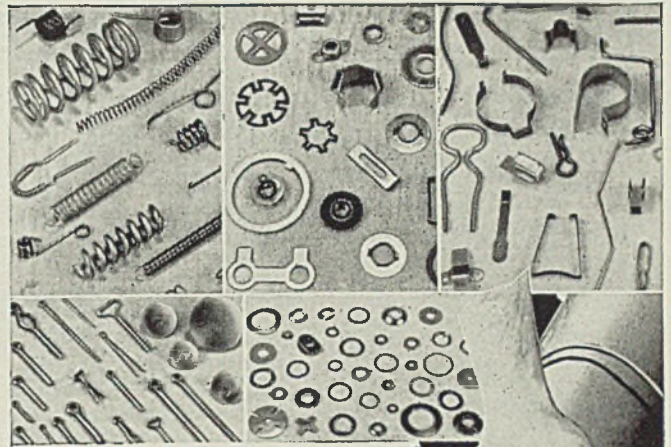
Cleveland Worm & Gear Co.,
3270 E. 80th St., Cleveland, O.
Horsburgh & Scott Co., The,
5112 Hamilton Ave., Cleveland, O.
Michigan Tool Co., 7171 E.
McNichols Rd., Detroit, Mich.
Pittsburgh Gear & Machine Co.,
2680-2700 Smallman St.,
Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The,
25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING

Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
General Electric Co.,
Schenectady, N. Y.
Grant Gear Works,
2nd & B Sts., Boston, Mass.
Horsburgh & Scott Co., The,
5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co.,
1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co.,
4437 Roosevelt Rd., Chicago, Ill.
Lewis Foundry & Machine Div. of
Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and
Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466,
Pittsburgh, Pa.
Michigan Tool Co., 7171 E.
McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Pittsburgh Gear & Machine Co.,
2680-2700 Smallman St.,
Pittsburgh, Pa.
Simonds Gear & Mfg. Co.,
25th St., Pittsburgh, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

GENERATING SETS

Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave.,
Chicago, Ill.
General Electric Co.,
Schenectady, N. Y.
Harnischfeger Corp., 4411 W. Na-
honal Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co.,
1081 Ivanhoe Rd., Cleveland, O.



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Linde Air Products Co., The, 30 E. 42nd St., New York City.
- GENERATORS (Electric)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. H75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Relliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
- GENERATORS (Plating)**
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.
- GRABS—FOOD SHEETS, COILS, INGOTS**
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.
- GRATING**
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.
- GREASE (Lubricating)—Sea LUBRICANTS (Industrial)**
- GREASE RETAINERS AND SEALS**
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
- GRINDERS (Circular Saw)**
Match & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
- GRINDERS (Foundry Core)**
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
- GRINDERS (Precision Thread)**
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.
- GRINDERS (Single Slide Internal)**
Bryant Chucking Grinder Co., Springfield, Vt.
- GRINDERS (Surface)**
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.
- GRINDER CENTERS**
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
- GRINDING (Shear Knife)**
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
- GRINDING COMPOUNDS**
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
- GRINDING MACHINES (Automotive Reconditioning)**
Heald Machine Co., Worcester, Mass.
- GRINDING MACHINES (Centerless, Internal and External)**
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
- GRINDING MACHINES (Chuckling)**
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
- GRINDING MACHINES (Crank Pin, Cam, Piston & Valve Face)**
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Norton Company, Worcester, Mass.
- GRINDING MACHINES (Oscillating)**
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
- GRINDING MACHINES (Plain and Universal)**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Norton Co., Worcester, Mass.
- GRINDING MACHINES (Roll)**
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.
- GRINDING MACHINES (Hotary Surface)**
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.
- GRINDING MACHINES (Segmental)**
Norton Company, Worcester, Mass.
- GRINDING MACHINES (Tool and Cutter)**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Norton Co., Worcester, Mass.
- GRINDING MACHINES (Swing Frame)**
Excelsior Tool & Machine Co., Ridge & Jefferson Aves., E. St. Louis, Ill.
- GRINDING WHEELS**
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., The, Jackson, Mich.
Norton Co., Worcester, Mass.
- GRINDING WHEELS (Segmental)**
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.
- GUARDS (Belt, Machine & Window)**
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
- GUIDE SHOES**
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.
- GUIDES (Mill)**
Ampeco Metal, Inc., Dept. S-84, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.
- GUNS (Blast Furnace Mud)**
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
- GUNS (Steam, Hydraulic, Electric)**
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
- HAMMER BUSHINGS**
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.
- HAMMERS (Drop)**
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
- HAMMERS (Power)**
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.
- HAMMERS (Steam)**
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
- HANGERS**
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
- HANGERS (Shaft)**
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
- Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
- HEADING MACHINERY**
National Machinery Co., Tiffin, O.
- HEATERS (Air)**
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, Refractories Div., 83 Liberty St., New York City.
- HEATERS (Electric Space)**
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
- HEATERS (Unit)**
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.
- HEET TREATING**
Commercial Metals Treating, Inc., Toledo, O.
- HELMETS (Blast Cleaning)**
Langborn Corp., Hagerstown, Md.
- HITCHINGS (Mine Car)**
American Chain & Cable Co., Inc., Bridgeport, Conn.
- HOBS**
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
- HOISTS (Chain)**
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. 36, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.
- HOISTS (Electric)**
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Reading Chain & Block Corp., Dept. 36, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.
- HOISTS (Monorail)**
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reading Chain & Block Corp., Dept. 36, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.
- HOISTS (Pneumatic)**
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1993 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
- HONING MACHINES**
Micromatic Hone Co., 1345 E. Milwaukee Ave., Detroit, Mich.
- HOOKS (Chain)**
American Chain & Cable Co., Inc., Bridgeport, Conn.
- HOOPS AND BANDS**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
- Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ryerson Job, T. & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.
- HOSE (Flexible Metal)**
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.
- HUMIDIFIERS (Industrial)**
Grinnell Co., Inc., Providence, R. I.
- HYDRAULIC MACHINERY**
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
- HYDRAULIC PRESSES—See PRESSES (Hydraulic)**
- HYDRAULIC UNITS**
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
- INDICATORS (Blast Furnace Stock Line)**
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
- INDICATORS (Temperature)**
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
- INGOT MOLDS**
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Superior Mold & Iron Co., Penn. Pa. Valley Mould & Iron Corp., Hubbard, O.
- INHIBITORS**
American Chemical Paint Co., Dept. 310, Ambler, Pa.
- INSTRUMENTS (Electric Indicating and Recording)**
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
- INSULATING BLOCK**
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Eagle-Picher Lead Co., The, Cincinnati, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
- INSULATING BRICK**
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.
- INSULATING CONCRETE**
Atlas Lumite Cement Co., Dept. S-16, Chrysler Bldg., New York City.

INSULATING CONCRETE—Con.

Illinois Clay Products Co.,
214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th
St., New York City.

**INSULATING POWDER AND
CEMENT**

Alax Electrothermic Corp.,
Ajax Park, Trenton, N. J.
Armstrong Cork Co.,
985 Concord St., Lancaster, Pa.
Babeock & Wilcox Co., The,
Refractories Div., 85 Liberty St.,
New York City.
Eagle-Picher Lead Co., The,
Cincinnati, O.
Illinois Clay Products Co.,
214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th
St., New York City.

INSULATION (Building)

Eagle-Picher Lead Co., The,
Cincinnati, O.
Johns-Manville Corp., 22 E. 40th
St., New York City.

**INSULATION (Furnace, Boiler
Settings, Ovens, Steam Pipe, Etc.)**

Armstrong Cork Co.,
985 Concord St., Lancaster, Pa.
Eagle-Picher Lead Co., The,
Cincinnati, O.
Illinois Clay Products Co.,
214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp.,
22 E. 40th St., New York City.
Quilley Co., 56 W. 45th St.,
New York City.

IRON (Bar)

Ryerson, Jos. T. & Son Co.,
16th & Rockwell Sts., Chicago, Ill.

IRON ORE

Ala Wood Steel Co.,
Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union
Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The,
Ecorse, Detroit, Mich.
Shenango Furnace Co.,
Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P. & Co.,
Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The,
Youngstown, O.

JIG BORERS

Bryant Machinery & Engineering
Co., 400 W. Madison St.,
Chicago, Ill.
Cleereman Machine Tool Co.,
Green Bay, Wis.

JIGS AND FIXTURES

Columbus Die, Tool & Mach. Co.,
955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. Na-
tional Ave., Milwaukee, Wis.

KEYS (Machine or Woodruff)

Moltrup Steel Products Co.,
Beaver Falls, Pa.

KNIVES

American Shear Knife Co.,
3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co.,
2086 W. 110th St., Cleveland, O.
Ohio Knife Co., Dremam Ave. &
B. & O. R.R., Cincinnati, O.

