STEEL

ESTABLISHED 1882

Contents

Volume 109—No. 9 **September 1, 1941**

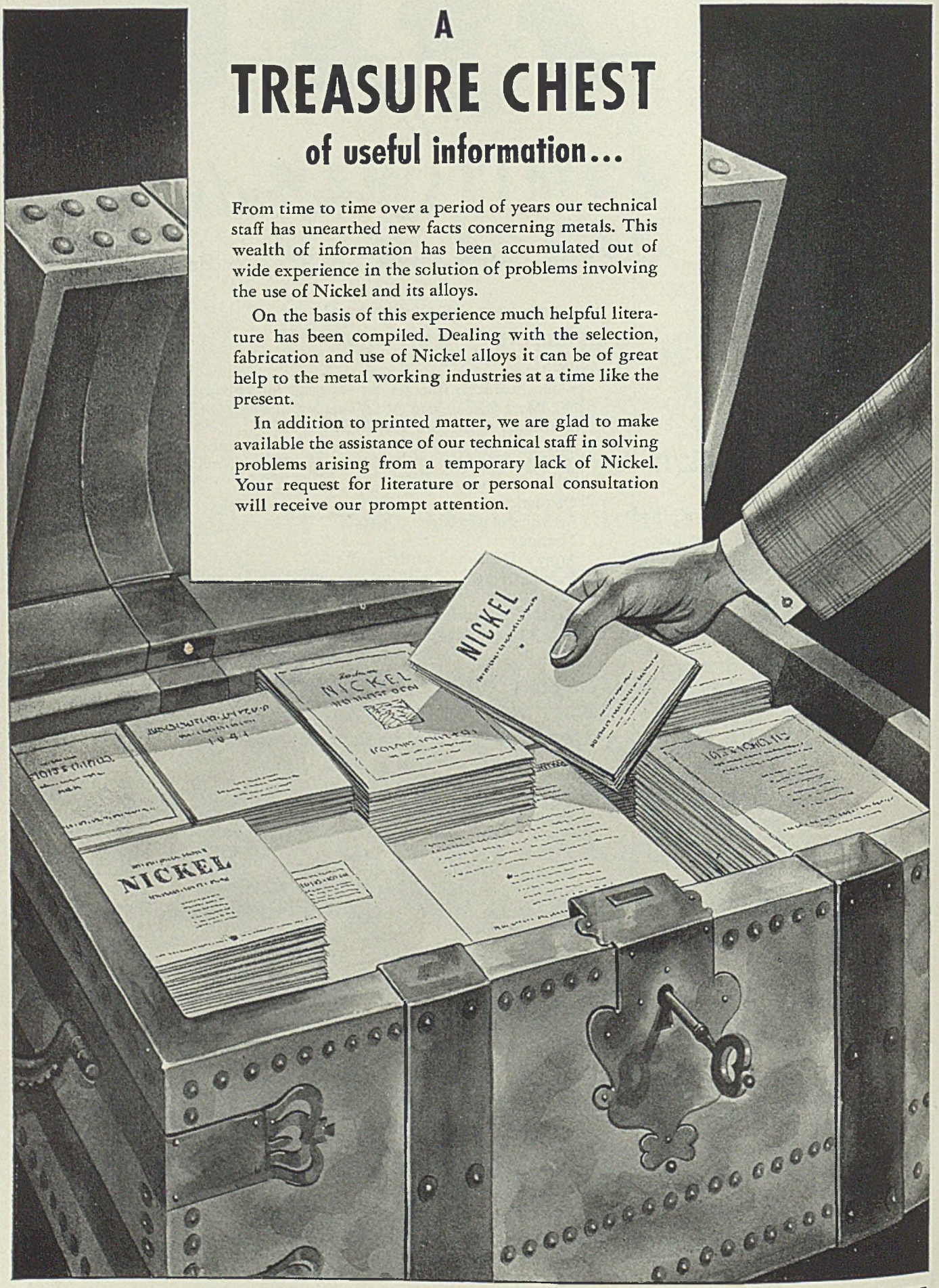
PRODUCTION • PROCESSING • DISTRIBUTION • USE

A TREASURE CHEST
of useful information...

From time to time over a period of years our technical staff has unearthed new facts concerning metals. This wealth of information has been accumulated out of wide experience in the solution of problems involving the use of Nickel and its alloys.

On the basis of this experience much helpful literature has been compiled. Dealing with the selection, fabrication and use of Nickel alloys it can be of great help to the metal working industries at a time like the present.

In addition to printed matter, we are glad to make available the assistance of our technical staff in solving problems arising from a temporary lack of Nickel. Your request for literature or personal consultation will receive our prompt attention.



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

HIGHLIGHTING THIS ISSUE OF STEEL

■ ANNOUNCEMENT last week of the President's appointment of a new 7-member Supply Priorities and Allocations Board was received by industry as a favorable development and one calculated to prevent recurrence of controversies, as the one between OPM and the former OPACS with reference to the extent of the cut in automobile production, that have created considerable uncertainty. The SPAB, as it immediately came to be known, has complete power to allocate all available raw materials, giving it control over all manufacture whether for defense or nondefense. One gratifying feature is that the men who compose the new SPAB **(p. 21)** have demonstrated in the past their ability to get along harmoniously.

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Scrap Prices To Be Enforced

Without saying just how he is going to do it, Leon Henderson served warning **(p. 23)** that after Tuesday, Sept. 2, the iron and steel scrap price schedule will be enforced with "every sanction and power of the government" and he talked about allocating scrap. The trade sees in Mr. Henderson's position no cure for the tight situation and feels that a tough government policy will result only in curtailing further rather than increasing the supply of scrap. . . . OPM will contract soon for two new steel plants to increase ingot output **(p. 32)** by 1,400,000 tons. In addition to the 2,500,000-ton expansion in pig iron capacity already ordered (p. 32) 10,000,000 more tons are under consideration.

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STEEL Prints PD Forms

It now appears certain that defense will absorb so much steel that civilian consumers' supplies will be reduced sharply **(p. 87)** but the industry hopefully believes that the supply will become easier, possibly within 60 days. In the meantime no orders are being accepted unless they are accompanied by Form PD-73 properly filled in. . . . Because of the need for copies of the various PD forms in large numbers, STEEL **(p. 31)** offers them at prices figured close to cost. . . . Maritime Commission **(p. 27)** has placed 23 of 48 projected shipways. . . . SWOC **(p. 26)** signs its first "white collar" contract. . . . Manufacturers desiring defense work are presented **(p. 46)** with a list of opportunities.

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Gun Making At Watervliet

Practice in manufacture of huge built-up guns at Watervliet Arsenal is detailed **(p. 56)** this week by Professor Macconochie who also gives some background information on this important defense plant. . . . Good practice in steel plant lighting and how to get it is explained **(p. 64)** by Davis H. Tuck. . . . In the third section of his series on how to get the most from arc welding, E. W. P. Smith shows **(p. 74)** how important production speed increases and cost reductions can be obtained by positioning the work when it can be moved, thus allowing welding to be accomplished most efficiently. . . . A combined freighter and aircraft carrier **(p. 76)** is described.

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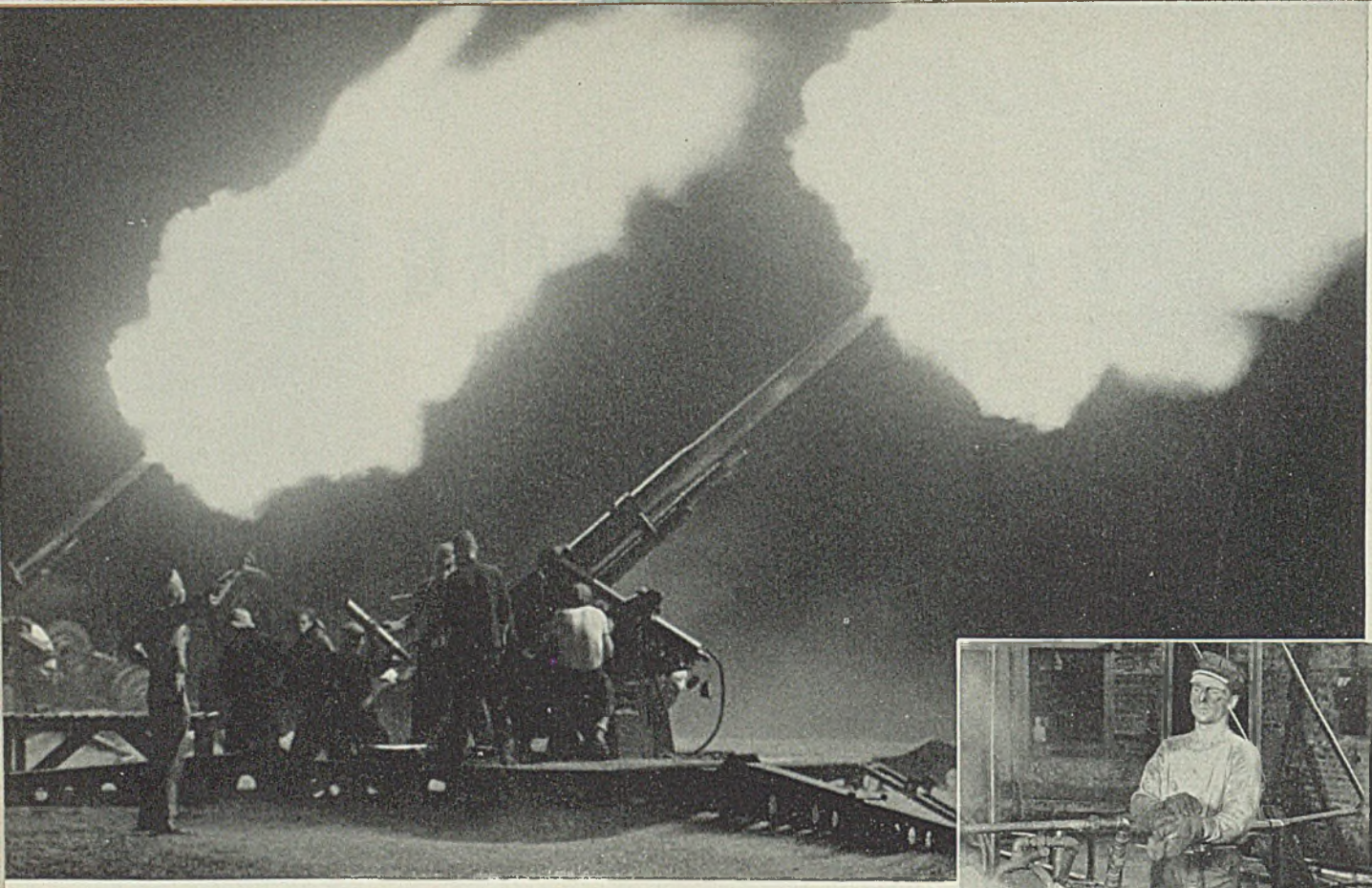
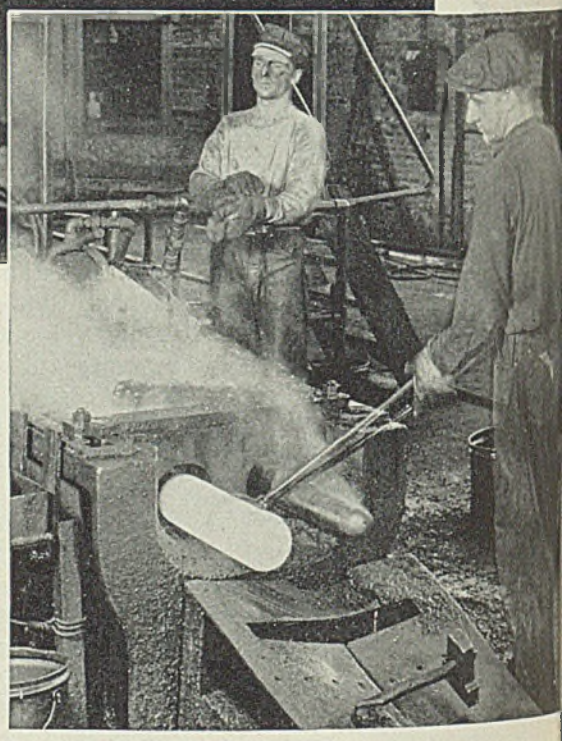
1700 H.P. Each 24 Minutes

Typical of the speedy mass production methods being employed by the aircraft industry is the assembly of Wright Cyclone 14-cylinder double-row radial aircraft engines. A line assembles 8500 parts to complete one of these 1700-horsepower giants every 24 minutes. . . . John L. Buehler tells **(p. 78)** of special practices developed to heat-treat gears for aircraft engines without distortion and without any volumetric change. . . . Hot-die steels that have given excellent results in piercing shell are detailed **(p. 62)** by W. H. Wills. . . . Some unusual operations **(p. 54)** are employed in making a special chain that operates in two planes, according to L. W. Moen.





Shells for Defense

Another Example of How Inland Steel Is Used in the Preparedness Program

Numerous plants throughout the United States are busy manufacturing enormous quantities of artillery shells—shells needed for the defense of America. Flowing from the Inland mills is steel from which thousands of these shells are being forged.

Inland has never been a producer of munitions; nor has it made steel for munitions in times of peace. Inland manufactured no steel for war purposes between the close of hostilities in the First World War and the outbreak of the present war.

But today, with the same spirit exhibited by all American industry, Inland is doing its part by making steel, in whatever form required for our National Defense Program, to the limit of its manufacturing facilities. This is Inland's No. 1 job!

When forging one size of field artillery shell, a 50-lb. billet is heated in a continuous furnace. The billet is quickly descaled and pierced, then follow two fast drawing operations. Above is shown a shell after the first draw.

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38 S. Dearborn Street, Chicago · Sales Offices: Milwaukee, Detroit, St. Paul, [illegible], Cincinnati, New York

7-Man Board To Allocate All Materials

For Military, Civilian Uses

New Dealers dominate new super-control agency, designed to employ available supplies to best advantage . . . OPM to function through six divisions . . . OPACS divided . . . Stettinius named lend-lease administrator

WASHINGTON

■ INCREASING shortages in the supply of many strategic raw materials last week prompted the second wholesale reorganization of the national defense machinery.

The seven-member Supply Priorities and Allocations Board appointed by the President now has power to allocate all available raw materials between military and civilian production; it also will allocate those materials reserved for nondefense commodities among the individual manufacturers.

Extension of the allocation control and the admission by high defense officials that the "strategic materials situation is just about as tight as it could be" are expected to cause a more severe pinch in plants without defense orders. Many of these already have been forced to suspend or sharply curtail operations due to material shortages and the problems of "priorities depression" and "priorities unemployment" are recognized as major.

No Defense "Czar"

The new board, dominated by New Dealers, will have practically complete control over manufacturing through its control of raw materials. It implements the administration's program for greater *materiel* output and regulated civilian production.

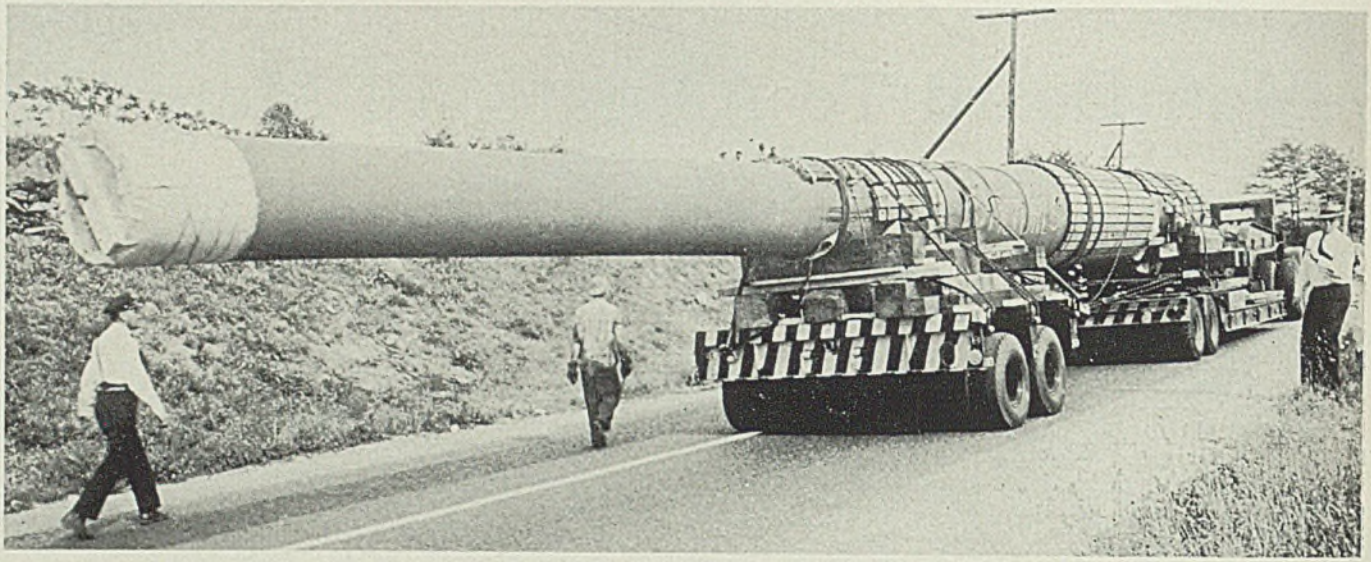
The reorganization takes no cognizance of widespread demands that all defense agencies be placed under a single co-ordinating head, similar to the War Industries Board of the first world war under Bernard Baruch. Mr. Roosevelt will continue to be "The Boss."

Chairman of SPAB is Vice President Henry Wallace, who also is chairman of the recently appointed Economic Defense Board.

Other members are OPM Director General William S. Knudsen; OPM Associate Director Sidney Hillman; Secretary of War Henry Stimson; Secretary of Navy Frank Knox; Leon Henderson, price administrator; and Harry L. Hopkins, the President's man Friday in charge of the lend-lease activities.

Donald M. Nelson, OPM director of purchases, has been named executive director. Mr. Nelson will preside in the absence of Chairman Wallace and also become director of priorities, replacing E. R. Stettinius Jr., former United States Steel Corp. chairman. Mr. Stettinius has been appointed lend-lease adminis-

■ Donald M. Nelson, right, executive director of the Supply Priorities and Allocations Board and director of priorities, is regarded by many observers as the coming No. 1 man in the new super-co-ordinating agency. Although Vice President Henry Wallace is chairman of the SPAB, it is believed his other duties will not permit him to devote full time to the job, and in his absence Mr. Nelson presides. Above, Mr. Nelson chats with Sidney Hillman, OPM co-director and head of the labor division. NEA photo



Transporting 68-foot Gun

■ Huge coast defense rifle transported from Tiverton, R. I., to Fort Church, near Compton, R. I., for installation. This great gun weighs almost 145 tons, is 68 feet long, and was hauled at the rate of two miles an hour on tractor with double trailers equipped with a total of 38 huge pneumatic truck tires. Photo Goodyear Tire & Rubber Co.

trator under the overall supervision of Mr. Hopkins.

John D. Biggers was withdrawn as OPM production director and will go to England with the title of Minister to expedite aid to Britain. He will work to synchronize British and American production.

W. L. Batt, president of SKF Industries, who has been deputy director of the OPM production division, will head a new OPM division in charge of production of raw materials.

W. H. Harrison, of American Telephone & Telegraph Co., who also has been a deputy director in the production division, will take over another new OPM division in charge of production of finished articles.

OPACS Divided

These two changes will split the old production division into two parts, returning to an arrangement like that of the National Defense Advisory Commission in which Mr. Knudsen had charge of finished products and Mr. Stettinius of raw materials.

The Office of Price Administration and Civilian Supply was changed to the Office of Price Administration, with Leon Henderson continuing as price administrator. The civilian allocations branch was switched to OPM where it now is a separate division, under Mr. Henderson.

Donald MacKeachie, deputy in the purchasing division under Mr. Nelson, will become head of that division.

Thus OPM, under the new setup, will function through six divisions: Civilian allocations, under Mr. Henderson; raw materials, under Mr. Batt; finished goods production, under Mr. Harrison; labor, under Mr. Hillman; priorities, under Mr. Nelson; and purchases, under Mr. MacKeachie.

A contributing factor in the establishment of SPAB is believed to have been the friction over priorities between OPM and OPACS. This came to a head when Mr. Henderson, without consulting OPM, ordered a 50 per cent reduction in automobile production. OPM heads had been working on plans for a 20 per cent curtailment.

SPAB will have no power to determine the distribution of finished materials, such as ships, planes or guns, but will allocate only the materials, parts and tools needed for their manufacture.

White House spokesmen explained the agency's functions as follows:

"The board, subject to the general policies enunciated by the President, periodically and whenever necessary, will fix the amount of materials to be allocated to military needs, defense-aid needs, economic warfare needs and total civilian needs.

"In the general field of civilian needs, this group will make policies and regulations for the allocation of the available supply of materials between the different competing civilian industries and users. To illustrate, if the commodity involved is steel, this board will determine upon policies and regulations under which steel will be allocated, first for materials required by the Army and Navy of the United States, and then for defense-aid needs, economic warfare needs and civilian needs.

Nelson To Handle Priorities

"When the total amount determined for civilian needs is arrived at, this board will determine the policies and make regulations for the amount to be allocated to automobiles, railroad cars, refrigerators, building, typewriters, etc. The actual administration of these policies by way of issuance of priority certificates for the various purposes, will be carried on through the appropriate divisions of OPM. It is, of course, not contemplated that this board actually will pass on specific priority applications which are filed by the thousands every week. That will continue to be done in the priorities division under Donald Nelson. Only broad policies and general regulations for priorities and allocations will be determined by the board; and pursuant to these policies and regulations the actual day-by-day administration of specific priorities will be carried out by the priorities division."

Washington observers predicted a reorganization of the priorities sys-

(*Please turn to Page* 106)

W. L. Batt

Who has been designated as director of the new OPM raw materials division. Before joining the defense organization, Mr. Batt was head of the SKF Industries Inc., Philadelphia

"No More Shenanigans After Tuesday," Henderson Warns Scrap Buyers, Sellers

WASHINGTON

■ STRICT compliance with the iron and steel scrap price schedule will be enforced with "every sanction and power of the government" after Tuesday, Sept. 2.

This warning was made by Leon Henderson, administrator, Office of Price Administration and Civilian Supply, before a meeting of about 200 scrap brokers and representatives of steel mills and foundries here last week.

The conference was called by OPACS and the Office of Production Management to consider ways of accelerating the flow of scrap to defense industries.

OPACS and OPM officials said the present price schedule has been ignored almost 100 per cent and that little, if any, scrap was being moved at the established prices.

Mr. Henderson laid the blame for violations of the price schedule equally on sellers and buyers, but said his agency will allow "no monkey business" after Labor day. OPACS expects that all contracts for sale of scrap above schedule prices will be terminated by Tuesday and that no contracts at over-ceiling prices will be made after that.

The steel, foundry and scrap men were told that scrap would be brought under full priority control within the next few days, presumably by Labor day, and that the priority order is being written with a view of enforcement of the price schedule. There will be no general revision of the present schedule, Mr. Henderson said.

The powers and sanctions available to OPACS in enforcing the order are adequate, Mr. Henderson declared, although he did not specifically list them. If more sanctions are needed, he said he would go to the White House and get them.

Provides Emergency Pool

Revelation that a mandatory priority order is coming was made by Arthur D. Whiteside, chief of the OPM iron and steel section. The order will follow the fundamental of the pig iron order, and will provide for an emergency pool based on a percentage of scrap handled.

R. C. Allen, deputy chief of raw materials, cited a plan whereby county agents of the Department of Agriculture will survey farms in their jurisdiction for available scrap. The auto wrecking program is resulting in considerable scrap, he indicated.

Mr. Allen emphasized that OPM is backing OPACS on the price schedule and that OPM officials believe it provides a stable base which is necessary for the collection programs.

Mr. Henderson said that after Labor day the British will not bid in the American market and that the Army and Navy and Lease-Lend administration will not pay over the established prices. Any Canadian buyers found to be bidding higher prices will have their export licenses revoked.

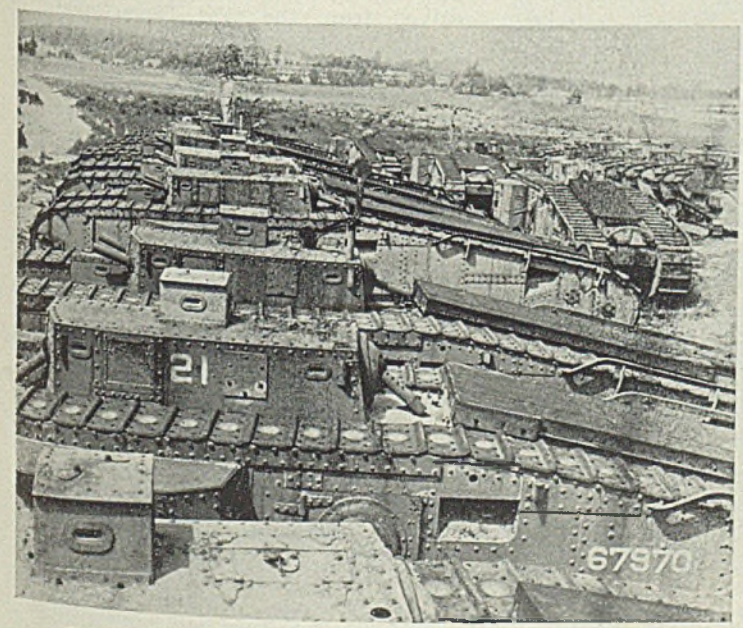
Board of directors of the Institute of Scrap Iron and Steel Inc. later urged dealers and handlers to refuse immediately to accept any business at over-ceiling prices and to do everything possible to keep scrap rolling to steel mills and foundries.

E. C. Barringer, executive secretary of the institute, pointed out that the institute had previously made recommendations to OPACS that would accelerate the flow of scrap and would gladly take advantage of an invitation extended at the joint meeting to help iron out existing inequalities so that the defense program would not be impeded.

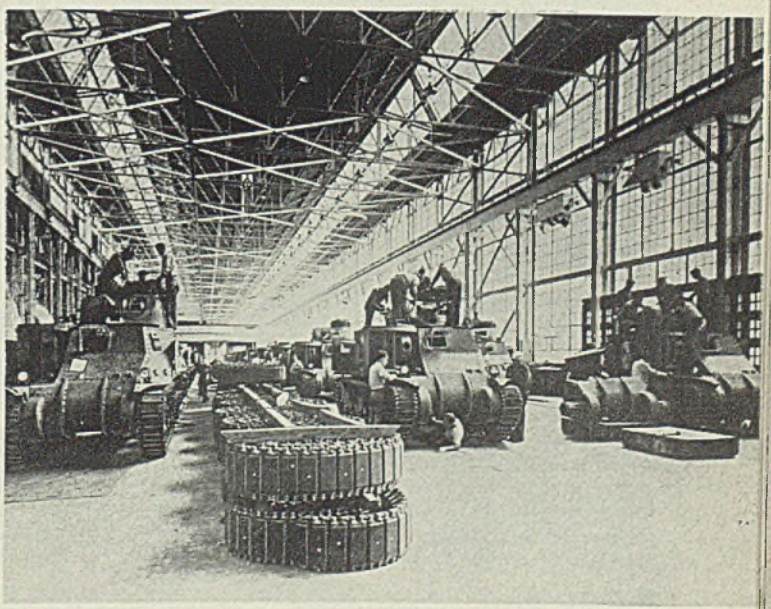
Forty-five per cent of the purchased scrap consumed originates in industrial plants and railroads, he said. This scrap will come out. The remaining 55 per cent is dealers' scrap, from auto wreckers, peddlers and obsolescent material, which is very sensitive to price.

"We find no objection to the $20 level for Pittsburgh, but we do believe certain inequalities must be

1918 Tanks Ready for Scrap; 1941 Models Ready for War



■ Nearly 100 of these 6-ton, 1918 vintage, Mark VIII tanks have been gathering rust and cluttering up the grounds at Ft. Meade, Maryland, for years. Some of them, recently sent to Canada, may never be used. NEA photo



■ This picture of the Chrysler tank arsenal in Detroit shows the M-3's rolling off assembly lines. These 28-ton machines for the United States army and Britain are being produced far ahead of schedule (See story on Page 37). NEA photo

adjusted to attract certain types of scrap. Even then we are not certain there will be an adequate supply for all defense and civilian needs."

Priorities, Price Control Held Insufficient To Ease Shortage

NEW YORK

Reaction here to strict enforcement of ceiling prices and proposed mandatory priority order covering iron and steel scrap is that further tampering with prices, extra-legal attempts to enforce them and mere allocating priority ratings for material to consumers will not solve or ease shortage now confronting the industry.

Direct dealing in recent past has weakened the position of the dealer as a specialist and what is left for him appears to be mainly miscellaneous scrap collected by hundreds of individuals. Many observers believe only a gigantic collection job will relieve shortage.

Practically all mills and foundries have priorities or can get them now, and a mandatory order is not likely to change the flow of scrap or add one ton to volume.

Steel Scrap Stocks Off 10 Per Cent at End of Second Quarter

Domestic stocks of iron and steel scrap at consumers' and suppliers' totaled approximately 6,529,000 net tons. This was 10 per cent less than 7,235,000 tons March 31, according to the Bureau of Mines, Department of the Interior.

Known stocks held by consumers and suppliers at end of the second quarter were equal to a 5-weeks' supply, based on the quarter's consumption rate, a position slightly below that at end of the first three months. Although total stocks decreased 10 per cent, those on hand at consumers' plants and in transit declined only 3 per cent, from 5,220,000 tons March 31 to 5,051,000 tons at end of June.

Suppliers' stocks, however, were reduced from 2,015,000 tons to 1,478,000 tons, a decrease for the second quarter of 27 per cent. While suppliers' stocks in general decreased, those held by railroads increased 4 per cent, and manufacturers' stocks increased 36 per cent.

Reported stocks of purchased and home scrap in Western Pennsylvania were equal to at least a 4-weeks' supply at the estimated rate of consumption in the second quarter. District comprising Eastern Ohio and West Virginia also had a comparable amount available. Other principal scrap consuming areas had on hand supplies for four to six weeks. Inventories in New England and Western states were equal to 15 and 11 weeks' supply, respectively. Southwestern states had scrap sufficient to last 41 weeks.

Estimate of consumers' stocks is based on assumption companies reporting their inventories held 95 per cent of the total stocks on hand at consumers' plants.

Seven-Month Scrap Melt Exceeds Entire 1917

Steel and iron scrap consumption in the first seven months this year amounted to 30,948,000 gross tons, exceeded only by seven entire years in the past 30 years, according to estimates by the Institute of Scrap Iron and Steel Inc.

In all 1917, the greatest scrap consuming year in the first World war, the melt was only 26,800,000 tons.

July consumption was about 4,415,000 tons, 25 per cent more than 3,526,000 tons in July, 1940. The seven-month total this year is an increase of 45 per cent over 21,738,000 tons in the comparable period last year.

Refinery Center Plans Scrap Gathering Drive

Chambers of Commerce in Oil City and Franklin, Pa., have organized a county-wide campaign to collect iron and steel scrap. Local melters will be supplied first, and the remainder will be shipped to steel mills within easy reaching distance. A survey has indicated that several thousand tons is available from oil refineries and other sources.

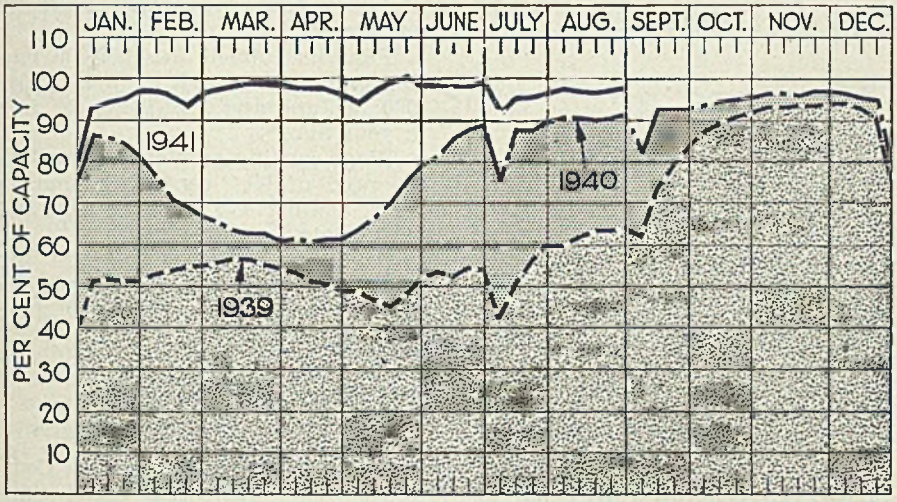
Tougher Steel in New Two-in-One Helmet

■ Army officials are considering the adoption of a new two-in-one helmet, said to have several advantages over the type now in use. Inner part is light fabric and is designed to be worn as a field hat. Outer section is of tougher steel and covers more of the soldier's head and neck than the present type. Doughboy at left is wearing the double purpose helmet as he would in combat. At right, he illustrates the two parts. Acme photos

Army Awards Douglas $176,316,690 Contract

■ Douglas Aircraft Co., Santa Monica, Calif., late last week received from the War Department a $176,316,690 contract for aircraft. This was one of the largest awards made by the War Department in recent weeks. Most contracts for the air corps lately have been for accessories, spare parts, and improvement and expansion of airports.

Twenty-one thousand employes of Douglas Aircraft Co. over the Labor Day week-end received wage increase checks amounting to $536,997.32, representing wage increases retroactive to July 3, and affecting 70 per cent of the company's total 33,000 workmen. This is the fourth time in five months that upward wage adjustments have been made at the Douglas plant. President Donald W. Douglas stated the special checks were presented to employes as a result of the wage stabilization program initiated by aircraft manufacturers and authorized by the federal government as a step toward regional wage stabilization in the aircraft industry (see page 40).



PRODUCTION . . . . Up

■ STEELWORKS operations last week advanced ½ point to 96½ per cent, over the revised rate of 96 per cent the previous week. Two districts rose slightly and ten were unchanged. A year ago the rate was 91½ per cent; two years ago it was 64 per cent.

Based on new capacity figures of 86,148,000 net tons, as announced by the American Iron and Steel Institute last week, instead of 84,152,000 tons capacity in first half, production rates from July 1 in the above chart have been revised, giving figures about 2 points lower on the broader base. Most steelmaking departments are working through Labor Day in the interest of sustained production.

Birmingham, Ala. — Rose 5 points to 95 per cent. Pig iron production is at 100 per cent with all 18 blast furnaces active.

Youngstown, O. — With 76 open hearths and three bessemers in production the rate remained at 98 per cent for the eighth week. All plants but one are operating through Labor Day, with some finishing capacity idle for 24 hours.

Chicago — Remained at 101½ per cent, four of the district's six plants at 100 per cent or better, with no curtailment in prospect.

St. Louis — Unchanged at 98 per cent, with expectation of a higher rate early this month when pig iron will be available from a Granite City Pig Iron Co. furnace.

Cincinnati — Held at 88 per cent, three open hearths being out for repairs.

Central eastern seaboard—Continued at 95½ per cent for the sixth week.

Buffalo — No change was made in the operating rate of 93 per cent, with pig iron production at 100 per cent.

Pittsburgh — Maintained 100 per cent production for the sixth week.

Wheeling — Gained 1 point to 93 per cent.

New England — One open hearth down for repairs held production down to 90 per cent.

Detroit — Short strike at Great Lakes plant did not affect open hearths and rate remained at 92.

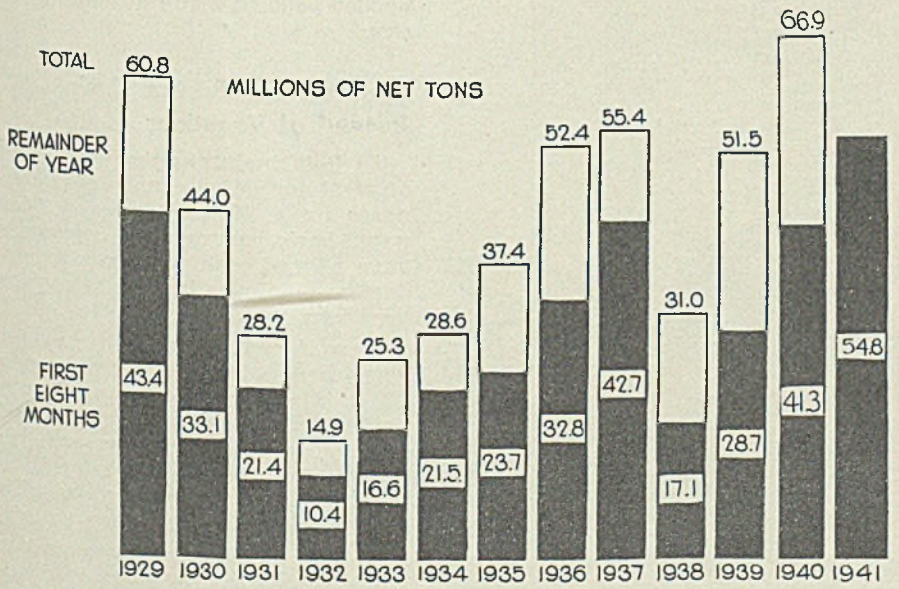
Cleveland — Production continued at 93 per cent, with an increase indicated for this week.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Aug. 30	Change	Same week 1940	Same week 1939
Pittsburgh	100	None	86.5	59
Chicago	101.5	None	99	54
Eastern Pa.	95.5	None	89	44
Youngstown	98	None	84	56
Wheeling	93	+ 1	98	86
Cleveland	93	None	90	80
Buffalo	93	None	90.5	60.5
Birmingham	95	+ 5	88	75
New England	90	None	80	70
Cincinnati	88	None	77	66
St. Louis	98	None	80	63.5
Detroit	92	None	93	90
Average	96.5	+ 0.5	91.5	64

New Eight-Months Record in Steel



■ Chart shows steel ingot production for full years, 1929 to 1940, inclusive, and eight months output for each year, including 1941. A preliminary estimate based on weekly operating averages places August output at 7,135,000 net tons. This yields 54,865,000 tons in eight months this year, far outstripping any similar period in the past

Lucky Fellow

■ *"I would like one length of strap-iron, ¼-inch thick, 1½-inches wide, 6 feet long," said a customer stepping up to the counter of a mill supply store in Cleveland last Friday.*

"What do you mean, strap iron?" asked the clerk.

"Oh, the ordinary kind, the kind a blacksmith uses in forging a bracket; I want to make a few brackets for a flower box."

"Got a priority order?"

"A priority order? Why, no! Priorities don't go in until Sept. 1."

"Oh, yeh?" The clerk showed the customer a pink-slip inter-office message giving instructions not to sell iron and steel "in the future," without a priority order.

The customer went to the head of the department and finally got the iron.

"Sixty-nine cents," said the clerk. "You're lucky."

Iron and Steel Exports in June

Lowest in Fourteen Months

■ STEEL and iron exports in June, excluding scrap, totaled 398,667 gross tons, valued at $35,213,412, lowest figure in 14 months, according to the Department of Commerce. This compares with 409,840 tons valued at $35,346,239 in May this year, and 617,181 tons valued at $38,771,792 in June, 1940.

Exports in the first six months this year totaled 3,016,668 tons valued at $223,202,280, compared with 2,764,943 tons valued at $195,682,417, in first half, 1941.

Nonalloy ingots, blooms and other semifinished steel led in tonnage in June, 58,595 tons, against 58,900 tons in May. Pig iron was second in tonnage, 35,402 in June; 27,444 in May.

Scrap exports in June totaled 59,018 tons valued at $1,059,524, compared with 62,894 tons valued at $1,260,688 in May. In June, 1940, scrap exports were 317,683 tons valued at $5,251,031. Iron and steel scrap accounted for 58,037 tons of the June total, the only other scrap export being 81 tons of waste-waste tin plate.

Cumulative scrap exports for first half were only 415,880 tons valued at $8,111,351, compared with 1,478,806 tons valued at $23,468,354, in the corresponding period in 1940.

Steel Employs 648,000, Breaks Record Again

■ About 10,000 additional employes went to work in July, bringing total employment in steel industry last month to a new peak of 648,000, according to the American Iron and Steel Institute.

Steel employment in June averaged 638,000, while in July, 1940, the industry had an average of 549,000 employes.

Payrolls totaled $114,059,000 during July, compared with $110,504,000 in June and $82,215,000 in July a year ago.

Wage-earning employes earned an average of 99.1 cents per hour in July, against 99.2 cents in June and 85.6 cents in July, 1940.

An average of 37.8 hours per week was worked by wage earners in July, compared with 38.2 in June and 36.5 a year ago.

SWOC Signs First "White Collar" Pact at National Tube

Steel Workers Organizing Committee last week announced signing of the first white collar contract in the steel industry with the National Tube Co., subsidiary of United States Steel Corp.

Approximately 1700 employes are covered in the plants at McKeesport and Elwood City, Pa., and Lorain, O.

A wage increase of $17 a month is provided as of Aug. 16, affecting all salaried employes up to but excluding those now making $4000 a year. A one week vacation for employes of six months' service and two weeks for those of one year or more, a 40-hour week with time-and-a-half for overtime are provided. Holidays are July 4, Labor day and Christmas.

The contract does not provide for a base rate but any question of inequalities in salaries can be taken up under the grievance machinery.

A seniority clause is provided with continuous service the chief factor where ability to perform the work and physical fitness are equal. No union employe can be peremptorily discharged. He can only be suspended pending a full hearing of his case.

Steelworkers Accept Cash Instead of Vacations

To help maintain the production of steel for defense and other purposes on a 24-hour day and 7-day week basis, many steel companies have offered cash payments to production employes instead of regular vacations this year.