LABORATORY WARE

Bay State Abrasive Products Co.,
Westboro, Mass.
Norton Company, Worcester, Mass.

LAMPS (Industrial)

General Electric Co., Dept. 166-S-G,
Nela Park, Cleveland, O.

LAPPING MACHINES

Cincinnati Milling Machine
and Cincinnati Grinders, Inc.,
Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman
Rd., Detroit, Mich.
National Broach & Machine Co.,
5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

LAPPING PLATES

Challenge Machinery Co.,
Grand Haven, Mich.

LARRIES (Coat)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.

LATHE CENTERS

McKenna Metals Co.,
200 Lloyd Ave., Latrobe, Pa.

LATHE DOGS (Drop Forged)

Williams, J. H. & Co.,
400 Vulcan St., Buffalo, N. Y.

LATHES

Axelson Manufacturing Co.,
6160 So. Boyle Ave.,
Los Angeles, Cal.
Jones & Lamson Machine Co.,
Springfield, Vt.

LeBlond, R. K., Machine Tool Co.,
Dept. J-2, Cincinnati, O.
Monarch Machine Tool Co.,
Sidney, O.
South Bend Lathe Works, 889 E.
Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Car-
negie Ave., Cleveland, O.

LATHES (Automatic)

Brown & Sharpe Mfg. Co.,
Providence, R. I.
Gisholt Machine Co.,
1217 E. Washington Ave.,
Madison, Wis.
Jones & Lamson Machine Co.,
Springfield, Vt.
Monarch Machine Tool Co.,
Sidney, O.

LATHES (Chucking)

Gisholt Machine Co.,
1217 E. Washington Ave.,
Madison, Wis.

LATHES (Engine)

Monarch Machine Tool Co.,
Sidney, O.
South Bend Lathe Works, 889 E.
Madison St., South Bend, Ind.

LATHES (Roll Turning)

Continental Roll & Steel Fdry. Co.,
E. Chicago, Ind.
Hyde Park Foundry & Machine Co.,
Hyde Park, Pa.
Lewis Foundry & Machine Div. of
Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and
Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co.,
P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.
Warner & Swasey Co.,
5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)

Brown & Sharpe Mfg. Co.,
Providence, R. I.
Bullard Company, The,
Bridgeport, Conn.
Gisholt Machine Co.,
1217 E. Washington Ave.,
Madison, Wis.
Jones & Lamson Machine Co.,
Springfield, Vt.
Warner & Swasey Co.,
5701 Carnegie Ave., Cleveland, O.

LAYOUT SURFACE PLATES

Challenge Machinery Co.,
Grand Haven, Mich.

LEAD (Tellurium)

National Lead Co.,
111 Broadway, New York City.

LEVELING MACHINES

Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co.,
Hyde Park, Pa.
McKay Machine Co.,
Youngstown, O.
Mesta Machine Co., P. O. Box 1466,
Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg.,
Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty
Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

**LIFT TRUCKS—See TRUCKS
(Lift)**

**LIFTING MAGNETS—See
MAGNETS (Lifting)**

LIGHTING (Industrial)

General Electric Co., Dept. 166-S-G,
Nela Park, Cleveland, O.
Graybar Electric Co., Dept. ST,
Graybar Bldg., New York City.

LINERS (Pump and Cylinder)

Shenango-Penn Mold Co., Dover, O.

**LOCOMOTIVE CRANES—See
CRANES (Locomotive)**

LOCOMOTIVES (Diesel-Electric)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Porter, H. K., Co., Inc.,
49th & Harrison Sts.,
Pittsburgh, Pa.
Whitcomb Locomotive Co.,
Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)

Porter, H. K., Co., Inc.,
49th & Harrison Sts.,
Pittsburgh, Pa.
Whitcomb Locomotive Co.,
Rochelle, Ill.

LOCOMOTIVES (Electric)

Porter, H. K., Co., Inc.,
49th & Harrison Sts.,
Pittsburgh, Pa.

LOCOMOTIVES (Electric Trolley)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
General Electric Co.,
Schenectady, N. Y.
Whitcomb Locomotive Co.,
Rochelle, Ill.

LOCOMOTIVES (Fireless)

Porter, H. K., Co., Inc.,
49th & Harrison Sts.,
Pittsburgh, Pa.

LOCOMOTIVES (Gasoline-Electric)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
General Electric Co.,
Schenectady, N. Y.
Whitcomb Locomotive Co.,
Rochelle, Ill.

**LOCOMOTIVES (Gasoline Me-
chanical)**

Whitcomb Locomotive Co.,
Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.

LOCOMOTIVES (Steam)

Porter, H. K., Co., Inc.,
49th & Harrison Sts.,
Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
General Electric Co.,
Schenectady, N. Y.
Whitcomb Locomotive Co.,
Rochelle, Ill.

LUBRICANTS (Industrial)

American Lanolin Corp.,
Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna.,
Gulf Refining Co., 3800 Gulf
Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant
Co., 292 Madison Ave.,
New York City.
Penola, Inc., 34th & Smallman Sts.,
Pittsburgh, Pa.
Shell Oil Co., Inc.,
50 W. 50th St., New York City.
Secony-Vacuum Oil Co., Inc.,
26 Broadway, New York City.
Sun Oil Co., Dept. 1, 1608 Walnut
St., Philadelphia, Pa.
Tide Water Associated Oil Co.,
17 Battery Place, New York City.

LUBRICATING SYSTEMS

Farval Corp., The,
3270 E. 80th St., Cleveland, O.

MACHINE WORK

Continental Roll & Steel Fdry. Co.,
E. Chicago, Ind.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock
Co., Kearney, N. J.
Hanna Engineering Works,
1765 Elston Ave., Chicago, Ill.
Hyde Park Foundry & Machine Co.,
Hyde Park, Pa.
Lewis Foundry & Machine Div. of
Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The,
Alliance, O.

MACHINERY (Special)

Allis-Chalmers Mfg. Co.,
Milwaukee, Wis.
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co.,
Birdsboro, Pa.
Brusler, Edgar E., Inc., Sharps-
burg Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works
Co., The, 3917 St. Clair Ave.,
Cleveland, O.
Columbus Die, Tool & Mach. Co.,
955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co.,
E. Chicago, Ind.
Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
Chicago, Ill.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So.
Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of
Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The,
Alliance, O.
National Broach & Machine Co.,
5600 St. Jean, Detroit, Mich.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The,
Avonmore, Pa.
Niagara Machine & Tool Works,
637-697 Northland Ave.,
Buffalo, N. Y.

Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The,
New Haven, Conn.
Thomas Machine Mfg. Co., Elma
Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

MACHINERY (Used & Rebuilt)

Albert, L. & Son, Whitehead Rd.,
Trenton, N. J.
Crawbuck, John D., Co.,
Empire Bldg., Pittsburgh, Pa.
Galbreath Machinery Co.,
Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 No. Peoria
St., Chicago, Ill.
Iron & Steel Products, Inc.,
Hegewisch Sta., Chicago, Ill.
Lang Machinery Co., 28th &
A.V.R.R., Pittsburgh, Pa.
Motor Repair & Mfg. Co.,
1558 Hamilton Ave., Cleveland, O.
Philadelphia Transformer Co.,
2829 Cedar St., Philadelphia, Pa.
West Penn Machinery Co.,
1208 House Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)

Norton Co., Worcester, Mass.

**MAGNETIC SEPARATORS—See
SEPARATORS (Magnetic)**

MAGNETS (Lifting)

Cutler-Hammer, Inc., 4211 St. Paul
Ave., Milwaukee, Wis.
Dings Magnetic Separator Co.,
523 E. Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co.,
2670 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The,
5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)

Dings Magnetic Separator Co.,
523 E. Smith St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The,
5906 Maurice Ave., Cleveland, O.

MANDRELS (Expanding)

Nicholson, W. H. & Co.,
177 Oregon St., Wilkes-Barre, Pa.

**MANGANESE METAL AND
ALLOYS**

Electro Metallurgical Co.,
30 E. 42nd St., New York City.

MANGANESE ORE

Cuban-American Manganese Corp.,
122 E. 42nd St., New York, N. Y.
Samuel, Frank & Co., Inc.,
Harrison Bldg., Philadelphia, Pa.

MANIPULATORS

Continental Roll & Steel Fdry. Co.,
E. Chicago, Ind.
Morgan Engineering Co., The,
Alliance, O.

MARKING DEVICES

Cunningham, M. E., Co., 172 E.
Carson St., Pittsburgh, Pa.

**METAL (Perforated)—See
PERFORATED METAL**

**METAL BLAST ABRASIVES
(Shot and Grit)**

American Foundry Equipment Co.,
The, 509 So. Byrkit St., Mishaw-
aka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co.,
4839 Harrison St., Pittsburgh, Pa.

METAL CLEANERS

American Chemical Paint Co.,
Dept. 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., Dept.
E. Pennsalt Cleaner Div.,
Philadelphia, Pa.
Udylite Corp., The, 1651 E. Grand
Blvd., Detroit, Mich.

METAL FINISHES

American Nickeloid Co.,
1310 N. Second St., Peru, Ill.

**METAL SPECIALTIES AND
PARTS—See STAMPINGS**

**METAL STAMPINGS—See
STAMPINGS**

METALS (Hard Surfacing)

Stoddy Co., Whittier, Calif.

METALS (Nonferrous)

American Brass Co., The,
Waterbury, Conn.
International Nickel Co., Inc., The,
67 Wall St., New York City.

MICROMETERS

Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING CUTTERS

Brown & Sharpe Mfg. Co., Providence, R. I.
 Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
 McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

MILLING MACHINES

Brown & Sharpe Mfg. Co., Providence, R. I.
 Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
 Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
 National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

MILLING MACHINES (Milling and Centering Combined)

Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDING MACHINERY (Foundry)

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM

Clmax Molybdenum Co., 500 Fifth Ave., New York City.

MONEL METAL (All Commercial Forms)

International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
 Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
 Reading Chain & Flock Corp., Dept. 36, Reading, Pa.
 Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
 Fairbanks, Morse & Co., Dept. H75, 600 So. Michigan Ave., Chicago, Ill.
 General Electric Co., Schenectady, N. Y.
 Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
 Harnischfeger Corp., 4111 W. National Ave., Milwaukee, Wis.
 Lincoln Electric Co., The, Cleveland, O.
 Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
 Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

MUCK BAR

Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
 Bethlehem Steel Co., Bethlehem, Pa.
 Columbia Steel Co., San Francisco, Calif.
 Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
 *Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
 *Republic Steel Corp., Dept. ST, Cleveland, O.
 Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
 Wickwire Brothers, 189 Main St., Cortland, N. Y.
 Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
 Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)

Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)

International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)

International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)

Bethlehem Steel Co., Bethlehem, Pa.
 Bliss & Laughlin, Inc., Harvey, Ill.
 Republic Steel Co., Dept. ST, Cleveland, O.
 Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

NOZZLES (Blasting)

Pangborn Corporation, Hagerstown, Md.

NUTS

(*Also Stainless)
 Bethlehem Steel Co., Bethlehem, Pa.
 Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
 Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.
 Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
 *Harper, H. M. Co., The, 2646 Fletcher St., Chicago, Ill.
 Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
 *Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
 Russell, Burdull & Ward Bolt & Nut Co., Port Chester, N. Y.
 Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)

Bethlehem Steel Co., Bethlehem, Pa.
 Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
 Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
 Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
 National Acme Co., The, 170 E. 131st St., Cleveland, O.
 Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
 Russell, Burdull & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Machine Screw)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.

NUTS (Self Locking)

Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.

NUTS (Semi-Finished)

Bethlehem Steel Co., Bethlehem, Pa.
 Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
 Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
 Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
 Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
 Russell, Burdull & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
 Parker-Kalon Corp., 194-200 Varick St., New York City.

OIL RETAINERS AND SEALS

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)

Gulf Oil Corp. of Penna., Gulf Refining Co., 3500 Gulf Bldg., Pittsburgh, Pa.
 Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
 Shell Oil Co., Inc., 50 W. 50th St., New York City.
 Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
 Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
 Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)

American Chemical Paint Co., Dept. 310, Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)

Ilagan, Geo. J. Co., 2400 E. Carson St., Pittsburgh, Pa.
 Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
 Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.

OVENS (Coke, By-Product Recovery)

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)

Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
 Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS

Air Reduction, 60 E. 42nd St., New York City.
 Linde Air Products Co., The, 30 E. 42nd St., New York City

PACKING (Asbestos or Rubber)

Johns-Manville Corp., 22 E. 40th St., New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Veve)

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

PAINT (Alkali Resisting)

Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PAINT (Aluminum)

Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting)

American Chemical Paint Co., Dept. 310, Ambler, Pa.

PAINT (Marking)

Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Rust Preventive)

American Chemical Paint Co., Dept. 310, Ambler, Pa.
 Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PARALLELS

Challenge Machinery Co., Grand Haven, Mich.

PARTS (Precision)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PATTERN EQUIPMENT (Wood or Metal)

Wellman Bronze & Aluminum Co., The, 6002 Superior Ave., Cleveland, O.

PERFORATED METAL

Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
 Erdle Perforating Co., 171 York St., Rochester, N. Y.
 Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
 Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUNDS

American Chemical Paint Co., Dept. 310, Ambler, Pa.
 Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING CRATES

Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

PICKLING EQUIPMENT

Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
 International Nickel Co., The, 67 Wall St., New York City.

PICKLING MACHINERY

Erie Foundry Co., Erie, Pa.
 Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
 Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
 Wean Engineering Co., Warren, O.

PICKLING TANK LININGS

Celleste Co., 750 Rockefeller Bldg., Cleveland, O.
 Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS

Youngstown Alloy Casting Corp., 103 E. Indiana Ave., Youngstown, O.

PIG IRON

Alan Wood Steel Co., Conshohocken, Pa.
 American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
 Bethlehem Steel Co., Bethlehem, Pa.
 Brooke, E. & G., Iron Co., Birdsboro, Pa.
 Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
 Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
 Jackson Iron & Steel Co., Jackson, O.
 Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST, Cleveland, O.
 Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
 Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
 Snyder, W. P. & Co., Oliver Bldg., Pittsburgh, Pa.
 Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
 Wieman & Ward Co., The, Oliver Bldg., Pittsburgh, Pa.

PIG IRON (Charcoal)

Tennessee Products Corp., Nashville, Tenn.

PILING (Iron and Steel)

Bethlehem Steel Co., Bethlehem, Pa.
 Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 Columbia Steel Co., San Francisco, Calif.
 Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
 National Tube Co., Frick Bldg., Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)

Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
 Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

PILLOW BOXES

SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (MBH)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
 Farrell-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
 322 Vulcan St., Buffalo, N. Y.
 Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
 National-Erie Corp., Erie, Pa.
 Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
 United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Case Hardened or Heat Treated)

Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.

PINS (Taper)

Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)

American Brass Co., The, Waterbury, Conn.
 Bridgeport Brass Co., Bridgeport, Conn.
 Shenango-Penn Mold Co., Dover, O.

PIPE (Square and Rectangular)

Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)

Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
 American Rolling Mill Co., The, 2351 Curtis St., Middletown, O.
 Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
 Bethlehem Steel Co., Bethlehem, Pa.
 Columbia Steel Co., San Francisco, Calif.
 Crane Co., 836 So. Michigan Ave., Chicago, Ill.
 Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.

WHERE TO BUY

PIPE (Steel)—Con.
National Tube Co.,
Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST,
Cleveland, O.
Western Gas Div., Koppers
Co., Fort Wayne, Ind.
Wheeling Steel Corp.,
Wheeling, W. Va.
Youngstown Sheet & Tube Co., The,
Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp.,
103 E. Indianola Ave.,
Youngstown, O.

PIPE BENDING
Crane Co., 836 So. Michigan Ave.,
Chicago, Ill.

**PIPE CUTTING AND THREAD-
ING MACHINERY**
Landis Machine Co.,
Waynesboro, Pa.

PIPE FITTINGS
Babcock & Wilcox Co., The,
Refractories Div., 85 Liberty St.,
New York City
Crane Co., 836 So. Michigan Ave.,
Chicago, Ill.

Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
PIPE LINES (Riveted and Welded)
Bethlehem Steel Co.,
Bethlehem, Pa.

PIPE MILL MACHINERY
Taylor-Wilson Mfg. Co.,
15 Thompson Ave.,
McKees Rocks, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.
Yoder Co., The, W. 55th St. & Wal-
worth Ave., Cleveland, O.

PIPE ROLLS (Magnetic)
Dings Magnetic Separator Co.,
523 E. Smith St., Milwaukee, Wis.

**PIPE STRAIGHTENING
MACHINERY**
Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
Chicago, Ill.

Logemann Brothers Co., 3126 Bur-
leigh St., Milwaukee, Wis.
Sutton Engineering Co.,
Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co.,
15 Thompson Ave.,
McKees Rocks, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp.,
Greenfield, Mass.

PIPING CONTRACTORS
Grinnell Co., Inc., Providence, R. I.
Power Piping Co., Beaver and
Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring
Div., Koppers Co.,
Baltimore, Md.

PISTON RODS
Bay City Forge Co., W. 19th and
Cranberry Sts., Erie, Pa.
Biss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield
Sts., Pittsburgh, Pa.

Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.

National Forge & Ordnance Co.,
Irvine, Warren Co., Pa.
Republic Steel Corp.,
Dept. ST, Cleveland, O.

Standard Steel Works Div. of The
Baldwin Locomotive Works,
Philadelphia, Pa.
Union Drawn Steel Div., Republic
Steel Corp., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and
Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works
Co., The, 3917 St. Clair Ave.,
Cleveland, O.