Plans for vacations with pay for wage-earning employes have been in effect in the majority of steel companies for the past five years and more. The steel industry was one of the first large manufacturing industries in the nation to offer such plans on such a wide scale.

Of 36 companies whose vacation plans were analyzed by the American Iron and Steel Institute, 22 have permitted or have required cash bonuses to replace vacations with pay. Vacation plans of the other 14 companies specify that employes take time off from their jobs.

IRON AND STEEL FOREIGN TRADE STATISTICS

UNITED STATES EXPORTS OF IRON AND STEEL PRODUCTS

(Gross Tons)

Articles	June 1941	June 1940	Jan. thru June 1941
Pig iron	35,402	30,915	304,224
Ferromanganese and spiegeleisen	521	777	2,328
Other ferroalloys	1,479	3,087	13,161
Ingots, blooms, etc.:			
Not containing alloy	58,595	206,403	631,720
Alloy incl. stainless	31,130	9,525	229,940
Steel bars, cold fin.	2,503	2,815	55,461
Bars, iron	125	1,362	1,830
Bars, concrete	13,075	10,257	89,242
Other steel bars:			
Not containing alloy	15,849	28,937	112,731
Stainless steel	29	33	312
Alloy, not stainless	9,209	3,006	39,600
Wire rods	6,575	28,036	62,177
Boiler plate	514	754	16,169
Other plates, not fab.:			
Not containing alloy	20,696	48,551	187,188
Stainless steel	12	107	163
Alloy, not stainless	764	125	3,134
Skelp iron or steel	16,128	11,290	83,055
Sheets, galv. iron	708	1,102	5,588
Sheets, galv. steel	5,823	13,200	49,469
Sheets, "black" steel:			
Not containing alloy	27,255	48,852	195,069
Stainless steel	74	154	543
Alloy, not stainless	961	509	6,435
Sheets, black iron	2,520	2,239	7,928
Strip steel, cold-rolled:			
Not containing alloy	3,086	4,317	26,544
Stainless steel	40	49	235
Alloy, not stainless	143	35	445
Strip steel, hot-rolled:			
Not containing alloy	5,922	10,028	46,726
Stainless steel	....	1	25
Alloy, not stainless	91	58	348
Tin plate, taggers' tin	23,700	33,386	109,793
Terneplate (incl. long ternes)	851	688	4,219
Tanks, except lined	1,296	2,546	11,873
Shapes, not fabricated	15,259	26,777	141,646
Shapes, fabricated	667	9,123	28,508
Plates, fabricated	796	1,560	14,431
Metal lath	315	31	1,198
Frames and sashes	176	59	969
Sheet piling	122	3,105	3,711
Rails, 60 lbs.	8,885	2,227	55,541
Rails, under 60 lbs.	2,750	2,635	22,165
Rails, relaying	69	180	3,348
Rail fastenings	1,511	429	9,955
Switches, frogs, crsgs.	43	139	810
Railroad spikes	654	239	3,794
R.R. bolts, nuts	234	187	1,026
Boiler tubes, seamless	4,468	1,378	26,609
Boiler tubes, welded	43	269	792
Pipe:			
Seamless casing and oil-line	12,242	7,083	43,172
Do., welded	1,489	1,040	9,234
Seamless black	2,430	3,455	15,389
Pipe fittings:			
Mall.-iron screwed	363	306	2,533
Cast-iron screwed	48	369	565
Pipe and fittings for:			
Cast-iron pressure	4,182	5,727	25,444
Cast-iron soil	1,162	1,513	6,839
Pipe, welded:			
Black steel	6,738	4,938	30,184
Black wrought-iron	238	616	2,097
Galvanized steel	5,324	4,432	39,026
Galv. wrought-iron	150	1,217	2,519
All other pipe, fittings	1,138	1,111	12,670
Wire:			
Plain iron or steel	6,015	7,655	33,952
Galvanized	4,398	5,953	29,548
Barbed	7,477	3,658	30,865
Woven-wire fencing	339	308	2,113
Woven-wire sc'n cloth:			
Insect	78	57	539
Other	217	171	1,304
Wire rope and cable	1,179	683	7,575
Wire strand	105	38	993
Electric welding rods	328	344	2,902
Card clothing*	.....	2	.....
Other wire	1,083	1,034	6,854
Wire nails	5,321	5,707	25,331
Horseshoe nails	206	86	1,313
Tacks	85	45	582
Other nails, staples	424	605	3,539
Ordinary bolts, machine screws	3,402	1,675	20,526
Castings:			
Gray-iron (incl. semisteel)	1,094	394	5,298
Malleable-iron	173	225	1,905
Steel, not alloy	432	70	1,819
Alloy, incl. stainless	426	65	943
Car wheels, tires, axles	4,307	1,626	11,357
Horseshoes and calks	20	25	317
Forgings, n.e.s.:			
Not containing alloy	4,467	2,898	22,231
Alloy, incl. stainless	519	568	3,007
Total	398,667	617,181	3,016,668
Scrap, iron and steel:	.....	316,516	.....
No. 1 heavy melting†	14,185	.....	95,070
No. 2 heavy melting†	29,236	.....	182,835
Raled and bundled†	6,715	.....	36,119
Cast and burnt†	2,226	.....	21,981
Other†	6,575	.....	73,002
Scrap, tin plate	.....	158	176
Tin plate circles, strips, cobbles, etc.	.....	457	2,459
Waste-waste tin plate	81	319	3,884
Terneplate clippings and scrap	.....	233	354
Total scrap	59,018	317,683	415,880
GRAND TOTAL	457,685	934,864	3,432,548
Iron ore	250,864	278,689	531,333

*Not separately classified after December 31, 1940. †New class.

Commission Reports First Awards in New $1,698,650,000 Ship Program

WASHINGTON

■ FOLLOWING approval by President Roosevelt of the new $1,698,650,000 shipbuilding bill, the Maritime Commission last week announced the first contracts negotiated for new construction.

Contracts for 23 of 48 new ways were allocated as follows:

South Portland Ship Building Corp., a Todd subsidiary, two ways, with shops, equipment and machinery, to cost $2,000,000.

Bethlehem Steel Co., Sparrows Point, Md., yard, two ways and equipment, $2,000,000.

Alabama Dry Dock & Shipbuilding Co., eight ways and equipment, $8,000,000.

Ingalls Shipbuilding Co., Pascagoula, Miss., two ways and equipment, $2,000,000.

Delta Shipbuilding Co., two ways and equipment, $2,000,000.

Consolidated Steel Corp. Ltd., Los Angeles, four ways and equipment, $4,000,000.

Richmond Shipbuilding Corp., a Todd subsidiary, Richmond, Calif., three ways and equipment, $3,000,000.

Contracts were completed for only 66 of 566 additional ships to be built under this expansion. These, to be standard C-type design, were allocated as follows:

Consolidated Steel Corp. Ltd., 26 C-1 ships; Gulf Shipbuilding Corp., 16 C-2 ships; Ingalls Shipbuilding Corp., 10 C-3 ships and Bethlehem Steel Co., Sparrows Point yard, 14 C-3 ships.

Cost of these vessels ranges from $2,200,000 to $3,000,000 each, the commission said. All 566 are to be completed before the end of 1943.

Many of the remaining 500 will be of the "ugly duckling" type, it was indicated. How many will be of this type and how many of the standard C-type will depend on progress of the commission's plan to expand production of turbine and gear facilities. A $50,000,000 program for this expansion was recently announced. "Ugly duckling" ships are propelled by steam reciprocating engines and the standard C-type ships by turbine and gear drives.

Additional contracts to keep new shipyards operating at capacity beyond 1942 will be signed by the end of 1941, the commission said. Shipyards are now constructing 312, "ugly duckling" type, which will be completed by the end of next year.

In all, $1,246,650,000 of the new bill has been allocated to construction of additional ships, $350,000,000 to charter, purchase, requisition, maintain, repair and operate ships, and $48,000,000 for new facilities.

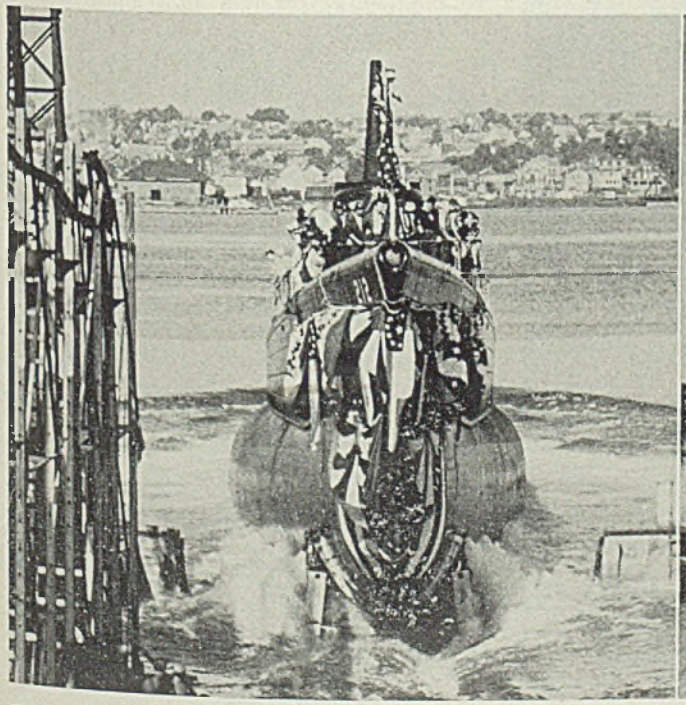
Bill signed by President Roosevelt includes $698,650,000 in cash appropriations and $1,000,000,000 in contract authorizations.

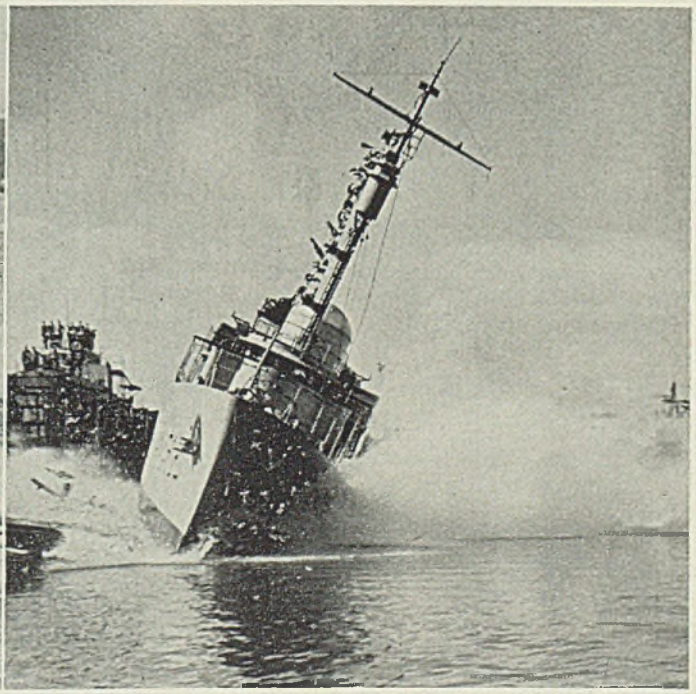
Lakes Shipyards Sign Stabilization Agreement

■ Stabilization agreement increasing wages in Great Lakes shipyards and banning lockouts and strikes was reported late last week by Sidney Hillman, associate director, OPM. The pact, according to Mr. Hillman, was ratified by the Great Lakes Metal Trades District Council, AFL, after having been approved by the Navy, OPM and the Maritime Commission.

Similar to those already in effect at Atlantic, Gulf Coast and Pacific yards, the agreement covers both construction of ships and ship repairs. It provides minimum wages and working standards and does not interfere with elections scheduled to determine bargaining agents for various yards. Incidentally, the agreement on the Atlantic coast did not prevent the strike at Federal Shipbuilding & Dry Dock Co., Kearny, N. J. (See p. 49.)

Submarine and Chaser Launched for Navy





■ The submarine GATO slides down the ways, at left above, at the Electric Boat Co.'s yards at New London, Conn. It was the twenty-second to be launched by the company since 1933. Right, a submarine chaser for the Navy splashes into Saginaw river at Bay City, Mich., where 14 are being constructed. They will be towed to shipyards on the Atlantic coast for installation of propulsion equipment and other facilities. NEA photos

MEN of INDUSTRY

■ **FRED H. HAGGERSON** has been elected a director, Union Carbide & Carbon Corp., New York. He is a vice president of the corporation; president of Union Carbide Co., and president of the companies in the Electro-Metallurgical group. He has been with the corporation over 20 years.

♦

R. E. Desvernine has resigned as president and a director, Crucible Steel Co. of America, New York. **F. B. Hufnagel,** chairman of the board, has also assumed the duties of president.

♦

Gordon Lefebvre has been elected a director and vice president and general manager, Cooper-Bessemer Corp., Mt. Vernon, O.

♦

J. M. Franklin, manager of the southern plants of Central Foundry Co., New York, has been elected a vice president and director.

♦

James W. Griffiths, director of training and education for the Youngstown, O., district, Carnegie-Illinois Steel Corp., has retired after 39 years with the company.

♦

Leo T. Tierney has been named purchasing agent, Madison-Kipp Corp., Madison, Wis. He succeeds **Ray Togstad,** who has resigned to engage in private business.

♦

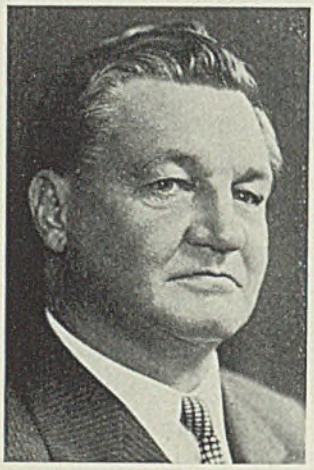
Alden G. Roach, heretofore executive vice president, Consolidated Steel Corp., Los Angeles, has been elected president, succeeding **Donald G. Henderson,** who has become chairman of the board.

♦

Victor A. Hanson has been named general sales manager, Whitney Chain & Mfg. Co., Hartford, Conn. Mr. Hanson formerly served as assistant sales manager and as field manager.

♦

L. W. Wallace, research and management engineer, has joined Trundle Engineering Co., Cleveland, as vice president. He formerly was director of engineering and research, Crane Co., Chicago, and previously held executive positions with Diamond Chain & Mfg. Co. and the W. S. Lee Engineering Corp. Mr. Wallace is a member, American Society of Mechanical Engineers, American Association for the Advancement of Science, Society for the Promotion of Engineering Education and American Academy of Political and Social Science, and has served as chairman, Industrial Research Institute and as president, Indiana Engineering Society and the National Society of Industrial Engineers.



Fred H. Haggerson

R. E. Desvernine

L. W. Wallace

♦

Milton W. Lightcap, in charge of maintenance sales, Devoe & Raynolds Co. Inc., New York, has been appointed sales manager of the newly created painter and maintenance division.

♦

E. W. Whiteway has been elected vice president, Steel Sales Corp., Chicago. Associated with the company since its incorporation in 1915, Mr. Whiteway has served in various executive positions. **George D. Potter** has been appointed assistant secretary. He joined the company following graduation from Northwestern University in 1935.

♦

John A. McDonald, formerly associated with Republic Steel Corp. at Youngstown, O., has been named assistant blast furnace superintendent, Hanna Furnace Corp., Buffalo.

♦

Andrew W. Liger has joined the research staff of Battelle Memorial Institute, Columbus, O., and has been assigned to the division of electrochemical research. He was formerly associated with the W. B. Jarvis Co., Grand Rapids, Mich.

♦

W. M. Ballenger has been named assistant district engineer, central district, General Electric Co., Chicago. He has been a member of the company's central district application engineering section since 1928, specializing in steel mill and associated industrial problems.

♦

John L. Auch, the past year treasurer, Pittsburgh Coal Co., Pittsburgh, has been elected comptroller to succeed **John L. Glenn,** who has resigned to establish a practice as tax consultant. **Joseph W. Oliver,** heretofore director of budgets, has been elected treasurer. **M. R. Cohen** has been named assistant comptroller, and **Louis W. Linsley** has

been promoted from assistant to director of budgets.

♦

James G. Parks has joined the staff of American Steel Warehouse Association Inc., Cleveland, as statistician and assistant to **W. S. Doxsey,** president. The past five years Mr. Parks has been in the standards department of Swift & Co., Cleveland.

♦

R. N. McAdams, assistant secretary and assistant treasurer, Hercules Powder Co., Wilmington, Del., has been elected secretary. He succeeds the late H. F. Smith. **William R. Stevens,** credit manager, has been named assistant treasurer, while **George B. Baylis** has become assistant secretary. **John B. Lodge,** assistant credit manager, succeeds Mr. Stevens as credit manager.

♦

J. O. Holloway has been elected vice president in charge of finance, Crane Co., Chicago. He joined the organization in 1935, was elected secretary in 1937 and also was assistant to the president. **W. H. Winslow Jr.,** heretofore assistant secretary, has become secretary.

♦

John Coakley, advertising manager, Thomas A. Edison Inc., West Orange, N. J., has been elected president, Industrial Marketers of New Jersey, Newark, N. J. He succeeds **Robert S. Bubb,** who has resigned due to other assignments. Mr. Bubb, however, has been elected to the vice presidency vacated by Mr. Coakley.

♦

C. G. Taylor has been elected chairman, Taylorcraft Aviation Corp., Alliance, O., to succeed **James S. Ogsbury,** resigned. Mr. Taylor resigned the presidency of the company, leaving the position vacant. Mr. Ogsbury, who is president of Fairchild Aviation Corp., continues as a member of the Taylorcraft board. **Richard H. Depew Jr.** has been made executive vice president of Taylorcraft in addition to his duties as general manager and treasurer.

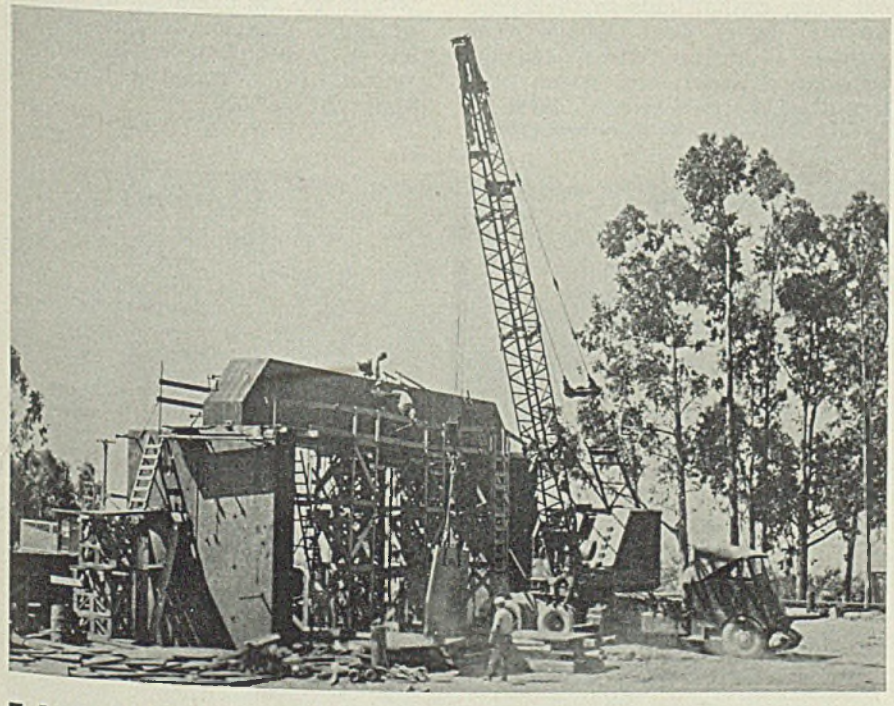
♦

Dr. James T. Pardee has resigned as chairman, Dow Chemical Co., Midland, Mich., after 44 years as a director and seven years as chairman. He has been named chairman emeritus. **Dr. Willard H. Dow,** president and general manager, has taken over the additional duties of chairman. **Leland I. Doan,** vice president and general sales manager, has been named secretary, **Earl W. Bennett** retaining the offices of vice president and treasurer.

♦

Walter P. Carroll has been appointed manager, Chicago branch, National Lead Co., to succeed **E. A. de Campi,** retired.

4900 Tons of Steel Welded Into Atom Smasher



■ Arc welded steel construction is used in the $1,500,000 cyclotron for the University of California at Berkeley. About 4900 tons of steel is being fabricated. Photo courtesy Lincoln Electric Co., Cleveland

DIED:

■ **Edward Harrison McCloud,** vice president, Kinnear Mfg. Co., Columbus, O., maker of fire doors and other safety devices, at his home in that city, Aug. 14. He had been associated with the company 47 years.

♦

George A. Eddy, 67, former president, Goss Printing Press Co., Chicago, in that city, Aug. 26.

♦

Moses W. Faitoute, 68, president, Faitoute Iron & Steel Co., Newark, N. J., Aug. 27 in Los Angeles, while on vacation.

♦

Robert J. Cordes, 59, assistant superintendent, Lamson & Sessions Co., Cleveland, Aug. 24, in that city.

♦

Horace A. Staples, vice president in charge of engineering, Phelps-Dodge Copper Products Corp., New York, Aug. 25, at his home in Plainfield, N. J.

♦

Charles Baisley, 76, retired plant manager, Great Lakes Engineering Works, Detroit, Aug. 25. He supervised ship construction at the Great Lakes plant 33 years.

♦

Frederick W. Robertshaw, 88, inventor of a thermostat, recently at his home in Pittsburgh. He formed his own company in 1907 to manufacture the Robertshaw thermostat, retiring from the presidency in 1928. The company is now a subsidiary of Reynolds Metals Co.

♦

Gordon S. Meek, 67, president and general superintendent, Pittsburgh & Conneaut Dock Co., Conneaut, O., and the Pennsylvania & Lake Erie Dock Co., Fairport, O., Aug. 23 at Lexington, Ky.

♦

John Morse, 25, assistant manager, San Francisco office, Fairbanks, Morse & Co., Chicago, and son of Col. Robert H. Morse, president of the company, Aug. 22.

♦

Samuel D. Strong, 79, president and general manager, Homer Furnace & Foundry Co., Coldwater, Mich., Aug. 19.

♦

William D. Pangborn, 65, an electrical engineer associated with General Electric Co. 46 years, Aug. 18 at Montclair, N. J.

♦

Guy K. Keely, 63, treasurer, Keely Die & Tool Co., Goshen, Ind., recently.

♦

J. M. Bettinger, 61, president, Bettinger Coal & Coke Corp., Aug. 27, in Buffalo.

Activities of Steel Users, Makers

■ RESEARCH CORP., affiliate of Reynolds Metals Co., has added 125,000 square feet of manufacturing space to its plants in Louisville, through leasing the American Oak Leather plant. About $250,000 will be spent in modernizing the building and installing machinery to manufacture metalcapped paper containers for use in shipping gun powder.

♦

Laclede-Christy Clay Products Co., St. Louis, is engaged in a $1,000,000 plant expansion program, including the building of two new tunnel kilns, installation of modern presses, dryers and other equipment.

♦

Doall Co., Des Plaines, Ill., manufacturer of metal-cutting band saws, has standardized its product in line with the Aug. 20 ruling of OPM, providing 42 sizes, all raker tooth, heavy set, A temper. Other sizes can be supplied only with permission of OPM. A schedule of standard sizes and recommendations for substitutions for discontinued sizes will be provided by the company.

♦

Detroit Broach Co., Detroit, manufacturer of broaches and broaching fixtures, recently completed erection of a new plant on Sherwood avenue near Eight Mile road which triples former floor area and provides increased production facilities. Austin Co. designed and constructed the new building.

♦

Illustrating importance to the national defense program of metallurgical research, and its increasing functions and facilities, is a lead article in the July-August issue of *Oakite News Service,* house organ of Oakite Products Inc., New York. Especially featured is the recently expanded metals section of the Oakite Research Laboratories. This, the company reports, provides the most modern facilities available for reproducing on a pilot-plant scale actual production conditions generally found in metal plating and fabricating plants.

♦

National Acme Co., Cleveland, builder of automatic screw machines, has announced plans for expanding manufacturing.

Company will finance cost of the new building, estimated at $300,000. Defense Plant Corp. will finance the new machinery, to cost $488,000, and will retain title to the machines.

♦

Sherwin-Williams Co., Cleveland, has completed plans for construction, management and operation for the government of a bomb and shell loading plant at Marion, Ill., it was reported last week by the War Department. Estimated construction cost, including equipment but not purchase price of the land, is from $27,000,000 to $40,000,000. The plant site comprises about 25,000 acres. Sherwin-Williams Defense Corp., has been set up to operate the project on a management contract, with headquarters at Cleveland.

♦

Radical transitions necessitated by war conditions in England are indicated by an advertising campaign just launched in the United States by Coventry Climax Engines Ltd., Coventry, England. The company, which has specialized in engine construction for 38 years, has developed a trailer fire-engine to combat fires started by German air raiders. Since the beginning of the war, 10,000 units have been placed in service in Great Britain.

Texasteel Mfg. Co. To Build Shell Steel Mill

■ Texasteel Mfg. Co., Fort Worth, Tex., George W. Armstrong, president, will build a rolling mill plant at Port Arthur, Tex., with monthly capacity for 10,000 tons of shell steel.

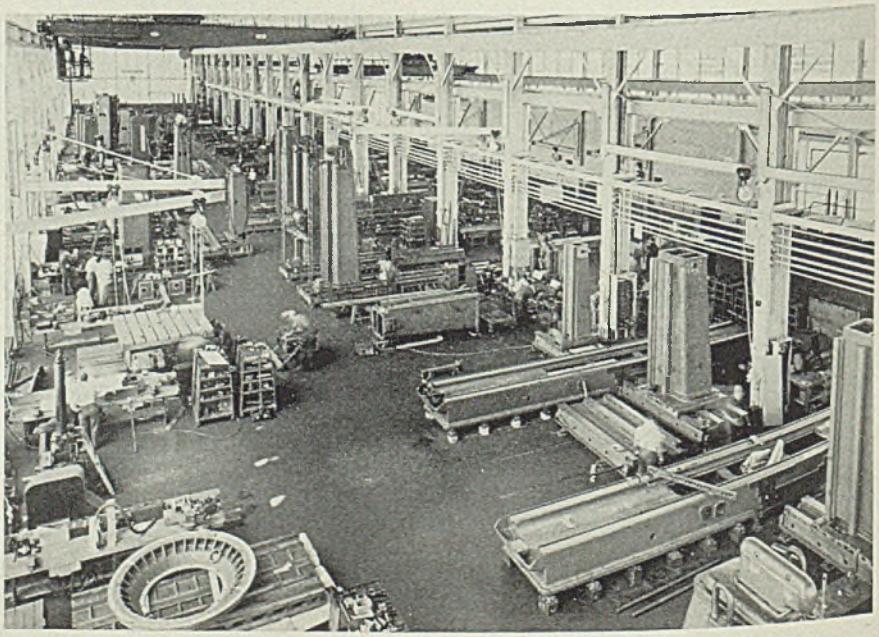
The mill, costing about $2,000,000, will be of the continuous automatic type and the first unit is to be in operation by Jan. 1. Plans are being made to double capacity within the first six months next year. Allen H. Armstrong, vice president and general manager, will be in charge. The company has a plant at Fort Worth, Tex., for production of electric steel and reinforcing bars. Construction contract has been let to Spence & Howe Construction Co., Port Arthur, on a cost plus basis.

$10,000,000 Tool Plant Starts Shipments

■ Marking first shipment of large machine tools for defense work from its recently completed War Department Emergency Plant Facilities, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., was host to a group of distinguished guests Aug. 27. Among those present were: Julius Heil, Governor of Wisconsin; Senator Alexander Wiley; Harold Falk, civilian aide to the Secretary of War; Col. Donald Armstrong, executive officer, Chicago Ordnance District; and Mason Britton, chief of tools section, OPM.

Last November the company was asked by the War Department to triple its capacity. Ground for a so-called "parent plant," built by the company itself, was broken in December, and by the end of March this plant was in operation. The War Department "emergency plant," which is separate from the other, was begun in January and was ready for operation by the end of May. Interior of this plant is shown in acompanying illustration.

Cost of the complete project is about $10,000,000.



MEETINGS

Foundry Conference To Study Substitution Problems

■ A REGIONAL foundry conference will be held at Purdue university, West Lafayette, Ind., Oct. 17-19, under sponsorship of the Chicago, Michiana and Central Indiana chapters of the American Foundrymen's association, in co-operation with the university's engineering extension department.

Program is being geared to foundry practice as influenced by national defense. The four major foundry divisions—steel, gray iron, malleable and nonferrous—will conduct separate group meetings morning and afternoon, each day.

In addition, a general-interest dinner-meeting is scheduled for the evening of Oct. 17, to take the place of the regular October meetings of the three chapters. This will be devoted to "Employer-Employe Relations," with a well-known industrial executive as speaker.

Another feature of the conference will be a student meeting at which a prominent member of the foundry industry will speak on "Properties and Uses of Castings in Industry."

Friday morning sessions of the steel, gray iron and malleable divisions will be devoted to the currently important subject: "Substitutions in Raw Materials Because of Shortages;" afternoon sessions to the equally important topic: "Effect on Melting Practices Due to Substitutions of Materials Because of Shortages."

J. D. Burlie, foundry engineer, Western Electric Co., Chicago, is chairman of the general conference committee; and R. L. McIlvaine, foundry engineer, National Engineering Co., Chicago, is vice chairman.

Defense Supplies Group Sponsors 40 Meetings

Meetings of the Industrial Supplies Defense Committee of the Industrial Supplies Industry are to be held in approximately 40 industrial centers of the United States as rapidly as arrangements can be completed, according to W. C. Stauble, chairman.

Scheduled is a session Sept. 3 in St. Francis hotel, San Francisco. OPM officials will be present, it is reported, to explain the defense supplies rating plan. A. J. Glesener, A. J. Glesener Co., will be chairman.

H. V. Waterman, Hendries & Bolthoff Mfg. & Supply Co., will be chairman of a meeting to be held in Denver Sept. 6. Details of a meeting to be held in Chicago Sept. 9 have not been announced.

Meetings have been held in Waterbury, Conn., Cleveland, and Los Angeles. About 500 manufacturers attended each.

Plan Chicago Meeting To Clarify Priorities Situation

A meeting to discuss priorities will be held in Palmer House, Chicago, Sept. 00. Sponsors are the Illinois Manufacturers' Association, Central States Mill Supply Association and Purchasing Agents Association of Chicago.

Scheduled to speak are: Joseph L. Overlock, administrator, defense supplies rating plan, Washington, and vice president, Continental Illinois National Bank of Chicago; H. K. Clark, assistant administrator, defense supplies rating plan, Washington, and vice president, Norton Co., Worcester, Mass.; and William G. Bailey, director, priorities division, OPM, Chicago, and formerly president and general manager, O'Cedar Corp.

Galvanizers' Program Includes Three Papers

American Hot Dip Galvanizers Association Inc. has announced the following papers for presentation at its semiannual meeting, Netherland Plaza hotel, Cincinnati, Oct. 2-3:

"Metallurgical Factors Affecting the Galvanizing of Steel," by Dr. R. W. Sandelin, metallurgist, Atlantic Steel Co., Atlanta, Ga.

"Production and Priorities," by John A. Church, chief, Copper-Zinc Branch, Office of Production Management, Washington.

"Recent Developments on the Painting of Galvanized Iron," by Wallace G. Imhoff, the association's technical director of research.

Convention Calendar

Sept. 5—American Ceramic Society. Autumn meeting of Refractories Division at Life Science building, Denison University, Granville, O. Gilbert Soler, 2525 N. High street, Columbus, O., is chairman.

Sept. 8-12—American Chemical Society. Annual meeting, Atlantic City. Dr. Charles L. Parsons, 728 Mills building, Washington, is secretary.

Sept. 12-13—Associated Machine Tool Dealers of America. Annual meeting, The Homestead, Hot Springs, Va. Thomas A. Fernley Jr., 505 Arch street, Philadelphia, is executive secretary.

Sept. 19-20—Concrete Reinforcing Steel Institute. Seventeenth semiannual meeting, The Broadmoor, Colorado Springs, Colo. H. C. Delzell, Builders building, Chicago, is executive secretary.

Sept. 23-25—Association of Iron and Steel Engineers. Annual convention and exposition, Public Auditorium, Cleveland. Brent Wiley, 1010 Empire building, Pittsburgh, is managing director.

Sept. 25-26—Powdered Metallurgy Conference. Second annual meeting at Massachusetts Institute of Technology, Cambridge, Mass. John Wulff, Massachusetts Institute of Technology, Cambridge, Mass., is secretary.

Sept. 25-26—Society of Automobile Engineers Inc. National tractor meeting, Hotel Schroeder, Milwaukee. John A. C. Warner, 29 W. 39th street, New York, is secretary.

Oct. 1-2—Farm Equipment Institute. Forty-eighth annual convention at Edgewater Beach hotel, Chicago. R. A. Jones, 608 S. Dearborn street, Chicago, is secretary.

Oct. 1-4—Electrochemical Society Inc. Fall meeting, Hotel Knickerbocker, Chicago. Dr. Colin G. Fink, Columbia University, 3000 Broadway, New York, is secretary.

Oct. 2-3—American Hot Dip Galvanizers Association Inc. Semiannual meeting, Netherland Plaza hotel, Cincinnati. S. J. Swensson, 903 American Bank building, Pittsburgh, is secretary.

Oct. 6-10—National Safety Council. Thirtieth annual meeting at Hotel Stevens, Chicago. W. H. Cameron, 20 N. Wacker Drive, Chicago, is managing director.

Government Forms Are Available

■ Forms PD-73, PD-25-C, PD-25-D which now must be attached to every order or contract for defense supplies are available to STEEL's readers, shipments being made the same day as orders are received.

These forms can be obtained from STEEL, Readers' Service Department, Penton Building, Cleveland, at the following prices:

Quantity of		Quantity of	
100	$1.00	1,000	$3.55
200	$1.50	2,500- 5,000	$3.25 per M
300	$2.00	5,000-10,000	$2.95 per M
400	$2.50	10,000-20,000	$2.75 per M
500	$3.00	20,000 and over	$2.55 per M

OPM steel order M-21 is also available at $15.00 per M

Windows of WASHINGTON

OPM Reported Ready To Recommend Two New Steel Plants To Cost $100,000,000

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ OFFICE of Production Management shortly will recommend government-financed construction of two new steel plants at a cost of approximately $100,000,000 which would add roughly 1,400,000 tons to the nation's annual steelmaking capacity, it was reported here last Friday.

Both plants are said to be covered by proposals submitted to the OPM by two leading steel companies. One of the proposals is understood to be in the hands of defense officials in its final form and probably will be recommended in the next few days. The other is said to be still in the rough draft stage but should be in final form shortly.

The first proposal is stated to call for a $60,000,000 plant complete from blast furnace to finishing capacity which would add roughly 800 000 tons to present annual capacity. The second proposal also is said to cover a complete plant which would add between 500,000 and 600,000 tons to capacity. Both plants, it is stated, would concentrate principally on products required for shipbuilding.

Reports are current that the proposed 6,500,000-ton increase in pig iron capacity may be further increased by 6,000,000 or more tons superimposed on the original tonnage.

OPM officials dealing with this situation explain they believe that the original 6,500,000-ton increase will do no more than protect the present ingot capacity of the country.

Jesse Jones, loan administrator, announced that Defense Plant Corp., RFC subsidiary, at the request and with the approval of OPM and the War and Navy departments, has authorized execution of a contract with Republic Steel Corp. for construction of plants and acquisition of facilities and equipment for production of pig iron to meet the deficiency of scrap metal.

Plants are to be located at Cleveland, Youngstown, and Warren, O., and Birmingham, Ala. Mining operations will be at Port Henry, New York and Birmingham, Ala.

These expansions will involve construction of four blast furnaces with necessary coke ovens and other equipment to produce approximately 1,572,000 tons of pig iron per year, as well as mining operations to produce necessary additional iron ore and coal.

It is estimated the overall cost of the plants and facilities will be approximately $58,312,000.

Facilities will be owned by Defense Plant Corp., and operated by Republic Steel Corp. under a five-year lease. Republic estimates it will be producing pig iron at the Birmingham plant in approximately six months. The other plants will require from 10 to 15 months.

This contract together with the contract recently made with Carnegie-Illinois Steel Corp. for construction of a pig iron plant at Braddock, Pa., provides for approximately 2,500,000 tons of new pig iron capacity of the 6,500,000 tons recommended by OPM.

517 Locomotives Shipped in First Seven Months of 1941

During the first seven months of 1941, the 12 manufacturers of railroad locomotives in the United States, representing the entire industry except railroad companies, shipped 517 locomotives, compared with 273 during the comparable seven months of 1940, according to a report by the Bureau of the Census, Department of Commerce.

At the end of July these manufacturers had unfilled orders for 947 locomotives, compared with 232 at the end of July, 1940.

Of the 517 locomotives shipped during these seven months, the domestic market absorbed 473 divided as follows: Steam, 68; straight electric, 2; diesel electric, 368, and others, 35. The foreign market absorbed 44 as follows: Steam, 30; straight electric, 13; diesel electric. one. Of the 947 on order at the end of July, 900 were for the domestic market and 47 for the foreign market.

In addition, Class 1 railroads produced nine locomotives in the seven months and as of July had 51 on order in their own shops.

War May Decrease Imports of Russian Manganese, Other Metals

Imports of Russian manganese, chromium, platinum and iridium can be expected to decline if Russia's transport facilities are badly disrupted by the war, according to a report to the Department of Commerce recently. Before the war, Russia shipped most of her goods to this country by way of the Baltic and Black seas. Since outbreak of the conflict almost all shipments have come through the Pacific coast port of Vladivostok.

Stettinius Rules Manufacturers Must Accept Defense Orders

A regulation was issued last week by E. R. Stettinius Jr., director of priorities, that all manufacturers and producers must accept defense orders, with few specific exceptions, regardless of whether acceptance prevents or delays deliveries on non-defense orders or defense orders with low preference ratings.

It applies a principle embodied first in the pig iron priority order but includes all manufacturers, producers, distributors and dealers in

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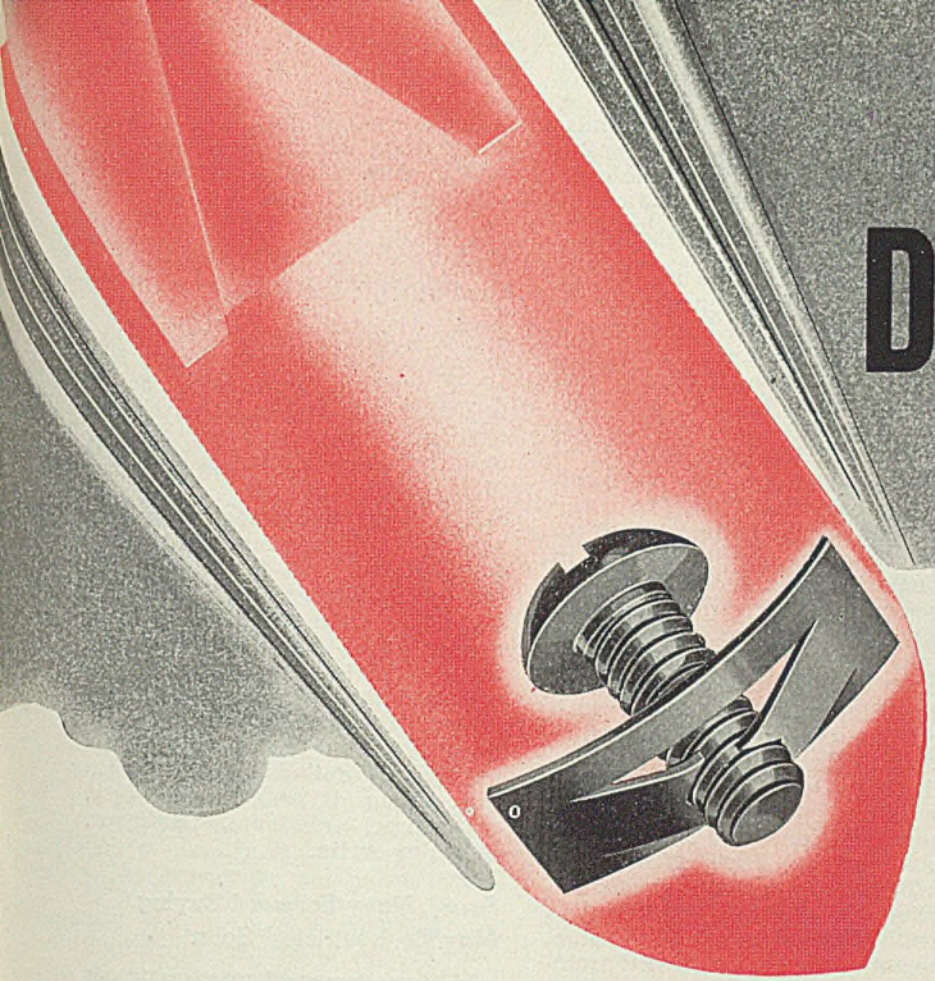
■ While the Office of Price Administration and Civilian Supply was abolished as such by the President's executive order of Aug. 28, references to actions and orders by OPACS, occurring before that date, are credited to OPACS in this issue of STEEL.

A DIRECT HIT on Defense Bottlenecks



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THE FASTEST THING IN FASTENINGS

Streamline your assembly methods with the SPEED NUT System and break your own best assembly records with ease.

SPEED NUTS always replace 2 or more parts, reduce weight, lower net costs and provide a double-locked spring tension assembly that prevents vibration loosening.