PLANT DISMANTLERS
Hetz Construction Co., Warren, O.

PLATE CASTORS
Hyatt Bearings Div., General Mo-
tors Sales Corp., Harrison, N. J.

PLATES (Sheared or Universal)
(*Also Stainless)
*Alan Wood Steel Co.,
Conshohocken, Pa.
*Allegheny Ludlum Steel Corp.,
Dept. T-125,
Oliver Bldg., Pittsburgh, Pa.

*American Rolling Mill Co., The,
2351 Curtis St., Middletown, O.
*Bethlehem Steel Co.,
Bethlehem, Pa.

*Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Columbia Steel Co.,
San Francisco, Calif.

Enterprise Galvanizing Co.,
2525 E. Cumberland St.,
Philadelphia, Pa.

Granite City Steel Co.,
Granite City, Ill.
Ingersoll Steel & Disc Div., Borg
Warner Corp., 310 S. Michigan
Ave., Chicago, Ill.

Inland Steel Co., 38 So. Dearborn
St., Chicago, Ill.
Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.

Levinson Steel Co.,
33 Pride St., Pittsburgh, Pa.
*Republic Steel Corp.,
Dept. ST, Cleveland, O.

*Ryerson, Jos. T., & Son, Inc.,
16th and Rockwell Sts.,
Chicago, Ill.
Tennessee Coal, Iron & Railroad
Co., Brown-Marx Bldg.,
Birmingham, Ala.

Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The,
Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co.,
Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-
Warner Corp., 310 S. Michigan
Ave., Chicago, Ill.

**PLATES (Steel—Floor)—See
FLOORING (Steel)**

**PLATES (Terne and Tin)—See
TIN PLATE**

PLATING EQUIPMENT
Udyllite Corp., The, 1651 E. Grand
Blvd., Detroit, Mich.

PLUGS (Expansion)
Hubbard, M. D., Spring Co.,
434 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp.,
103 E. Indianola Ave.,
Youngstown, O.

POLES (Tubular Steel)
National Tube Co.,
Frick Bldg., Pittsburgh, Pa.

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(Tube and Bar)**
Medart Co., The, 3520 de Kalb
St., St. Louis, Mo.

POTENTIOMETERS
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112 Bristol Rd., Waterbury, Conn.

POTS (Case Hardening)
Pressed Steel Tank Co., 1461 So.
66th St., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.

Kemp, C. M., Mfg. Co.,
405 E. Oliver St., Baltimore, Md.

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for Industrial Trucks)**
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3828 Grand River Ave.,
Detroit, Mich.

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Babcock & Wilcox Co., The,
Refractories Div., 85 Liberty St.,
New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal
Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works
Co., The, 3917 St. Clair Ave.,
Cleveland, O.

Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
Chicago, Ill.

Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.

Logemann Brothers Co., 3126 Bur-
leigh St., Milwaukee, Wis.
Niagara Machine & Tool Works,
637-697 Northland Ave.,
Buffalo, N. Y.

Tomkins-Johnson Co., The,
611 N. Mechanic St.,
Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Bending)
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Av-
enue A, Newark, N. J.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
Chicago, Ill.

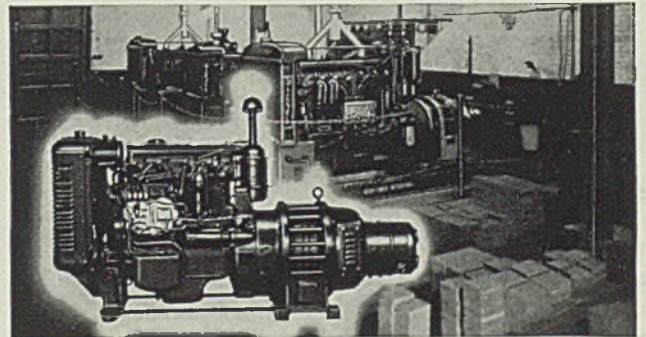
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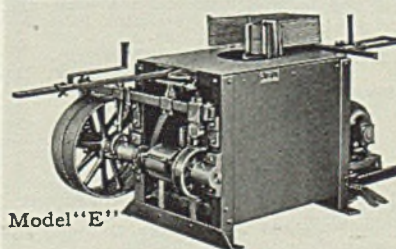
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 Watson-Stillman Co., Roselle, N. J.
 Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.
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 Chambersburg Engineering Co., Chambersburg, Pa.
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 Erie Foundry Co., Erie, Pa.
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 322 Vulcan St., Buffalo, N. Y.
 Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
 Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
 Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
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 Morgan Engineering Co., The Alliance, O.
 National-Erie Corp., Erie, Pa.
 Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.
 Watson-Stillman Co., Roselle, N. J.
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 Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
 Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.
 Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.
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- PRESSES (Scrap Bundling and Baling)**
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- PRESSES (Stamping)**
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- PRESSES, BRIQUETING (Turnings & Borings)**
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- PUMPS**
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 Fairbanks, Morse & Co., Dept. H75, 600 S. Michigan Ave., Chicago, Ill.
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 Oil Well Supply Co., Dallas, Texas.
 Roper, The Geo. D., Corp., Rockford, Ill.
 Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
- PUMPS (Boiler Feed)**
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 Fairbanks, Morse & Co., Dept. H75, 600 S. Michigan Ave., Chicago, Ill.
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 Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
 National-Erie Corp., Erie, Pa.
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 Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
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- PUMPS (Rotary)**
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 Fairbanks, Morse & Co., Dept. H75, 600 S. Michigan Ave., Chicago, Ill.
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 Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
 Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
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 Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
 Chambersburg Engineering Co., Chambersburg, Pa.
 Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
 Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
 Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
 Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
 Morgan Engineering Co., The Alliance, O.
 Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
 Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
 United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
- PYROMETER TUBES**
 Norton Company, Worcester, Mass.
- PYROMETERS**
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 Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
 Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
 Leeds & Northrup Co., 4957 Sten-ton Ave., Philadelphia, Pa.
- RAIL BREAKERS**
 National Roll & Foundry Co., The, Avonmore, Pa.
 United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
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 Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
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 Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 Columbia Steel Co., San Francisco, Calif.
 Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
 Ryerson, Jos. T. & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
 Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
 Weirton Steel Co., Weirton, W. Va.
- REAMERS**
 Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
 Gisholt Machine Co., 1217 E. Wash-ington Ave., Madison, Wis.
 Greenfield Tap & Die Corp., Greenfield, Mass.
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 Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
 Greathart Machinery Co., Empire Bldg., Pittsburgh, Pa.
 General Blower Co., 404 N. Peoria St., Chicago, Ill.
 Iron & Steel Products, Inc., Hegewisch Sta., Chicago, Ill.
 Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
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- RECORDERS (Combustion)**
 Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
- RECORDERS (Pressure, Speed, Temperature, Time)**
 Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
 Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
 Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
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- REDUCTION GEARS**
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 Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
 National-Erie Corp., Erie, Pa.
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 Basic Refractories, Inc., Hanna Bldg., Cleveland, O.
- REFRATORIES (Fire Clay)**
 Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
 Carter County Fire Clay Corp., 212-214 Kitchen Bldg., Ashland, Ky.
 Eureka Fire Brick Co., 1100 B. F. Jones Lay Bldg., Pittsburgh, Pa.
 Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
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 Norton Co., Worcester, Mass.
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 Carborundum Co., The, Perth Amboy, N. J.
 Norton Co., Worcester, Mass.
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- REGULATORS (Temperature)**
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- Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
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 Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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- RESISTORS (Graphite Disc)**
 Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.
- RHEOSTATS (Plating)**
 Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
 Udyllite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.
- RINGS (Steel)**
 Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
 Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
 King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
 Moltrup Steel Products Co., Beaver Falls, Pa.
 National Forge & Ordnance Co., Irvine, Warren Co., Pa.
 Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
- RINGS (Weldless) (*Also Stainless)**
 Midvale Co., The, Nicetown, Philadelphia, Pa.
- RIVET SETS**
 Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
- RIVETERS (Hydraulic—Portable and Stationary)**
 Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
 Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
- RIVETERS (Pneumatic)**
 Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
 Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
- RIVETING MACHINERY**
 Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
 Chambersburg Engineering Co., Chambersburg, Pa.
 Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
 Shuster, F. B., Co., The, New Haven, Conn.
 Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.
 Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
- RIVETS (*Also Stainless)**
 Bethlehem Steel Co., Bethlehem, Pa.
 Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
 *Republic Steel Corp., Upon Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
 *Russell, Burdall & Ward Bolt & Nut Co., Port Chester, N. Y.
- RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)**
 American Brass Co., The, Waterbury, Conn.
 Bridgeport Brass Co., Bridgeport, Conn.
 Roebbling's, John A., Sons Co., Trenton, N. J.
 Seymour Manufacturing Co., 51 Franklin St., Seymour, Conn.
- RODS (Drill)**
 Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
 Fifth-Sterling Steel Co., McKeesport, Pa.
 Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
- RODS (Phosphor Bronze)**
 Seymour Manufacturing Co., 51 Franklin St., Seymour, Conn.
- RODS (Rounds, Flats and Shapes) (*Also Stainless)**
 Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.

WHERE-TO-BUY

- RODS (Rounds, Flats, Shapes)**
(Also Stainless)—Con.
- American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
 - Bethlehem Steel Co., Bethlehem, Pa.
 - Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 - Columbia Steel Co., San Francisco, Calif.
 - Copperweld Steel Co., Warren, O.
 - Firth-Sterling Steel Co., McKeesport, Pa.
 - Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
 - Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
 - Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
 - Republic Steel Corp., Dept. ST, Cleveland, O.
 - Roebling's, John A., Sons Co., Trenton, N. J.
 - Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
 - Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
 - Washburn Wire Co., Phillipsdale, R. I.
 - Youngstown Sheet & Tube Co., The, Youngstown, O.
- RODS (Steel and Iron)**
- Firth-Sterling Steel Co., McKeesport, Pa.
 - National Forge & Ordnance Co., Irvine, Warren Co., Pa.
 - Roebling's, John A., Sons Co., Trenton, N. J.
- RODS (Welding)**—See **WELDING RODS**
- RODS (Wire)**—See **WIRE PRODUCTS**
- ROLLER LEVELLERS (Rucked-up)**
- Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
- ROLLING DOORS & SHUTTERS**—See **DOORS AND SHUTTERS**
- ROLLING MILL BEARINGS**—See **BEARINGS (Rolling Mill)**
- ROLLING MILL EQUIPMENT**
- Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
 - Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
 - Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
 - Farral-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
 - 322 Vulcan St., Buffalo, N. Y.
 - Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
 - Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
 - Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
 - Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
 - Morgan Construction Co., Worcester, Mass.
 - Morgan Engineering Co., The, Alliance, O.
 - National Roll & Foundry Co., The, Avonmore, Pa.
 - United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
 - Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
 - Wean Engineering Co., Warren, O.
 - Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.
- ROLLS (Bending and Straightening)**
- Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
- ROLLS (Sand and Chilled)**
- Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
 - Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
 - Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
 - Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
 - Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
 - Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
 - National Roll & Foundry Co., The, Avonmore, Pa.
 - Ohio Steel Fdry. Co., Lima, O.
 - Springfield, O.
 - Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
 - United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
- ROLLS (Steel and Iron)**
- Bethlehem Steel Co., Bethlehem, Pa.
 - Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
 - Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 - Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
 - Farral-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
 - 322 Vulcan St., Buffalo, N. Y.
 - Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
 - Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
 - Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
 - Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
 - National Roll & Foundry Co., The, Avonmore, Pa.
 - Ohio Steel Fdry. Co., Lima, O.
 - Springfield, O.
 - Pittsburgh Steel Foundry Corp., Glassport, Pa.
 - United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
- ROLLS (Tinning Machine)**
- American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
- ROOFING AND SIDING**
- Johns-Manville Corp., 22 E. 40th St., New York City.
- ROOFING AND SIDING (Corrugated and Plain)**
- American Rolling Mill Co., The, 2351 Curtis St., Middletown, O.
 - Andrews Steel Co., The, Newport, Ky.
 - Bethlehem Steel Co., Bethlehem, Pa.
 - Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
 - Columbia Steel Co., San Francisco, Calif.
 - Granite City Steel Co., Granite City, Ill.
 - Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
 - Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
 - New Jersey Zinc Co., 160 Front St., New York City.
 - Republic Steel Corp., Dept. ST, Cleveland, O.
 - Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
 - Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
 - Weirton Steel Co., Weirton, W. Va.
 - Youngstown Sheet & Tube Co., The, Youngstown, O.
- ROOFING (Plastic and Liquid)**
- Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
- RUST PREVENTIVES**
- Alrose Chemical Co., 80 Clifford St., Providence, R. I.
 - American Lanolin Corp., Railroad St., Lawrence, Mass.
 - Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
 - Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
- RUST PROOFING COMPOUNDS**
- Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
- RUST PROOFING PROCESS**
- Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
 - Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
 - Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
 - Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.
- SAFE ENDS (Boiler Tube)**
- National Tube Co., Frick Bldg., Pittsburgh, Pa.
- SAFETY DEVICES (Electric)**
- Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
- SALT TABLETS**
- Fairway Laboratories, Div. The G. S. Suppliger Co., 1530 Hadley St., St. Louis, Mo.
 - Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.
- SAND-BLASTING NOZZLES (Borium)**
- Stoody Co., 1134 W. Slauson Ave., Whittier, Calif.
- SAND CONDITIONING AND PREPARING MACHINERY**
- Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.



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Morgan Engineering Co., The,
Alliance, O.
Motch & Merryweather Machinery
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Pittsburgh Saw & Tool Co.,
78-80 Sycamore St., Etna P. O.,
Pittsburgh, Pa.
United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

SAWING MACHINES (Contour)

Continental Machines, Inc.,
1324 So. Washington Ave.,
Minneapolis, Minn.

SAWS (Band—Metal Cutting)

Huther Bros. Saw & Mfg. Co.,
1190 University Ave.,
Rochester, N. Y.
Simonds Saw & Steel Co.,
Fitchburg, Mass.

SAWS (Hack)

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Chicago, Ill.
Simonds Saw & Steel Co.,
Fitchburg, Mass.

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Huther Bros. Saw & Mfg. Co.,
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Motch & Merryweather Machinery
Co., Penton Bldg., Cleveland, O.

SAWS (Inserted Tooth, Cold)

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Pittsburgh Saw & Tool Co.,
78-80 Sycamore St., Etna P. O.,
Pittsburgh, Pa.
Simonds Saw & Steel Co.,
Fitchburg, Mass.

SAWS (Metal Cutting)

Brown & Sharpe Mfg. Co.,
Providence, R. I.
Motch & Merryweather Machinery
Co., Penton Bldg., Cleveland, O.
Pittsburgh Saw & Tool Co.,
78-80 Sycamore St., Etna P. O.,
Pittsburgh, Pa.
Simonds Saw & Steel Co.,
Fitchburg, Mass.

SAWS (Segmental)

Motch & Merryweather Machinery
Co., Penton Bldg., Cleveland, O.
Pittsburgh Saw & Tool Co.,
78-80 Sycamore St., Etna P. O.,
Pittsburgh, Pa.

SCAFFOLDING (Tubular)

Dravo Corp. (Machinery Div.)
300 Penn Ave., Pittsburgh, Pa.

SCALES

Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave.,
Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial & Recording)

Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)

Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave., Chicago, Ill.

SCALES (Monorail)

American MonoRail Co., The,
13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleve-
land Crane & Engineering Co.,
1125 E. 283rd St., Wickliffe, O.
Fairbanks, Morse & Co., Dept. H75,
600 So. Michigan Ave.,
Chicago, Ill.

Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp.,
353 Schuyler Ave.,
Montour Falls, N. Y.

SCHOOLS

International Correspondence
Schools, Box 9375-B, Scranton,
Pa.

**SCRAP BALING PRESSES—See
BALING PRESSES****SCREENS AND SIEVES**

Ajax Flexible Coupling Co.,
4 English St., Westfield, N. Y.
Buffalo Wire Works Co.,
437 Terrace, Buffalo, N. Y.
Chicago Perforating Co.,
2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co.,
171 York St., Rochester, N. Y.
Harrington & King Perforating Co.,
5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Con-
struction Div., 901 Koppers
Bldg., Pittsburgh, Pa.

Ludlow-Saylor Wire Co., The,
Newstead Ave. & Wabash R. R.,
St. Louis, Mo.
Wickwire Spencer Steel Co.,
500 Fifth Ave., New York City.

SCREENS (Vibrating)

Ajax Flexible Coupling Co.,
4 English St., Westfield, N. Y.

SCREW EXTRACTORS

Greenfield Tap & Die Corp.,
Greenfield, Mass.

SCREW MACHINE PRODUCTS

Barnes, Wallace, Co., The, Div.
Associated Spring Corp.,
Bristol, Conn.
Hindley Mfg. Co.,
Valley Falls, R. I.
National Acme Co., The, 170 E.
131st St., Cleveland, O.

**SCREW MACHINES (Automatic,
Single and Multiple Spindle)**

Brown & Sharpe Mfg. Co.,
Providence, R. I.
Cone Automatic Machine Co., Inc.,
Windsor, Vt.
National Acme Co., The, 170 E.
131st St., Cleveland, O.

SCREW PLATES

Greenfield Tap & Die Corp.,
Greenfield, Mass.

**SCREW STOCK—See STEEL
(Screw Stock)****SCREWS**

Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Continental Screw Corp.,
New Bedford, Mass.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp.,
194-200 Varick St.,
New York City.

SCREWS (Cap, Set, Safety-Set)

Bristol Co., The,
112 Bristol Rd., Waterbury, Conn.
Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E.
131st St., Cleveland, O.