SPEED NUTS and SPEED CLIPS are precision-made to fit bolts, screws, rivets and studs in blind location or visible assemblies. Over 800 shapes and sizes for metal, wood, ceramic and plastic applications. Many SPEED CLIPS are also available to fasten cables, wires, tubes and conduit by simply snapping them into holes in panels or sheets.

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Send us your assembly details and we will furnish samples and engineering data promptly.

TINNERMAN PRODUCTS, INC. 2033 FULTON ROAD CLEVELAND, OHIO

MANUFACTURERS OF PATENTED SPEED NUTS

IN CANADA: Wallace Barnes Co., Ltd., Hamilton, Ontario. IN ENGLAND: Simmonds Aerocessories, Ltd., London. IN FRANCE: Aerocessoires Simmonds, S. A., Paris.

OVER A BILLION IN USE—OVER 800 SHAPES AND SIZES

all categories. Provisions follow:

(1) Any defense customer for any material who is unable to place his order satisfactorily or whose delivery has been delayed may bring the matter before Mr. Stettinius for action.

(2) Director may assign preference ratings to orders already placed or not placed and issue binding instructions regarding deliveries without assigning preference ratings.

(3) Any person with defense orders on hand must so schedule production that deliveries under defense orders will be made on dates required.

(4) Delivery dates specified in defense orders must not be earlier than required.

(5) Any allocations of material ordered by the director may be made regardless of preference ratings which may have been assigned to deliveries under particular contracts or purchases. Specific allocations take precedence over individual preference certificates or blanket ratings.

(6) Intracompany deliveries, except otherwise specified, are subject to the same restrictions applying to intercompany orders. This prohibits accumulation of excess inventories.

T. B. McCabe Named Deputy Director of Priorities

Thomas B. McCabe, president, Scott Paper Co., Chester, Pa., has been appointed deputy director in charge of operations in the OPM priorities division. He replaces James L. O'Neill who is returning to his duties as operating vice president of the Guaranty Trust Co., New York.

Col. Edgar S. Gorrell, president of the Air Transport Association of America, is a new consultant on domestic air transportation in the transportation division of the Office for Emergency Management. He replaces C. R. Smith who has resigned to return to the presidency of American Airlines.

William A. Spurr has been named regional business consultant in the Cleveland office of the Department of Commerce.

OPM Moves To Adjust Auto Employment Dislocations

Emergency national committee on automobile employment has been set up by Associate Director General Sidney Hillman with OPM's Labor Division, to co-operate with labor and industry committees on re-employment and retraining of workers for defense jobs, and carry out field operations in local dislocations as they arise.

Eric Nicol, associate chief of Labor Supply Branch, and former industrial relations and personnel adviser for large industries in Philadelphia and elsewhere, was designated by Hillman to head the committee. Robert Barnett, also of the Labor Supply Branch, is executive secretary.

The committee, made up of representatives of the defense activities of the United States Employment Service, and the Labor Relations, Priorities, Defense Training and Training Within Industry branches of the Labor Division held its first meetings Monday and Tuesday.

An immediate survey, to determine the extent and location of the immediate furloughs and layoffs to result from the production cut in the industry, was decided upon by the committee. The regional labor supply committees of OPM's Labor Division will make the survey, through the facilities of the United States Employment Service, which has direct contact with the industries and plants involved.

Through local co-operation of management and labor, the operations will be conducted on community and regional levels as much as possible, by promoting registration of workers in employment offices prior to their layoffs, and the establishment of necessary special training courses to open up new opportunities for re-employment.

Hillman announced that information on pending and prospective labor displacements, as fast as it is obtained through Employment Service channels, will be sent to the Priorities branch of the Labor Division, and forwarded to the Defense Contract Service to guide it in its subcontracting and farming-out activities. Under this procedure, the Priorities branch will certify to the Defense Contract Service that labor is threatened with loss of jobs, because of material shortages, in certain non-defense plants, industries or communities. The Defense Contract Service will propose the negotiation of contracts, waiving the usual bidding procedure, or other methods of awarding defense jobs for the plants or industries affected.

The committee is sending its representatives to Detroit and other automobile centers at once to prepare the ground work.

Employment Service regional directors, now serving as active chairmen of the recently-created regional Labor Supply committees, will head and carry out the government operations necessary to registering, re-training and re-employing the displaced workers. This is in accordance with programs as proposed by the United Automobile Workers, CIO, and by AFL unions in the industry.

First attention will be given to one-industry localities where automobile industry work predominates and no defense contracts have yet been placed. Automobile parts plants, which are major industries in many small cities, will be given equal attention with the big assembly centers of the industry.

Withdraw Tax Exemptions On Strategic Metals

Senate finance committee, driving to complete the new tax bill last week, sustained prior house action in withdrawing exemption from excess profits taxes previously allowed on strategic metals mined in United States.

House ways and means committee explained, when it reported the bill to the house, that it had removed the exemption because it was felt that "if these companies make money out of the defense program" they should bear their share of the tax burden. The exemption formerly applied to that part of the excess profits tax on net income of domestic corporations attributable to the mining of tungsten, mercury, manganese, platinum, antimony, chromite or tin.

Army, Navy Forward Buying May Be Restricted Soon

Military demand for raw materials may have to be restricted, some defense officials believe, so serious is the raw materials problem becoming in the nondefense industries. These officials suspect unnecessary forward buying by the armed forces, and they add that rationing these raw materials intake would not necessarily hamper defense output.

Simplification of Bicycles Requested by McConnell

R. E. McConnell, chief, conservation bureau of OPM, has asked bicycle manufacturers to conserve materials and manpower in their operations by simplifying design, reducing the number of models offered, and substitution of materials.

WPA To Salvage Street Car Rails for Defense Production

Program for removal of abandoned publicly-owned street car rails by WPA to salvage steel for defense production was issued last week by Howard O. Hunter, work projects commissioner. Plan was prepared at request of Ralph Budd, transportation commissioner of OEM, who estimates more than 200,000 tons of publicly-owned rails lie abandoned.

WPA rail removal operations are conditional on local governments submitting statement they will dispose of steel as directed by OPM.

Under arrangements with OPM, scrap would be shipped by local government, charges collect, to a steel mill or other assembly point designated by OPM. Steel company would

pay the maximum mill price established by OPACS after deducting transportation cost.

Production, Maintenance of Farm Tools Assured by Stettinius

Plan directly affecting farmers and producers of farm machinery throughout the country and designed to speed production of new farm equipment and facilitate maintenance of existing machines was announced last week by E. R. Stettinius Jr., director of priorities.

Entitled the "Farm Machinery and Equipment Rating Plan," the new set-up involves two preference rating orders. One assigns a defense rating of A-10 to deliveries of materials necessary for production of parts for repair and maintenance of existing farm machinery. The other assigns the highest civilian rating, B-1, to deliveries of materials which appear on the priorities critical list to a manufacturer who needs them for production of new farm machinery.

The new plan has been issued to make certain there shall be no lack of equipment required to produce crops, livestock, poultry and other farm produce.

Expanded Minerals Yearbook Published by Bureau of Mines

Because of increased interest due to defense work, Bureau of Mines has scheduled publication of its *Minerals Yearbook* more than three months in advance of last year, it was reported last week by Dr. R. R. Sayers, Director. The new edition will be placed on sale early in September.

The volume includes hitherto unavailable information relating to strategic and critical materials. It was prepared by specialists in mineral economics and technology, under the direction of E. W. Pehrson, chief of the Bureau of Mines' Economics and Statistics branch.

Transfer OPM Unit to Ordnance Division To Speed Tank Output

Office of Production Management's tank unit is being loaned to the Ordnance branch of the War Department to assist in carrying out swiftly the greatly increased tank program recently requested by President Roosevelt, it was reported last week by John D. Biggers, OPM director of production.

This arrangement, he said, would result in unified control of tank production for both the United States Army and Britain. OPM, the Ordnance Department and British authorities agreed unified supervision was the best means of expediting the expanding tank program which is expected to reach $1,000,000,000-per-year levels in 1942.

Headed by W. W. Knight Jr., the tank unit was formerly in the ordnance branch of OPM, under E. F. Johnson. It is being made part of the Ordnance Department's recently-created Tank and Combat Vehicle Division, directed by Lieut. Col. John K. Christmas.

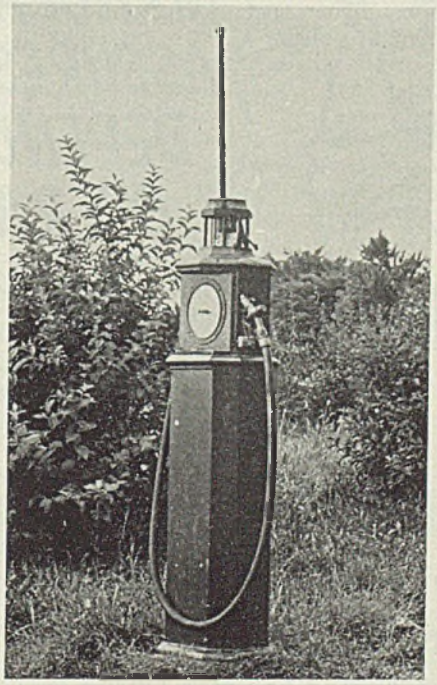
Rating Plan Is Issued To Assure Health Supplies

Health supplies rating plan was issued last week by E. R. Stettinius Jr., priorities director, to assure a plentiful flow of essential health supplies into civilian channels as well as for military use.

Accompanying the order which put the plan into effect was a list of 14 categories covering medical, surgical and dental essentials to which an A-10 rating may be assigned. This list, it was reported, will be revised as scarcities are relieved or threaten to develop.

Manufacturers wishing to avail themselves of the plan should write to the Health Supplies Section, Office of Production Management, Washington, for form PD-79, "Report of Requirements for Scarce Materials." Simultaneously he should file a complete list of all the finished articles he fabricates which may be covered by the plan.

Ickes' Own



OLNEY, MD.: This is the private gasoline pump on "Headlands", the ultra-modern 350-acre estate of Harold L. Ickes, Secretary of the Interior and Petroleum Co-ordinator. Tank under pump has capacity for 500 gallons, assuring Mr. Ickes that any gasoline difficulties will not be felt for some time. His gas-consuming vehicles include farm tractor and truck, station wagon, private sedan and government limousine. NEA photo

OPACS Wants Standardized Household Refrigerators

American Standards Association was asked last week by the Office of Price Administration and Civilian Supply to start immediately a compilation of standards for electric household refrigerators.

Purpose of the standards, according to the association, is to eliminate all unnecessary variety in sizes and styles to conserve production facilities and to assure the public of serviceable refrigerators in the face of shrinking raw materials supplies.

OPACS is reported to have suggested a standardization program including concentration on a smaller number of sizes, perhaps only three or four, and minimum performance requirements for protection of purchasers. Important economies in production and distribution would be expected from such a program, resulting in output of more refrigerators and in better service to consumers than would otherwise be possible, according to OPACS.

Metals for Radio Replacement Parts Assured by Henderson

Metals required for replacement tubes and condensers needed to keep in operation the 50,000,000 radio sets in United States were allocated last week by Leon Henderson, OPACS administrator. Maintenance of existing communications is considered "essential to morale," and replacement of burned-out tubes and defective condensers is held "a matter of prime importance."

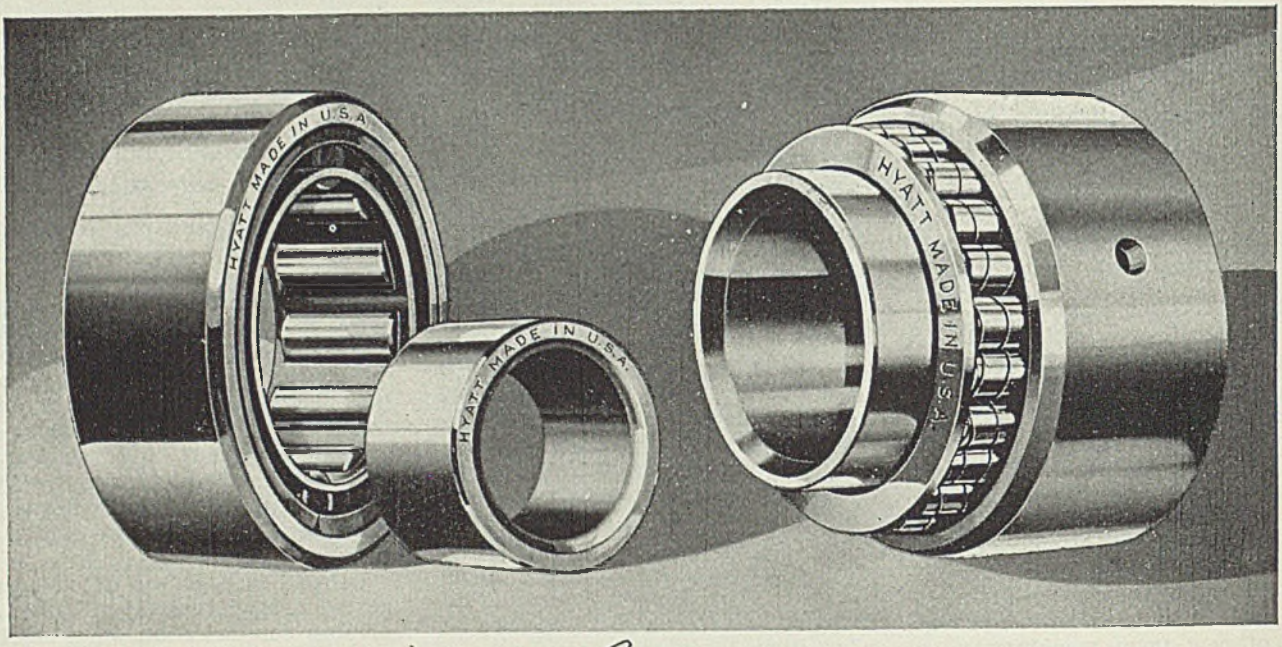
Program stipulates that from Aug. 20 through Nov. 30, highest civilian rating shall be given specific amounts of nickel, steel, aluminum, copper, chromium, tin, brass and other metals required. Supplies that can be produced from metals allocated are estimated sufficient for the period October through December.

Army Designs New Tableware To Conserve Nickel, Zinc

Forks and spoons of plated steel designed to eliminate zinc and nickel which thus will be saved for defense use have been announced by the Army Quartermaster Corps.

Purchase of 160,000 each of these articles has been authorized. They will conserve "nearly 10,000 pounds of nickel and more than 9000 pounds of zinc."

KEEP THEM YOUNG WITH HYATTS



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At the IRON & STEEL EXPOSITION in Cleveland visit the Hyatt exhibit —spaces 24 and 25. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, N. J., Chicago, Pittsburgh, Detroit and San Francisco.

HYATT

ROLLER BEARINGS

QUIET

Mirrors of MOTORDOM

Chrysler stepping up defense production, with engineers readying 2000-horsepower airplane engine for production, developing new 500-horsepower liquid-cooled engine for use in tank, and designing propulsion machinery for cargo ships . . . New models are glittering affairs, with few if any substitutes in evidence as yet . . . Packard covered on materials for at least four months production

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ BRINGING into sharp focus its No. 1 job of expediting some $400,000,000 worth of defense contracts, Chrysler Corp. last week conducted 300 press representatives on a tour through some of its Detroit operations on defense, concluding with an "incidental" display of 1942 models of Plymouth, Dodge, De Soto and Chrysler passenger cars.

Highlight of the day, defensewise, was a visit to the army tank arsenal, where 6000 men are now at work on parts manufacturing and assembly of the M-3 medium 28-ton tank. The final assembly line is now operating one shift daily, turning out three or four completed tanks daily. Certain other departments are working two shifts and a few are on a full 24 hours. Still to be employed are some 4000 or 5000 more and they are now being put on at a rate of 300 a day. By Jan. 1, the tanks will be coming off the lines 15 a day.

Plant Is Master Mechanic's Dream

The plant appears to be fully equipped and is a master mechanic's dream if there ever was one. A feature is the large heat treating department for normalizing and carburizing various sections of armor plate. Forgings are normalized for 22 hours in a three-section gas furnace—6 hours heating to 1700 degrees Fahr., 2 hours at that temperature, 4 hours dropping down to 1200 degrees and 10 hours slow cooling to 400 degrees.

One interesting piece of equipment is a 76-inch Hanna hydraulic riveter capable of putting on a 100-ton squeeze, and used for driving ¾-inch nickel steel rivets cold in the tank body. Pressure of 66 tons is used in the riveting work, which spreads the jaws of the riveter 7/16-inch. Drive sprockets of alloy steel are flame cut on a pantograph-type machine which has capacity for cutting through 18 inches of steel. Typical of the heft of some of the armor plate castings going into the tank is the differential housing, weighing 2400 pounds.

As the tanks come off the assembly line they are run out onto a figure-8 concrete test track for a 75-mile driving test. After approval they are lifted onto flat cars, one tank to a car, by means of an overhead crane with two 20-ton hoists.

Now in process of development by Chrysler engineers is a new 500-horsepower liquid-cooled engine for use in the tank, suggesting that the present 450-horsepower air-cooled radial engine may not be entirely satisfactory. It is somewhat of a problem to cool a radial engine mounted in the rear of the tank, a blower now being used to force air over the cylinders. It is also possible that an in-line liquid cooled engine may be accommodated more easily in the tank, perhaps saving some space over the present arrangement. Engines now being used are Wright Whirlwinds, built under license by Continental Motors in Muskegon, Mich., and Detroit.

It was revealed that Chrysler engineers also have brought the 2000-horsepower liquid-cooled airplane engine almost to the production stage, although no government orders for it have been placed as yet. The engine is understood to be an inverted V-16. A third engine project on which Chrysler is working is some form of propulsion machinery for a new type of cargo boat which is going into production for ferrying military supplies abroad. Not many details of this craft have been divulged officially, but reports are that it is some form of shallow-draft barge or scow made up of welded steel plates and carrying its own power.

Other phases of the snowballing Chrysler defense output include nose and center sections for the Martin bomber, and the Bofors anti-aircraft gun. Most all plants of the corporation will contribute to some phase of these two projects, with final assembly of the bomber sections in the leased Graham plant here, and the gun in the Highland Park plant of Chrysler. The Bofors gun will be made in two types—a single air-cooled type for stationary service, and a four-barrel water-cooled unit of the pom-pom type for use on shipboard.

In adapting the gun to mass production, Chrysler engineers have discarded much of the old-style "file and fit" method of gun assembly in favor of precision machined forgings. Production of the barrel alone requires 70 different types of machine tools, all of them "foreign" to motor car production.

As an example of the intricacy of the bomber sections, consider that there are 11,500 separate pieces in the two sections, weighing 4800 pounds and 33 feet in length. Over 2,000,000 hours of tooling have gone into the preparatory work since last October. Five hundred subcontractors will assist the 11 Chrysler plants in putting together these two bomber elements which require in their assembly a total of 54,000 rivets.

Industry Can Help in Designing Improved Arms

Speaking just before the tour got under way, K. T. Keller, Chrysler president, suggested that manufacturers might apply their specialized talents to a study of the needs of military equipment in the effort to assist the army and navy in development of newer and better types of equipment, rather than waiting for the service people to do their own development work and then contract for production of specific items.

Most thrilling event of the day was a demonstration of army trucks going through some of the most

grueling and punishing driving tests imaginable — through waist-deep mud, up and down steep grades, over ditches, etc. This was staged at the Dodge truck plant which has now turned out some 57,000 military trucks and still has thousands more on order.

Somewhat anticlimactic, perhaps, but nevertheless brilliant, glittering creations were the 1942 models of Chrysler Corp. cars. They represented a tooling expenditure of twenty million dollars and sport numerous refinements in design and decorative trim. All have new front-end appearance, and De Soto is pioneering dash-controlled headlight covers which when closed make front fender styling completely streamlined.

Functional Streamlining Is Packard Story

With prices starting at $1250, Packard last week unveiled a new body style in the Clipper motif—a 2-door club sedan with streamline or "fast" back. This supplements the body style introduced on the Clipper this spring. The cars are available on 120 and 127-inch wheelbases in the Clipper styling, with either a 6-cylinder 105-horsepower engine, or an 8-cylinder 125-horsepower engine, the latter carrying a price premium of $55. No effort is going to be made to make the 6-cylinder the price or style leader this year by Packard; in fact just the reverse is being done, production now being geared to the ratio of 70 per cent eights and 30 per cent sixes.

Speaking to dealers and distributors here Monday, M. M. Gilman, Packard president, offered to pay $1000 to anyone who could find a single substitute material or part in the 1942 models on display. Close inspection indicated his money was pretty safe—no discernible substitutes. Mr. Gilman said Packard now has materials on hand or being fabricated for at least four months production, that the company got a "fine break" as far as production curtailment was concerned.

Engines remain basically unchanged except for the fact power output has been stepped up by 5 horsepower with the compression ratio 6.85 to 1. High-lead babbitt bearings have been adopted for rods and mains—0.0045-0.00575-inch thick on rods and 0.005-0.008-inch for main bearings.

Unusual type of bright metal belt molding has been designed for Packard bodies. Of stainless steel, it is formed by rolling, the center portion of the 1-inch strip being somewhat depressed. The raised edges have a high-luster buffed finish, while the center is finished with aluminum paint, giving a satin or matte appearance.

Packard is emphasizing "functional streamlining" in new models, citing proving ground tests on the Clipper-style body which showed a 19 per cent reduction in wind drag, 12-18 per cent improvement in fuel economy, 21 per cent reduction in wind noise, 24 per cent better steering and handling ease, 29 per cent reduction in road shocks and a 26 per cent improvement in visibility.

Low, wide and massive characterize appearance of the new Plymouth bodies. Front end features an aircraft-style air scoop underneath the bumper. Engine horsepower is 95 at 3400 r.p.m., the added horsepower at lower speed permitting use of a lower axle gear ratio, improving economy.

Novel idea in wiring of Plymouth horns prevents their operation when the ignition key is not turned on.

Cast iron pistons of a light weight type have supplanted aluminum alloy pistons and are reported to have proved so satisfactory there is some question over whether specifications ever will return to aluminum, even should this metal become available.

Automobile Production

Passenger Cars and Trucks—United States and Canada

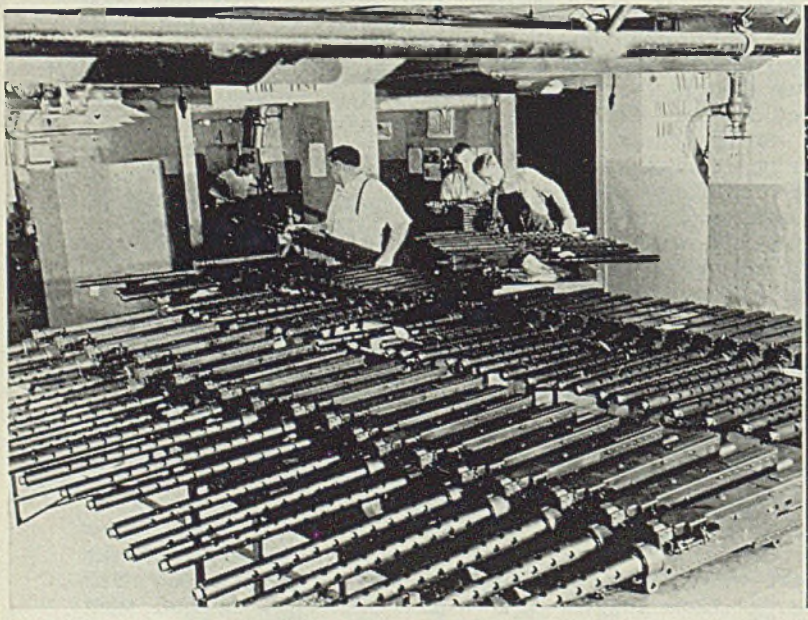
By Department of Commerce

	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	545,355
June	324,253	362,566	546,278
July	218,600	246,171	468,757
7 mos.	2,274,348	2,785,611	3,617,510
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	.....

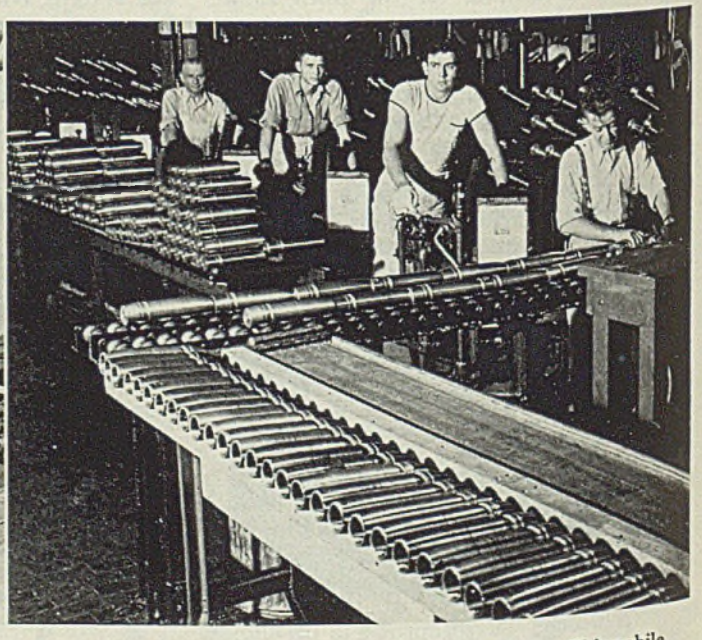
Estimated by Ward's Reports

Week ended:	1941	1940†
Aug. 2	62,146	17,373
Aug. 9	41,795	12,635
Aug. 16	46,750	20,475
Aug. 23	45,525	23,732
Aug. 30	39,965	27,645

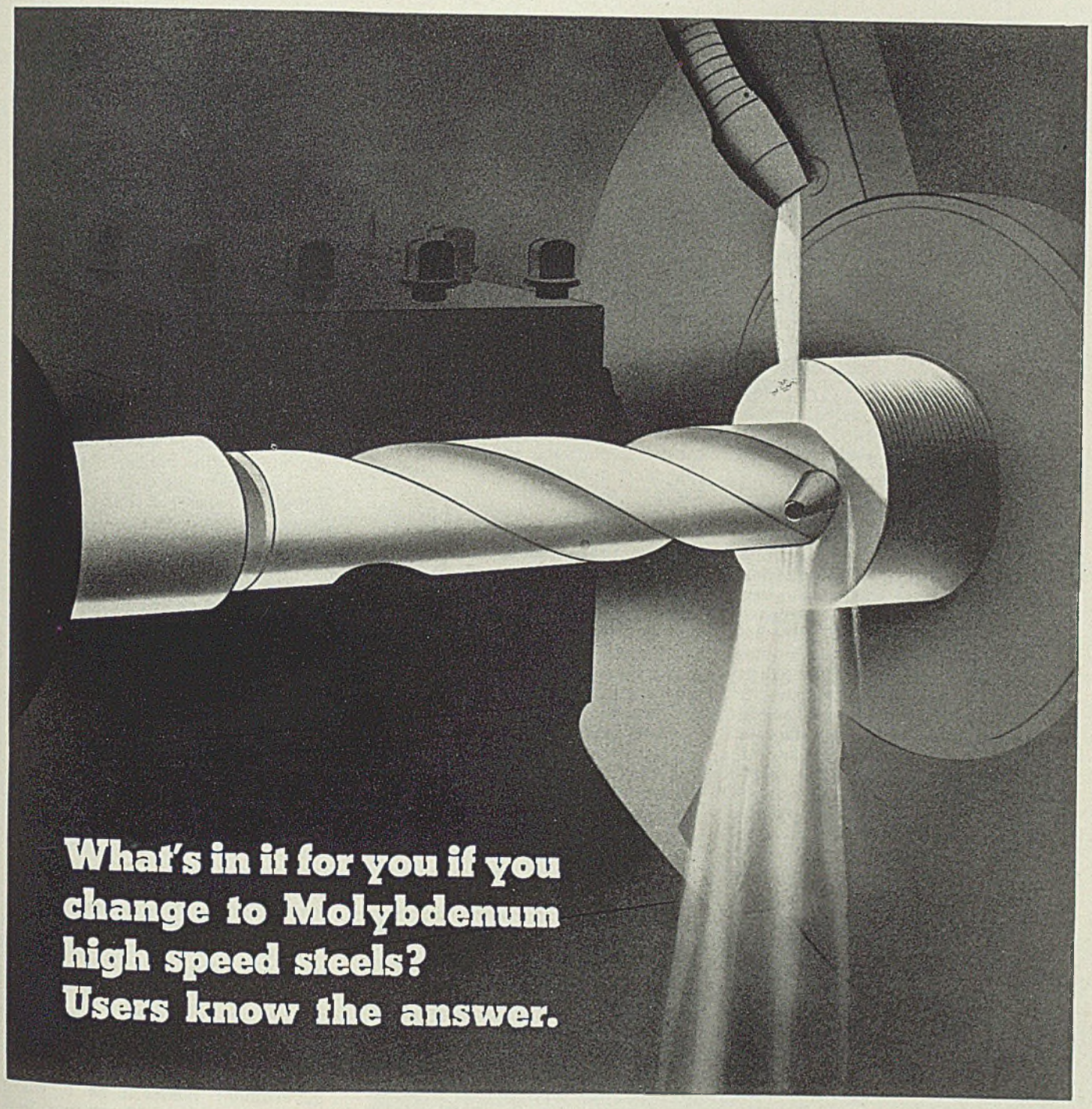
†Comparable week.



■ Here in General Motors AC Spark Plug Division, Flint, Mich., .50 calibre machine guns are inspected and put through firing tests before final delivery to the United States Army. General Motors machine gun assignments total $83,697,839 for guns and $26,583,306 for facilities



■ Here at General Motors Forge plant of the Oldsmobile Division, Lansing, Mich., a steady stream of 75 mm. shells is shown in production. General Motors has delivered $7,000,000 worth of shells, guns and fuzes, in its total of $209,500,000 of defense item deliveries to date



There are three good reasons for changing to Molybdenum high speed steels.

1. Equal cutting properties.
2. Better toughness.
3. Lower cost.

The three advantages combine to reduce machining costs. Confirmation is found in the experience of thousands of shops that have changed over from Tungsten high speed steels.

Your tool steel supplier will give you information on the Molybdenum high speed steel analysis and heat treatment to meet each cutting requirement.

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MOLY

WING TIPS

Wage stabilization agreements appear blocked by refusal of unions to sit in on discussions, but plane builders are anxious to work out industry-wide plan . . . Design changes make cost estimates difficult, often result in large losses . . . Douglas plant at Long Beach embodies many new ideas in aircraft manufacture . . . 450,000 tons of steel for aviation in 1942

■ OUT among the mushrooming airplane plants on the West coast one of the main topics for discussion behind managerial doors is some form of wage stabilization agreement to apply to all plants in the industry. Soon after wage increases were granted at North American and other companies it was realized that what was bound to happen was a slow process of overlapping pay boosts with the different plants competing for workmen. This would naturally be productive of a situation which certain labor elements would seize upon to incite further unrest and strikes.

So a wage stabilization committee under Donald Douglas was set up to explore the possibilities of wage stabilization agreements, working in co-operation with government and labor unions. Government participation was sought since so large a portion of the industry's contracts are now on a cost-plus-fixed-fee basis. Unfortunately, however, thus far heads of CIO and AFL unions have refused to meet with manufacturers in scheduled conferences at Washington, and the project is now stymied.

Douglas sees little chance of any stabilization agreement until the union groups can be persuaded to sit down together, each apparently being afraid to make any agreement for fear of what the other will do.

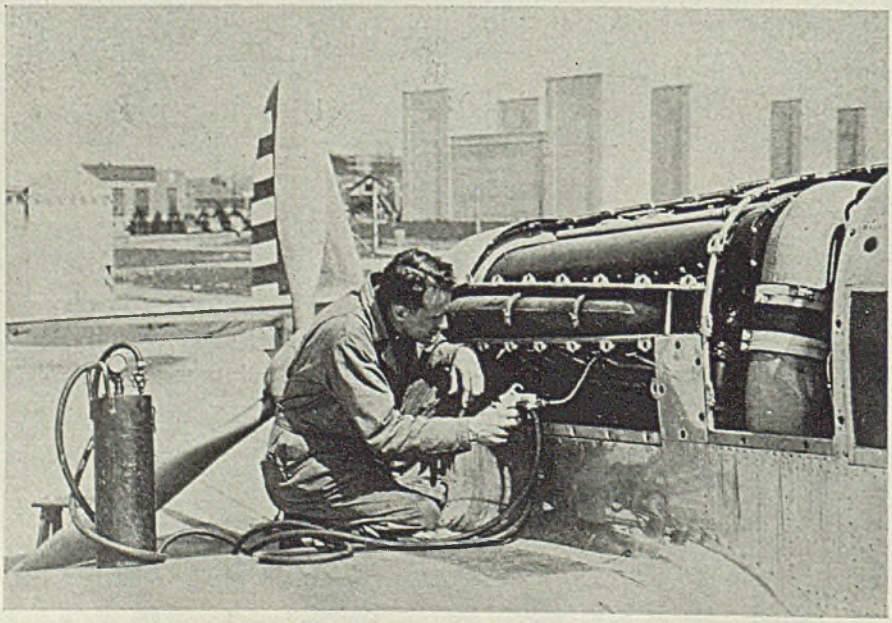
J. H. Kindelberger, president of North American Aviation, said in Washington recently that the two labor factions are now proposing to go out separately and "try to effect something."

Concurrently, Mr. Douglas gave to a senate investigating committee some interesting figures on manufacturing costs in connection with the huge B-19 bomber now undergoing test flights. He said the ship cost the company $3,970,685, and the contract price to the government was only $1,142,651. The Douglas company reports a loss of nearly two millions on government contracts for the first six months of this year, and well over one million for all of 1940.

North American reports gross profits on government plans have run as high as 30 per cent, but bomber contracts have shown losses of 20 per cent, making profits on government business as a whole somewhere around 10 per cent. Reason for the losses is said to be design changes constantly dictated by the Army and Navy. While it is obvious that such changes are essential if military aircraft is to keep pace with European craft, nevertheless they make cost estimating difficult. Once a manufacturer gets over the hump of design changes and experimental work into the smooth road of production, profits are good, but he often takes a severe kicking around in the early stages.

Large-scale production virtually has started in the vast new "blackout" plant which Douglas has built at Long Beach, Calif. Although several of the plant's 11 buildings are still to be completed, about 4000 are now at work against eventual

Protecting Fighting Planes from Corrosion



■ Fighter planes and bombers which are out of active service for as long as a week must have their engines sprayed with an anticorrosive compound containing castor oil. Photo shows this operation being performed at Wright Field, Dayton, O., with DeVilbiss equipment

employment of 15,000 to 20,000 in production of four-engine bombers, military cargo carriers, troop transports and attack-bombers.

Subcontracts to the tune of $100,000,000 have been let for wings, engine nacelles, tail groups and other subassemblies, a number of eastern and middle western suppliers sharing the business. Murray Corp. of America, Briggs Mfg. Co., Pullman-Standard, Fleetwings and McDonnell Aircraft are five of the principal subcontractors. To expedite this business and to keep it flowing in a steady stream to the Long Beach plant, Douglas has set up district offices in Detroit, in charge of Fred Essig, veteran Douglas official, and Fred Rockelman, for many years in executive capacities with various motor companies. Offices are located in the Fisher building in Detroit. Fifty specially designed box cars with built-in racks for subassemblies will shuttle back and forth between suppliers' plants and the Long Beach plant.

Four-engine bombers which Douglas will build are the Boeing B-17E type, or flying fortress, under co-operative Douglas-Vega-Boeing program. Production is directed by a joint administrative committee from the three companies, with subcommittees on engineering, tooling and purchasing. Blueprints and templates will be furnished by Boeing and duplicated by Douglas and Vega.

The $11,000,000 Long Beach plant was erected in record time, and provides well over a million square feet of floor space. Included are administration building, personnel building, welfare and restaurant unit, two fabricating buildings, two final assembly units, raw stock storage structure, shipping and receiving building, paint storage and a large garage. All are completely windowless, lacking even skylights. Automatic air conditioning and fluorescent lighting are used.

Straight-line assembly techniques are a feature of the new plant. Every production operation has been made as simple and automatic as possible. Power-driven monorails, conveyor belts, jig tracks and overhead cranes combine to reduce manual effort. The raw stock department features an automatic conveyor to move large sheets of duralumin through successive chambers where it is washed, dried and sprayed with primer without a hand touching it.

Typical of the continuous flow of processes is the hammer room for forming sheet metal parts. At one end is a pattern room lined with benches for patternmakers who are served with wet plaster from a monorail conveyor. Patterns are picked up by cranes controlled from the floor, moved to inspection and then to the foundry where the dies are cast. Dies follow through a group of machines which grind, clean, service and stamp them.

When a die is needed in production, the crane lifts it from its storage space and carries it to one of a large number of high speed air operated hammers. When the hammer operator has nearly finished the work for which he needed the die, he pushes a button to notify the production control department it is time to bring him another die and more material for the next job.

In both fabricating and final assembly buildings, wing and fuselage jigs are set on tracks and moved along by power winches at regular intervals. After the landing gear has been installed, the airplanes are drawn down the line by tractors.

Much of the equipment in the plant is highly specialized in design. For example, there are two six-sided hydraulic presses, each of 2500-ton capacity. On each of the six sides is an electrically-operated loading table to handle material into and out of dies. Press equipment in general is of such variety and capacity that all hand-forming of aluminum parts is eliminated.

Seek To Move 85,000 from Rail Shops to Plane Plants

Consolidated Aircraft has started a program to train and employ women in aircraft manufacture, in response to a request from the Hillman side of OPM to 200 airplane companies. Consolidated now employs 19,000 in its San Diego plants and will start with a group of 300 or 400 women, giving preference to women members of present workers' families. They will be used to staff lighter mechanical operations.

Solar Aircraft Co. in San Diego has set up a working agreement with Edward G. Budd Mfg. Co. in Philadelphia to accelerate production of exhaust manifolds and cowling for military aircraft, made primarily of

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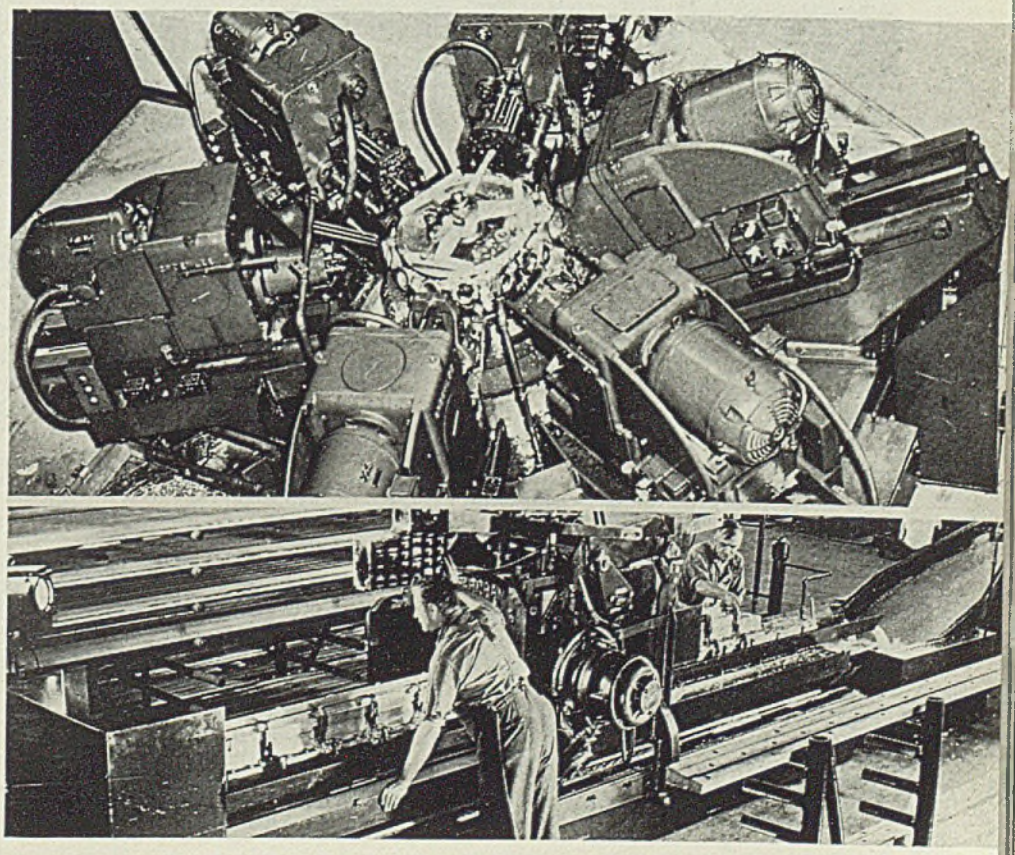
New Tools for Faster Production



Two examples of newly designed machines which are speeding output of American airplanes and aircraft engines. Upper, an automatic high production machine in an engine factory which finishes supercharger housings made in one-tenth the time the job formerly required. Lower, a wing spar milling machine which has reduced production time for airplane wing "backbones" from days to hours. Photos, Aeronautical Chamber of Commerce, Washington

Air Corps Awards Lead Army's Defense Contracts Placed in Week

■ AIRCRAFT, engines, spare parts, accessories and other supplies for the Air Corps comprised substantially over half the total value of defense awards reported last week by the War Department. Aggregate of all contracts for the period was $52,325,009. Ordnance branch of the Army again reported the greatest number of awards, most of which were small and represented wide distribution of defense work. Contracts placed included:

Ordnance Department Awards

Adirondack Foundries & Steel Inc., Watervliet, N. Y., castings, $1470.98.