SCREWS (Cold Headed)

Central Screw Company,
3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.

SCREWS (Conveyor)

Lee Spring Co. Inc.,
30 Main St., Brooklyn, N. Y.

SCREWS (Drive)

Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp.,
194-200 Varick St.,
New York City.

SCREWS (Hardened Self-Tapping)

Central Screw Company,
3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp.,
194-200 Varick St.,
New York City.

SCREWS (Machine)

Central Screw Company,
3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.

SCREWS (Machine, Recessed Head)

American Screw Co.,
Providence, R. I.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co.,
New Bedford, Mass.
Corbin Screw Corp.,
New Britain, Conn.
Harper, H. M., Co., The,
2646 Fletcher St., Chicago, Ill.
International Screw Co.,
Detroit, Mich.

Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.

National Screw & Mfg. Co.,
2440 E. 75th St., Cleveland, O.

New England Screw Co.,
Keene, N. H.

Parker-Kalon Corp., 194-200 Varick
St., New York City.

Pawtucket Screw Co.,
Pawtucket, R. I.

Pheoll Mfg. Co., 5700 Roosevelt
Rd., Chicago, Ill.

Russell, Burdall & Ward Bolt &
Nut Co., Port Chester, N. Y.

Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)

Shakaproof Lock Washer Co.,
2525 N. Keeler Ave.,
Chicago, Ill.

**SCREWS (Sheet Metal, Recessed
Head)**

American Screw Co.,
Providence, R. I.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co.,
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SCREWS (Socket, Cold Forged)

Parker-Kalon Corp., 194-200 Varick
St., New York City.

SCREWS (Thread-Cutting)

Shakaproof Lock Washer Co.,
2525 N. Keeler Ave.,
Chicago, Ill.

SCREWS (Thumb)

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2440 E. 75th St., Cleveland, O.
Parker, Charles, Co., The,
Meriden, Conn.
Pheoll Mfg. Co., 5700 Roosevelt
Rd., Chicago, Ill.
Southington Hdwe. Mfg. Co.,
Pawtucket, R. I.
Whitney Screw Co., Nashua, N. H.

**SEAMLESS STEEL TUBING—
See TUBES****SEPARATORS (Magnetic)**

Cutler-Hammer, Inc., 1211 St. Paul
Ave., Milwaukee, Wis.
Dings Magnetic Separator Co.,
523 E. Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The,
2670 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The,
5906 Maurice Ave., Cleveland, O.

**SHAFT HANGERS—See
HANGERS (Shaft)****SHAFTING**

Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.
Moltrup Steel Products Co.,
Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty
St., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc.,
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Chicago, Ill.
Standard Steel Works Div. of The
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Philadelphia, Pa.

Union Drawn Steel Div. Republic
Steel Corp., Massillon, O.

Edgar T. Ward's Sons Co.,
Carnegie, Pa.

Wyckoff Drawn Steel Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

SHAKERS

Ajax Flexible Coupling Co.,
4 English St., Westfield, N. Y.

SHAPERS

Cincinnati Shaper Co., Garrard and
Elam Sts., Cincinnati, O.

**SHAPES (Steel)—See STEEL
(Structural)****SHAPES, SPECIAL (Steel)**

Bliss & Laughlin, Inc., Harvey, Ill.

Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.

Columbia Steel Co.,
San Francisco, Calif.

Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.

Laclede Steel Co., Arcade Bldg.,
St. Louis, Mo.

Monarch Steel Co., 545 W. McCarty
St., Indianapolis, Ind.

Pressed Steel Tank Co.,
1461 So. 66th St.,
Milwaukee, Wis.

Roebbing's, John A., Sons Co.,
Trenton, N. J.

Tennessee Coal, Iron & Railroad
Co., Brown-Marx Bldg.,
Birmingham, Ala.
Union Drawn Steel Div. Republic
Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

SHEAR BLADES

American Shear Knife Co.,
3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works Co.,
The, 3917 St. Clair Ave.,
Cleveland, O.
Heppenstall Co., 47th & Hatfield
Sts., Pittsburgh, Pa.

Ohio Knife Co., Dreman Ave. &
B. & O. R.R., Cincinnati, O.

Wapakoneta Machine Co., The,
Wapakoneta, O.

SHEARS

Beatty Machine & Mfg. Co.,
Hammond, Ind.

Buffalo Forge Co.,
446 Broadway, Buffalo, N. Y.

Cincinnati Shaper Co., Garrard and
Elam Sts., Cincinnati, O.

Cleveland Punch & Shear Works Co.,
The, 3917 St. Clair Ave.,
Cleveland, O.

Continental Roll & Steel Fdry. Co.,
E. Chicago, Ind.

Halden Machine Co., The,
Thomaston, Conn.

Hannliff Mfg. Co., 621-631 So.
Kolmar Ave., Chicago, Ill.

Hyde Park Fdry. & Mach. Co.,
Hyde Park, Pa.

Levis Fdry. & Mach. Div. of Blaw-
Knox Co., Pittsburgh, Pa.

Morgan Engineering Co., The,
Alliance, O.

Niagara Machine & Tool Works,
637-697 Northland Ave.,
Buffalo, N. Y.

Thomas Machine Mfg. Co.,
Etna Branch P. O.,
Pittsburgh, Pa.

United Engineering & Fdry. Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

**SHEARS, ROTARY (Sitting,
Beveling, Circling, Flanging)**

Yoder Co., The, W. 55th St. &
Walworth Ave., Cleveland, O.

SHEET BARS

Andrews Steel Co., The,
Newport, Ky.

Bethlehem Steel Co.,
Bethlehem, Pa.

Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.

Columbia Steel Co.,
San Francisco, Calif.

Jones & Laughlin Steel Corp.,
Jones & Laughlin Bldg.,
Pittsburgh, Pa.

Republic Steel Corp., Dept. ST,
Cleveland, O.

Tennessee Coal, Iron & Railroad
Co., Brown-Marx Bldg.,
Birmingham, Ala.

Youngstown Sheet & Tube Co., The,
Youngstown, O.

**SHEET LIFTERS AND
CARRIERS**

American MonoRail Co., The,
13102 Athens Ave., Cleveland, O.

Cullen-Friedest Co., 1308 S.
Kilburn Ave., Chicago, Ill.

Hyde Park Fdry. & Mach. Co.,
Hyde Park, Pa.

J-B Engineering Sales Co.,
1743 Orange St.,
New Haven, Conn.

**SHEET METAL PRODUCTS—
See STAMPINGS****SHEET METAL WORKERS
MACHINES**

Cincinnati Shaper Co., Elam and
Garrard Sts., Cincinnati, O.

Excelsior Tool & Machine Co.,
Ridge & Jefferson Aves.,
E. St. Louis, Ill.

Niagara Machine & Tool Works,
637-697 Northland Ave.,
Buffalo, N. Y.

Yoder Co., The, W. 55th St. &
Walworth Ave., Cleveland, O.

**SHEET STEEL PILING
(New and Used)**

Bethlehem Steel Co.,
Bethlehem, Pa.

Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.

Foster, L. B., Co., Inc.,
P. O. Box 1647, Pittsburgh, Pa.

Inland Steel Co.,
38 S. Dearborn St., Chicago, Ill.

SHEETS (Acid Resisting)

International Nickel Co., Inc., The,
67 Wall St., New York City.

SHEETS (Black)

American Steel & Wire Co.,
Rockefeller Bldg., Cleveland, O.

Andrews Steel Co., The,
Newport, Ky.

WHERE - TO - BUY

SHEETS (Black)—Con.
 Granite City Steel Co.,
 Granite City, Ill.
 Great Lakes Steel Corp., Ecorse,
 Detroit, Mich.
 Inland Steel Co., 38 So. Dearborn
 St., Chicago, Ill.
 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts., Chicago, Ill.
 Tennessee Coal, Iron & Railroad
 Co., Brown-Marx Bldg.,
 Birmingham, Ala.
 Wheeling Steel Corp.,
 Wheeling, W. Va.

**SHEETS (Brass, Bronze, Copper,
 Nickel Silver, Silicon-Bronze)**
 American Brass Co., The,
 Waterbury, Conn.
 Ameco Metal, Inc., Dept. S-84,
 3830 W. Burnham St.,
 Milwaukee, Wis.
 Bridgeport Brass Co.,
 Bridgeport, Conn.

SHEETS (Corrugated)
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Andrews Steel Co., The,
 Newport, Ky.
 Apollo Steel Co., 2243-2244 Oliver
 Bldg., Pittsburgh, Pa.
 Bethlehem Steel Co.,
 Bethlehem, Pa.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Columbia Steel Co.,
 San Francisco, Calif.
 Inland Steel Co., 38 S. Dearborn
 St., Chicago, Ill.
 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Tennessee Coal, Iron & Railroad
 Co., Brown-Marx Bldg.,
 Birmingham, Ala.
 Weirton Steel Co., Weirton, W. Va.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

**SHEETS (Deep Drawing and
 Stamping)**
 Alan Wood Steel Co.,
 Conshohocken, Pa.
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Andrews Steel Co., The,
 Newport, Ky.
 Apollo Steel Co., 2243-2244 Oliver
 Bldg., Pittsburgh, Pa.
 Bethlehem Steel Co.,
 Bethlehem, Pa.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Granite City Steel Co.,
 Granite City, Ill.
 Great Lakes Steel Corp.,
 Ecorse, Detroit, Mich.
 Inland Steel Co., 38 So. Dearborn
 St., Chicago, Ill.
 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Wheeling Steel Corp.,
 Wheeling, W. Va.
 Weirton Steel Co., Weirton, W. Va.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

SHEETS (Electrical)
 Allegheny Ludlum Steel Corp.,
 Dept. T-125, Oliver Bldg.,
 Pittsburgh, Pa.
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Andrews Steel Co., The,
 Newport, Ky.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Granite City Steel Co.,
 Granite City, Ill.
 Ingersoll Steel & Disc. Div., Borg-
 Warner Corp., 310 S. Michigan
 Ave., Chicago, Ill.
 Inland Steel Co., 38 So. Dearborn
 St., Chicago, Ill.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

SHEETS (Galvanized)
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Andrews Steel Co., The,
 Newport, Ky.

Apollo Steel Co., 2243-2244 Oliver
 Bldg., Pittsburgh, Pa.
 Bethlehem Steel Co.,
 Bethlehem, Pa.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Columbia Steel Co.,
 San Francisco, Calif.
 Granite City Steel Co.,
 Granite City, Ill.
 Inland Steel Co., 38 S. Dearborn
 St., Chicago, Ill.
 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Tennessee Coal, Iron & Railroad
 Co., Brown-Marx Bldg.,
 Birmingham, Ala.
 Wheeling Steel Corp.,
 Wheeling, W. Va.
 Weirton Steel Co., Weirton, W. Va.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

**SHEETS (Hot Rolled and Hot
 Rolled Annealed)**
 Alan Wood Steel Co.,
 Conshohocken, Pa.
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Andrews Steel Co., The,
 Newport, Ky.
 Apollo Steel Co., 2243-2244 Oliver
 Bldg., Pittsburgh, Pa.
 Bethlehem Steel Co.,
 Bethlehem, Pa.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Columbia Steel Co.,
 San Francisco, Calif.
 Granite City Steel Co.,
 Granite City, Ill.
 Great Lakes Steel Corp.,
 Ecorse, Detroit, Mich.
 Inland Steel Co., 38 So. Dearborn
 St., Chicago, Ill.
 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Levinson Steel Co.,
 33 Pride St., Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Tennessee Coal, Iron & Railroad
 Co., Brown-Marx Bldg.,
 Birmingham, Ala.
 Wheeling Steel Corp.,
 Wheeling, W. Va.
 Weirton Steel Co., Weirton, W. Va.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

SHEETS (Long Terne)
 Andrews Steel Co., The,
 Newport, Ky.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.
 Weirton Steel Co., Weirton, W. Va.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

SHEETS (Nickel Silver)
 Seymour Manufacturing Co.,
 51 Franklin St., Seymour, Conn.

SHEETS (Perforated)
 Harrington & King Perforating Co.,
 5634 Fillmore St., Chicago, Ill.

SHEETS (Phosphor Bronze)
 Seymour Manufacturing Co.,
 51 Franklin St., Seymour, Conn.

SHEETS (Reinforced)
 Erdle Perforating Co.,
 171 York St., Rochester, N. Y.

**SHEETS (Roofing)—See ROOFING
 AND SIDING**

SHEETS (Stainless)
 Allegheny Ludlum Steel Corp.,
 Dept. T-125, Oliver Bldg.,
 Pittsburgh, Pa.
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Columbia Steel Co.,
 San Francisco, Calif.
 Republic Steel Corp., Massillon, O.
 Ryerson, Jos. T., & Son, Inc.,
 16th & Rockwell Sts.,
 Chicago, Ill.

SHEETS (Stainless Clad)
 Granite City Steel Co.,
 Granite City, Ill.
 Ingersoll Steel & Disc Div., Borg-
 Warner Corp., 310 S. Michigan
 Ave., Chicago, Ill.

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SHEETS (Steel)
Mahoning Valley Steel Co., The, Niles, O.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
American Rolling Mill Co., The, 2351 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHELLS (Seamless Drawn)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

SHOVELS (Power)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.

SILICO-MANGANESE
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SILICON METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 2520 Park Ave., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Broslus, Edgar E., Inc., Sharpshurg Branch, Pittsburgh, Pa.

SLITTERS
Ohio Knife Co., Dremam Ave. & B. & O. R.R., Cincinnati, O.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.

Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLDER
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.

SOLENOIDS (Electric)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Grant Gear Works, 2nd & B. Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Co., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLES (Grinding)
Bryant Chucking Grinder Co., Springfield, Vt.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

SPINDLES (Lathe)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS
(*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hubbard, M. D., Spring Co., 434 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
*Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Coil & Elliptic)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Compression)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Oil Tempered—Flat)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Torsion)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Valve)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

SPRUCE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Dayton Rogers Co., Dept. "C," 2830-13th Ave., So., Minneapolis, Minn.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Hubbard, M. D., Spring Co., 434 Central Ave., Pontiac, Mich.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Stanley Works, The, Bridgeport, Conn.
New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Transue & Williams Steel Forging Co., Alliance, O.
Whitehead Stamping Co., 1667 W. Lafayette Blvd., Detroit, Mich.

STAMPS (Steel)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Crucible Steel Co. of America, Room 137, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nletown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren, Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Steel Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Edgar T. Ward's Sons Co., Carnegie, Pa.
Washburn Wire Co., Phillipsdale, R. I.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Edgar T. Ward's Sons Co., Carnegie, Pa.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
*Copperweld Steel Co., Warren, O.
*Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Roebling's, John A., Sons Co., Trenton, N. J.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Edgar T. Ward's Sons Co., Carnegie, Pa.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

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 Monarch Steel Co., 545 W. McCarty
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 Ryerson, Jos. T. & Son, Inc.,
 16th & Rockwell Sts., Chicago, Ill.
 Union Drawn Steel Div. of Republic
 Steel Corp., Massillon, O.
 Wyckoff Drawn Steel Co.,
 First National Bank Bldg.,
 Pittsburgh, Pa.

STEEL (Corrosion Resisting)
 Allegheny Ludlum Steel Corp.,
 Dept. T-125 Oliver Bldg.,
 Pittsburgh, Pa.
 American Rolling Mill Co., The,
 2351 Curtis St., Middletown, O.
 American Steel & Wire Co.,
 Rockefeller Bldg., Cleveland, O.
 Andrews Steel Co., The,
 Newport, Ky.

Bethlehem Steel Co.,
 Bethlehem, Pa.
 Bissett Steel Co., The,
 900 E. 67th St., Cleveland, O.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Carpenter Steel Co., 139 W. Bern
 St., Reading, Pa.

Crucible Steel Co. of America,
 Room 117, 405 Lexington Ave.,
 New York City.
 Firth-Sterling Steel Co.,
 McKeesport, Pa.
 Granite City Steel Co.,
 Granite City, Ill.
 Ingersoll Steel & Disc Div. Borg-
 Warner Corp., 310 S. Michigan
 Ave., Chicago, Ill.

Inland Steel Co.,
 38 So. Dearborn St., Chicago, Ill.
 Jessop, Wm., & Sons, Inc.,
 627-629 Sixth Ave.,
 New York City.
 Jessop Steel Co., 584 Green St.,
 Washington, Pa.
 Midvale Co., The, Nicetown,
 Philadelphia, Pa.

National Forge & Ordnance Co.,
 Irvine, Warren Co., Pa.
 National Tube Co.,
 Frick Bldg., Pittsburgh, Pa.
 Pittsburgh Steel Co.,
 1653 Grant Bldg., Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.

Roebling's, John A., Sons Co.,
 Trenton, N. J.
 Rustless Iron & Steel Corp.,
 3400 E. Chase St., Baltimore, Md.
 Ryerson, Jos. T. & Son, Inc.,
 16th & Rockwell Sts., Chicago, Ill.
 Stanley Works, The,
 New Britain, Conn.
 Bridgeport, Conn.

Superior Steel Corp., Carnegie, Pa.
 Timken Roller Bearing Co., The,
 Steel & Tube Div., Canton, O.

STEEL (Die)
 Crucible Steel Co. of America,
 Room 117, 405 Lexington Ave.,
 New York City.
 Jessop, Wm., & Sons, Inc.,
 627-629 Sixth Ave.,
 New York City.
 Jessop Steel Co., 584 Green St.,
 Washington, Pa.
 Vanadium-Alloys Steel Co.,
 Latrobe, Pa.