Allegheny Ludlum Steel Corp., Dunkirk, N. Y., steel rods, $1512.28.

Allen, H. F., Co. Inc., Buffalo, drill presses, $2910.

Aluminum Co. of America, Massena, N. Y., aluminum, $8284.80.

Aluminum Seal Co., New Kensington, Pa., cups for percussion primers, $224,700.

American Brake Shoe & Foundry Co., American Forge Division, Chicago, shell forgings, $507,960.

American Brass Co., Waterbury, Conn., brass discs, cartridge brass, brass cups, $37,822,216.69.

American Car & Foundry Co., Berwick, Pa., parts for tanks, $18,828.25.

American Cutter & Engineering Co., Detroit, tools and nuts, $5855.

American Locomotive Co., Railway Steel Spring Division, Latrobe, Pa., volute steel springs, $1503.60; Schenectady, N. Y. Division, forgings, $392,040.

American Mfg. Co. of Texas, Ft. Worth, Tex., shells, $2,550,000.

American Smelting & Refining Co., Federated Metals Division, Whiting, Ind., metal, $1019.

American Steel & Wire Co. of New Jersey, Newburgh Works, Cleveland, steel, $1096.26.

Ampco Metal Inc., Milwaukee, welding rods, $3345.

Ampco Twist Drill Co., Jackson, Mich., twist drills and reamers, $3394.22.

Anthracite Bridge Co., Scranton, Pa., furnish and fabricate steel trusses, bottom and top chord bracing, $2396.

Armstrong-Blum Mfg. Co., Chicago, hydraulic hack saws, $5208.

Armstrong Cork Co., Lancaster, Pa., cartridge cases, $520,000.

Arrow Metal Products Co., Detroit, fixtures, $12,919.

Associated Spring Corp., Wallace Barnes Co. Division, Bristol, Conn., retaining springs, $1325.

Atlas Powder Co., Reynolds, Pa., cartridges, $24,500.

Austin-Hastings Co. Inc., Cambridge, Mass., radial drills, $25,232.

Babcock & Wilcox Co., New York, install steam generating unit, $121,887.96.

Baldwin-Southwark Corp., Eddystone, Pa., parts for presses, $3101.70.

Barnes Drill Co., Rockford, Ill., honing machines, $64,791.

Beaird, J. B., Corp., Shreveport, La., shells, $378,000.

Bearings Co. of America, Lancaster, Pa., bearings, $7128.95.

Belmont Iron Works, Philadelphia, steel, $1100.

Bendix Aviation Corp., Eclipse Aviation Division, Bendix, N. J., shield covers, $1699.75; Scintilla Magneto Division, Sidney, N. Y., magneto switches, $4252.80.

Bethlehem Steel Co., Bethlehem, Pa., demolition bombs, steel, $91,540.35.

Bishop & Babcock Mfg. Co., Cleveland, shells, $2,096,766.

Broadway Office Supply & Equipment Co., Springfield, Mass., office equipment, $2240.40.

Brown Lipe Gear Co., General Drop Forge Division, Buffalo, drop forgings, $2405.25.

Brown & Sharpe Mfg. Co., Providence, R. I., end mills, calipers, gages, squares, pumps, grinders, $5822.31.

Buda Co., Harvey, Ill., parts for tanks, $3,390,072.35.

Budd Wheel Co., Detroit, cap nuts, wrenches, gaskets, $8465.38.

Bullard Co., Bridgeport, Conn., parts for machines, $1573.

Campbell, A. S., Co. Inc., Boston, cartridge cases, $1,864,000.

Carboloy Co. Inc., Detroit, furnaces, tools, $137,747.26.

Carborundum Co., Philadelphia, aluminum oxide grain, $1075.

Carnegie-Illinois Steel Corp., Pittsburgh, steel, $31,339.06.

Carpenter Steel Co., Reading, Pa., tool steel, $8865.

Chrysler Corp., Detroit, parts for tanks, $26,250.

Cincinnati Milling Machine & Grinders Inc., Cincinnati, parts for milling machines, $3155.25.

Cincinnati Planer Co., Cincinnati, parts for planers, $9562.

Clark, W. E., Co., Boston, structural steel, $3249.65.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., parts for guns, $685,672.65.

Continental Machines Inc., Minneapolis, contour cutting machines, $3812.17.

Continental Motors Corp., Muskegon, Mich., governors, $9726.56.

Copperweld Steel Co., Warren, O., steel, $91,270.80.

Covel Mfg. Co., Benton Harbor, Mich., grinders, $33,000.

Crucible Steel Castings Co., Milwaukee, castings, $3072.98.

Crucible Steel Co. of America, New York, steel, $10,083.93.

Dauber Co., Oshkosh, Wis., drills, $2810.

Dempster Bros. Inc., Knoxville, Tenn., hoisting units and buckets, $3676.80.

Derbyshire Machine & Tool Co., Philadelphia, dies, $20,940.

Deveau, C. O., Machine Tool Co., Charlestown, Mass., fixtures, $4495.

Diecasters Inc., Ridgefield, N. J., ogives for fuzes, $39,827.50.

Doehler Die Casting Co., Pottstown, Pa., parts for bombs, $7200.

Dresser Mfg. Co., Bradford, Pa., shell forgings, $962,500.

Drive-All Mfg. Co., Detroit, gear boxes, $52,650.

Dunlap, John, Co., Carnegie, Pa., cartridge cases, $970,000.

Electric Household Utilities Co., Chicago, booster parts, $755,590.

Elliott-Lewis Electric Co. Inc., Philadelphia, lighting fixtures, metal conduit and connectors, $6002.37.

Ever-Tite Mfg. Co., Davenport, Iowa, mud guards for tanks, cleaning rods, $17,648.91.

Ex-Cell-O Corp., Detroit, cutting tools, grinders, $9096.40.

Farquhar, A. B., Co. Ltd., York, Pa., mounts, mortars and parts, $553,111.65.

Federal Cartridge Corp., Minneapolis, cartridges, $127,800.

Federal Machinery Sales Co., Chicago, shapers, $2513.50.

Finkl, A., & Sons Co., Chicago, forgings, die blocks, $93,707.63.

Firestone Tire & Rubber Co., Chicago, parts for scout cars, $6060.

Firth-Sterling Steel Co., McKeesport, Pa., dies, $13,494.

Gabriel Co., Cleveland, shell bodies, $610,000.

Gairing Tool Co., Detroit, reamers, $13,425.

Gallmeyer & Livingston Co., Grand Rapids, Mich., grinders, $1830.50.

Gas Weld Equipment Co. Inc., Boston, tools, $1811.50.

General Electric Co., Schenectady, N. Y., doors, transformers, $5253.30.

General Electric Supply Corp., Boston, magnetic controllers, $1620.26.

General Motors Corp., Guide Lamp Division, Anderson, Ind., cartridge cases, $611,000.

General Motors Sales Corp., Hyatt Bearings Division, Harrison, N. J., bearings, $5679.60; New Departure Division, Meriden, Conn., bearings, $2932.75.

General Tool & Mfg. Co., Irvington, N. J., dies, $29,400.

General Tool Sales Co., Philadelphia, drills, $1142.76.

Gilbert, W. L., Clock Co., Winsted, Conn., collars, timing discs, and centrifugal weights, $1648.50.

Gisholt Machine Co., Madison, Wis., lathes, $668,500.

Gleason Works Rochester, N. Y., sharpeners, $1063.38.

Globe Steel Tubes Co., Milwaukee, seamless tubing, $1181.61.

Gorham Tool Co., Detroit, tool bits, for lathe turning operations, $1670.

Grandahl Tool & Machine Co., Hartford, Conn., gages, $1164.

Greenfield Tap & Die Corp., Greenfield, Mass., gages, $1199.25.

Guiberson Diesel Engine Co., Dallas, Tex., parts for tool roll, $3173.05.

H. A. K. Products Corp., Ft. Lauderdale, Fla., projectiles, shells, $768,000.

Harnischfeger Corp., Milwaukee, trolley motor, $2283.

Hartford Electric Steel Corp., Roxbury, Mass., steel castings, $4813.52.

Hayes, Charles E., Co., Springfield, Mass., wire, $1080.

Heppenstall Co., Pittsburgh, die blocks, $48,884.58.

Hepworth, Albert, Tool Machine Co., Philadelphia, hydraulic shapers, $6829.

Illinois Tool Works, Chicago, hobs, tools, $7448.

Industrial Steel Inc., Cambridge, Mass., steel die blocks, $46,975.84.

Ingraham, E., Co., Bristol, Conn., collars, bushings and nuts, $7784.25.

Inland Steel Co., Chicago, steel bars, $542,314.50.

International Harvester Co., Ft. Wayne, Ind., trucks, $5200.61.

Jacobs, F. L., Co., Detroit, plugs and pins, $11,724.

Jahn Mfg. Co., New Britain, Conn., dies, $4945.

J. C. H. Automatic Machine Co., Philadelphia, progressive dies, shell bodies, $5055.

Johns-Manville Sales Corp., Manville, N. J., pipe, $3397.51.

Kearney & Trecker Corp., West Allis, Wis., milling machines, $966,889.

Kelly, John P., Philadelphia, castings, $5517.90.

Kilby Steel Co., Anniston, Ala., shell forgings, $6,127,200.

Kingston Products Corp., Kokomo, Ind., tubes for fuzes, $17,721.

Koppers Co., Baltimore, parts for gun carriages, $226,836.

Landis', A. B., Sons Inc., Wyndmoor, Pa., parts for cartridge cases, $12,821.

Landis Machine Co. Inc., Waynesboro, Pa., machines, $3879.42.

Larkin Packer Co. Inc., Davis Boring Tool Division, St. Louis, boring bars, $1490.

LeBlond, R. K., Machine Tool Co., Cincinnati, lathes, $175,346.

Leeds & Northrup Co., Philadelphia, furnaces, $6763.

Leland-Gifford Co., Worcester, Mass., drilling machines, $23,895.

Le Maire Tool & Mfg. Co., Dearborn, Mich., gages, $4508.

Lincoln Tool & Die Co., Detroit, gages, dies, $4290.

Logansport Machine Inc., Logansport, Ind., machines, $1728.

Louden Machinery Co., Fairfield, Iowa,

furnish and install motoveyors for monorail system, $4322.
Lufkin Rule Co., Saginaw, Mich., calipers, $1525.22.
Lynd-Farquhar Co., Boston, cutting machines, $2514.
Mackintosh-Hemphill Co., Pittsburgh, steel castings, $356,927.04.
Mack Mfg. Corp., Long Island City, N. Y., transmission and drive assemblies for tanks, $4,674,969.10.
Magnus Tool & Die Co., Newark, N. J., guides, sleeves and anvils, $7834.
Manistee Iron Works Co., Manistee, Mich., presses, $1,153,239.
Marshall & Huschart Machinery Co., Chicago, planers and lathes, $27,278.
May Co., Moline, Ill., pipe, $11,143.77.
McCrosky Tool Corp., Meadville, Pa., tools, $3075.50.
McGonegal Mfg. Co., East Rutherford, N. J., grinders, $2270.
Mercury Mfg. Co., Chicago, electric trucks, $5956.
Micromatic Hone Corp., Detroit, honing machines, $4895.
Midvale Co., Nicetown, Philadelphia, steel, forgings, tubes, $2,262,788.50.
Modern Collet & Machine Co., Ecorse, Detroit, collets, $1237.50.
Moloney Electric Co., Chicago, transformers, $2442.
Monarch Machine Tool Co., Sidney, O., lathes, $12,102.45.
Moore Special Tool Co. Inc., Bridgeport, Conn., fuze plates, dies, $8355.
Murray Mfg. Corp., Brooklyn, N. Y., shell bodies, $1,792,000.
National Die Co., Waterbury, Conn., dies, $11,400.
National Supply Co., Spang-Chalfant Division, Ambridge, Pa., shell forgings, $5,093,130.
National Tube Co., Christy Park Works, McKeesport, Pa., bombs, $4,141,500.
Nelpin Mfg. Co. Inc., Long Island City, N. Y., gages, $1488.
New England Plumbing Supply Co., Springfield, Mass., steel pipe, $2964.15.
Niles-Bement-Pond Co., Pratt & Whitney Division, West Hartford, Conn., gages, shanks and spools, $55,053.05.
Norris, W. C., Manufacturer Inc., Tulsa, Okla., shell, $574,024.
Norton Co., Worcester, Mass., grinding wheels, $3971.88.
O. K. Tool Co. Inc., Shelton, Conn., cutters, holders, planers, etc., $1839.98.
Oliver Farm Equipment Co., Springfield, O., metal packing crates, $804,100.
Otis Elevator Co., Buffalo, steel castings, $12,596.08.
Peco Mfg. Co., Philadelphia, fuze bodies, $95,450.
Pennsylvania Tool & Mfg. Co., York, Pa., dies, $15,850.
Philadelphia Engineers, Philadelphia, parts for machines, $2029.60.
Philco Distributors Inc., Philadelphia, air conditioning units, $1400.
Pittsburgh Steel Co., Allenport, Pa., shell, $1,890,000.
Porter Machinery Co., Grand Rapids, Mich., routing machines, $1457.50.
Prentiss, Henry, & Co., Boston, drilling and milling machines, $66,098.
Prest-O-Lite Battery Co. Inc., Indianapolis, parts for tanks, $1584.21.
Production Tool & Die Co. Inc., Springfield, Mass., inspection gages, $1899.
Pullman Standard Car Mfg. Co., Butler, Pa., shell, $915,000.
Putnam Tool Co., Detroit, reamers, $7560.
Quality Tool & Die Co., Indianapolis, furnaces, $5493.50.
Ransohoff Inc., Cincinnati, "parkerizing" machine, $7675.
Reasoner Tool & Supply Co., Greenfield, Mass., hand taps, $3436.05.
Regina Corp., Rahway, N. J., bomb nose fuzes, $548,895.
Reliable Tool Co. Inc., Irvington, N. J., holders, bolts, punches and dies, $3311.
Revere Copper & Brass Co., Chicago, brass and tubing, $3427.
Rockford Machine Tool Co., Rockford, Ill., shapers, slotter, $38,484.23.
Rock Island Metal Foundry, Rock Island, Ill., castings, $1420.80.
Roessler Machine Co., Elkins Park, Pa., tools, $5652.
Rollway Bearing Co. Inc., Syracuse, N. Y., roller bearings, $2620.
Rooksby, E. J., & Co., Philadelphia, overhaul machines, $1295.
Rotary Electric Steel Co., Detroit, steel, $7763.68.
Russell, Burdsall & Ward Co., Rochester, N. Y., steel nuts, $1584.
Ryerson, Joseph T., & Son Inc., Chicago, tank parts, $2677.50.
Service Caster & Trunk Co., Somerville,

Book $2,000,000 Ordnance Order Under York Community Plan

■ An ordnance order amounting to approximately $2,000,000 has been awarded by the Army to the York Ice Machinery Corp. as prime contractor under the "York Plan" of pooling men and machines for co-operative community defense work on large government contracts.

This plan has been widely publicized (STEEL, Feb. 17, page 44) and recommended by OPM and NAM officials as a pattern for other industrial communities.

The Army needs a number of 6-inch Barbette guns for harbor defense at undisclosed points. This type of gun is protected by an armored hood. When bids for the gun carriages were asked several months ago, the York corporation brought home the plans and immediately consulted with executives and engineers from the S. Morgan Smith Co., A. B. Farquhar Co. Ltd., Brandt-Warner Mfg. Co., Read Machinery Co., and other York firms.

After studying the plans and checking available machinery and manpower in York and neighboring communities, this group of men decided they could handle the job and were shortly able to produce an exact estimate of materials and primary and subcontract work. The bid was submitted to Army ordnance officials by the York corporation as prime contractor.

Shown above is the group preparing the collective bid. Left to right around the table, including those standing and those partially hidden: P. P. Stock and H. C. Bentzel, methods department, York Ice; Burwell B. Smith, vice president and secretary, Smith company; Warren C. Bulette, president, Brandt-Warner; William S. Shipley, chairman, and Marshall G. Munce, assistant to the president, York Ice; Beauchamp Smith, vice president and general manager, and D. C. DeVine, general superintendent, Smith company; T. C. Cottrell, sales engineering department, York Ice; M. L. Gotwalt, estimator, Read Machinery; and Edward Fisher, general works manager, Farquhar company.

Pooling of facilities thus enables many small manufacturers to participate in defense work that would otherwise be impossible.

Mass., steel, $1075.
Sheet Aluminum Corp., Jackson, Mich., aluminum, $131,598.20.
Sheffield Corp., Dayton, O., multicheks, gages, $647,.976.72.
Somerville Machine & Foundry Co., Somerville, Mass., manganese aluminum bronze castings, $1048.22.
Standard Gage Co., Poughkeepsie, N. Y., gages, $6797.20.
Struthers-Wells-Titusville Corp., Titusville, Pa., tube steel for forgings, forgings, $613,827.
Superior Steel Corp., Carnegie, Pa., steel, $5545.77.
Super Steel Inc., Cleveland, hot rolled steel, $2170.30.
Surface Combustion Corp., Toledo, O., gages, $3050.
Swind Machinery Co., Philadelphia, grinders, $9610.20.
Taft-Peirce Mfg. Co., Woonsocket, R. I., gages, $7314.92.
Thurston Mfg. Co., Providence, R. I., end mills, $3980.05.
Timken-Detroit Axle Co., Detroit, parts for gun carriages, $1018.
Timken Roller Bearing Co., Canton, O., steel, bearings, $41,038.81.
Titeflex Metal Hose Co., Newark, N. J., tubes, $2980.65.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind., bomb bodies, $2,094,870.
Transmission Engineering Co. Inc., Philadelphia, loading machines, $4989.30.
Tri-Metal Products Inc., Conshohocken, Pa., manganese bronze base castings, $5459.
Union Twist Drill Co., Athol, Mass., mills and cutters, hobs, taps, $9178.84.
Unique Specialties Inc., New York, dies, punches, holders, supports, $3030.75.
Unitcast Corp., Toledo, O., alloy steel castings, $1800.
United States Gauge Co., Sellersville, Pa., gages, $1007.
U. S. Machine Corp., Lebanon, Ind., shells, $1,259,000.
U. S. Tool & Mfg. Co., Dearborn, Mich., tools, $2057.25.
Universal-Cyclops Steel Corp., Titusville, Pa., steel, $1110.25.
Veeder-Root Co., Hartford, Conn., fuzes, $577,500.
Veit & Young, Philadelphia, funnels, ejecting stems, dies and punches, sleeves, cutters, $62,490.
Vinco Corp., Detroit, gages, $5236.
Wadell Engineering Co., Newark, N. J., arbors, $1551.
Warner & Swasey Co., Cleveland, tools, $1373.50.
Weatherhead Co., Cleveland, fuzes, $730,-300.
Westinghouse Electric & Mfg. Co., Newark, N. J., transformers, $2015.64.
White & Crowley Inc., Springfield, Mass., pipe, $3310.50.
Winter Bros. Co., Wrentham, Mass., taps, $1279.68.
Zimmerman Steel Co., Bettendorf, Iowa, castings, $3539.80.

Air Corps Awards

Aerial Machine & Tool Corp., New York, gun mount assemblies, $124,920.
American Seating Co., Grand Rapids, Mich., metal chairs, $84,600.
Beach-Russ Co., New York, vacuum pumps, $91,109.
Blackmer Pump Co., Grand Rapids, Mich., pumps, $30,000.
Buffalo Forge Co., Buffalo, fan system, $178,840.
C & E Marshall Co., Chicago, lathes, $82,000.
Cessna Aircraft Co., Wichita, Kans., airplanes and spare parts, $12,043,865.47.
Cincinnati Milling Machine & Cincinati Grinders Inc., Cincinnati, tool and cutter grinders, $45,047.15.
Cleveland Pneumatic Tool Co., Cleveland, forceps, $63,825.
Corbin Cabinet Lock Co., New Britain, Conn., padlocks, $50,485.
Crosley Corp., Cincinnati, gun mounting post assemblies, $88,650.
Curtiss-Wright Corp., Airplane Division, St. Louis Plant, Robertson, Mo., airplanes and spare parts, $28,150,824.56; Curtiss Aeroplane Division, Buffalo, servicing and assembling of airplanes, wing panel units, $944,493.50.
Dearborn Tool & Die Co., Dearborn, Mich., machines, $16,848.
Denison Engineering Co., Columbus, O., s and assemblies, $705,367.10.
Dowty Equipment Corp., Long Island, N. Y., assemblies, $759,200.
Eastman Kodak Co., Rochester, N. Y., ground camera units, $204,000.
Fairchild Aviation Corp., Jamaica, N. Y., magazine assemblies, roll film, aircraft camera, $259,960.
Hardinge Bros. Inc., Elmira, N. Y., milling machines, $82,166.50.
Holley Carburetor Co., Detroit, carburetor assemblies, and parts for engines, $131,962.95.
International Engineering Inc., Dayton, O., lamp assemblies, $243,991.
Jaeger Watch Co. Inc., New York, clock assemblies, $118,188.
Kinner Motors Inc., Glendale, Calif., engines and parts, $745,342.60.
Lights Inc., and Fritz Ziebarth, Alhambra, Calif., portable field lighting sets, $269,125.
Lockheed Aircraft Corp., Burbank, Calif., dual control conversion sets for aircraft, $50,428.80.
Lord Mfg. Co., Erie, Pa., absorbers, $76,-430.19.
Motch & Merryweather Machinery Co., Cleveland, grinders, $28,594.
North American Aviation Inc., airplane maintenance parts, $1,404,307.55.
Rolls-Royce Inc., Detroit, tools for engines, $160,022.72.
Rowles, E. W. A., Co., Arlington Heights, Ill., metal chairs, $21,861.40.
Sperry Gyroscope Co. Inc., Brooklyn, N. Y., automatic pilots and data, $69,496.
Taylor Machine Co., Cleveland, hoist assemblies, $48,681.50.
United Aircraft Corp., Pratt & Whitney Aircraft Division, East Hartford, Conn., tools, $51,347.46.
U. S. Electrical Motors Inc., Milford, Conn., test stands, $152,607.
Variety Aircraft Corp., Dayton, O., tensiometer assemblies, $60,894.
Western Electrical Instrument Co., Newark, N. J., indicator assemblies, $108,-129.
Yale & Towne Mfg. Co., Stamford, Conn., pumps and motors, padlocks, $156,-172.30.

Corps of Engineers Awards

Addressograph-Multigraph Corp., Multigraph Division, Washington, printing frames and whirler dryers, $4976.
Alban Tractor Co. Inc., Baltimore, construction machinery, rollers, $19,043.41.
Allis-Chalmers Mfg. Co., Milwaukee, tractors, $8036.
Alteneder, Theo., & Sons, Philadelphia, straightedges, scales, $44,523.75.
American Blue Print Co. Inc., New York, drafting instruments, $134,698.96.
American Fork & Hoe Co., Cleveland, shovels, $16,200.
American Steel & Wire Co., Cleveland, barbed wire, $376,050.
Anaconda Wire & Cable Co., New York, cable, $6278.40.
Armco International Corp., Middletown, O., ammunition storage units, $9860.
Atlas Powder Co., Wilmington, Del., cap crimpers and blasting machines, $75,-300.
Austin-Western Road Machinery Co., Aurora, Ill., railroad dump cars, $12,-193.
"Automatic" Sprinkler Corp., Youngstown, O., sprinkler systems for warehouses and annexes, Patterson field, Fairfield Air Depot, Osborn, O., $65,419.
Bausch & Lomb Optical Co., Rochester, N. Y., projectors and frames, $32,520.
Bowen & Co. Inc., Bethesda, Md., dividers, planimeters, $42,149.
Bruning, Charles, Co. Inc., New York, surveying instruments, $6605.50.
Buda Co., Harvey, Ill., diesel electric generator sets, $34,138.35.
Carpenter Construction Corp., Norfolk, Va., highway bridge, Great Bridge, Va., $214,312.
Chicago Bridge & Iron Co., Birmingham, Ala., erection of water tank, Advanced Twin-Engine Flying school, Columbus, Miss., $48,500.
Chicago Pneumatic Tool Co., St. Louis, pneumatic riveting hammers, Ft. Crook assembly plant, Nebraska, $96,-690.
Clark Tructractor Co., Battle Creek, Mich., Clark utilitruc with tools, $3954.46.
Cleveland Twist Drill Co., Cleveland, twist drills, $3874.20.
Commercial Enclosed Fuse Co., Hoboken, N. J., cartridge fuses, $4050.
Commercial Shearing & Stamping Co., Youngstown, O., ponton treadways and pins, portable bridges, $183,203.24.
Crown Iron Works Co., Minneapolis, portable bridges, $162,003.92.
Cummins Diesel Engine Corp., New York, generating sets, $237,451.73.
Cummins Engine Co., Columbus, Ind., furnishing electric power generating and distributing plant, Ft. Church, Rhode Island, $58,812.
Dietzgen, Eugene, Co. Inc., Chicago, dividers, rods and rules, $10,260.
Etnyre, E. D., & Co., Oregon, Ill., distributors, $3850.
Florence Pipe Foundry & Machine Co., Philadelphia, cast iron water pipe, U. S. Engineer warehouse, Kingston, Pa., $2100.
Freyn Bros. Inc., Indianapolis, storage racks, tanks, and grating, Fairfax Aircraft Assembly Plant, Kansas City, Kans., $58,085.
Galion Iron Works & Mfg. Co., Galion, O., roller repair parts, $3247.60.
General American Transportation Corp., Chicago, railroad tank cars, $1,287,000.
General Electric Co., Schenectady, N. Y., cable, $8350.
General Electric Supply Corp., Washington, electrical equipment, $2657.76.
Gibbons, Boyd H., Los Angeles, automobiles, Los Angeles engineer district, $4160.
Gilbert & Bennett Mfg. Co., Georgetown, Conn., wire netting, $25,066.
Greenville Steel Car Co., Greenville, Pa., fire control car, $199,230.
Haffner-Thrall Car Co., Chicago, flat railroad cars, $26,000.
Hime, J. R., Electric Co., Palm Beach, Fla., electric wiring and lighting facilities, Mobile Municipal Airport, Mobile, Ala., $16,285.
Industrial Construction Corp. Ltd., Los Angeles, monorail system, Aircraft Assembly Plant, Tulsa, Okla., $115,417.
Ingalls Iron Works Co., Birmingham, Ala., structural steel for two air corps hangars, two control towers, boiler house and extension to boiler house, Eglin field, Valparaiso, Fla., and Tyndall field, Panama City, Fla., $70,483.
Ingersoll-Rand Co., New York, spare parts, air compressors and accessories, nail drivers, circular saws, $49,206.90.
International General Electric Co. Inc., New York, generators and spare parts, $97,873.71.
Jahn, C. R., Co., Chicago, trailers, $176,-756.
Keuffel & Esser Co., Hoboken, N. J., map measurers, $4774.
Machinery Sales Co., Los Angeles, high speed jig borers with accessories, Aircraft Assembly Plant, Tulsa, Okla., $7905.
Mall Tool Co., Chicago, portable hand saws, repair parts, $34,685.13.
Mann, David W., Lincoln, Mass., protractors, $2835.
Manning, Maxwell & Moore Inc., Shaw-Box Crane & Hoist Division, Bridgeport, Conn., railroad drop table, $5160.
Marshall Supply & Equipment Co., Tulsa, Okla., turret lathes with equipment, Aircraft Assembly Plant, Tulsa, Okla., $25,944.
Matthews Electric Supply Co., Birming-

ham, Ala., electric cable, Brookley field, Mobile, Ala., $5750.
Medart, Fred, Mfg. Co., St. Louis, warehouse equipment, $2213.10.
Ohio Locomotive Crane Co., Bucyrus, O., locomotive cranes, $112,912.
O. K. Clutch & Machinery Co., Columbia, Pa., hoists and hand winches, $28,285.
O'Leary, Arthur J., & Son Co., Chicago, steel pickets and stirrups, $7215.45.
Onan, D. W., & Sons, Minneapolis, generator sets, $19,158.
Pacific States Cast Iron Pipe Co., Ironton, Utah, cast iron pipe, bell and spigot, Hill field, Ogden, Utah, $5622.49.
Paving Supply & Equipment Co., Washington, centrifugal pumps, $7939.40.
"Quick-Way" Truck Shovel Co., Denver, truck mounted cranes, attachments and trailers, $383,076.
Ransome Concrete Machinery Co., Dunellen, N. J., concrete road pavers, $20,675.
Ruedy, Eugene, Co., Portland, Oreg., gasoline unloading facilities, pump line, pump house, Pendleton airfield, Pendleton, Oreg., $21,657.45.
Seaman Motor Co., Milwaukee, pulvimixers, $10,210.90.
Simplex Wire & Cable Co., Cambridge, Mass., cable, Middletown air depot, Middletown, Pa., $6683.90.
Snead & Co., Jersey City, N. J., ponton sets, $247,104.
Sperry Gyroscope Inc., Brooklyn, N. Y., searchlight equipment, $49,000.
St. Louis Car Co., St. Louis, ammunition cars, $744,600.
Stott, Charles G., Co. Inc., Washington, lettering pens, $21,000.
Sullivan Machinery Co., New York, air compressors, $7224.
Trailer Co. of America, Cincinnati, semitrailers and dollies, $1,126,778.25.
Travelcar Corp., Detroit, semitrailers, $14,625.
Triumph Mfg. Co., Chicago, blasting galvanometers, $15,300.
Upson-Walton Co., Cleveland, steel blocks, $6016.20.
Virginia Bridge Co., Roanoke, Va., portable bridges, $104,592.
Wallace & Tiernan Co. Inc., Belleville, N. J., chlorine cylinders, illuminators, $9839.
Weil, J. H., & Co., Philadelphia, drawing instruments, and rulers, thumb tacks and templates, $8208.50.
Well Machinery & Supply Co. Inc., Ft. Worth, Tex., bench grinders and adjustable lamps for same, Aircraft Assembly Plant, Tulsa, Okla., $2325.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., panel resistors, power plant equipment, $10,683.
Westinghouse Electric Supply Co., St. Louis, copper wire and cable, Scott field, Illinois, and Jefferson barracks, Missouri, $12,853.42.
Whitcomb Locomotive Co., Rochelle, Ill., locomotives, $5372.
Wood Roadmixer Co., Alameda, Calif., roadmixers, $29,961.
Yale & Towne Mfg. Co., Philadelphia, trucks, hoists, $6565.50.

Medical Corps Awards

American Sterilizer Co., Erie, Pa., tables, $2372.80.
Cleveland Dental Mfg. Co., Cleveland, dental equipment, $26,686.50.
Dallett Co., Philadelphia, chisel blanks, $1950.
Girard Dental Mfg. Co., Philadelphia, dental equipment, $9271.
Haslam, Fred, & Co. Inc., Brooklyn, N. Y., metcalf sets, $258,109.
Landers, Frary & Clark, New Britain, Conn., sabatier knife, $1291.50.
Legion Utensils Corp., Long Island City, N. Y., mess equipment, $16,591.94.
Liebel-Blarsheim Co., Cincinnati, tables, $35,750.
Metal Office Furniture Co., Grand Rapids, Mich., nurses' desks, $38,269.50.
Penn Surgical Mfg. Co. Inc., Philadelphia, forceps, retractors, surgical instruments, $56,800.
Picker X-Ray Corp., Cleveland, X-ray field units, $535,500.
Ransom & Randolph Co., Toledo, O., dental burs, $30,361.25.
Schaar & Co., Chicago, laboratory equipment, $4708.10.
Schultes, H. W., Brooklyn, N. Y., forceps, $2408.
Sklar, J., Mfg. Co., Long Island City, N. Y., metcalf sets, surgical instruments and scissors, $506,005.30.
Standard X-Ray Co., Chicago, X-Ray equipment, $78,075.
Swartzbaugh Mfg. Co., Toledo, O., electric food carts, $12,845.
Union Dental Instrument Mfg. Corp., Philadelphia, dental equipment, $30,901.50.
Weck, Edward, & Co. Inc., Brooklyn, N. Y., forceps, $52,940.

Quartermaster Corps Awards

Autocar Co., Ardmore, Pa., tractor-trucks, $962,268.
Marietta Mfg. Co., Point Pleasant, W. Va., coast artillery boats, $4,560,000.

Signal Corps Awards

Calvin Mfg. Corp., Chicago, mobile frequency modulation units, $3820.
Cardwell, Allen D., Mfg. Corp., Brooklyn, N. Y., communications equipment, $83,809.25.
Conckey, H. D., & Co., Conco Engineering Works Division, Mendota, Ill., reels, $8790.
Homelite Corp., Port Chester, N. Y., power units, $1635.62.
Leich Electric Co., Genoa, Ill., switchboards and parts, $129,590.
Pioneer Gen-E-Motor Co., Chicago, dynamotor units and spare parts, $75,014.25.
Rauland Corp., Chicago, transmitting equipment, $210,052.50.
RCA Mfg. Co. Inc., Camden, N. J., transmitters, $1,295,127.96.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., switchboards and component parts, $100,702.81.
Western Electric Co. Inc., New York, telephone central office equipment, microphones and component parts, cases, racks, $46,852.72.

Celebrate Tank Work at Lebanon with Picnic and Parade

■ Eight hundred fifty men, who are making tank armor plate and transmission cases, and their families saw their craftsmanship in a completed M-3 (13½-ton) light tank brought especially from the American Car & Foundry, Berwick, Pa., plant to the second annual picnic of the Lebanon Steel Foundry, Lebanon, Pa., last week.

Manufacturers are being encouraged to give workers and their families a chance to see close-up the defense articles to which their work contributes.

"By displaying a finished tank," said W. H. Worrilow, president, Lebanon Steel Foundry, "we are getting right down to the people (foundrymen) who are responsible for the success of our program."

Lebanon Steel, which began defense production six months ago, is operating 90 per cent on armor castings, a new development in armor manufacture. Company is working three shifts, seven days a week, and is rushing to completion a large expansion in the foundry and a new laboratory.

T. J. Quinn, secretary, presented gold buttons to 43 men who have been with Lebanon 20 years or more.

Lieut. Col. D. N. Hauseman, commanding officer, Philadelphia Ordnance District, in charge of $400,000,000 of war work, called upon women to encourage their men to keep up and increase this important armor output.

■ Pictured with the M-3 tank are the "quintuplets" of the Lebanon Steel Foundry, the five Wagner brothers, Charles, Harry, Paul, Arthur and Earl. These brothers have a total service record of 98 years with the company

Defense Service Office Lists Many Subcontracting Opportunities

■ CLEVELAND Defense Contract Service Office last week issued the following list of subcontract and prime contract procurement opportunities in various cities, available to qualified manufacturers whose facilities are suitable or could be adapted to defense production.

All firms and individuals having automatic screw machines or hand screw machines that are not working to capacity 20 to 24 hours per day on government work are requested to file a list of their facilities with the Service. Inquiries for the district should be sent to the regional office, Federal Reserve Bank Building, Cleveland.

Classification Number	SUBCONTRACTORS WANTED Item
2-711	Schenectady, N. Y., manufacturer requires pooled facilities for pouring and machining large gray iron castings up to 45 tons individual weights. Annealing furnace, to take castings up to 14 feet x 14 feet x 5 feet, which requires equipment for vibrating. Machining requires 20-foot boring mill for one operation, 14 feet for balance. Horizontal boring mill, bar 8 feet above floor. Planer 15 feet between uprights. Ten-foot radial drill and smaller equipment. Priority A-1-a.
6-630	Chicago manufacturer wants to subcontract grinding of gears, having 20 degrees pressure angle and involute stub teeth on gear grinding machines for 8/10 diametric pitch, 28 to 42 teeth, P. D. from 3.5 to 4.6. Requires 72 to 180 per day.
9-623	Cleveland manufacturer has work to subcontract on steel and aluminum parts for aircraft. Rough and finished machine drawings furnished for most parts and work may be sublet for rough finish only if desired. Weight of parts ranges from 1.5 pounds to 150 pounds each. Most work requires boring, turning on heavy turret lathes, or boring and turning on vertical boring mill, milling machines, internal and external grinding, 4-foot arm radial drill press and heat treating facilities.
10-729	Akron manufacturer has work to subcontract for small forgings. This requires die sinking facilities, small milling machines and heat treating equipment.
11-729	Eastern Ohio manufacturer has subcontract for work of rough machining, heat treating and finish machining of alloy steel 3-inch face ring gears, 72-inch diameter. Also similar operations on cast steel segmental gear. Monthly requirement.
12-801	Cleveland manufacturer has large quantity of steel forgings approximately 3 inches diameter x 5½ inches long to be rough machined. This is an opportunity for a shop having Monarch or equal lathe for production work.
13-711	An Ohio manufacturer desires to subcontract the complete manufacturing of a small precision built aircraft device requiring a well-balanced shop of small and medium size tools. Steel, aircraft aluminum, and bronze materials requiring internal, external and surface grinding to close tolerances. Delivery requirements will be continuous.
14-717	A Cleveland manufacturer desires to subcontract machine work on a number of parts up to 6 inches in diameter. Materials are die cast aluminum, magnesium and steel. Various operations required on some parts using multiple drill presses, lathes, grinders, and broaching machine for splining small shafts. Other parts require turning only.
15-804	Brooklyn manufacturer desires to subcontract machining work on 30-inch x 30-inch x 12-inch box shaped, light sectioned, sand cast, heat treated aluminum with silicon content ranging from 7 to 12 per cent. Operations will include layout, milling, drilling, reaming, boring, and tapping. Equipment desired for this work includes No. 330 Giddings & Lewis boring bars, 36-inch diameter index table, Pratt & Whitney profilers (new type with fast spindles), open side, milling type Gray planers, 48-inch x 48-inch x 8-foot traverse; 1 rail and 1 side head, 1 planer with swivel head on cross rail, radial drills with 4-foot or longer swing, single and multiple spindle drill presses up to 1 inch capacity. Delivery requirements up to 1800 pieces per month.
16-804	Cleveland manufacturer desires to subcontract work of cutting and heat treating 20 degree helical gears. Sizes up to 12 inches O. D. Delivery requirements 800 pieces per month. Priority A-1-a.
17-728	Ohio manufacturer desires to subcontract work of building fixtures for airplane wing assembly. This 30-foot structure made of steel, structural and steel plate requires welders, shapers, drills, etc. Delivery requirements indefinite as yet; however, current requirements call for 62 for first operation.
18-809	Western Ohio manufacturer desires to subcontract internal grinding operations on spindle bearings, gears, and small parts 1 to 4 inches in length. Concerns with No. 81 Heald, No. 3 Bryant, or its equivalent have opportunity of this attractive work. Quantities to 5000.
19-807	A Texas shipbuilding company desires to subcontract work of machining, grinding and polishing and, if desired, dynamic balancing of a number of manganese bronze three blade propellers. Approximate dimensions: 11.5-foot diameter, 4.5-foot hub thickness. Approximate weight 15,000 pounds each. This work continuous for deliveries up to 1943.
20-811	A St. Louis manufacturer requires first class toolmaking establishment to fill a demand for dies, punches, guide bushings, and small parts for making .30 and .50 caliber ammunition. Top flight lathe, internal, and external grinding equipment is a necessity to undertake this work. This material should not be confused with commercial diemaking. The design is quite simple. The dimensions must be held within close limits. Heat treating and hardening directions are given and must be adhered to. This is a very desirable contract for a medium-sized toolshop, the quantities worthwhile, and deliveries for fall and winter of 1941 and 1942.
21-815	Delaware manufacturer has work to subcontract for 500,000 adapters, 3.31 inches outside diameter, with tolerances 0.004-inch. Will require boring, turning, facing, threading, drilling and punching. Materials to consist of carbon steel 80,000 pounds tensile. Delivery requirements as yet indefinite.
22-820	Eastern Ohio manufacturer wants to subcontract machine work on 200 forged steel rolls 12 inches diameter x 45 inches long. Bearings and caps. Will require turning, milling, and drilling. Materials consist of 30-40 C forged steel (rollers) cast steel bearing and caps. Bronze bushings. Materials are furnished and delivery requirements are to be completed by Sept. 30.
23-823	Indiana manufacturer has work to subcontract for dies, jigs, and fixtures (small). General equipment necessary for above. Will furnish material, if necessary. Complete tool drawings will be furnished. Will require 1000 manhours or any part per week.
25-823	Indiana manufacturer requires subcontractors for gun directors. Fifty sets of parts (20 castings per set). Equipment to consist of horizontal boring mill, jig borers, milling machines and radial drill presses. Materials consist of steel, bronze and aluminum.
26-823	Indiana manufacturer wants to subcontract housing and end frames for high power propeller motors. Will require equipment of No. 4 P. and J. automatic chucking turret lathe and drill. Operations are boring, facing, drilling and tapping. Materials consist of magnesium, cast steel, and aluminum. Permanent mold, sand and die casting—all furnished, together with jigs and fixtures. Quite close finish is important.

$17,000,000 Ammonia Plant Contract Awarded

■ Hercules Powder Co., Wilmington, Del., last week awarded a $17,000,000 contract for design and construction of an ammonia plant to Bechtel-McCone-Parsons Co., Los Angeles, according to John A. McCone, president of the engineering firm.

Plant capacity is to be 150 tons of ammonia daily, entire output to be used in manufacture of smokeless powder and other explosives for the War Department, with whom Hercules has an operating agreement. Construction of the plant, at an as yet unannounced site "in the Middle West", is scheduled to start within 30 days.

Over 10,000 Telegrams Daily; War-Time Tempo in U. S. Steel Organization

■ "WE NO longer need stenographers; we need telegraph and telephone operators," said a manufacturer at a recent meeting of a trade association. He was referring to the increased tempo of business due to the national armament program, requiring immediate communication, instead of letter writing.

Fact is many large companies today depend more on wire service than the mails for fast transactions, especially in intercompany affairs, and are using letters only where necessary for confirmation of wired messages.

An outstanding example of this modern system is that of the United States Steel Corp. Its leased wire network handles an average of 230,000 messages per month, between 61 offices in 46 cities.

U. S. Steel's modernized system dates from April 1, 1939, when during the first month 106,680 messages were sent. The number has been stepped up almost continuously to 242,625 last June, last count available.

This is an average of 10,549 messages a day, of which approximately 80 per cent originate and end within the corporation's subsidiaries. Counting each switch as a handling, and each receipt as well, there were approximately 30,000 handlings per day.

It takes 158 employes to operate the system, of whom 28 are part-time operators, doing other office work between messages.

At U. S. Steel's invitation many customers have inspected the central office installations in New York, Pittsburgh, Cleveland and Chicago, to promote a better appreciation of the psychology of service. Thirteen subsidiary companies are in the hook-up.

The network has handled more than 5,000,000 messages since its installation two years ago. It is claimed that the system is "the only complete one where a telegram is typed only once and thereafter moves throughout an entire network, passing through a number of reperforator switching centers, without the necessity of ever typing it again." Elimination of manual handling of telegrams, once they have been transmitted by the originating office, increases speed of service.

One of the main features is the printer reperforator which makes it possible for anyone to read the incoming perforated tape at a switching center, and thus quickly identify the beginning and end of each message, as well as its destination. Another feature provides numerical sequence on all messages sent over circuits controlled by reperforator transmitters, thus avoiding any possibility of a lost message.

The system has diminished the amount of mail correspondence, and, according to the report of one affiliated company, "at a considerable saving."

Among other "statistics" of U. S. Steel's system are: Miles of leased wire, 4766; miles of leased communication channels, 15,214; number of originating teleprinter positions (not including 14 receiving only positions), 88; number of switching positions, 101.

Messages are receivable without attendants being at the incoming station. They are "stored" at switching centers or destinations until the office force arrives on the job. This is important because of time differentials. Simultaneous communication between Pittsburgh and San Francisco is limited to four hours per day.

The system was planned, engineered and installed by Western Union engineers, working with R. W. Baridon, supervisor of U. S. Steel's leased wire system, in co-operation with H. C. Stevens, J. H. Brooks and C. E. Roney, managers of office services of subsidiary companies.

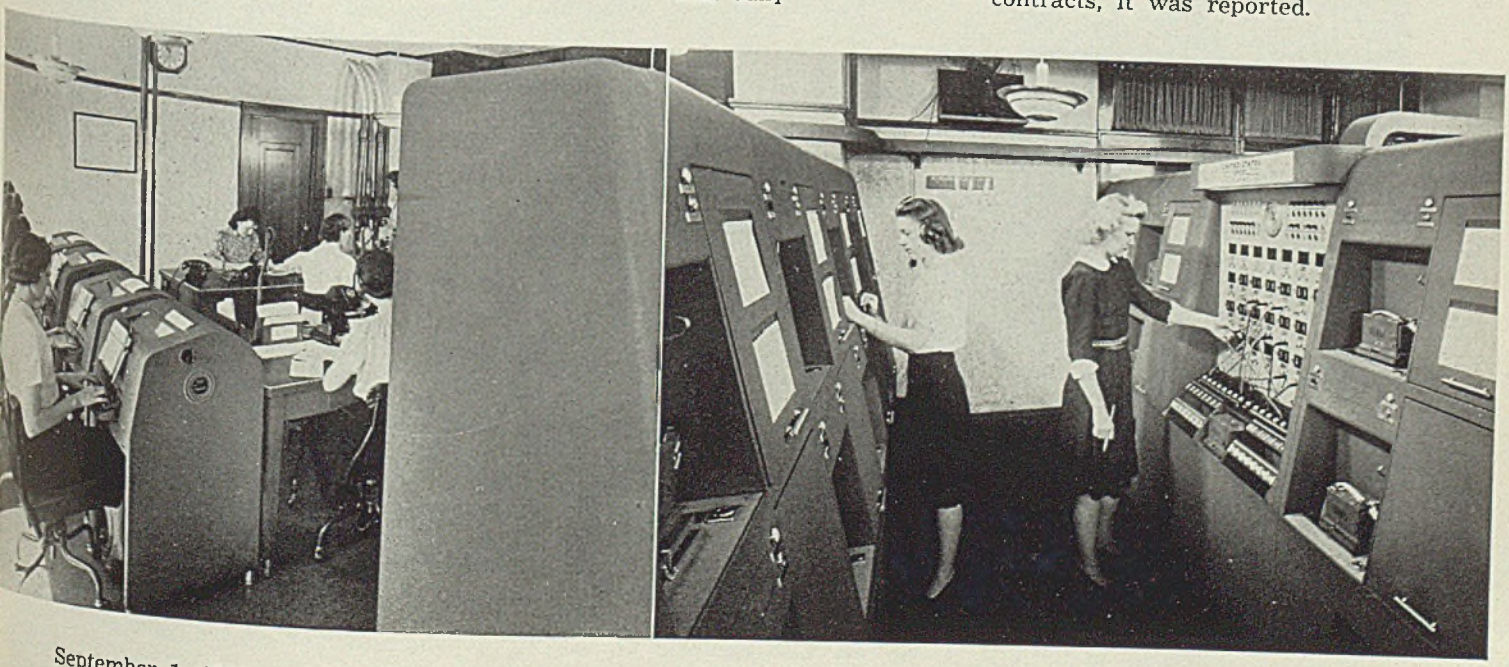
Shell Award Forestalls Utensil Plant Shutdown

■ War Department last week authorized the first contract to be awarded upon advice of the Contract Distribution Division, recently created in the office of Under Secretary of War.

The division was designed to bring more manufacturers, especially the smaller ones, into defense production.

The contract, for 1,000,000 cases for 37 mm. shells, was authorized for award to Aluminum Goods Mfg. Co., Manitowoc, Wis. This firm, with about 4000 workers, formerly manufactured aluminum kitchen utensils and is the principal source of employment in the town.

Upon completion of this initial order, the company will be equipped to handle additional ammunition contracts, it was reported.



■ Typical equipment installation in a United States Steel subsidiary's communications office. Urgency of the war and preparedness situation has more than doubled the number of messages sent daily

Canada Organizing Steel Priorities; Clamps Down on Civilian Consumption

TORONTO, ONT.

■ FOLLOWING organization of an Advisory Committee on Steel, headed by T. N. Hutchison, president, Drummond, McCall & Co. Ltd., Montreal, Que., it was announced last week that drastic restrictions on civilian consumption are to be put in effect immediately, with priority control of all steel used or produced in this country.

Canada is faced with a serious shortage of steel despite capacity operations of its own mills and large imports from the United States. It is said to be jeopardizing the dominion's war industry and every phase of industrial activity.

Three Canadian industrial groups directly affected:

(a) Vital war industries, such as shipbuilding, which delayed in establishing priority ratings in the United States.

(b) Miscellaneous war projects and allied industries as railways, new power plants, mines, etc., which may now have difficulty in establishing adequate priorities.

(c) Civilian consumers that will have to face elimination of United States importations and curtailment of Canadian supplies.

Department of Munitions and Supply, in the week ending Aug. 12, awarded 3452 contracts totaling $10,575,013. Orders valued at $355,000 were placed with United States companies. Orders included:

Shipbuilding: S. G. Mason, Tancook, N. S., $30,000; Peterborough Canoe Co. Ltd., Peterborough, Ont., $10,434; Taylor Boats, Port Stanley, Ont., $8040; Norse Boat & Ski Co., Penetanguishene, Ont., $9125; Empire Brass Mfg. Co. Ltd., London, Ont., $6000; Anaconda American Brass Ltd., New Toronto, Ont., $5872.

Land transport: Arlington Cycle & Sports Ltd., Montreal, Que., $10,390; Ford Motor Co. of Canada Ltd., Windsor, Ont., $746,700.

Aircraft: Fairchild Aircraft Ltd., Longueuil, Que., $472,840; Noorduyn Aviation Ltd., Montreal, $130,054; Overseas Requisition, England, $18,882; Link Mfg. Co., Gananoque, Ont., $63,298; Belleville Foundry Ltd., Belleville, Ont., $5443; Fleet Aircraft Ltd., Ft. Erie, Ont., $11,321; National Steel Car Corp. Ltd., Malton, Que., $57,752; MacDonald Bros. Aircraft Corp. Ltd., Winnipeg, Man., $861,789.

Instruments: Overseas Requisition, England, $18,000; Northern Electric Co. Ltd., Ottawa, Ont., $7257; Canadian General Electric Co. Ltd., Ottawa, $73,277.

Electrical equipment: Canadian National Telegraph Co., Montreal, $7120; R. C. A. Victor Co., Montreal, $23,061; Canadian Marconi Co. Ltd., Montreal, $500,964; Northern Electric Co. Ltd., Ottawa, $9288; Renfrew Electric & Refrigerator Co. Ltd., Renfrew, Ont., $5832; Burlec Ltd., Scarboro Junction (Toronto), $15,400; Research Enterprises Ltd., Leaside, (Toronto), $5000; Canadian Telephone & Supplies Ltd., Toronto, $5078; D. N. Fraser Ltd., Toronto, $6048; Smith & Stone Ltd., Georgetown, Ont., $5346; Canadian Blower & Forge Co., Kitchener, Ont., $20,212.

Machinery: T. E. Ryder Machinery Co., Montreal, $11,777; A. R. Williams Machinery Co., Toronto, $11,840; Cleveland Pneumatic Tool Co. of Canada Ltd., Toronto, $14,760; B. C. Equipment Co., Vancouver, B. C., $10,480.

Ordnance: Climax Co. Ltd., Montreal, $57,850; Surgical Supplies, Toronto, $39,340; Atlas Steels Ltd., Welland, Ont., $197,100; Hill-Clark-Francis Ltd., New Liskeard, Ont., $11,700; Ford Motor Co. of Canada Ltd., Windsor, Ont., $1,203,012.

Munitions: Creighton & Smith, Fredericton, N. B., $265,663; International Flare Signal Co., Waterloo, Que., $17,600; Canadian Car Munitions, Montreal, $9750; Dominion Arsenals, Ottawa, $17,800; Oshawa Engineering & Welding Co., Oshawa, Ont., $105,570; W. H. Banfield & Sons Ltd., Toronto, $20,265; Aluminum Goods, Toronto, $64,800; Truscon Steel Co. Ltd., Walkerville, Ont., $61,827.

Metals: Consolidated Mining & Smelting Co. Ltd., Montreal, $33,110.

War construction projects: M. R. Chappell, Sydney, N. S., $91,000; Foundation Co. of Canada Ltd., Montreal, $68,000; Magloire Couchon Ltd., Quebec, Que., $129,260; Stewart Construction Co., Sherbrooke, Que., $210,672; Dufferin Paving Co. Ltd., Toronto, $132,592; Hornstrom Bros., Calgary, Alta., $124,324; Bennett & White Construction Co. Ltd., Calgary, $244,348; Northern Construction Co. Ltd., Vancouver, B. C., $84,122.

Miscellaneous: Manitoba Bridge & Iron Works, Winnipeg, Man., $8507; Dominion Bridge Co. Ltd., Lachine, Que., $73,572; Howard Furnace Co. Ltd., Toronto, $5785; Lundy Fence Co. Ltd., Toronto, $6291; Horton Steel Works Ltd., Toronto, $26,675; International Flare Signal Co. Ltd., Waterloo, Que., $62,714; T. W. Hand Fireworks Co., Cooksville, Ont., $91,904; Hy-Grade Metal Products Co., Guelph, Ont., $6120; Canadian Automotive Trim, Windsor, $33,518; Barr & Anderson, Vancouver, B. C., $6000; Trotter & Morton Ltd., Calgary, $40,000; Connolly & Twizell, Montreal, $112,000; McEachren & Strachan, Amherst, N. S., $41,000; Garth Co. Ltd., Montreal, $38,000.

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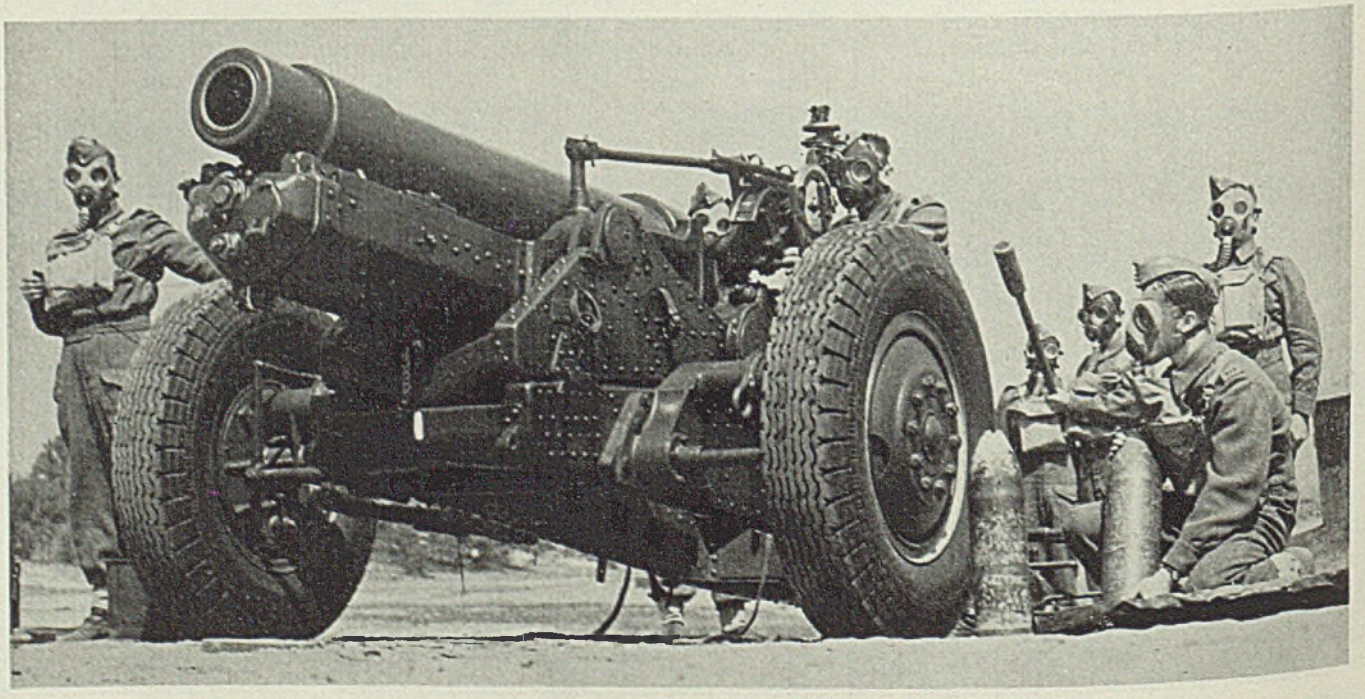
In the preceding week 3095 contracts with total value of $30,052,484 were reported placed, including an order to a Brazilian company for electrical equipment. Awards included:

Shipbuilding: Marine Industries Ltd., Montreal, Que., $23,684,000; Burrard Dry Dock Co. Ltd., Vancouver, B. C., $17,258,-

(*Please turn to Page* 106)

■ **Howitzer manned by artillerymen equipped with gas respirators, at Petawawa training camp, Canada. The Dominion government is calling for more recruits to man guns like this.**
Photo passed by Canadian censor



On the Record: How Compulsory Unionism Engulfed Federal Corp.

■ *Excerpts from a letter by L. H. Korndorff, president, Federal Shipbuilding & Dry Dock Co., Kearny, N. J., to President Roosevelt, dated Aug.* 16:

"On July 26th, 1941, two members constituting a majority of (a) Division of the Mediation Board, one additional member dissenting, made a recommendation that this company contract with the union that any employe who is now a member of the union, or who hereafter voluntarily becomes a member, shall, as a condition of continued employment, maintain membership in the union in good standing.

"This company on July 30th, 1941, advised the Mediation Board that it could not accept this recommendation of the majority of such Division, stating that such recommendation is contrary to the fundamental principle that the right to work is not dependent upon membership or nonmembership in any organization . . .

"We particularly believe that in this crisis no union should be permitted to use the present national emergency as a club to force us, or any other shipyard or defense industry, to accept the closed shop in any form, against its will and contrary to long established open shop policy.

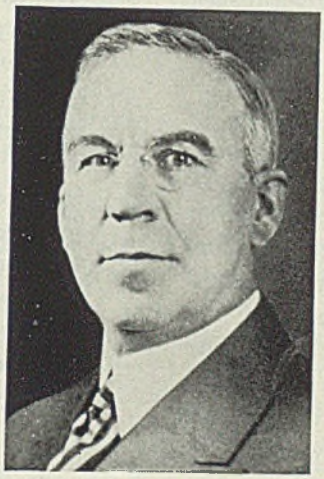
"So far we have been unable to secure any thorough discussion in Washington of these far reaching matters, which, I believe, are of so much importance to all of us. The position of the governmental authorities seems to be that unless this company accepts the recommendation of the Division of the Mediation Board, irrespective of whether such recommendation is sound and in the public interest or not, the government through some kind of commandeering order will take over our shipyard, the second largest on the Atlantic coast. . . ."

Excerpts from a letter by Mr. Korndorff to President Roosevelt, dated Aug. 22:

"As a consequence of your intervention, negotiations were resumed in Washington during the past three days between representatives of this company and of the Industrial Union of Marine and Shipbuilding Workers of America in an effort to settle the strike which has closed down our great shipyard at Kearny, N. J., since August 6th last . . .

"The situation stands thus:

"The union refuses to accept anything less than a contract containing a clause requiring this company to enforce such 'maintenance of membership' in the union, which has been classified by the Department of Labor as a modification of the closed shop. We cannot make a contract containing such a clause without sacrificing the fundamental principle of the right of the American worker to decide for himself whether or not he wants to join a union and to remain a member of a union. We believe this principle, which we are unwilling to sacrifice, to be vastly more important to this nation than the Federal Shipbuilding and Dry Dock Company . . .



L. H. Korndorff

Excerpts from a statement by Mr. Korndorff to employes of the company, dated Aug. 25:

"This change in the management of the shipyard (control by the government—Editor) has been brought about solely because of the unwillingness of this company to accede to the demand of the union that we should agree to discharge from our employ any worker, a member of the union now or hereafter, who failed to pay his union dues or otherwise failed to maintain his membership in the union in good standing . . .

"It is naturally a great regret to the officers of the company that the government has taken over the yard. But we must now all accept that action in good spirit. There must be no recriminations, and no ill-will. Let all carry on their work with energy and spirit in the interest of national defense."

From an Associated Press dispatch from Washington, dated Aug. 26:

"Mr. Roosevelt told a press conference . . . the next step would be to list the methods of operation, then talk the matter over with the owners.

"To a question whether the Navy would abide by recommendations of the National Defense Mediation Board in directing activities at the yard, Mr. Roosevelt said **that depended on who operated it.**"

Steel Pays $3 Taxes For Each $1 Dividend

■ Reflecting higher costs of operation, the total net earnings of steel companies in the first half of 1941 were only 1 per cent above the total earned in the last half of 1940, despite the fact production rose 9 per cent to near-capacity volume, according to the American Iron and Steel Institute. Figures were obtained from 80 companies representing over 90 per cent of the industry's steelmaking capacity.

Total earnings of $174,105,000 after all charges but before dividends were shown by these companies in the first six months, while steel production was averaging 98 per cent of capacity. Earnings during the period were at an annual rate of less than 8.9 per cent on investment.

Approximately the same group of companies, operating at 92 per cent of capacity in the last half of 1940, earned nearly $172,000,000, representing an annual rate of 9.3 per cent on investment. In the first six months of last year, at 72 per cent operations, their net earnings totaled $100,300,000, an annual rate of 5.7 per cent on investment.

Steel wages, taxes and raw materials costs have been substantially higher in 1941 than in the year before, and there has been no offsetting advance in the average price of steel products as quoted in trade papers.

Steel company taxes in the first six months of this year amounted to 29 cents per dollar of total payrolls, compared with 22 cents in taxes per dollar of payrolls in the last half of 1940, and 15 cents per dollar of payrolls in the first half of last year.

In the first half of 1941, dividends represented 10 cents per dollar of payrolls, against 11 cents in the preceding half-year, and 11 cents per payroll dollar during the first six months of 1940.

Total taxes during the first half of the current year were nearly three times the total which was paid out in dividends.

STEEL

Labor Marching for Democracy?

■ "LABOR Marches for Democracy Labor Day!"

Such is the inscription on banners which adorn the downtown streets of a Midwestern industrial city. Doubtless similar banners and slogans are used in other places throughout the nation where exultant union members will parade Sept. 1.

• • •

To millions of the marchers the thought that "labor marches for democracy" is not incongruous. Individually the men and women who belong to unions are as patriotic as any other group of Americans.

But is this true of them collectively? As a class, are union members as unselfishly loyal as they are individually? Are the unions, as organizations, truly working for democracy?

Unfortunately the record on these points is damaging to the cause of the legitimate labor movement. It is damaging on two counts.

First, the number of work stoppages due to jurisdictional disputes and to similar issues not involving hours, wages or working conditions has been excessive enough to raise the honest question as to whether union or nation comes first in the minds of union leaders in the present emergency.

On this score, the slogan "Labor Marches for Democracy" is ironic, to say the least.

Secondly, the labor movement—measured by its acts of the past eight months—is tending away from instead of toward democracy in the organization of labor.

This trend toward the absolute destruction of democracy within unions is one of the most dangerous threats to American unity today. Recent events have conspired to place union dictatorship in a position not only to deprive the union member of his constitutional rights but also to threaten the sovereignty of the federal government.

The potentials for these deplorable eventualities are found in the case of the Federal Shipbuilding & Dry Dock Co., but they were brewing long before that crisis developed. They are part and parcel of the determination of some union leaders to push on aggressively until a closed union shop has been sanctioned as national policy.

However, the Federal case provides a golden opportunity for a showdown. The government now is the employer.

• • •

If the government says to Local 16 of the Industrial Union of Marine and Shipbuilding Workers of America that as employer it will not discharge a faithful worker just because he is not in "good standing" in the union, the swing away from democracy in unions may be checked.

But if the government accedes to Local 16, then every local in the country will demand a closed shop.

That will mean that the right of man to work is controlled by the whim of the officers of local unions. It will mean that the government has yielded its sovereignty to a union local.

President Roosevelt may have decided this issue by the time this page is read. If he says "No" to Local 16, labor may still be able to "march for democracy." If he says "yes," democracy in this country may die.

E. L. Shaner

EDITOR-IN-CHIEF

Sept. 1, 1941

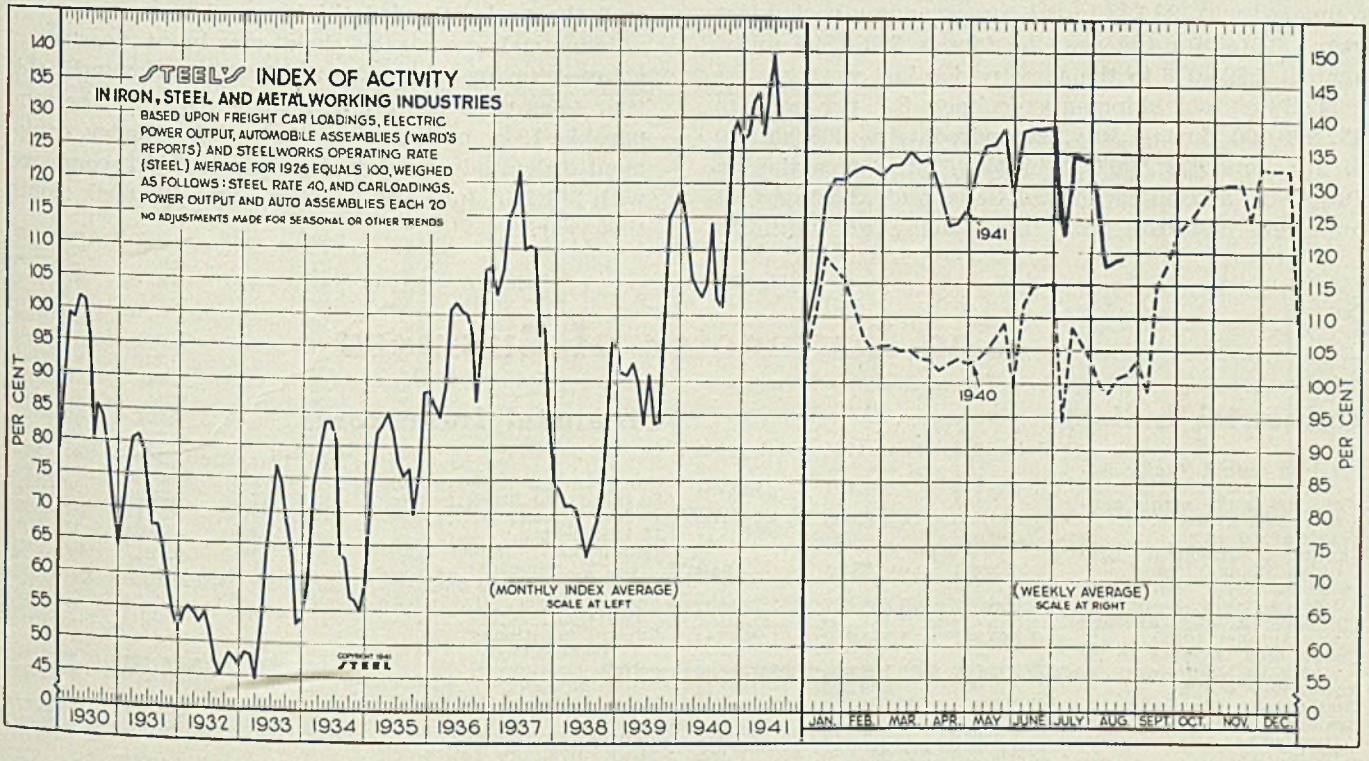
The BUSINESS TREND

Index of Activity Records Slight Gain

■ UPWARD trend of industrial production is expected to be temporarily halted by the shortages of raw materials and dislocations in production schedules resulting from the changeover of important industries from civilian to defense activity. However, production of durable goods will attain a new high plateau late this year as new plants now under construction are brought into service.

During the week ended Aug. 23 STEEL'S index of activity extended the gain recorded in the previous week to reach 119.5. This is a gain of 0.2 point over that registered during the week ended Aug. 16 and compares with 101.4 in the like 1940 period. Indications point to a further advance in the index during the week ended Aug. 30, followed by a temporary sharp dip over the Labor Day week. Currently the index is well below the peak established during June, due chiefly to the normal seasonal decline in automobile production.

Steelmaking operations advanced one-half point to 98.5 per cent during the week ended Aug. 23, compared with 90.5 in the same week a year ago. The



STEEL'S index of activity gained 0.2 point to 119.5 in the week ended Aug. 23:

Week Ended	1941	1940
June 7	138.4	111.9
June 14	138.7	114.6
June 21	138.7	114.8
June 28	138.8	115.3
July 5	122.9	94.2
July 12	134.5	108.5
July 19	134.1	106.0
July 26	133.3	103.4
Aug. 2	123.7	99.7
Aug. 9	118.1	98.4
Aug. 16	119.3	100.8
Aug. 23	119.5	101.4

Mo. Data	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930
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
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
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
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
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	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8
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
Aug.	.....	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4
Sept.	.....	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7
Oct.	.....	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8
Nov.	.....	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0
Dec.	.....	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64 3

American Iron and Steel Institute reports steelmaking capacity has been increased 2,000,000 tons during the first half this year, making the total capacity 86,148,700 tons as of June 30, or a gain of 18 per cent over 1929 and 40 per cent above that reported in 1918. Based on the new capacity figures, the national steel rate is at a slightly lower level of approximately 96.5 per cent.

Revenue freight carloadings moved slightly higher during the latest period to 899,740 cars, compared with 890,374 the preceding week and 908,664 during the week ended June 28, which was the peak freight movement thus far in 1941.

Automobile assemblies held steady during the period ended Aug. 23 at the 45,000 cars per week pace, compared with 23,732 in the corresponding period last year. Total for the year to date is 3,764,595 units, against 2,894,073 in the same period last year.

Machine tool shipments declined 8.7 per cent to $57,900,000 during July, compared with $63,000,000 in June and $60,800,000 in May. The recession in July was attributed to vacations and shortages of materials resulting from the placing of additional items under mandatory priorities. July output, however, was 83.8 per cent over the July, 1940, total of $34,500,000. In the first seven months this year production has aggregated $405,800,000, an increase of 92.4 per cent over that recorded in the same period in 1940. Production currently is said to equal or exceed the peak recorded this year.

Industrial gear sales held steady at near-record volume during July. For the first seven months this year sales were 123 per cent above those in the comparable 1940 period. The index of foundry equipment orders advanced during July to 358.1, compared with 281.1 in June and 377.2 in April, the peak month this year.

Where Business Stands

Monthly Averages, 1940 = 100

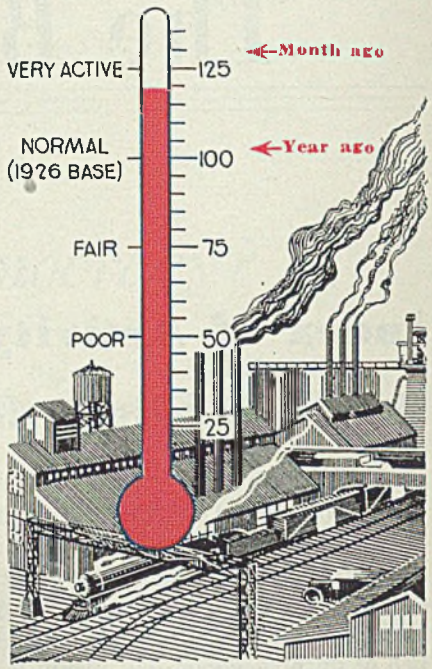
	July, 1941	June, 1941	July, 1940
Steel Ingot Output	120.4	123.8	101.1
Pig Iron Output	120.0	118.5	102.2
Building Construction	173.0	161.5	119.5
Auto Output	118.4*	138.1	63.0
Freight Movement	122.9	125.6	101.0
Wholesale Prices	112.6	110.7	99.0

*Preliminary.

Industrial Weather

TREND:

Downward



The Barometer of Business

Industrial Indicators

	July, 1941	June, 1941	July, 1940
Pig iron output (daily average, tons)	153,749	151,701	130,984
Iron and steel scrap consumption (tons)	4,415,000	4,406,000	3,526,000
Gear Sales Index	298	299	141
Foundry equipment new order index	358.1	281.1	194.4
Finished steel shipments (Net tons)	1,666,667	1,668,637	1,296,887
Ingot output (average weekly; net tons)	1,543,367	1,585,252	1,295,164
Dodge bldg. awards in 37 states ($ Valuation)	$577,392,000	$539,106,000	$398,673,000
Automobile output	463,000*	546,274	246,171
Coal output, tons	43,300,000	42,774,000	35,890,000
Business failures			
Number†	970	1,119	1,114
Liabilities†	$9,449,000	$10,065,000	$13,734,000
Nat'l Ind. Conf. board (25 industries, factory):			
Av. wkly. hrs. per worker	41.7	41.3	38.0
Av. weekly earnings	$34.11	$33.12	$28.23
Cement production, bbls.†.	15,222,000	14,732,000	12,490,000
Cotton consumption, bales†	875,137	918,902	565,416

†June, May and June respectively.
*Preliminary.

Foreign Trade

	July, 1941	June, 1941	July, 1940
Exports	$337,745,000	$384,637,000	$349,728,000
Imports	$279,536,000	$296,930,000	$211,425,000
Gold exports	$7,000	$5,000	$1,249,000
Gold imports	$30,719,000	$34,835,000	$1,164,224,000

Financial Indicators

	July, 1941	June, 1941	July, 1940
Car loadings (weekly av.)	859,298	878,000	706,438
30 Industrial Stocks‡	127.57	121.57	119.46
20 Rail stocks‡	29.60	28.11	24.66
15 Utilities‡	18.48	17.61	20.15
Commercial paper rate (N. Y., per cent)	½–⅝	½–⅝	½–⅝
*Com'l. loans (000 omitted)	$10,572,000	$10,250,000	$8,517,000
Federal Reserve ratio (per cent)	91.0	91.1	89.2
Capital flotations: (000 omitted)			
New Capital	$296,024	$519,255	$399,940
Refunding	$316,068	$361,876	$311,508
Federal Gross debt (millions of dollars)	$49,513	$48,961	$43,774
Railroad earnings†	$93,261,000	$88,630,000	$48,091,000
Stock sales, New York stock exchange (1,000,000)	17.87	10.45	7.31
Bond sales, par value ($1,000,000)	189.2	$149.6	98.1

†June, May and June respectively.
*Leading member banks Federal Reserve System.
‡Dow-Jones averages.

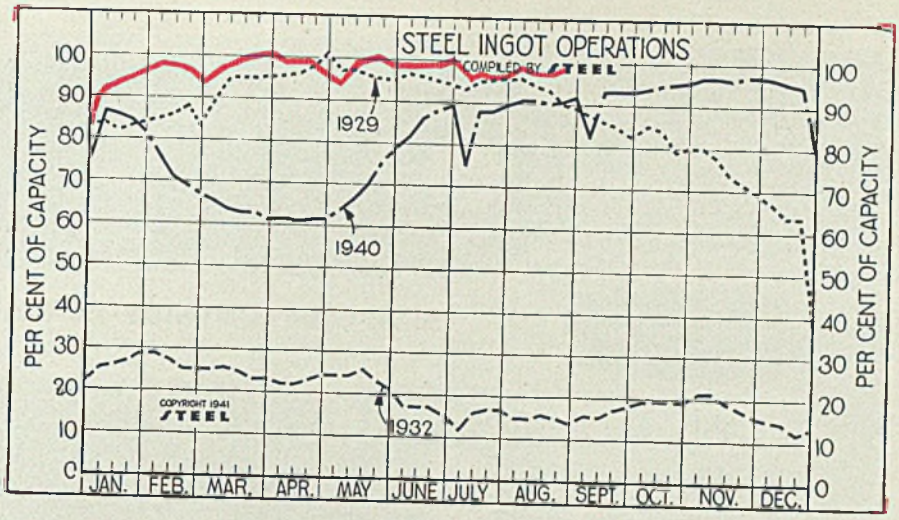
Commodity Prices

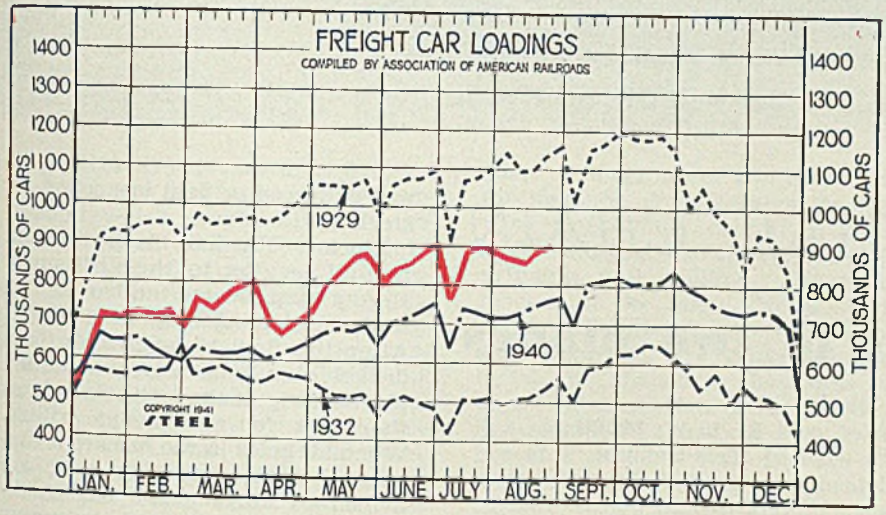
	July, 1941	June, 1941	July, 1940
STEEL's composite average of 25 iron & steel prices	$38.15	$38.15	$37.63
U. S. Bureau of Labor's index	88.8	$7.1	77.7
Wheat, cash (bushel)	$1.04	$1.043	$0.79
Corn, cash (bushel)	$0.86	$0.863	$0.765

Steel Ingot Operations

(Per Cent)

Week ended	1941	1940	1939	1938
Aug. 23....	98.5	90.5	63.5	43.5
Aug. 16....	98.0	90.0	63.5	41.5
Aug. 9....	98.0	90.5	62.0	40.0
Aug. 2....	98.5	90.5	60.0	40.0
July 26....	97.0	89.5	60.0	37.0
July 19....	97.0	88.0	56.5	36.0
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





Freight Car Loadings

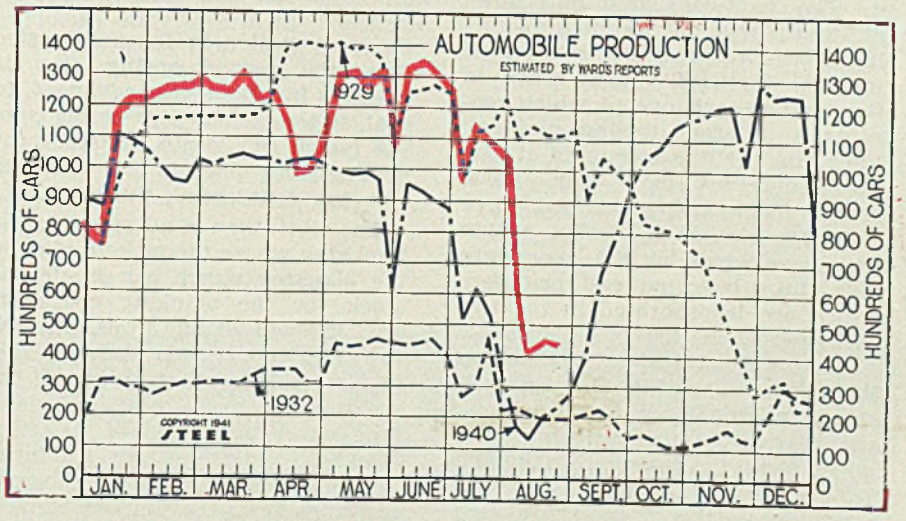
(1000 Cars)

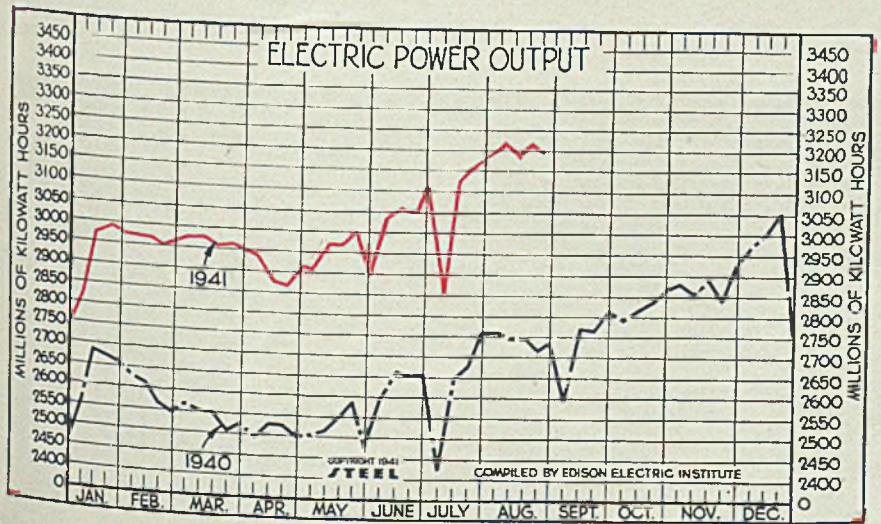
Week ended	1941	1940	1939	1938
Aug. 23.....	900	761	689	621
Aug. 16.....	890	743	674	598
Aug. 9.....	879	727	665	590
Aug. 2.....	883	718	661	584
July 26.....	897	718	660	589
July 19.....	899	730	656	581
July 12.....	876	740	674	602
July 5.....	740	636	559	501
June 28.....	909	752	666	589
June 21.....	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

Auto Production

(1000 Units)

Week ended	1941	1940	1939	1938
Aug. 23....	45.5	23.7	17.5	18.7
Aug. 16....	45.6	20.5	13.0	23.9
Aug. 9....	41.8	12.6	24.9	13.8
Aug. 2....	62.1	17.4	28.3	14.8
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





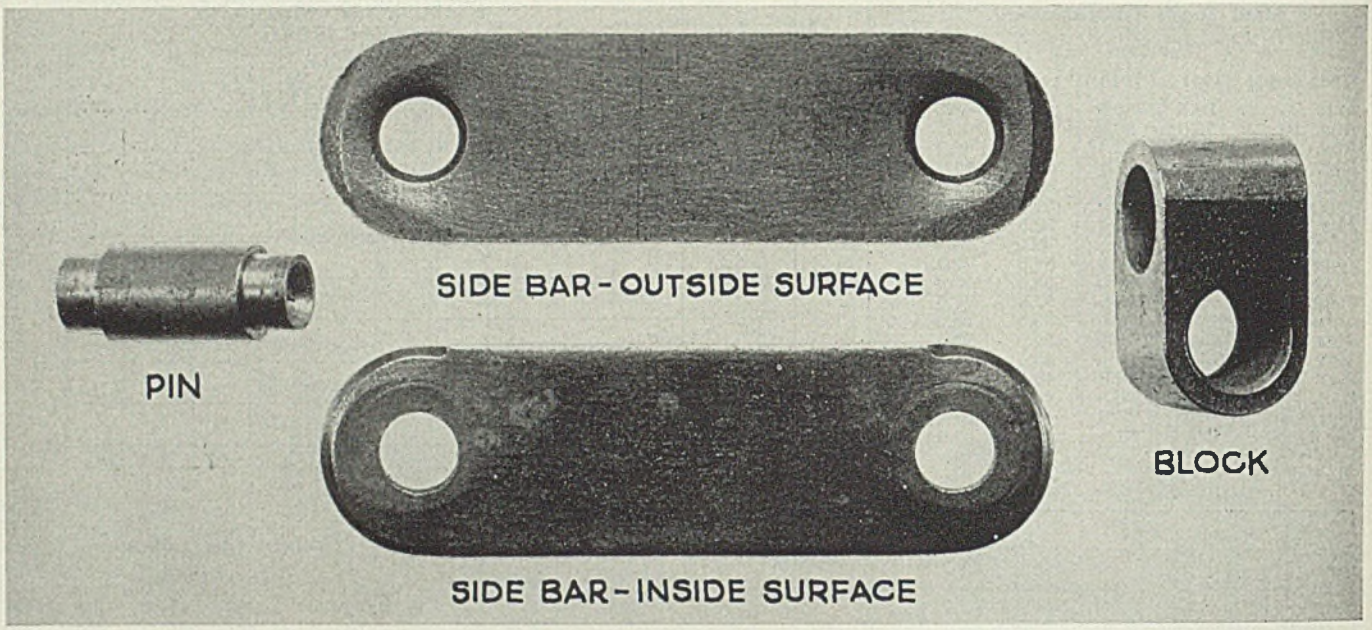
Electric Power Output

†

(Million KWH)

Week ended	1941	1940	1939	1938
Aug. 23.....	2,193	2,714	2,434	2,202
Aug. 16.....	3,201	2,746	2,454	2,207
Aug. 9.....	3,196	2,743	2,414	2,198
Aug. 2.....	3,226	2,762	2,400	2,194
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

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



MAKING SPECIAL CHAIN

. . . that operates in two planes

By L. W. MOEN
Tool Engineer
Lamson Corp.
Syracuse, N. Y.