STEEL (Drill)
 Crucible Steel Co. of America,
 Room 117, 405 Lexington Ave.,
 New York City.
STEEL (Electric)
 Bethlehem Steel Co.,
 Bethlehem, Pa.

Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Copperweld Steel Co., Warren, O.
 Crucible Steel Co. of America,
 Room 117, 405 Lexington Ave.,
 New York City.
 Firth-Sterling Steel Co.,
 McKeesport, Pa.

Inland Steel Co.,
 38 So. Dearborn St., Chicago, Ill.
 Jessop, Wm., & Sons, Inc.,
 627-629 Sixth Ave.,
 New York City.
 Jessop Steel Co., 584 Green St.,
 Washington, Pa.
 Latrobe Electric Steel Co.,
 Latrobe, Pa.

National Forge & Ordnance Co.,
 Irvine, Warren Co., Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Timken Roller Bearing Co., The,
 Steel & Tube Div., Canton, O.

STEEL (High Speed)
 Allegheny Ludlum Steel Corp.,
 Dept. T-125, Oliver Bldg.,
 Pittsburgh, Pa.
 Bethlehem Steel Co.,
 Bethlehem, Pa.
 Carpenter Steel Co., 139 W. Bern
 St., Reading, Pa.

Crucible Steel Co. of America,
 Room 117, 405 Lexington Ave.,
 New York City.
 Firth-Sterling Steel Co.,
 McKeesport, Pa.
 Ingersoll Steel & Disc Div., Borg-
 Warner Corp., 310 S. Michigan
 Ave., Chicago, Ill.
 Jessop, Wm., & Sons Co.,
 627-629 Sixth Ave.,
 New York City.
 Jessop Steel Co., 584 Green St.,
 Washington, Pa.

Latrobe Electric Steel Co.,
 Latrobe, Pa.
 Vanadium-Alloys Steel Co.,
 Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
 Alan Wood Steel Co.,
 Conshohocken, Pa.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Cold Metal Process Co., The,
 2131 Wilson Ave., Youngstown, O.

Columbia Steel Co.,
 San Francisco, Calif.
 Great Lakes Steel Corp.,
 Ecorse, Detroit, Mich.
 Inland Steel Co.,
 38 So. Dearborn St., Chicago, Ill.

Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
 Pittsburgh, Pa.
 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Ryerson, Jos. T. & Son, Inc.,
 16th & Rockwell Sts., Chicago, Ill.

Tennessee Coal, Iron & Railroad
 Co., Brown-Marx Bldg.,
 Birmingham, Ala.
 Youngstown Sheet & Tube Co., The,
 Youngstown, O.

STEEL (Nitriding)
 Allegheny Ludlum Steel Corp.,
 Dept. T-125,
 Oliver Bldg., Pittsburgh, Pa.
 Firth-Sterling Steel Co.,
 McKeesport, Pa.

**STEEL (Rustless)—See STEEL
 (Corrosion Resisting)**
STEEL (Screw Stock)
 American Steel & Wire Co.,
 Rockefeller Bldg., Cleveland, O.

Bethlehem Steel Co.,
 Bethlehem, Pa.
 Bliss & Laughlin, Inc. Harvey, Ill.
 Carnegie-Illinois Steel Corp.,
 Pittsburgh-Chicago.
 Jones & Laughlin Steel Corp.,
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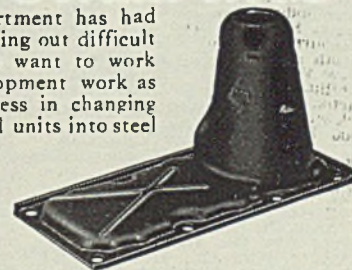
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Foxboro Co., The, 118 Neponset
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Hanna Engineering Works,
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Foxboro Co., The, 118 Neponset
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Nicholson, W. H., & Co.,
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VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)
Bartlett-Hayward Div., Koppers
Co., Baltimore, Md.
Crane Co., The, 836 S. Michigan
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American Chain & Cable Co., Inc.,
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Western Gas Div. Koppers Co.,
Fort Wayne, Ind.

VALVES (Globe)
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Birdsboro Steel Fdry. & Mach. Co.,
Birdsboro, Pa.
Elmes, Chas. F., Engineering
Works, 243 N. Morgan St.,
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Homestead Valve Mfg. Co.,
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Wood, R. D., Co., 400 Chestnut St.,
Philadelphia, Pa.

VALVES (Needle)
Crane Co., 836 S. Michigan Ave.,
Chicago, Ill.
Reading-Pratt & Cady Div. of
American Chain & Cable Co., Inc.,
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North American Mfg. Co., The,
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Thompson-Bremer & Co., 1638 W.
Hubbard St., Chicago, Ill.

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Asplated Spring Corp.,
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Raymond Mfg. Co., Div. Associated
Spring Corp., 280 So. Centre St.,
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tional Ave., Milwaukee, Wis.
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tional Ave., Milwaukee, Wis.
Lincoln Electric Co., The,
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Maurath, Inc., 7311 Union Ave.,
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can Chain & Cable Co., Inc.,
Monessen, Pa.

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*Republic Steel Corp.,
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Roebling's, John A., Sons Co.,
Trenton, N. J.
Seneca Wire & Mfg. Co.,
Fostoria, O.
Tennessee Coal, Iron & Railroad
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Wickwire Spencer Steel Co.,
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Youngstown Sheet & Tube Co., The,
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Pittsburgh Steel Co., 1653 Grant
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Pittsburgh Steel Co., 1653 Grant
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Harlem River, New York City.

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Page Steel & Wire Div. of Ameri-
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Republic Steel Corp., Dept. ST,
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 New York City.
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 Youngstown Sheet & Tube Co., The,
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 Bethlehem Steel Co.,
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 Jones & Laughlin Steel Corp.,
 Jones & Laughlin Bldg.,
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 Laclede Steel Co., Arcade Bldg.,
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 Page Steel & Wire Div. of
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 Firth-Sterling Steel Co.,
 McKeesport, Pa.
 Page Steel & Wire Div. of Ameri-
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 Monessen, Pa.
 Pittsburgh Steel Co., 1653 Grant
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 Raymond Mfg. Co., Div. Associated
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 Roebbing's, John A., Sons Co.,
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 *Pittsburgh Steel Co.,
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 Republic Steel Corp., Dept. ST,
 Cleveland, O.
 Roebbing's, John A., Sons Co.,
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 Seneca Wire & Mfg. Co.,
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 Tennessee Coal, Iron & Railroad
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 Washburn Wire Co.,
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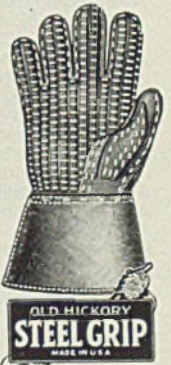
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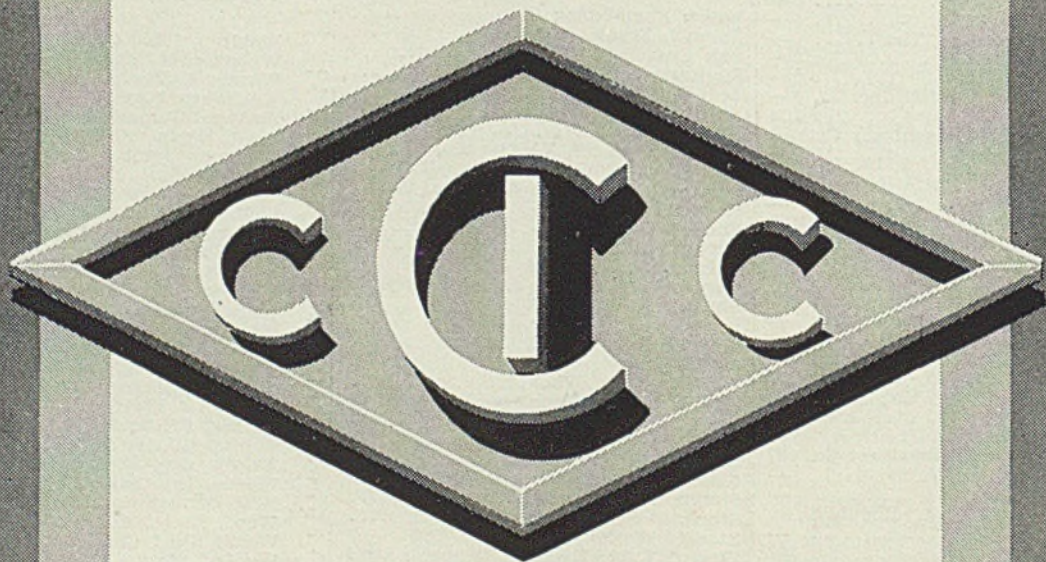
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