■ ACCOMPANYING illustrations show a unique chain that bends in two directions by means of a double-pivot arrangement built into it. The chain consists of only three different parts, but the manufacturing procedure involves a number of unusual features. It is made in three sizes, each one of which presents a different tooling problem. Each size chain is composed of just three different parts—side links, swivel block and pins. All three sizes are similar in design of pin and swivel block but the heavy-duty side links have no end chamfers which are incorporated in the two lighter designs.

Side Pins: The side links for the light chain as used in dairy and bottling equipment are fed through a progressive die, using stock a little wider than the length of the link. In operation, the stock is fed by operator to the first spring stop which has been pressed in to locate the link pin holes for piercing. At the next station in the progressive dies, the second spring stop is pressed in and stock advanced to that, so the pick-up pins on the coining punch can locate the stock for coining both sides of the link and also coin-countersink the holes.

The stock then is advanced to the final stop where the pick-up pins on the blanking punch can locate the stock for the blanking operation. The finished blank drops through the press into a tote pan. All subsequent passes on the bar use the end stop only and a completed blank falls out at each stroke of the press. The hole punchings are led away through another chute to separate the slugs from the finished piece.

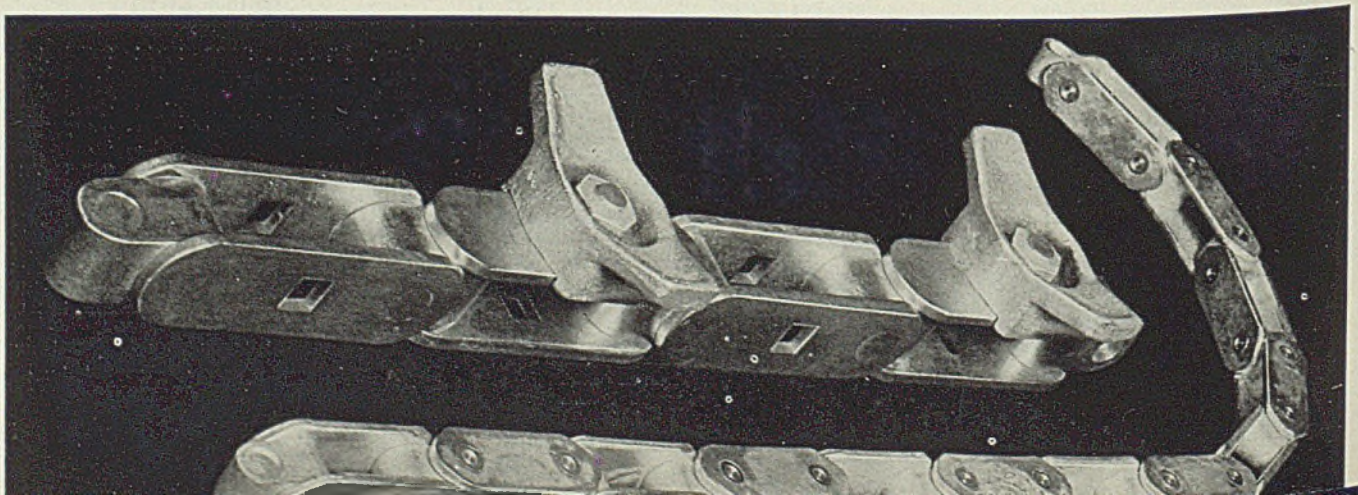
The side links are then tumbled, washed, carburized and hardened, and delivered to final inspection for stock.

Blocks: The link blocks are sent in mill lengths to the drill press. Here a stop locates the bar for the first multiple drilling of 10 holes. After the first 10 holes have been drilled simultaneously, a locating pin working in the last hole indexes the work for subsequent drilling. When all holes in the bar are drilled in one plane, the cross holes are drilled by turning the bar 90 degrees, locating the work by means of a side pin which brings the bar in proper position so the holes will have the right relationship to those previously drilled.

The drilled bars, 10 feet or more in length, next go to a double spindle press in which are mounted a reamer and a burring tool or countersink. Experience has taught us we cannot depend on drilled holes for maintaining close tolerances.

The burred and reamed bars then are transferred to the milling machine where they are mounted in a fixture and 20 pieces cut off at one pass.

The next operation is to mill a radius on each end. A fixture holds 20 pieces (four deep, five rows) while they are milled on one end. Five matched-on-diameter radius cutters are used on a gang arbor



with proper spacing collars. The blocks then are put back in the fixture and other ends done. While the cut is being taken the operator is burring the preceding lot. These parts in turn are washed, carburized and hardened, then inspected and delivered to stock.

Pins: The link pins are made from bar stock, first being shoulder turned and one end cupped out and cut off, on a Brown & Sharpe automatic.

The next operation is cupping the other end. This is done in a fixture on a drill press, a 2-lipped end mill ground to correct shape doing the cupping. Our first efforts on this operation were done on a hand screw machine but the drill press proves to be much faster and closer limits can be held.

It is the shape and amount of cupping on the pin that makes assembly possible on the punch press, as a good deep countersink for strength is made on the link pin hole and just enough metal must be left to fill completely the cavity of the countersink. On early developments of the pins, splitting of the head was experienced but that was finally overcome by getting the proper shape.

Assembly: The component parts are delivered to a punch press where the subassemblies are made. Two pins, two side link sections and two link blocks are assembled at one crack of the press. A flattening punch and die as well as a holding fixture are used in this operation.

These subassemblies consisting of complete links are then passed on to the next operator who joins these together by using another pair of pins and side link sections to complete the chain.

Note the pin heads are not spun over at all but are pressed flat and expanded in the holes in the link side sections. The resulting product is a smooth looking head which firmly holds the side links in place —all done on the punch press. Of course, both sides of two pins are done simultaneously.

WORKING MODELS

■ CHICAGO'S Museum of Science and Industry has built an extensive exhibit which graphically portrays the story of steel. From a full-size replica of a century-old blacksmith shop to a 40-foot working model of a contemporary hot strip mill shown below, a dramatic panorama of progress is unfolded. In a modest glass case are displayed a few spoonfuls of raw iron ore, together with some completed steel objects. A label besides each gives the dollar value for a ton of the product. Near the pile of red dust that is labelled "Value $5 per ton" is a hair spring ticketed "Value $16,000,000 per ton." Probably in no better way could the idea of what human ingenuity has accomplished with iron ore be more impressively expressed.

Outstanding feature of the entire exhibit is that visitors can push buttons or pull levers to see for themselves just how things are done. One group of five machines, for instance, demonstrates the five basic machining operations with steel—shaping, drilling, cutting, grinding and milling. Operating models in the main exhibit room demonstrate how iron ore, limestone and coal are converted into metal and shaped to thousands of uses. In succession the production line shows a 12-foot ore boat loading at a dock; a blast furnace on a 1 to 20 scale; an open-hearth furnace, scaled 1 to 25; and then the blooming mill and hot strip mill modeled after that in the Ford Motor Co.'s River Rouge plant.

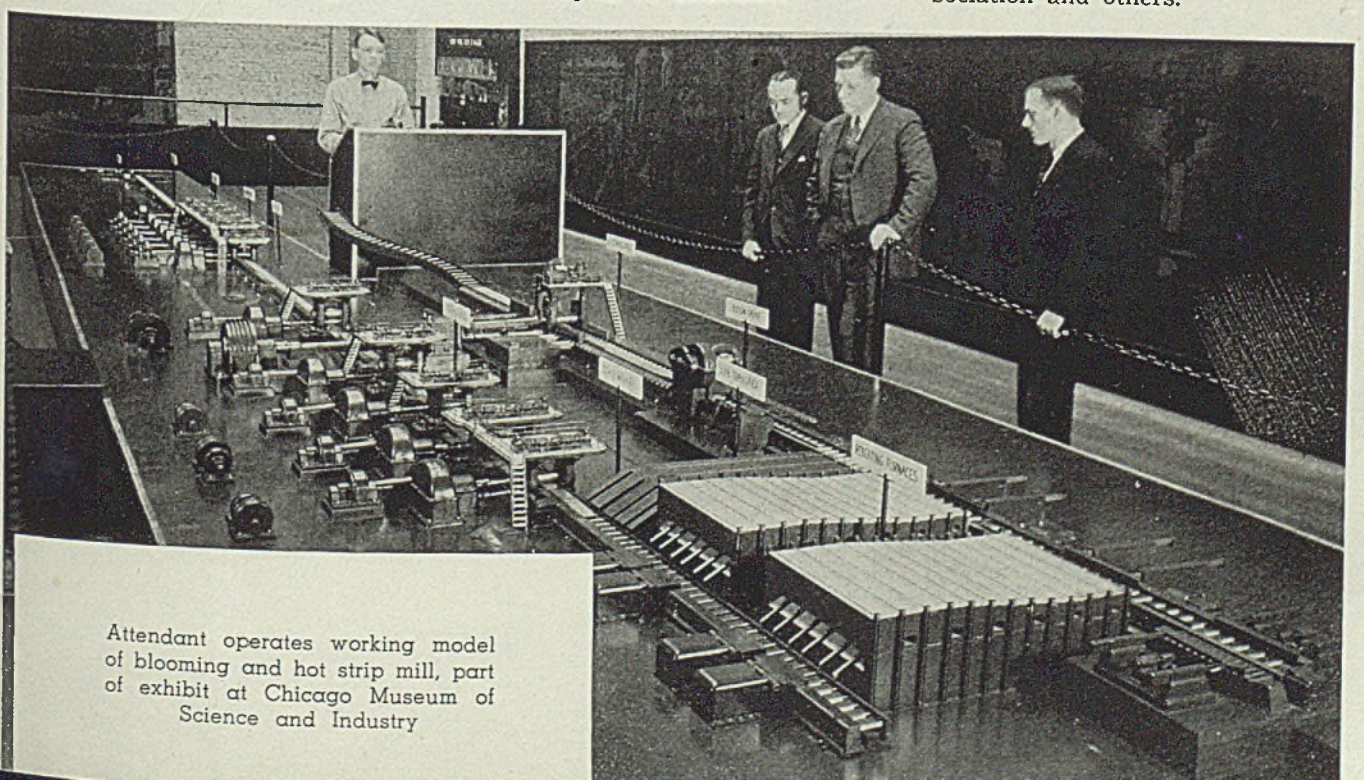
In lieu of hot steel, the museum's demonstrator puts a tiny ingot of soft lead through the blooming mill, reheating furnace, scale breaker, roughing mill, five finishing mills, hot bed and finally the strip coiler.

By H. H. SLAWSON

To show further processing operations manufacturers have contributed actual full-size machines which are operated at intervals. There's a ponderous upset forging machine with the necessary electric furnace nearby; a machine to make nails; another to make coil springs; a flame cutter; a pantograph; automatic hack saws and centering machines; one which combines sawing, filing and polishing in a continuous operation; a cylinder grinder; temperature control equipment, and other devices.

On the mezzanine balcony is a complete foundry where visitors, sheltered behind a plate glass partition, see gray iron castings being made. Electroplating is demonstrated here as are welding, grinding, and other operations.

In preparing the displays, museum authorities were given the close co-operation and expert guidance of committees representing the steel industry, American Welding Society, American Foundrymen's Association and others.



Attendant operates working model of blooming and hot strip mill, part of exhibit at Chicago Museum of Science and Industry

MAKING CANNON at Watervliet Arsenal

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.
And
Contributing Editor, STEEL

. . . . . details of the arsenal, its early development and present modern equipment; stages in manufacture of large caliber guns; reaming with packed bits; multiple tools to produce a taper of 0.005-inch per inch; grinding the powder chamber; assembling by shrinkage

This Is Number 27 in a Series on Ordnance and Its Production, Prepared for STEEL *by Professor Macconochie.*

■ UPON arrival at the gates of Watervliet Arsenal, Watervliet, N. Y., one morning a few weeks ago, the writer was immediately struck by the pleasant environment of this gun factory. Beautiful shade trees delight the eye of the visitor and create the impression of entering a delightful country estate, rather than the precincts of a great workshop. For such wise human understanding we have to thank Major James A. Dalliba, graduated fourth in his class at West Point in 1811 and appointed to Watervliet Arsenal in 1816. Witness this letter to his superior:

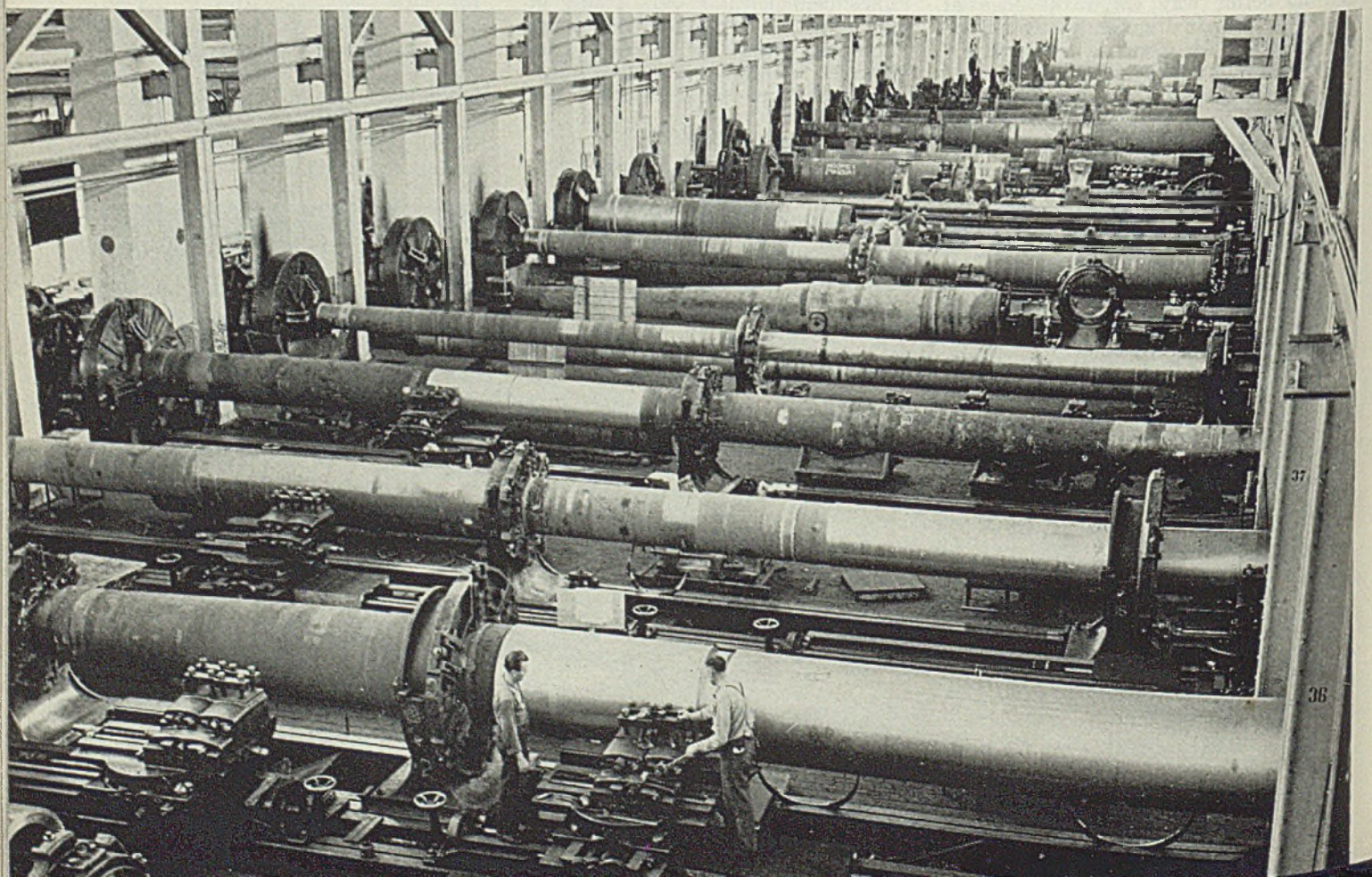
U. S. Arsenal,
Watervliet, N. Y.

"Sir,

Your orders of the 27th July have been duly received. The subject of my cash accounts is the object of this sheet.

"The authority upon which I purchased the shade trees for this post, was my judgment, the same authority upon which all my disbursements have been made, and in such case my judgment is law. I am not conscious of having departed from any instructions which I have received. As to the propriety of the purchase and its public utility, no one can doubt. But if the Department's wish is to control the detail of purchases it must issue its regulations before the purchases are made; otherwise it must pass the accounts.

"No act of mine has been more universally approved at this post than the cultivation of the shade



trees—some of them have been set out this three years, but the man has not before called for his pay. They are its greatest ornament.

"I request, sir, that you will pass the account to my credit.

Very respectfully, I am, Sir,
Your Obdt. Servant,
(Signed) James Dalliba,
Major of Ordnance"

Watervliet Arsenal dates back to 1813, to a time when our relations with the British Empire were a little strained and the need for protection of the Canadian frontier had become apparent. The name "Watervliet" however, was not adopted until about three years later. "Watervliet", by the way, is a Dutch word meaning "flowing water", the arsenal owing its title no doubt to the annual spring overflow of the Hudson river, which inundated the grounds to a greater or lesser degree. Plans and arrangements for the arsenal had been prepared in 1812, some of the considerations governing the selection of this particular site being closely concerned with the presence of the Hudson and Mohawk rivers and of the navigable waters of Lake Champlain, 60 miles to the north. However, the Pennsylvanians being noted for their skill in the construction of carriages were considered equal to the task of building gun carriages, together with the manufacture of the harness and other accoutrements of the period.

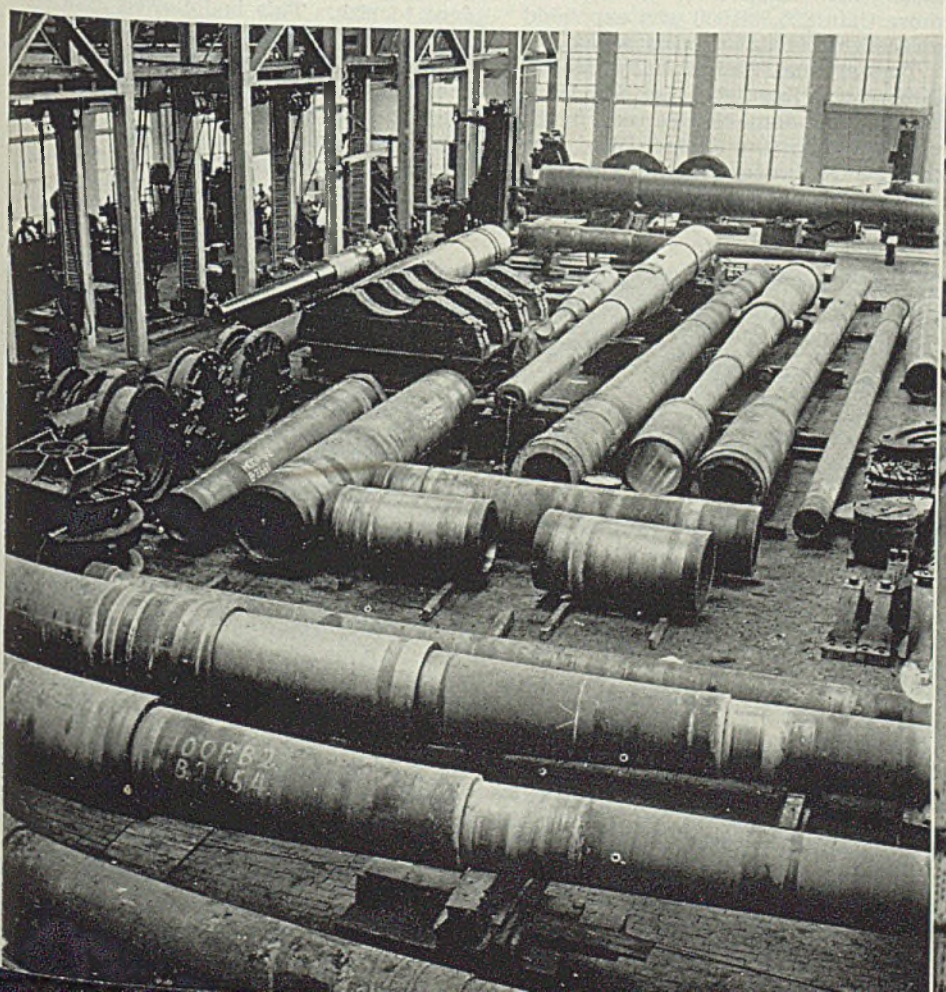
Some early records of the Arsenal make interesting reading and assist us to place in proper perspective the gains labor has made throughout the years which have elapsed since cartridges were made there by children of 12 to 14 years of age and when laborers were paid nine dollars a MONTH with no allowance for clothing. Further we read that one Dominic Travioli, a laborer in the United States Ordnance Department, was sentenced by court-martial on June 23, 1815, to be deprived of his liquor for the space of one month, to perform 15 days of fatigue duty and to be confined seven nights in the "black hole." One rather hopes that these several rigors were phrased in order of severity—the worst first.

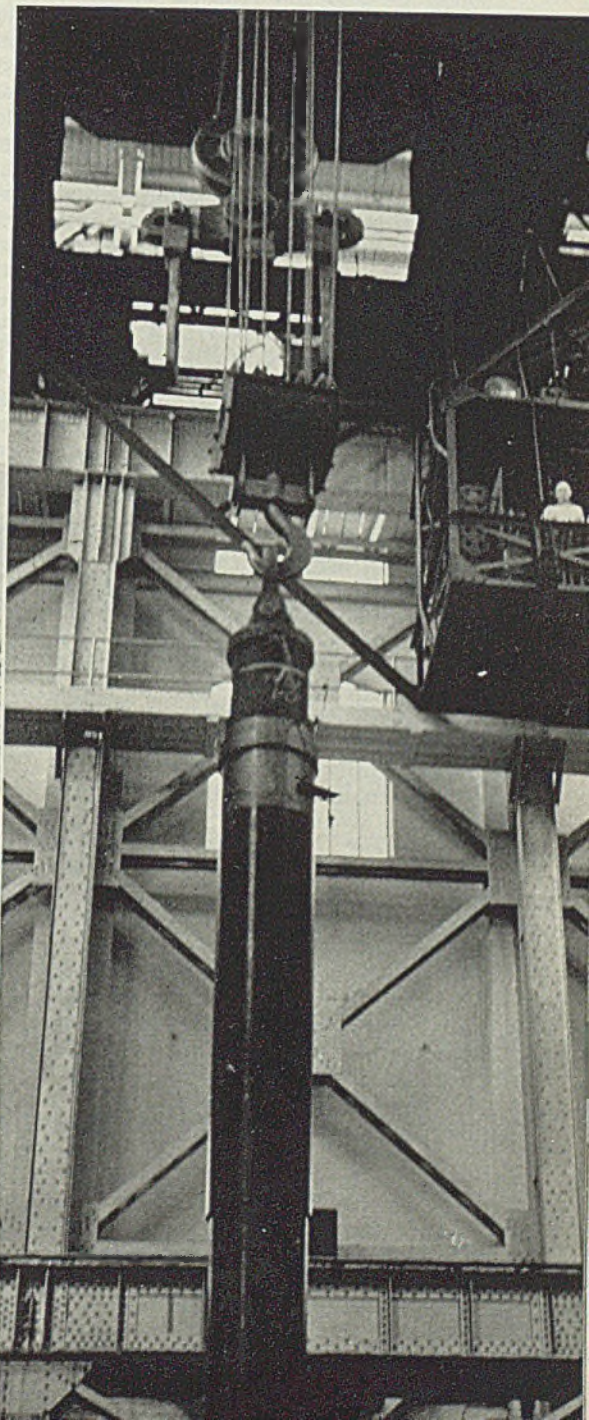
Succeeding commanding officers, with precedents to support them, found opportunity to construct walks, plant shrubberies and erect fountains. There is even a flower garden, as well as many trophy guns and piles of round shot to remind us of "battles long ago". Per-

Fig. 1. (Opposite page)—South wing of sea coast gun shop—gun boring and turning operations: Note foreground where main bed had two working or power feed beds, movable to any portion of gun length. Main power infeed and traverse are supplemented by hand feed and traverse. Also a turntable allows tool carriage to be swung at any angle desired so bevels can be cut by traverse mechanism. O.E.M. photo by Palmer

Fig. 2—Here are gun tubes, hoops, liners and various portions of big guns as well as some partially assembled units. Note their enormous size compared with the workmen in the view directly below. O.E.M. photo by Palmer

Fig. 3. (View at right)—The big gun pit is 102 feet deep, meaning that provision must be made for more than a 102-foot clearance under the crane hook. Guns are handled vertically in assembling and disassembling built up units due to necessity of progressive shrinkage control system that uses water and because bending stresses from handling horizontally must be avoided. O.E.M. photo by Palmer





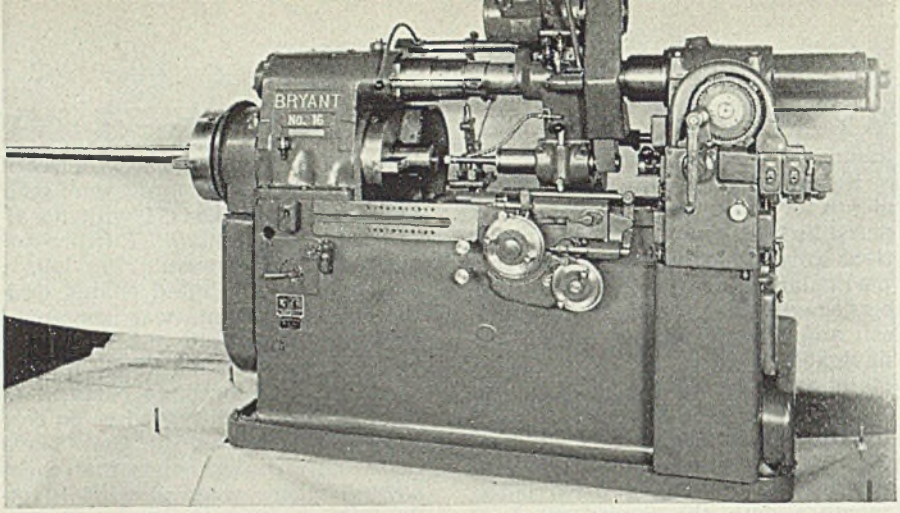


Fig. 4—This Bryant grinder finishes powder chambers for small caliber guns like the 37-millimeter anti-tank and anti-aircraft guns, one of which is shown inserted in machine. Two feed handwheels, lower center, control grinding in conjunction with form plates. Telescopic sleeves protect sliding arbor from flying grit

haps the most famous among the trophy cannon is the "Lafayette Gun", identified by General Marie Joseph Paul Yves Roch Gilbert Dumotier Lafayette when he visited the arsenal on Sept. 18, 1824. This was a brass piece of ordnance taken from the hapless Lord Cornwallis when he and his Hessian mercenaries surrendered to the American and French armies at Yorktown in 1781 and which Lafayette recognized because of a deep indentation made by a cannon ball just previous to its capture. In a characteristic gesture he embraced the gun, declaring it to be a companion of his youth. In death, too, it was standing by, firing a last salute in honor of this hero of American independence.

From a Small Start: It would no doubt, take us too far afield to recount the many steps by which, from far-off small beginnings, the arsenal has arrived at its present stage of development. Suffice, perhaps, to relate that from an establishment principally devoted to the manufacture of fixed ammunition and small articles of equipment, including leather goods, the arsenal blossomed into a gun factory in 1887. Prior to this date, most cannon used by the United States Army had been made in private plants. These cannon, of course, were of cast iron or bronze—muzzle loaders principally—easily cast at some of the larger foundries familiar with this class of work.

However, with the advent of breech-loading built-up steel cannon, the necessity for specialized facilities compelled the development of a government establishment equipped particularly for this work. And so, in a temporary shop, inadequately provided with facilities for handling heavy gun material, the first 10-inch rifle was made—a project which required two and a half years for its completion. Figs. 1, 2 and 3 show, by contrast, the busy scene the arsenal presents today, as a steady flow of large and medium caliber rifles moves through its various shops.

To a Huge Workshop: Immediately preceding America's entry into the World War of 1914-18, a large increase in the weight and length of heavy cannon necessitated an increase in the depth of the shrink pit and in its overhead clearance. It was further necessary to lengthen a number of the original gun lathes and purchase some new and larger equipment. This in turn required an extension to the south wing of the gun shop and an increase in its width. On the declaration of war by this country in April (a popular month) 1917, a period of unprecedented activity began, some $4,000,000 being appropriated for the erection of new buildings and $12,000,000 for machine tools, railroads and other equipment. Altogether more than $25,350,000 was expended on Watervliet during this period.

The arsenal had a busy season during the Spanish-American War, turning out some 190 cannon of all calibers from the 3.2-inch field gun to 12-inch breech-loading rifles of the model of 1895, not to mention considerable quantities of field shell and a number of experimental guns. Then again in 1917-18 it expanded to an industrial hive of more than 5000 employes. And had not Germany begged for (and obtained) a further opportunity to prepare against a new "Tag", 10,000 people would have been at work there by the spring of 1919. Now again boring bits are machining the inside of the guns and heavy lathes rotate long and heavy barrels against turning tools as the ponderous machinery of war steadily gathers momentum.

Usual Manufacturing Sequence: In the manufacture of large caliber guns at Watervliet, a number of well defined stages are recognized. First, there is the receipt and inspection of forgings, followed by machining operations to specified dimensions. For forging of large guns, see STEEL, August 25, 1941, p. 54. Next the various tubes, rings and liners are assembled in the shrinkage pit. The gun then is ready for the various finishing operations which include machining the bore to the final diameter, machining the chamber and finishing the outside surface to size. This is followed by a series of minor machining, lapping and fitting operations, including the mounting of the breech mechanism and the installation of the yoke. Forgings are usually rough-bored by the manufacturer but, as will be noted later on, the arsenal pre-

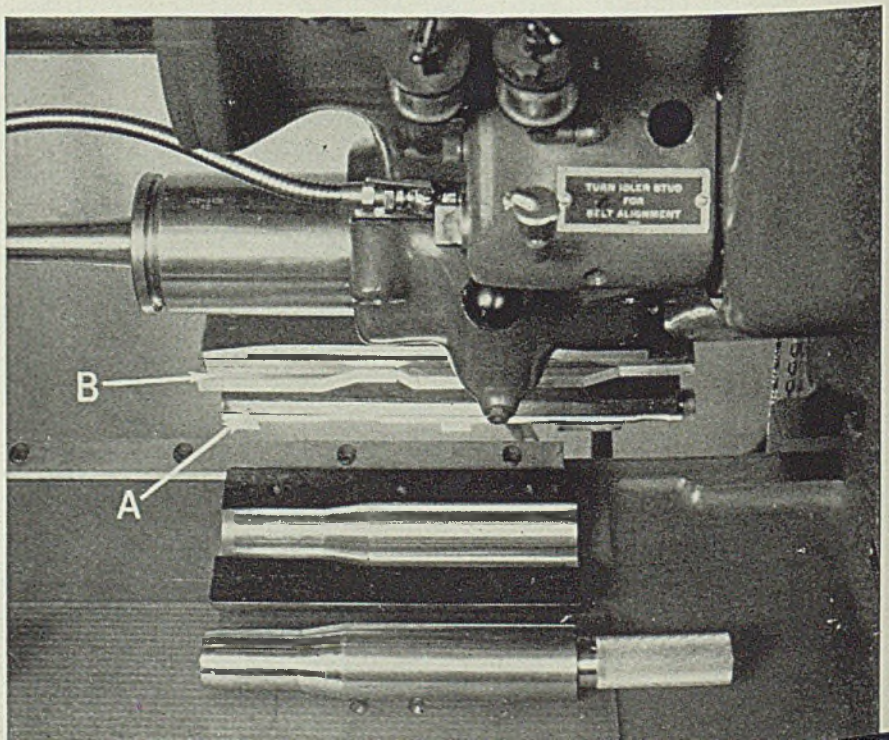


Fig. 5—Form plates A and B mounted on swinging head bear against shoes shown in rear view of machine, Fig. 6, and thus serve to guide grinding wheel in forming cavities

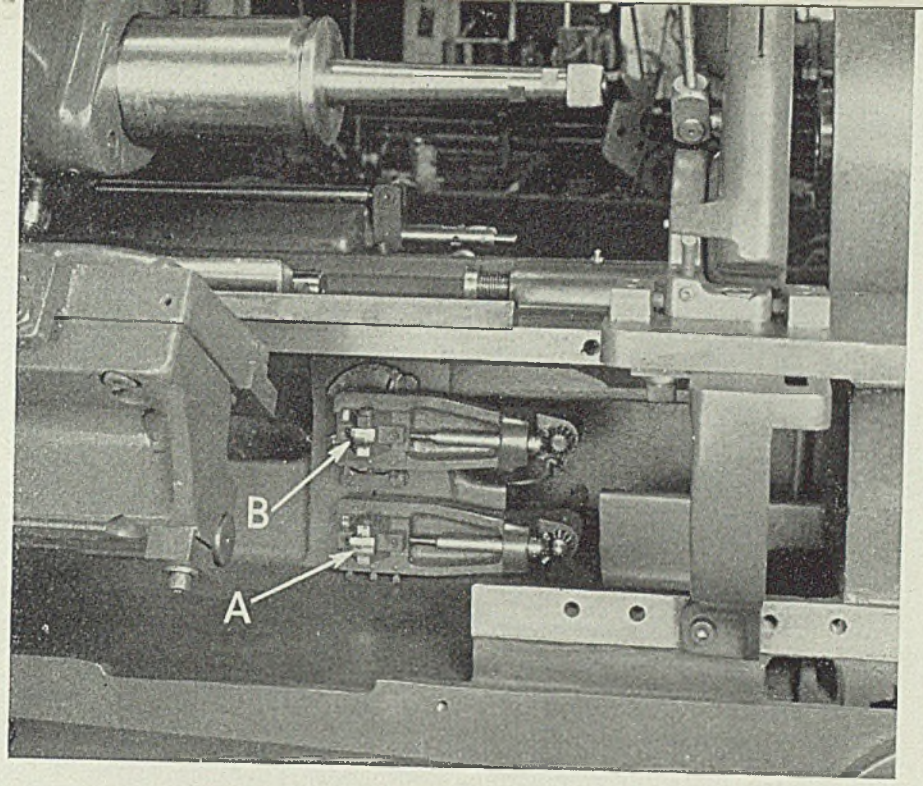


Fig. 6—Rear view of Bryant grinder showing bearing shoes and their longitudinal adjustment

fers to bore 37-millimeter forgings.

The rough turning of the outside of the forgings calls, perhaps, for no special mention, except to note that the final or finishing cuts are not taken until the parts into which each fits have been "star gaged" and the shrinkage calculations completed. One also observes a large increase in the use of sintered carbide tools in the field of gun manufacture—an increase comparable only to their widespread application to shell manufacture. Even from way "down under" in Melbourne, Australia, comes a report on the performance of a well known brand of American tungsten titanium carbide which permits speeds of 200 and 210 feet per minute on gun barrels and forgings of as high as 381 brinell, while taking cuts ⅜ and ½-inch deep with feeds of 60. These tools are reported as giving more than 200 hours of life.

Perhaps the drilling and reaming of the tube are the most interesting operations. For our present purpose we will confine our remarks to weapons destined for the field artillery and therefore of medium or smaller caliber. As a rule the manufacturer drills these tubes using, perhaps, a simple form of diamond pointed tool. However, the arsenal undertakes both the drilling and reaming of 37-millimeter forgings, possibly because this is not a particularly easy job. After facing off the ends, the tube is carefully centered after "tell-taling" or balancing to insure sufficient metal for cleaning up. Drilling is then carried out by means of a single fluted drill using a cutting tip of high-speed steel and flushed with a 2 to 1 kerosine-lard oil mixture under pressures ranging up to 500 pounds per square inch.

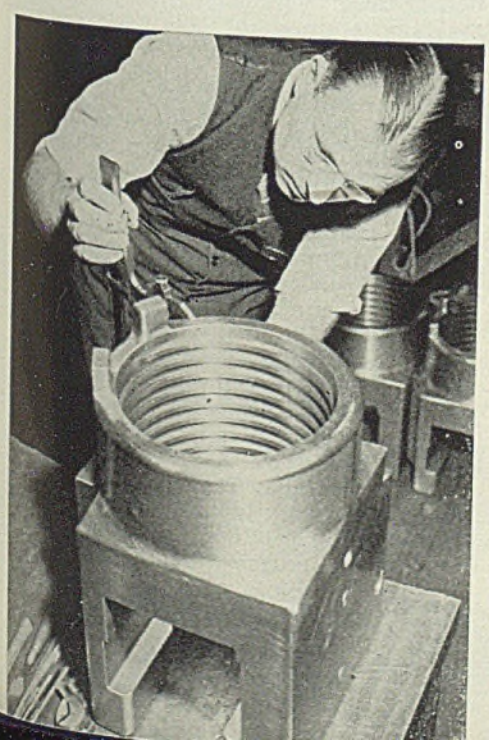


Fig. 7—Inspecting a breech ring. O.E.M. photo by Palmer

Long Wood Inserts Guide Bit: The reaming operation is familiarly carried out by means of the "packed bit" described and illustrated in a previous article, see STEEL, August 25, 1941, p. 54. This bit mounts two high-speed steel cutters at opposite ends of a diameter. In arsenal practice, the wood inserts, of well seasoned rock maple, are thoroughly impregnated under a high vacuum with No. 907 Socony Vacuum impregnating oil. These wood inserts then serve to support the cutting head and guarantee alignment since they are machined several thousandths larger than the reamed hole and thus fit very tightly. The treatment of the hard maple stock for these inserts warrants some notice, since upon the care with which the wood is prepared we are apparently dependent for satisfactory performance and freedom from splitting. Then, too, the wood must have a certain elasticity.

After being seasoned for about three years, selected pieces, all of the same length, are placed vertically in a circular tank surrounded by a steam jacket and closed with a cover capable of sustaining considerable pressure. Steam is then turned into the jacket and a high vacuum pulled in the tank by means of an air and vapor pump. Nothing happens for some hours, but finally vapor begins to come over and is condensed in a simple form of condenser provided for the purpose. This process may take several days. After virtually all of the moisture has been extracted from the wood, impregnating oil, previously heated to 150 or 160 degrees Fahr., is run into the tank until the stock is completely covered. Tank pressure is then raised to about 100 pounds per square inch and left 24 hours.

Tightly Packed Bit Cuts Straight Hole: The use of the wood-packed bit for years has been regarded as the only means of securing a straight hole. But it is time-consuming. Because of this and also because it is necessary to replace the wood after each operation, despite the free use of white lead and oil lubricant, many attempts have been made to modify it. For example, three operations are necessary on the 3-inch anti-aircraft gun tube—first a roughing cut from one end, then from the other, these being followed by finish reaming throughout the entire length. The entire job takes 24 hours. The use of wood packing, however, is not solely responsible for this lengthy period, since if ordinary carbon or high-speed steel tools are used, the cutting speed has to be held down to avoid tool wear and a tapered tube. Actually, while removing only about ¼-inch of metal, the speed may be no more than four or five revolutions per minute.

However, sintered carbide tools and the use of the hone bid fair to revolutionize the older methods. When carbide tips are used, a babbitt packing having about 0.001-inch clearance replaces the wood and makes it possible to reduce the time to rough ream the 37-millimeter tube to 20 minutes instead of 5½ hours. Further, these babbitt packings may be used some six or eight times before replacement becomes necessary. On these reaming operations, whether wood or babbitt packing is used, a sufficiently powerful stream of cutting oil must be maintained at all times to wash out the

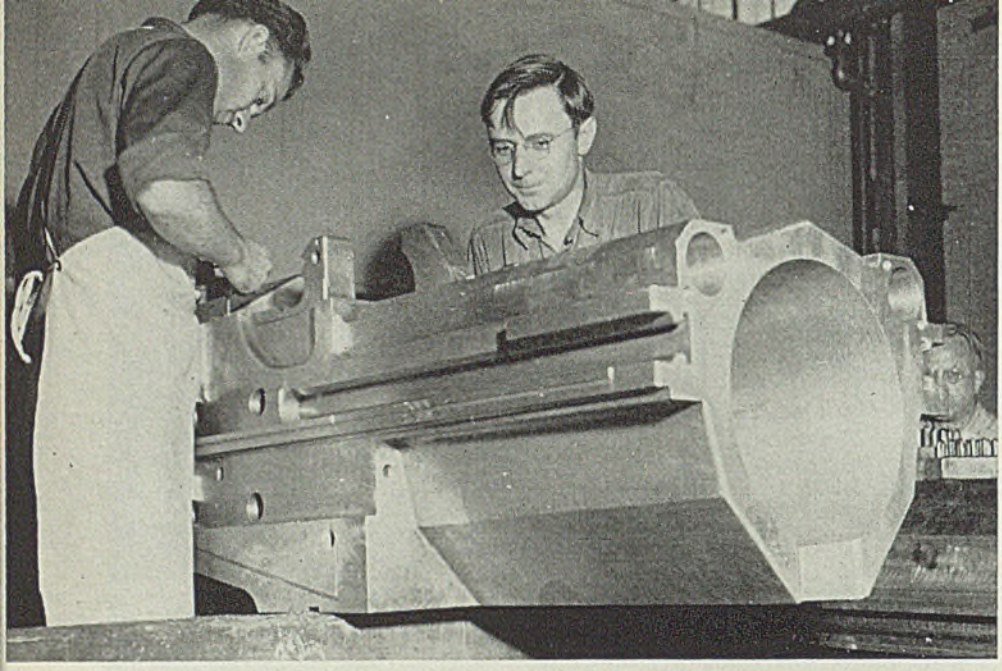


Fig. 8—Bench workers finishing a breech housing for a medium caliber gun. O.E.M. photo by Palmer

chips just ahead of the reamer.

Step Reaming Is Slow Work: Before leaving the subject of boring and reaming, it may be of interest to note the machining of the tapered hole in the 3-inch anti-aircraft tube into which the liner fits. Fourteen wood-packed bits of cylindrical form and progressively diminishing diameter are required, each reamer machining its assigned portion of the bore. Thereafter a series of tapered bits are fed in, one after another, each overlapping the work of its forerunner until the desired taper of 0.005-inch per inch of barrel length is obtained. These operations are extremely slow indeed, step reaming requiring about 48 hours and finish reaming some 44 hours. The time consumed may be in part responsible for the growing popularity of monoblock (one piece) construction, in which the entire barrel is removed in the field when worn and replaced with another.

The machining of the powder chamber may also be done with wood-packed tools, but in the case of the 37-millimeter gun, the powder chamber is first bored out on a turret lathe with cam-operated cutter and then finished on the Bryant grinder shown in Fig. 4. This machine has a hollow spindle, the gun barrel being loaded from the left and clamped by means of the two independent chucks shown. The grinding head, mounted in the upper arbor supported in the double head of the machine, is capable of longitudinal and rotary motion through a limited arc.

Form Plates Guide Grinder: Control over the grinding wheel feed is secured by means of two separate handwheels shown in Fig. 4, each of which operates a shoe which may be brought to bear on its own form plate, mounted on the swinging head, as shown in Fig. 5, which exhibits the form plates pulled away from the shoes. Fig. 6, taken from the rear of the machine, shows the shoes and the manner in which longitudinal positioning of the former bars with reference to the work, within very fine limits, is attained. Instead of moving the former bar, the shoe is traversed by means of the screw and bevel gear with which each is provided. The bevel gear in its turn is rotated by the smaller knurled head (either upper or lower according to which form plate is being contacted) seen projecting from the front of the machine to the left of the main handwheels in Fig. 4.

In operation, form plate B, Fig. 5, is used for grinding the tapered portion of the bore into which the body of the cartridge case fits, and also the steep taper of the neck, as shown in the sample lying on the bed of the machine. Plate A, Fig. 5, is next used to grind the cylindrical portion accommodating the mouth of the cartridge and also the small chamfer at the barrel end of the powder chamber. All grinding on the chamber is done with one dressing of the wheel, but there are, as indicated, two operations; First, grinding the long slightly tapered portion of the bore and the neck taper; then a change of spindle projection and a changeover to the other feed screw—followed by the second operation on the smaller end of the chamber.

Grinding Aids Extraction: The smooth finish obtained by grinding is highly desirable, inasmuch as it gives a positive guarantee against the possibility of circumferential scores left by a reamer. Such scores would make the cartridge case very difficult to eject if undiscovered—indeed, at Springfield Armory the powder chamber of the Garand rifle is honed longitudinally in order further to promote ease of extraction. Nowadays not only the powder chambers of all medium caliber guns, but also the bores are ground or "honed" by reciprocating and revolving hones, using a sulphur base oil mixed with kerosene as a lubricant. Some 0.005-inch of metal is removed in the process.

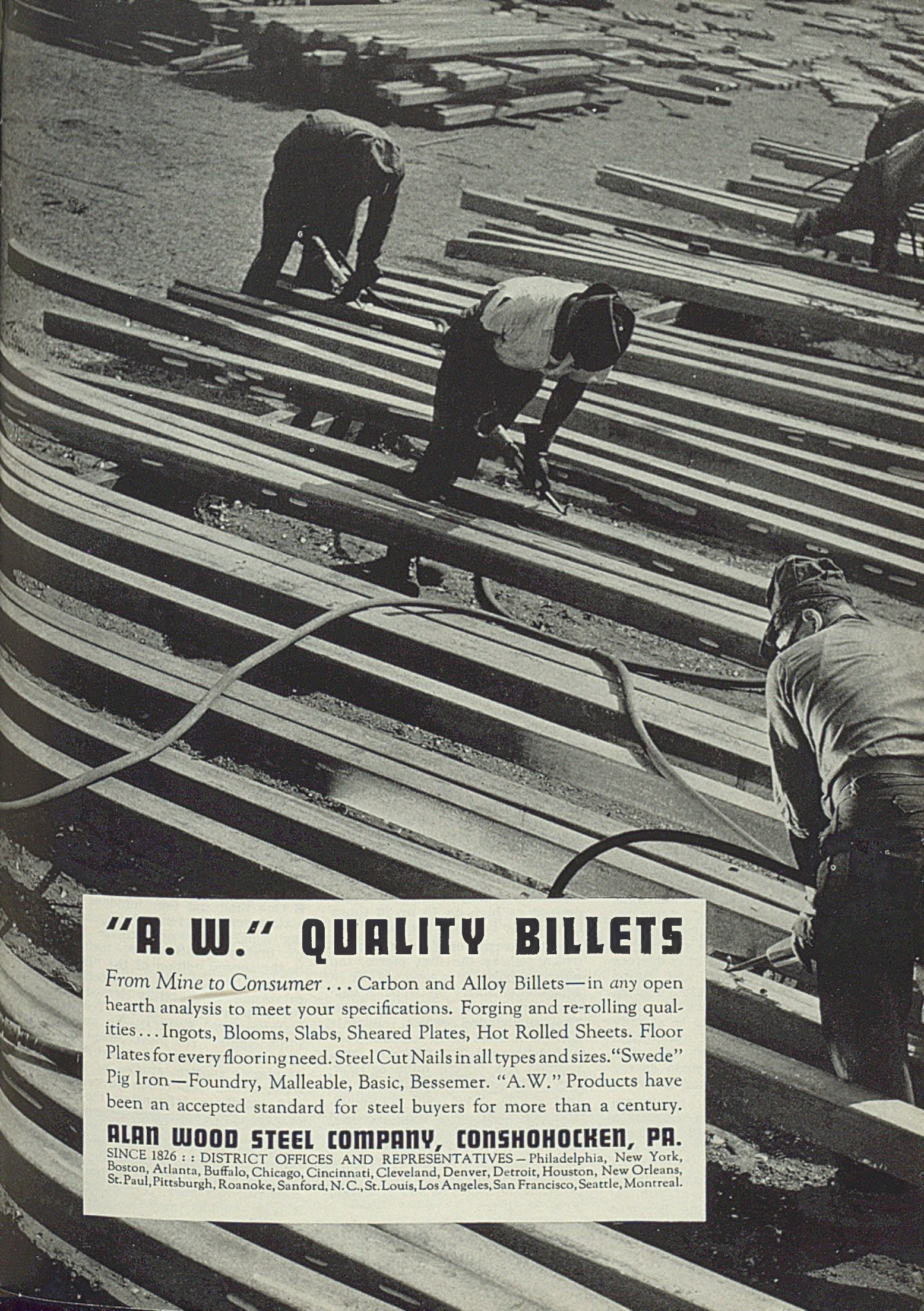
Rifling methods have been described in previous articles in this series so no extended reference is necessary here. As in a great many other operations on gun parts, especially among the smaller caliber guns, machine guns and semi-automatic rifles, one notes rapid extension of the use of the broach. While somewhat expensive in first cost, broaching operations are large time-savers, whether on rfling or some other job lending itself to this treatment. Rifling with the familiar White head took 8 hours. Now, using a series of 30 separate cutters pushed through the bore one at a time, the work can be done in 2 hours. Here, as in all gun boring operations, care must be taken to avoid scoring with chips. These are washed away in the broaching operation by applying an oil jet to the rear of each cutting tip, a mixture of kerosene and pure lard oil being used.

Straightness Checked: Among inspection procedures applied to gun barrels is the test for straightness. a "balance rod" fitted with a small roller at one end and pressing against a dial gage at the other being commonly used. Rotation of the barrel on its roller supports discloses any eccentricity, enabling the operator to apply corrective pressure at the proper point. Another interesting operation is the inspection of the gun barrel by means of the bore searcher or "boroscope", which readily reveals any discoloration, cracks or other defects. The bore searcher consists of a long handle upon which is mounted a mirror inclined at 45 degrees. In front of the mirror and shielded from the eyes of the observer are several incandescent lamps which intensely illuminate the portion of the barrel under observation. The observer uses a telescope which he directs upon the image in the mirror. To determine their depth, defects may be scratched with a "pricker" or sharp steel point mounted at right angles to a light wooden rod.

The Star Gage: The visitor's interest also is likely to be aroused by the "star gage" used to measure with great accuracy the inner diameters of tubes, hoops and the like.

(*Please turn to Page* 85)

The author wishes to take this opportunity of expressing his sincere appreciation of the courtesy shown him while a guest of Watervliet Arsenal; and also to thank the Chief of Ordnance for his kind permission to publish this account of his observations.



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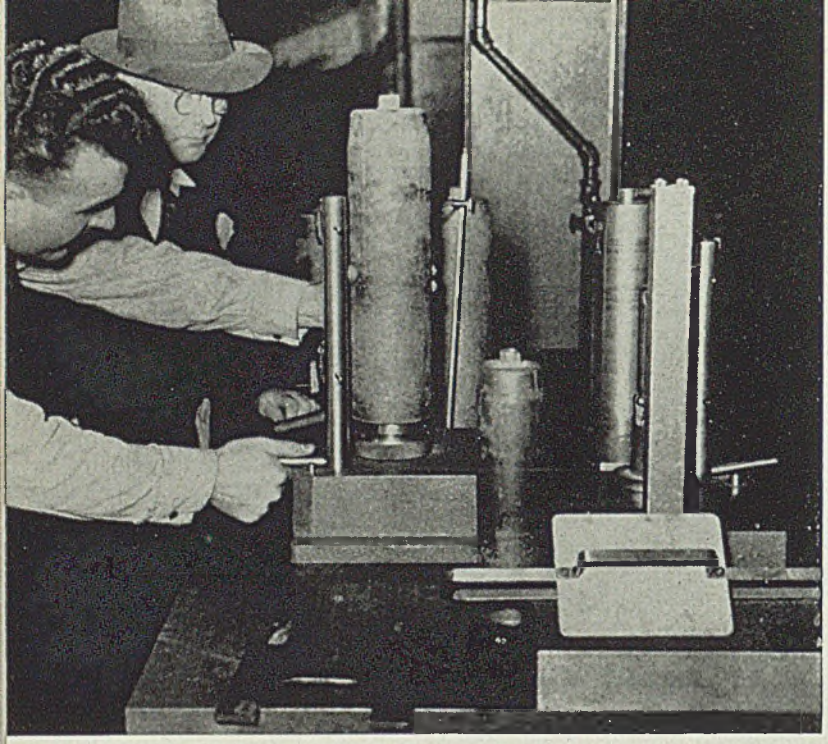


Dies must be in good shape if shell forgings are to meet close inspections such as that employed at General Motors' Olds Motor Works Division, Lansing, Mich., where large volumes of 75 and 105-millimeter shell are being made. Here William Roberts (left), forge shop foreman, and Joseph Hartman, drop forge superintendent, inspect a 105-millimeter shell forging just produced by an upsetter

HOT-DIE STEELS

For Forging Shell

Certain tungsten hot-die steels give excellent results in piercing shell. Their chemical analysis, heat treatment, lubrication and redressing are outlined here

By W. H. WILLS
Metallurgist
Allegheny Ludlum Steel Corp.
Dunkirk, N. Y.

■ TO SUPPLEMENT the information on shell forging practice which appeared in "Shaping Steel To Form High-Explosive Shell", STEEL, Feb. 17, 1941, p. 58, and also "Controlling Metal Flow in Forging High-Explosive Shell", STEEL, Feb. 24, 1941, p. 58, the following information on hot die steels used for tools on the presses and forging machines is offered.

As a material for shell-piercing points on vertical presses, a steel of the following analysis has given excellent results: 0.30 per cent carbon, 9 per cent tungsten, 3 per cent chromium, 0.50 per cent vanadium. This analysis when used for piercing points in the first press operation is given the following heat treatment to arrive at a hardness of 38 to 40 rockwell C. After being preheated to approximately 1500 degrees Fahr., the material is brought up rapidly to 2150 degrees Fahr., cooled in air and subsequently tempered at 1300 degrees Fahr. for 3 to 4 hours. The furnace atmosphere should be slightly reducing. This type of atmosphere results in a rather tight, thin scale which is allowed to remain on the punch when it goes into service.

When these piercing points are properly broken in in service, a smooth, glazed surface is produced which resists wear. It seems that the accumulation of lubricating mixture on the points has much to do with the length of run obtained before redressing becomes necessary. The lubrication found most suitable appears to be a mixture of graphite and quenching oil. In some cases a certain amount of powdered coal is added to the oil.

Runs obtained on these points vary considerably, but on 155-millimeter shell blanks at least 100 pieces can be worked before it is necessary to redress the points. Somewhat longer runs are obtained on smaller sizes. In redressing, approximately 1/32-inch is removed from the contour of the nose. The points are annealed before redressing and then again heat treated after the dressing operation. When the piercing points have been redressed so that they are below size, they can be turned down and used on the sizing press or second operation. However, under certain conditions the points can be redressed as high as 15 or 20 times before this becomes necessary.

In the second or sizing operation which follows the first pierce, the piercing point is supported by a submandrel since this work is usually done on a horizontal press. The submandrel which supports this point must be of a good grade of hot-die steel. The following composition has proved quite satisfactory: 0.30 per cent carbon, 1.25 per cent silicon, 5 per cent chromium, 1.5 per cent molybdenum. This same 5 per cent chromium steel also is extremely satisfactory when used for inserts and plungers on shell-forging machines of the type described on pages 60 and 61, STEEL, Feb. 24, 1941.

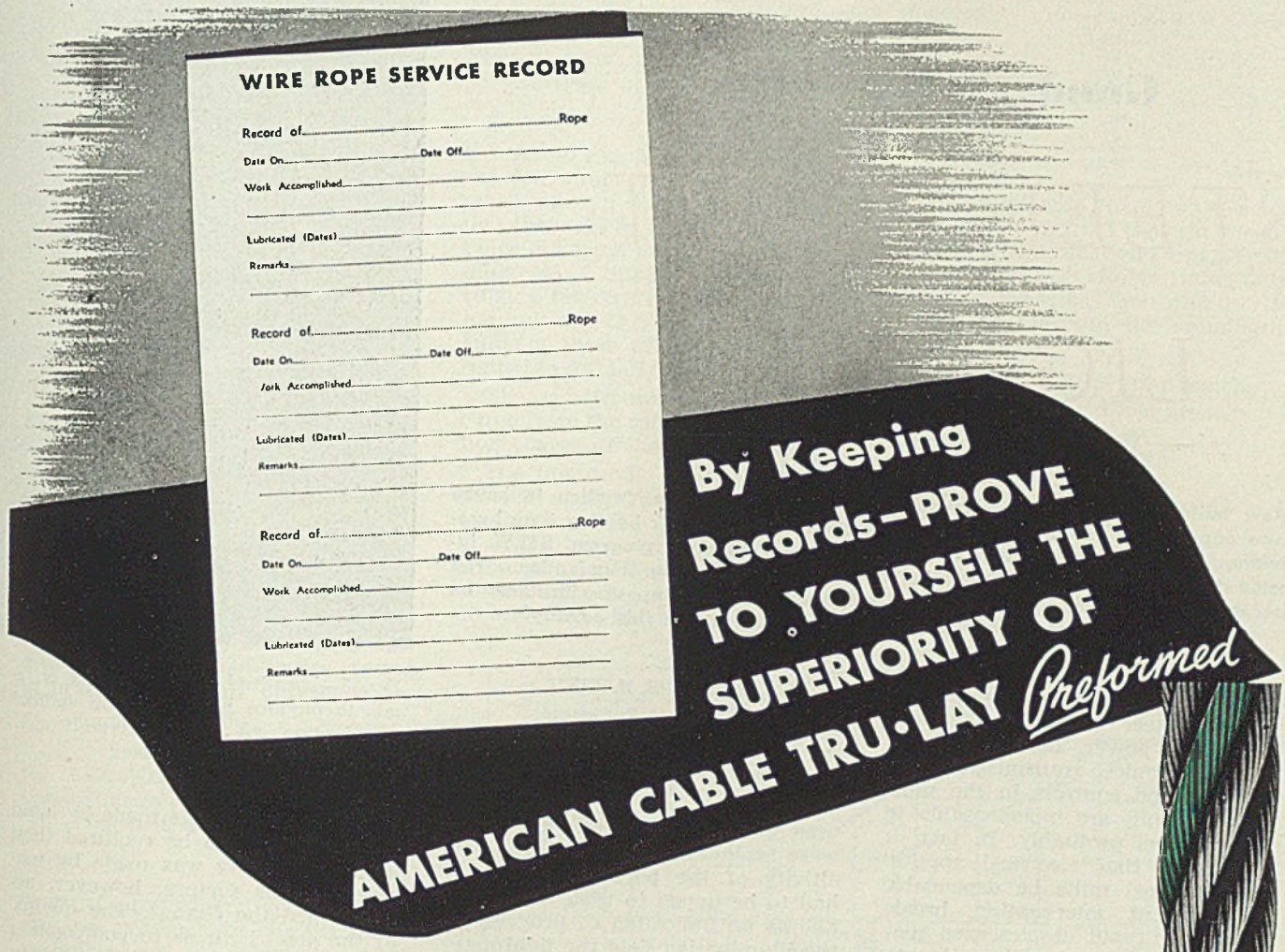
These submandrels are heat treated to approximately 375 brinell or 40 rockwell C by first preheating to 1400 degrees Fahr., followed by raising the heat rapidly to 1850 to 1900 degrees Fahr. After being cooled in air, the work is tempered at about 1200 degrees Fahr.

When this material is used for plungers and inserts on forging machines making shell, the plungers are hardened as above mentioned and tempered at about 1150 degrees to give a hardness of 41 to 43 rockwell C. The inserts of the gripper dies are left slightly harder—about 46 to 47 rockwell C. Where conditions are such that an excessive amount of scale is put on this hot-die steel when hardening in an open fire, the material may be pack hardened in pitch coke at about 1850 degrees Fahr.

New Spectrochemical Analysis Index Issued

■ One thousand four hundred and sixty-seven references, representing a 50 per cent increase over its first publication, are included in the second edition of the "Index to the Literature on Spectrochemical Analysis" recently issued by the American Society for Testing Materials, 260 South Broad street, Philadelphia. Its most recent additions cover improved descriptions of atomic spectra, studies of light sources and calibration processes, and conditions influencing the accuracy of quantitative determinations.

All papers in the index are arranged in chronological order, and in alphabetical order of authors in each calendar year. Copies of the 96-page booklet may be obtained from the society headquarters for $1.



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Good Practice in

STEEL PLANT LIGHTING

New buildings which steel companies now have under consideration to house new capacity for national defense purposes will require better lighting than heretofore. To assist engineers to cope with the new building program, STEEL invited the author to discuss various methods for calculating illumination. The accompanying article, which will be helpful in drawing up specifications on lighting, is based on a survey of 19 steel plants in this country

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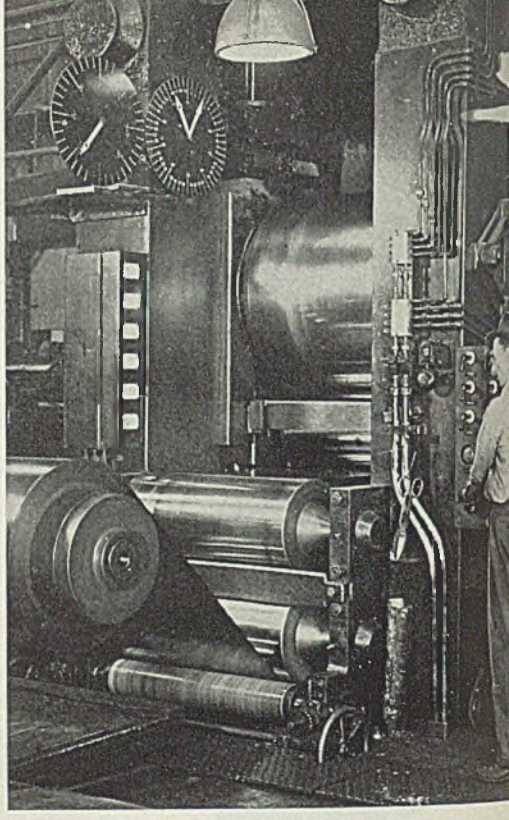


Fig. 3—Localized light mounted on a mill to produce horizontal and vertical illumination. A 400-watt type-H mercury lamp is used

■ Steel may be properly termed "Electric Steel" in that applications of electric power, heat, light, signals, photronics, transmission, distribution and controls in the modern steel mill are indispensable in making steel profitably. In fact, it is so vital that electrical applications in steel mills be dependable and free of interruption, breakdowns and rapid obsolescence that the electrical engineering department, including the design and maintenance departments, is the very nerve center of the industry.

Just as the methods of making steel have changed during the last 25 years, so lighting has changed to keep pace with the more modern methods of line production. In 1914 a survey of existing lighting conditions in the mills of the Pittsburgh area was made. Illumination values were so low at night that the sensitivity of the portable lightmeter had to be upped to read the meter, and as an indication of progress in the illumination field the lightmeter in 1914 weighed 30 pounds and required calibration weekly whereas modern lightmeters weigh 8 pounds and require calibration at six months intervals.

It seems paradoxical that as steel manufacturers changed over from a manual to an automatic process that levels of illumination should increase, because one would assume that when a thing is made by hand more light would be required than where the thing was made by machine. Other factors, however, accompanied the change. The quality of the steel both as to composition and tolerances advanced. The safety movement gained headway. The investment in high priced production machinery required protection by light. It was recognized that more light had a definite psychological effect toward better production and less spoilage. The spirit of progress in steel mill operation is quickly recognized by the good housekeeping in a modern mill and good lighting goes hand in hand with good housekeeping. Thus the steel industry is an example of the American way of living.

Lighting for the steel industry differs in many respects as regards types of equipment, from lighting for other industries. The mechanical construction must be rugged and must stand up in severe service where heat, dust, fumes and time will not leave their mark. In parts of the mill, such as pickling and galvanizing, there is an acid condition that must be considered. In many locations there is a conducting dust that may short equipment unless care is taken to prevent it. Direct current, used in many mills, limits the selection of equip-

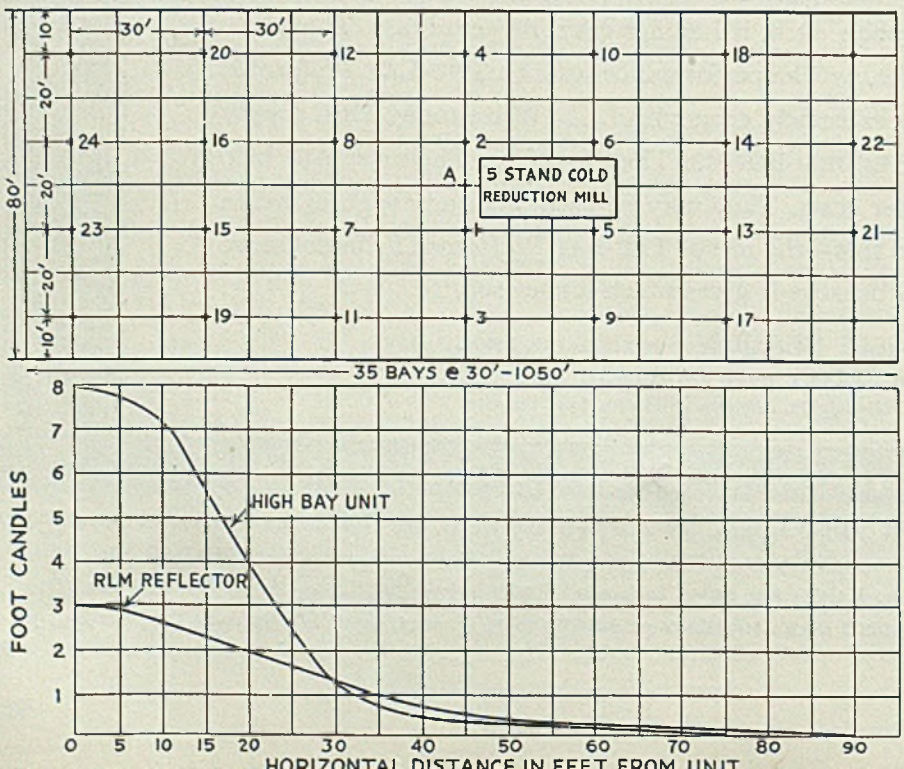


Fig. 1—Top left, part of floor plan showing location of lighting units
Fig. 2—Bottom left, chart showing footcandles at various horizontal distances out from a lighting unit

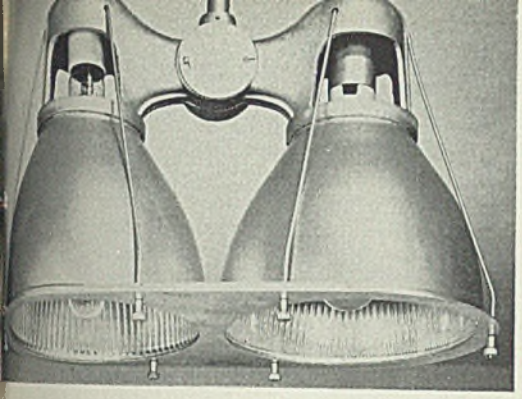


Fig. 4—A combination unit for 400-watt type-H mercury and 750-watt incandescent lamp or for two 400-watt type-H mercury lamps

ment. The 250-volt lighting circuits are not infrequent and when these are direct current and coupled with conducting dust, additional care must be taken. Steel mills are, in the main, buildings several hundred feet long, 100 or less feet wide and from 35 to 50 feet high to the roof trusses. The lighting equipment must be located above the crane carriage, which usually means even with the roof trusses. These conditions complicate lighting layout work because the theoretical formula for calculating footcandles do not give the actual footcandles found in practice, and this difference between theoretical and actual values may be as much as 50 per cent. Formulas used for calculating footcandles, F, are:

Fig. 6—Elevation of mill in Fig. 1 showing interception of light from lighting units by a machine

$$(1)\ F = \frac{\text{candlepower}}{(\text{mounting height})^2} \times \cos^3 \text{angle from light to work}$$

$$(2)\ F = \frac{\text{total lamp lumens}}{\text{floor area}} \times K$$

Where K is a constant depending on the length and width of the room, mounting height of the lighting unit and color of wall and ceilings.

For example: Assume a cold mill 1050 feet long, 80 feet wide, 40 feet to roof truss. Walls and ceiling have a reflection factor of 30 per cent. 1000 watt high bay units of 1000 watts each are spaced on 30 x 20-foot centers. Using formula No. 1, refer to Fig. 1 which is a plan of the cold mill. The first step is to make a graph showing the illumination that will be received at any distance out from one unit. Using formula No. 1 this illumination is calculated for directly under the lighting unit and at 5-foot intervals. Results of these calculations are presented in Table I.

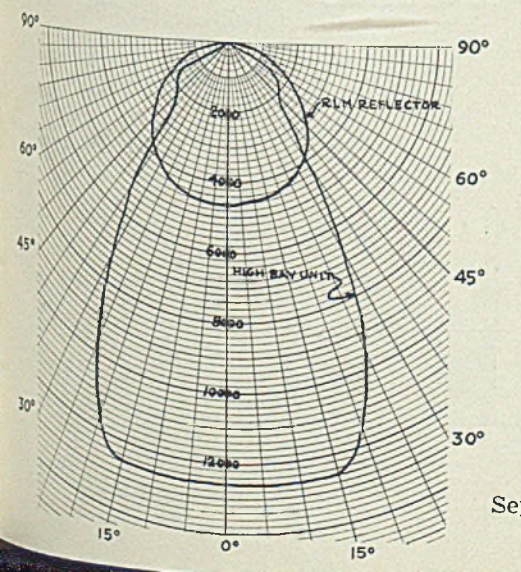


Fig. 5—Candlepower distribution curves of high bay reflector and RLM reflector

The candlepower figures are secured from the candlepower distribution curves of the reflectors, Fig. 5.

The footcandle values are then plotted against horizontal distance as shown in Fig. 2. The next step is to add up footcandle values contributed by all units to the Point A. Referring to Fig. 1 units 1 and 2 are 10 feet (horizontal) distance out from point A and Fig. 2 shows that at 10 feet the Hibay unit contributes 7.2 footcandles and the RLM 2.8 footcandles. In like manner units 3 and 4 are 30 feet distant and contribute 1.1 footcandles each for the Hibay units and 1.2 footcandles for the RLM. Units 5, 6, 7 and 8 are 32 feet distant and each of the four Hibay units contribute 1 footcandle and the RLM reflectors contribute 1.1 footcandles each. Units 9, 10, 11 and 12 are 42 feet distant and the Hibay units contribute 0.4-footcandle each and the RLM 0.6 footcandle each. Units 13, 14, 15 and 16 are 61 feet distant and each of the Hibay units contribute 0.8-footcandle and the RLM contributes 0.23 footcandle. Units 17, 18, 19 and 20 are 67 feet out and contribute 0.07-footcandle each for the Hibay units and 0.15-footcandle for the RLM. Units 21, 22, 23 and 24 are 91 feet out and there is no contribution from the Hibay units and 0.07 footcandles from each of the RLM. A summation of these contributions show:

Unit No.	Hibay units	RLM reflectors
1, 2	14.4	5.6
3, 4	2.2	2.4
5, 6, 7, 8	4.0	4.4
9, 10, 11, 12	1.6	2.4
13, 14, 15, 16	.4	.9
17, 18, 19, 20	.3	.7
21, 22, 23, 24	.0	.3
Total	22.9	16.7

Using formula No. 2 and selecting a value for K from General Electric Bulletin "Illumination Design Data," pages 27 and 28 (Room Index G) of 0.52 for the Hibay unit and 0.43 for the RLM reflector, the illumination will be:

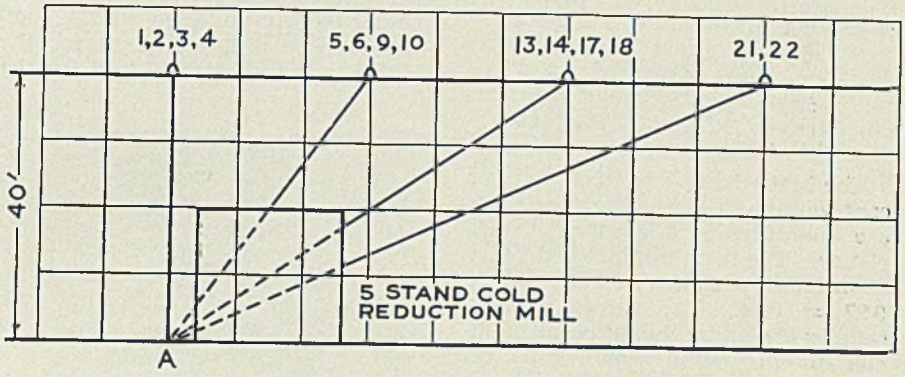
$$\text{Footcandles} = \frac{\text{Total lamp lumens}}{\text{Floor area}} \times K$$

$$\text{Footcandles (Hibay Unit)} = \frac{21{,}000}{600} \times 0.52 = 18$$

$$\text{Footcandles (RLM Reflector)} = \frac{21{,}000}{600} \times 0.43 = 15$$

Using the formula for Hibay units from Holophane catalog, pages 1-6:

$$\text{Footcandles (Hibay units)} = (15.4 - 0.1H)\ P$$



Where H is the mounting height in feet and P is the watts per square feet.

$$\text{Footcandles (Hibay units)} = (15.4 - 4)\frac{1{,}000}{600} = 19$$

Thus, by calculating the illumination by different methods different results are secured.

Method of calculation	Hibay units	RLM reflectors
Point by Point	23	17
Average Flux	18	15
Empirical Formula	19	..

The point by point method of calculating illumination is the only practical dependable method. It is based on the fundamental conception of illumination and is applicable to all illumination calculations. The average flux method depends on a judicial selection of a value for K and this value in turn depends on many variables and there is no accurate data available for valuating it. It might be assumed from the illustration given that footcandles calculated by the average flux method is always lower than calculated by the point by point method, and that same depreciation or interception is included. Such is not the case and the result for the average flux method might for some other

set of conditions be higher than for the point by point calculation. The Holophane formula is also an approximation and is applicable only to a narrow range of conditions.

None of the methods of calculation have taken into account any form of depreciation and in a steel mill this factor should not be overlooked because of its magnitude. A 1000-watt lamp drops to 0.83 of its initial lumen output at 70 per cent of its rated life and this figure should be taken for lamp depreciation. Actual observations in steel mills show that reflectors are not cleaned oftener than lamps are replaced (if then) which would mean 1000 burning hours which at 24-hour operation would be 40 days. Temporary dust and dirt depreciation on the reflector interior and on the upper walls of the lamp bulb will be at least 30 per cent, or a depreciation factor of 0.7.

Lamp Depreciation at 70 Per Cent of Rated Life

Lamp size, watts	Depreciation multiplying Factor
150	0.9
200	0.89
300 med. base	0.86
300 mogul base	0.86
500	0.84
750	0.89
1000	0.83
1500	0.71

The best wiring jobs allow a 2 per cent voltage drop so that the lamps are operating at 0.93 of rated efficiency. The most optimistic depreciation factor will then be $0.83 \times 0.7 \times 0.93 = 0.54$. The values of footcandles shown by the different methods of calculation would then become

Calculation	Hibay units	RLM reflectors
Point by point	12	9
Average flux	10	8
Empirical formula	10	

Some attempts have been made to decrease the inevitable depreciation factor by enclosing the reflectors with a glass plate over the bottom opening. Experience has clearly indicated that such an attempt is of no practical help and more often makes matters worse, not to mention the difficulty of removing the bottom cover for relamping when in a precarious position. In some instances the covers have been removed to facilitate maintenance. Even if the gasket for making a tight joint between the reflector and the cover glass maintained its seal after several bakings and openings, the dirt and dust loss would still be greater than for a well-ventilated open reflector, because with an open reflector 120 degrees of solid angle of bare lamp flux passes out directly from the lower part of the lamp, with little or no dust and dirt absorption, whereas all of the light from a covered unit must go through the dirt on the cover glass. The cover glass clean absorbs 15 per cent of the light.

One of the most serious factors in reducing calculated illumination is interception of light by machine parts. Referring to Figs. 1 and 4, it will be noted that the contribution of light from units 5, 6, 9, 10, 13, 14, 17, 18, 21, 22 is intercepted and although calculated for an empty room and added into the result they do not produce footcandles at Point A in actual practice. The calculated figures including depreciation now become

Calculation	Hibay units	RLM reflectors
Point by point	10	7

Thus in actual plant operation the calculated illumination of 23 footcandles has dropped to 10 for the Hibay unit and from 17 to 7 for the RLM unit. In general the high-angle light suffers more from interception than the more downward light and it is to bring this point out that the RLM reflector was included in the calculations.

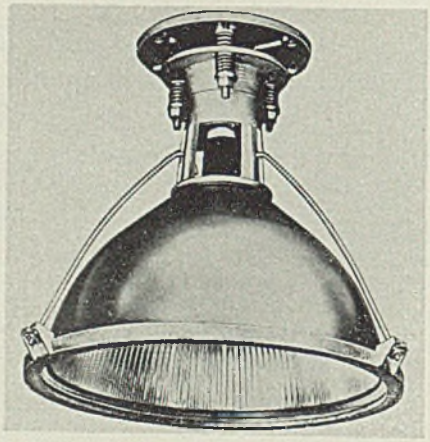


Fig. 7—Local light for mounting on catwalk of cranes. Indirect shock-absorbing device protects lamps and unit from vibration and whip

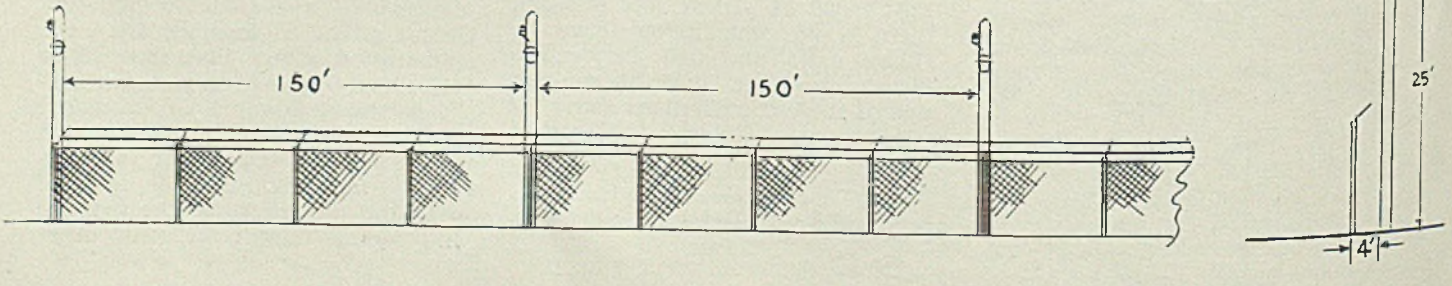
For quick calculation for Hibay reflectors a good figure is to allow 1 watt per square foot of floor area for each 5 footcandles required when incandescent lamps are used and for each 10 footcandles if mercury lamps are used. This figure includes all ordinary depreciation and interception and represents illumination under actual working conditions.

Although the effect of interception of light by machine parts and often the work has been generally known for the last 15 years, it has been "soft pedaled" because of the difficulty of evaluating it. One of the values of the point by point method of calculating illumination is that it offers a convenient method of estimating the effect of interception when the location and height of machinery is known. In general, the more crowded together the machines, the higher the machines and the more spread the light distribution the greater the effect of interception. For instance, with a 30-06 rifle you could kill a deer in Kansas a mile away, but not in the Pennsylvania woods.

A detailed report from one of the large Pittsburgh area steel mills shows calculated, actual and depreciated values of illumination that bears out the data already given. A forge shop building 90 feet wide and 260 feet long. Height to roof truss 50 feet. The furnace end of the building was equipped with 1000-watt Hibay units and the other half with 1000-watt RLM reflectors. The units were located in two rows staggered on 45 x 40-foot spacing. The calculated illumination by the point by point method was 7.7 for the Hibay units and 4.5 for the RLM reflectors. The initial measured illumination was 7 for the Hibay units and 4 for the RLM reflectors. After three months depreciation the illumination from the Hibay reflectors was 5 and 2 for the RLM reflectors. The reason why the calculated and actual initial values check so closely is because there was no machinery in the building where the test was made. The depreciation figures check closely with the 0.54 depreciation factor.

The use of type-H mercury lamps in certain steel mill locations, such as scarfing and chipping, cold mills,

Fig. 8—Arrangement of refractors for protective fence lighting



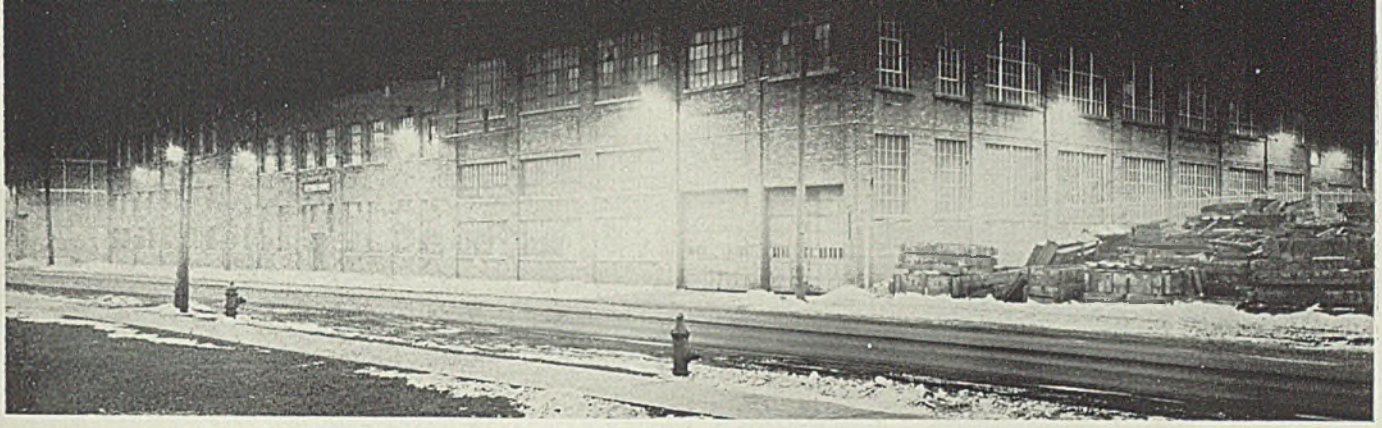


Fig. 9—Protective lighting installation using refractors mounted on brackets suspended from walls of building

hot strip finishing, machine shop, roll shop has gained favor during the past five years. It is believed that the color of the mercury light is advantageous for these locations. Due to the time required for relighting after an out due to voltage off or dip, some incandescent lighting is included with the mercury.

The amount of incandescent light varies from none to alternate units. From the standpoint of economy and color it is advisable to use as few incandescent lamps as possible. The stroboscopic effect can be largely overcome by using 2-lamp transformers with leading and lagging power factor. There are several drawbacks that are more or less serious depending on local conditions. Only 60-cycle current supply is satisfactory for type-H mercury lamps. Only one lamp size, 400 watts, is available which is equivalent approximately to a 750-watt Mazda lamp. The color of the light, while satisfactory for some processes is not satisfactory for others when true color value of the work is important. Alternate mercury and mazda lamps do not give a satisfactory color mix. The stroboscopic effect even with 2-lamp transformers may be objectionable. The most frequent use of mercury lamps is for chipping and scarfing and an objection here is the great number of outlets necessary to produce the required illumination of 50 footcandles, as units must be placed on approximately 9-foot centers. A way of overcoming this difficulty is to use a 2-lamp mercury unit on a 2-lamp mercury transformer on a 12½-foot spacing on centers. Fig. 4 shows a photograph of such a unit.

Table I—Illumination Data for Cold Mill
(Lamps mounted 40 feet high)

Distance	$\tan^{-1}x$	x	$\cos^3x$	Candlepower Hibay	Candlepower RLM	Foot candles Hibay	Foot candles RLM
0	0	0	1	12,620	4640	7.9	2.9
5	0.125	7.1	0.977	12,620	4550	7.9	2.8
10	0.250	14.1	0.912	12,620	4450	7.2	2.5
15	0.375	20.6	0.820	10,600	4350	5.4	2.2
20	0.500	26.6	0.714	9,000	4200	4.0	1.9
25	0.625	32.0	0.610	6,000	4000	2.3	1.5
30	0.750	36.9	0.510	3,600	3750	1.1	1.2
35	0.875	41.2	0.426	2,400	3400	0.64	0.90
40	1.00	45.	0.354	2,060	3100	0.46	0.69
45	1.11	48.0	0.300	2,000	2850	0.37	0.53
50	1.25	51.4	0.243	2,000	2650	0.30	0.40
55	1.37	53.9	0.204	1,800	2500	0.23	0.32
60	1.50	56.4	0.170	1,000	2250	0.10	0.24
65	1.63	58.5	0.144	900	2150	0.08	0.19
70	1.75	60.3	0.122	800	2000	0.06	0.15
75	1.87	61.8	0.105	500	1900	0.03	0.12
80	2.00	63.5	0.089	200	1850	...	0.10
85	2.12	64.8	0.077	140	1750	...	0.08
90	2.25	66.0	0.067	...	1600	...	0.07

Table II—COST ANALYSIS FOR MERCURY, INCANDESCENT AND FLUORESCENT LIGHTING FOR A HIGH BAY
(Building under consideration is 4,000 x 320 x 50 feet high. Mounting height of lamps 40 feet.)

	Mercury	Incandescent	Rectified Fluorescent
1. Square feet per unit	485	410	121
2. Total number of units	2,640	3,120	10,590
3. Initial footcandles	40	40	40
4. Average lamp life	2,000	1,000	3,000
5. Initial lumen output	32,000	27,000	8,000
6. Number and wattage of lamps per unit	2-400	2-750*	2-85
7. Lamp cost,			
$11 less 35%	$7.15 ea.		
$4.25 less 35%			$2.76
$3.50 less 35%		$2.275 ea.	
8. Cost of unit and auxiliaries	$31.20	$26.00	$27.50
9. Wiring and installation cost including conduit, wires, labor and switch panels	$15.00	$15.00	$15.00
10. Total initial cost per unit items 6, 7, 8, 9	$60.50	$45.55	$48.02
11. Total initial cost, items 2 times item 10	$160,000	$142,116	$508,000
12. Fixed yearly charge interest, taxes, insurance 10% of (item 8 plus item 9) times item 2	$12,200	$12,792	$44,900
13. Amortization for 6-year period 15% of item 8 plus item 9 times item 2	$18,300	$19,188	$67,400
14. Hours per year of plant operation	7,500	7,500	7,500
15. Yearly lamp renewal cost			
2 × 7.15 × 2.640 × 2.5	$94,380		
2 × 2.76 × 10,590 × 2.5			$146,000
2 × 2.275 × 3.120 × 7.5		$106,470	
16. Yearly cleaning & relamping cost at 50c per unit			
0.50 × 2.640 × 3.75	$4,950		
0.50 × 3.120 × 7.5		$11,700	
0.50 × 10,590 × 2.5			$13,210
17. Total Corrected load in k.w.			
2.640 × .832	2,210		
10,590 × .2			2,118
2 × .75 × 3,120		4,680	
18. Annual energy cost at 1c per k.w.h. operating for 7,500 hrs.			
2,210 × .01 × 7,500	$165,900		
2,118 × .01 × 7,500			$158,800
4,680 × .01 × 1.5		$251,000	
19. Total operating cost per yr. items 12, 13, 15, 16 and 18 added together	$295,730	$401,150	$430,310

*Bipost.

Has Definite Applications

Fluorescent lighting has a definite application for offices, drafting rooms, tin plate inspection, stainless steel polishing and similar operations. It is not suitable for high bay lighting. The following cost analysis made for a large recent defense project shows that for equal footcandles the first cost of fluorescent lighting is 3½ times greater and the operating cost, approximately the same as for incandescent lighting. Compared with mercury lighting the fluorescent first cost is 3 times greater and the fluorescent operating cost is 1½ times greater.

Due to small sizes of fluorescent lamps a great number are required for a high bay installation and maintenance becomes a serious problem. The illumination suffers an even greater depreciation than for incandescent or mercury lighting because burned out lamps, starters, transformers and reactors are not replaced promptly. It is not unusual to find an industrial fluorescent installation operating with 25 per cent of the lamps not burning, although office installations are better cared

(*Please turn to Page* 86)

Bethlehem's answer

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H-M HIGH SPEED tool steel is Bethlehem's answer to the present shortage in tungsten.

H-M High Speed will handle virtually any job formerly handled by 18-4-1 . . . and turn in a comparable performance. In addition, H-M High Speed is less expensive to buy than the 18% Tungsten grades. However, since the analysis of H-M is so different from that of the 18-4-1 grades, this steel must be heat-treated and forged with particular care. Here are recommendations on its forging and annealing practice:

FORGING—Recommended forging temperature for H-M is between 1900 and 1950 deg. F., after a careful uniform heating and soaking. Large pieces should be thoroughly preheated at 1300-1500 deg. F., before heating more rapidly to forging temperature. Long soaking at forging temperature should be avoided because of decarburization. Decarburization may be retarded by sprinkling borax on the steel when it is at a temperature of approximately 800 deg. F. Use a steel plate to protect the furnace hearth from the corrosive action of the borax. Atmospheric control in the heating furnace will also prove helpful in preventing decarburization.

ANNEALING—Annealing should always follow forging. The recommended practice is to "pack anneal" in coke breeze, cast iron chips, or a mixture of dry silica and pulverized charcoal at about 1500 deg. F., thoroughly soak, and then furnace cool.

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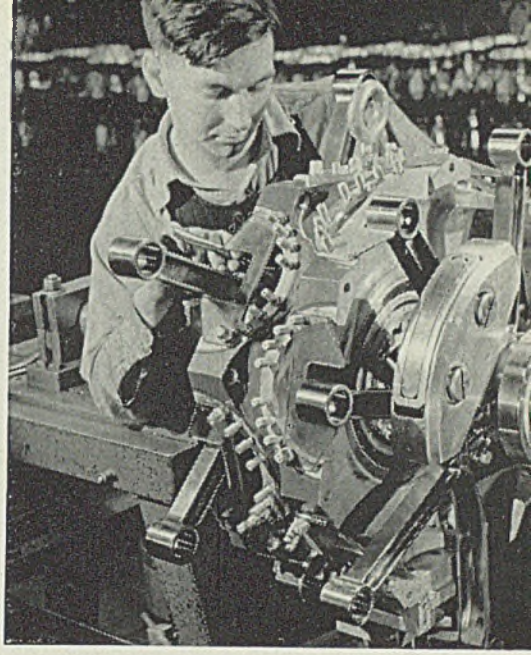


Fig. 1—This is power section with master rod assembly and dynamic damper —the heart of the engine. It contains the crankcase center section, the crankshaft center section, the two master rods, 12 articulated rods plus valve actuating mechanisms and timing gears —more than 500 parts

■ DID YOU ever wonder how a complicated assembly line was planned and what the steps were in laying it out?

Wright Aeronautical Corp. employs 18,500 workers at five plants at Paterson, N. J., to handle more than 80,000 operations between foundry and test floor to produce 1700-horsepower Cyclone 14-cylinder double-row radial aircraft engines at the rate of one every 24 minutes. The usual method of setting up the sequence of assembly operations and letting this determine the maximum output rate was exactly reversed.

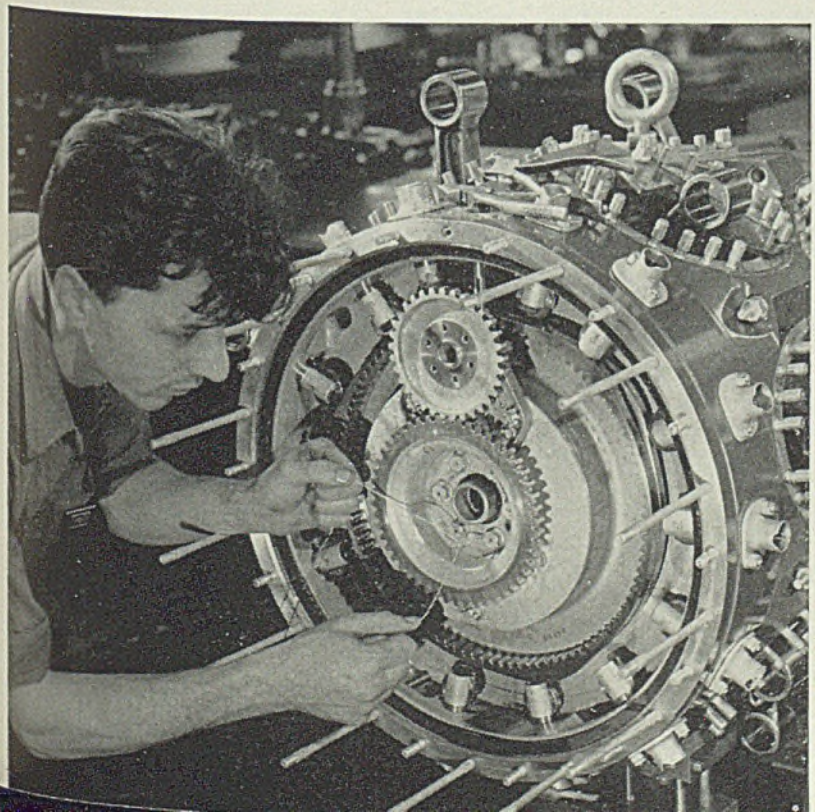
In planning this assembly line, it was found that the required plant output could be reached if each group of operations on the assembly line took no longer than 24 minutes, thus producing a completed engine every 24 minutes. But the 8500 parts which go into the Cyclone 14 engine were being assembled by an assembly method known as spot assembly. Here eight men put every piece into one engine, taking a full 8-hour day to complete the job. Assembling more engines by this method meant finding more skilled assemblers since these operators had to be familiar with every operation involved in the entire engine assembly. But these skilled hands were not obtainable.

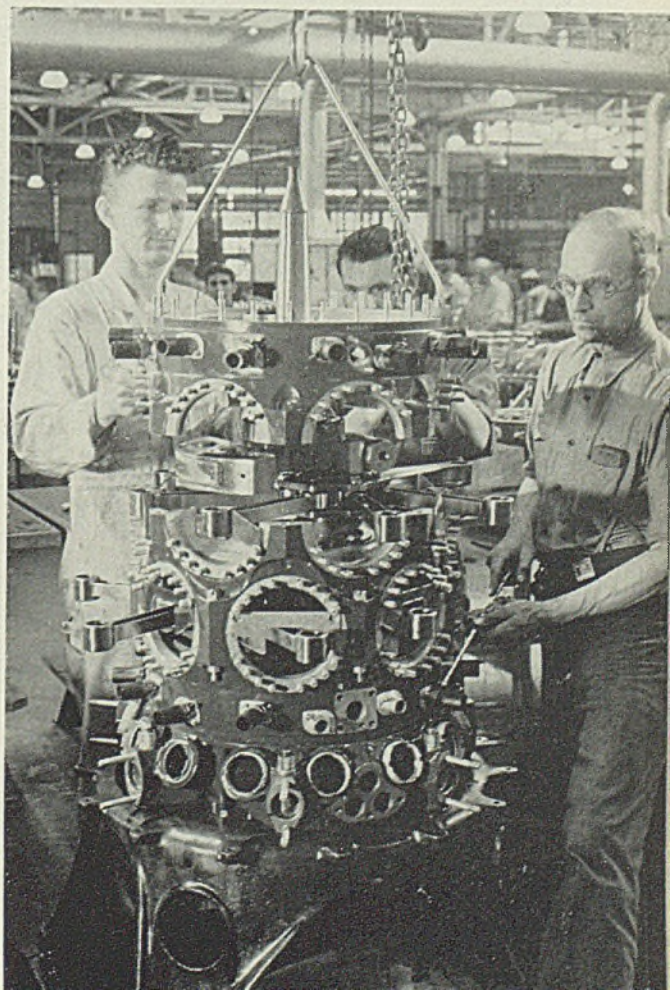
This bottleneck was broken by changing spot assembly over to a co-ordinated group of progressive assembly operations. Operators for such a line could be trained rather quickly since each man needs only to know how to assemble a few parts. But how to set up such a progressive assembly line—that was what caused M. F. Gemme, assembly superintendent, and his assistants, foremen and lead men to forget about time off month after month while they worked out an assembly system that was put into operation four months ago with excellent results. The spot assembly operations now are split up and co-ordinated into a group of operations which allow application of more man-power and remove bottlenecks in the engine output. Now the engine proceeds down a high speed progressive-type assembly line.

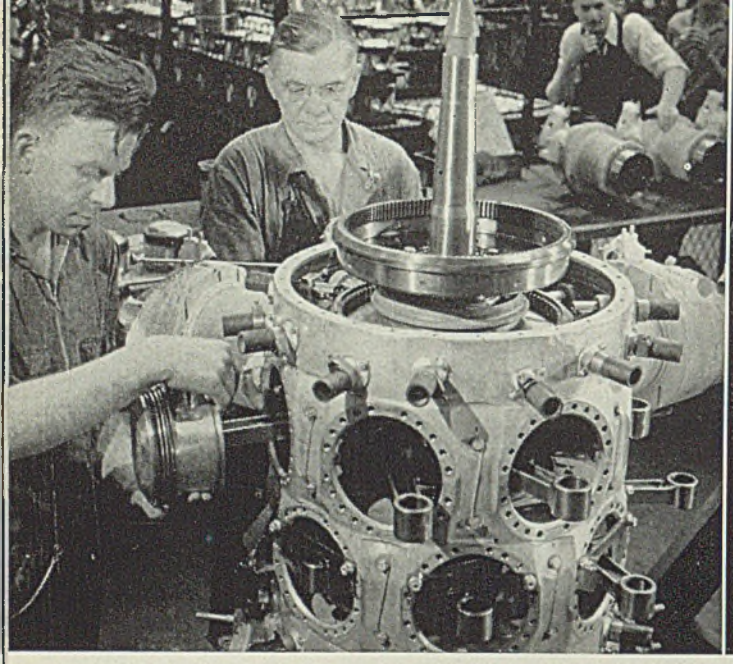
Just how this assembly line was developed is a long story, but briefly it is as follows: As a test experi-

Fig. 2. (Left below)—Here crankcase rear section has been added. To this will be assembled the supercharger front section, followed by supercharger rear section to complete rear end of the engine

Fig. 3. (Right below)—Then the engine is built up towards its front end by first adding the front section of the 3-section crankcase as shown here







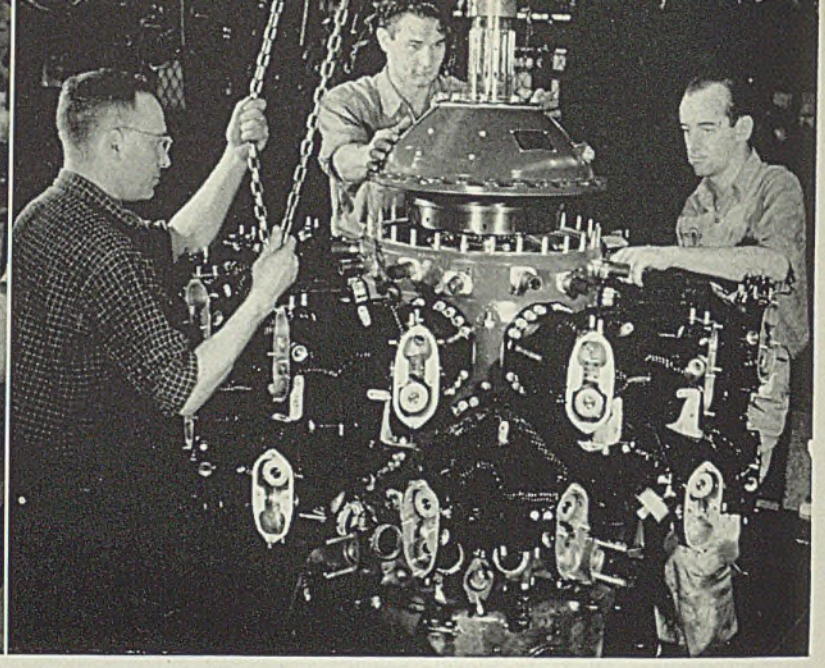
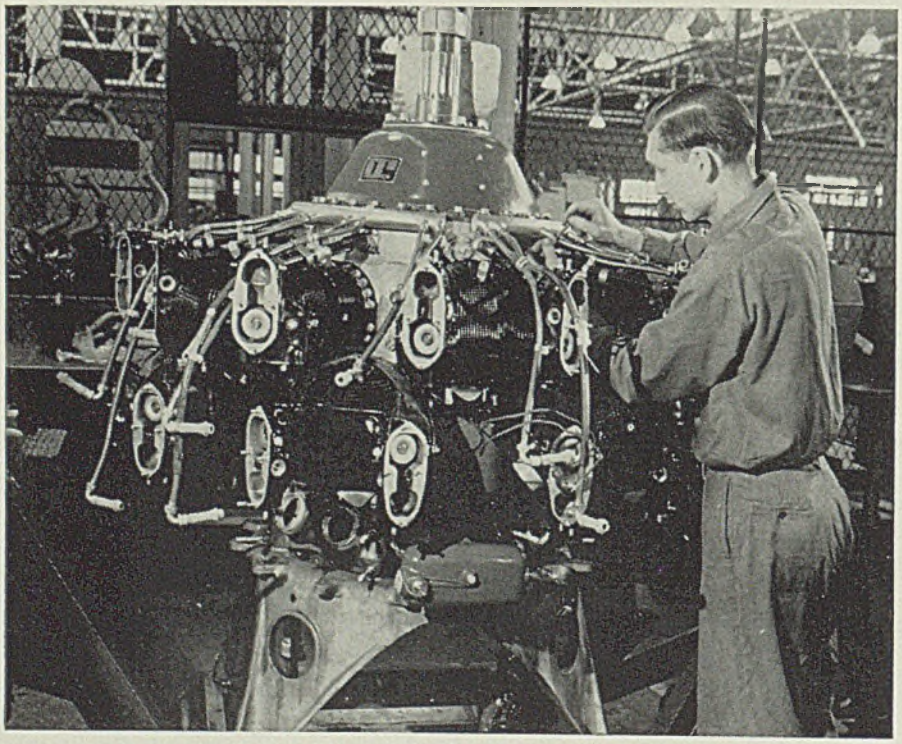
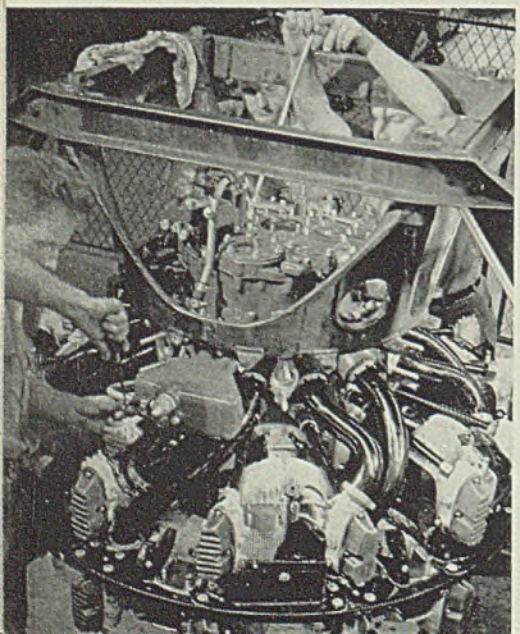


Fig. 4. (above left)—Pistons are assembled in engine and cylinders bolted on
Fig. 5. (above right)—Here cylinders are assembled and nose section added
Fig. 6. (directly below)—Ignition harness with its metallic shielding comes next. Note cradle





ment, all of the parts needed to make up a Cyclone 14 were set up on 20 different benches. Stop watches were started and picked crews of men went to work on each division. Some of the stations required a lot more than 24 minutes to complete, while others were finished in a shorter time. The obvious next step was to combine the easy operations that could be completed quickly into combinations that would hit the 24-minute schedule

Fig. 7—With engine upside-down in cradle, intake pipes, baffles and oil sump are added. Cradle permits positioning engine at any point in complete circle

right "on the nose."

The more lengthy operations were either split up or else more men were added until the 24-minute time limit on the operation was reached exactly. It was this experimenting, this almost endless shuffling and reshuffling of assembly assignments, that finally produced a rhythmical, perfectly timed, progressive assembly line. A 21st assembly station was even set up as a reserve in case of trouble at any one point.

Setting up these 21 stations whipped the mechanical problem of actual assembly, but it created a problem of supplying parts to the line at exactly the right time. More testing and timing were necessary before the routine was worked out for starting gears from East Paterson and pistons from plant No. 5 and machined parts from building 18 so all these units would mesh into the final assembly line without blocking floor space by arriving ahead of time or delaying the line by being late.

Of course the final assembly line is fed with many subassemblies. The biggest subassembly job of the entire line—a section of 500 individual pieces—is completed before the progressive line starts. This is the assembly of the crankcase center section, the crankshaft center section, the two master rods and the 12 articulated rods plus valve actuating mechanisms and timing gears. This is the actual torso of the engine, containing its vital parts. Fig. 1 shows this power section being built up. In Fig. 2, the crankcase rear section has been added and to this will be fastened the supercharger front section. The supercharger rear section—a jigsaw puzzle of gears and small parts built up as a separate subassembly—subsequently is assembled onto this builtup engine, completing the rear end of the engine.

At station No. 3 in the trip down the assembly line, partly assembled engine comes off its hoist and takes

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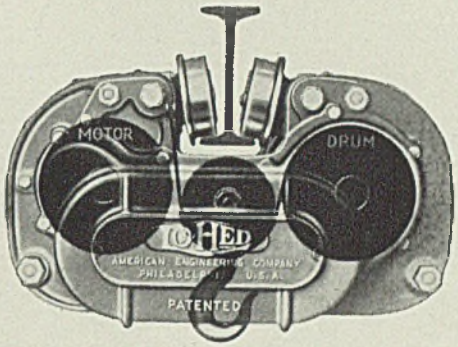

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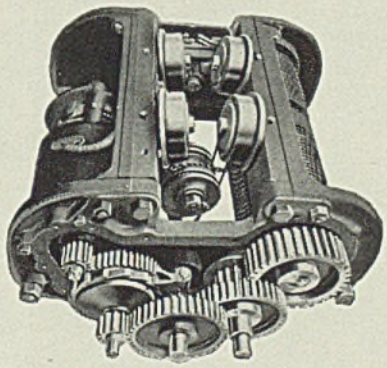

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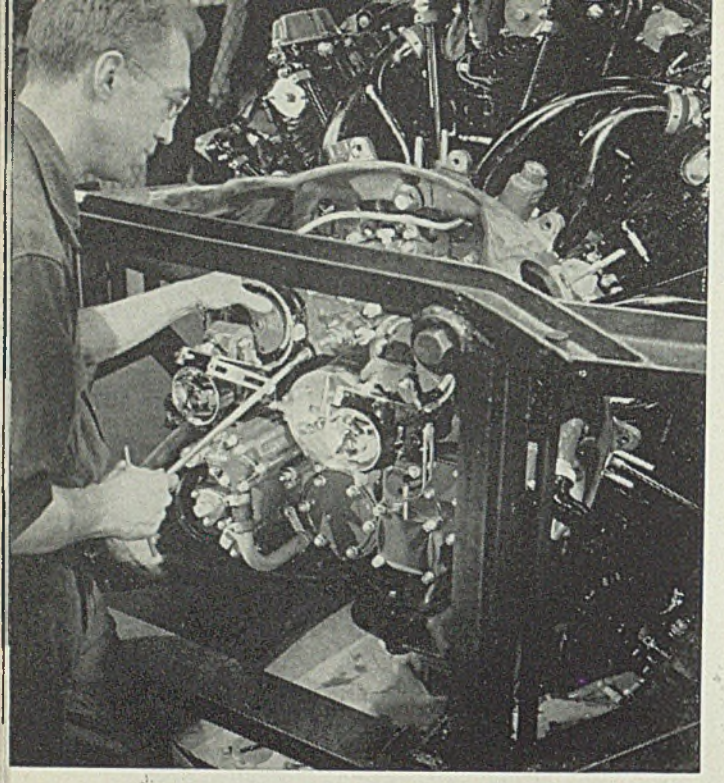


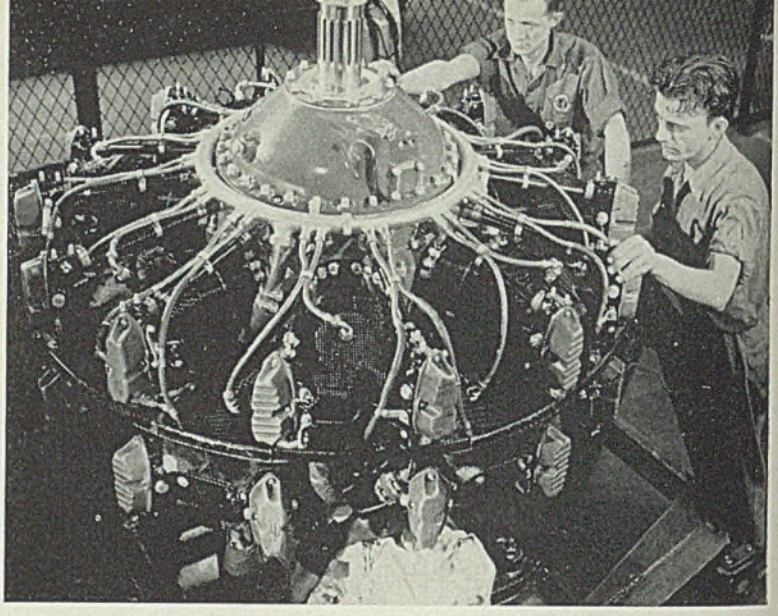
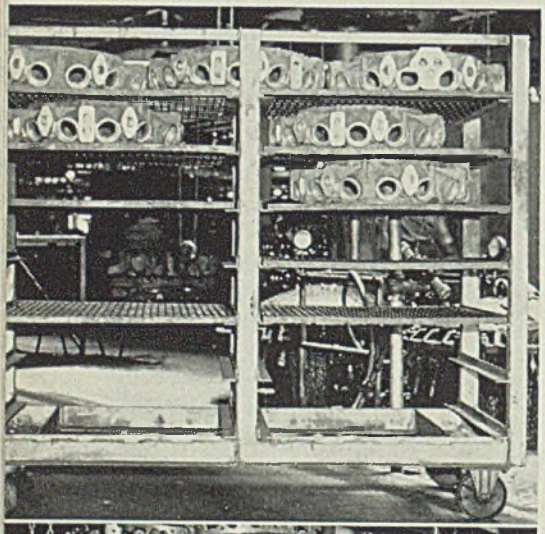


Fig. 8. (Left)—On its side, oil pump and magnetos are easily mounted in place

Fig. 9. (Right)—Completed engine, still on its cradle goes to test block



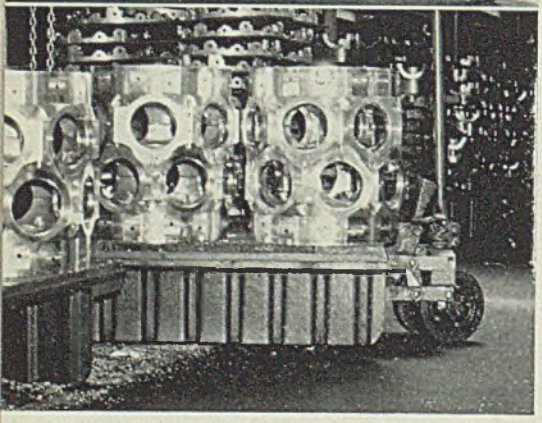


Fig. 10. (Upper view)—Typical racks employed to transport parts to assembly line. Fig. 11—Wood-faced steel skids and lift trucks move heavy crankcase sections. Note lower view

to wheels. As shown in Fig. 1, overhead hoists are available all up and down the assembly line. At station No. 3 the engine is transferred to a stand which rolls on wheels down the assembly line to the subsequent assembly stations. The engine is mounted on this stand in a cradle which permits the engine to be tilted to any angle desired. In fact, it may be turned vertically with nose end up as in Fig. 4, or completely over while still in the cradle as shown in Fig. 7 or on its side as in Fig. 8. The engine is bolted to this stand with the same brackets with which it will eventually be affixed to an airplane—by bolts running through the supercharger front housing. These brackets can be seen at the bottom of Fig. 3 and near the center of Fig. 8, in which view the third or front section of the crankcase is being lowered into place.

Parts are brought up to the assembly stations directly on racks or in steel tote pans of various sizes carried on portable steel racks equipped with rollers on their feet. The supply of parts at the assembly stations is replenished from stores on a regular systematic basis for the "green" assembly line. Here, as in many aircraft engine plants, the complete engine is assembled on the "green" line, given a preliminary running test for an average of 7 hours 15 minutes and then is completely disassembled and every one of the 8500 pieces of which it is composed inspected. After passing inspection, the engine goes down the "red" or final assembly line until it is ready for its final test of 5½ hours.

Of course this practice means that in assembling the engine after the green test the 8500 parts for that particular engine must be distributed to the various stations on the "red" line in the correct sequence so all the parts for that particular engine actually are reassembled in that engine.

Going back to the first or green assembly line, after the power section containing the master rod assembly and dynamic damper, Fig. 1, is completed it is transferred to the next station by means of overhead monorail hoist, using a lifting hook screwed in the center crankcase section. Here the crankcase rear section, Fig. 2, is added to the center section. The engine is built up from this center crankcase section by adding sections to its rear, followed by adding sections to the front.

In Fig. 3 the front third of the crankcase is being placed. This illustration reveals well the complexity of the 3-section crankcase. With the main section of the crankcase assembled and the front and rear sections of the supercharger, at successive stages down the line, pistons are joined to the rods, Fig. 4, cylinders slipped in place over pistons, the nose section added, oil pumps, gears and rear housing and rear cover assembly placed, with carburetor, magnetos, ignition harness and other small parts subsequently added.

Fig. 5 shows the nose section assembly being mounted. In this view all the cylinders have been added to the crankcase, and in Fig. 6 the ignition harness is being adjusted and connected.

In Fig. 7, the supercharger rear section is shown in place with intake pipes, baffles and oil pump added. Oil line connections are being made in this illustration. Note that the cradle supporting the engine has been turned completely upside-down, permitting complete access to rear of engine.

In Fig. 8, the two magnetos of the double-row engine are being mounted. Note here the cradle has been turned to support the engine on its side. In Fig. 9, the finished engine is being pushed off the assembly line.

Fig. 10 shows one of the steel

(*Please turn to Page* 85)

SOUTH BEND LATHES

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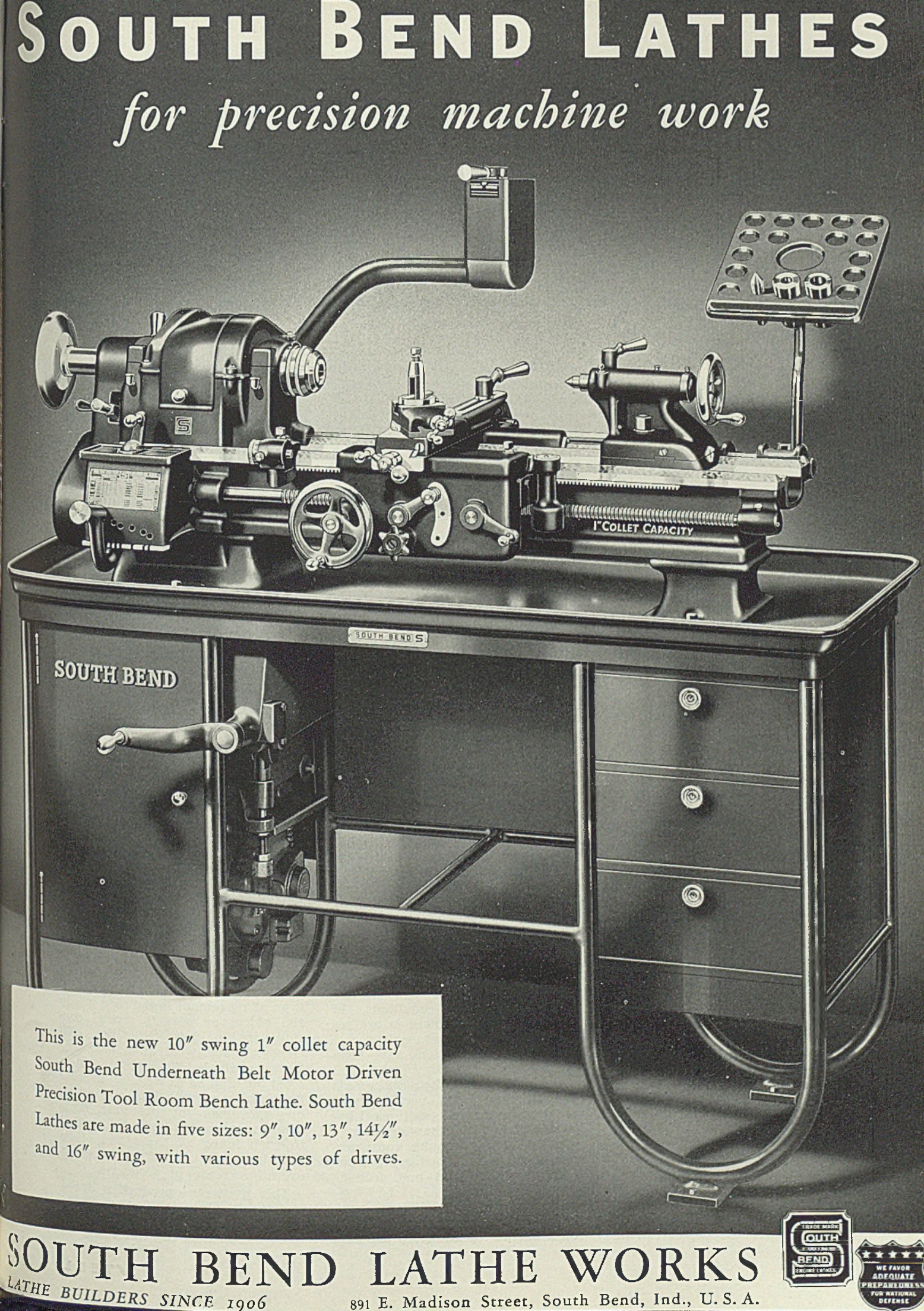

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How To Get the Most from

ARC WELDING

—Section III—

. . . . . Positioning the work when it can be moved and how important production speed increases and cost reductions are thereby attained

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

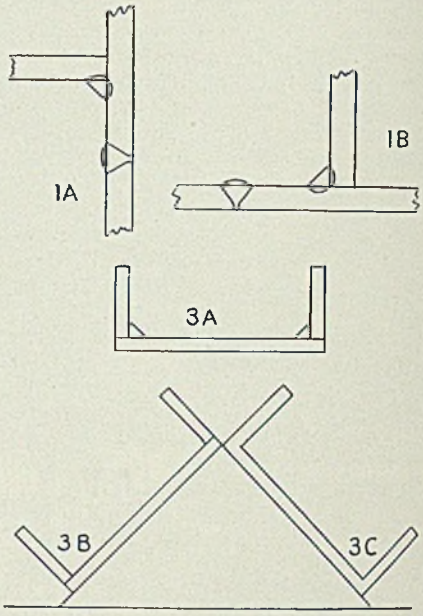


Fig. 1—Location of welds, top illustration, in service, 1A, and positioned for most efficient welding, 1B

Fig. 3—Machine base, lower illustration, in flat position, 3A; titled for one fillet, 3B; and for other fillet, 3C

AS WAS discussed in Section II, STEEL, Aug. 18, 1941, p. 86, position of the joint to be welded is of great importance in determining the maximum speed of production that is possible.

Note here that *position* (flat, vertical, horizontal and overhead) must not be confused with *positioning*. Position has to do with the way the parts come together to make a joint to be welded in a given installation, whereas positioning involves moving the work around so that weld metal can be placed most easily, thus increasing the speed of the welding operation. For example, a lap joint may have any one of the four positions (flat, vertical, horizontal or overhead), but there is, of course, only one position in which the speed will be the highest, and that may be none of these for maximum speed is had when top of fillet is level and molten metal can be "poured" into the joint.

From the viewpoint of positioning there are five main divisions:

First, the inherent position in the structure, such as flat, vertical, horizontal or overhead.

Second, the static or fixed position such as is the case in a bell hole weld in a pipe line, welds on extremely heavy parts of machinery, on the main framing of a ship and the like. In these cases, the selection of the type and location of the joint definitely determines the welding position.

Third, where the part may be moved to a number of fixed positions, it is possible to fix the work in a position where the weld metal is more easily deposited. An example is on parts of a ship such as bulkheads which may be moved to a fixed position, welded, and then moved to another fixed position and further welding done.

Fourth, where the object can be moved continuously, it is possible to adjust the motion of the work so the weld metal is always being deposited in the most desirable position. An example is roll welding on a pipe line.

Fifth, selection of the electrode determines largely the speed for a single position as well as for different positions.

This discussion is to show the advantages in increased speed of production that can be had by moving the work so it is turned to the most favorable position and held, or moved in continuous motion so the most favorable conditions will be maintained. A pipe line, as explained, may involve either—the static type (bell hole weld made in position) or the moving type (roll welding on the firing line).

Concentrate on Best Positions

A building may be fabricated in a number of different ways. Obviously, the building itself will be in position and cannot be moved. *The selection of the joint must, therefore, be such as to obtain the most advantageous welding position in the field.* However, individual parts, such as fabricated girders, columns and the like may be positioned by either the static or rolling method so maximum speed will be obtained. Similar conditions, of course, exist in reference to bridges and other large structures.

The inherent positions have been discussed in a preceding article and a comparison made between speeds of production in flat, vertical, horizontal and overhead positions. Limitations of available handling equipment frequently require considerations of these positions as do ease of making the joint and accessibility.

Likewise, these inherent positions and their characteristics in reference to speed of production must be taken into account in cases of static or fixed positions where parts cannot be moved.

When a part is not necessarily completely fixed or static but may be moved from one position to another, then it is possible to select that position most suitable for depositing weld metal. For example, while 1A, Fig. 1, indicates the location of the joint in service, it may be moved to 1B for welding with an important increase in production speed.

Note, too, the difference in plate edge preparation. In the horizontal weld the edges are not symmetrical—one being 20 degrees, the other 40 degrees—while in the flat position, the edges are symmetrical as far as preparation is concerned. This matter of edge preparation will be discussed later, but it is well to obtain early an appreciation of the relation of joint position to edge preparation.

Contrasted to this intermittent type of movement is the case where the object or part is moved continuously for best deposition efficiency. A roll weld on a pipe line is an example. This results in a fixed position as to welding, usually flat, but is, nevertheless, a continuous movement of the part. This continuous motion may be applied to such items as bases and other machine parts to afford a great overall increase in production.

This matter of production speed and positioning is further influenced by the selection of the electrode, illustrated by reference to

No. 5 rod curves, Fig. 2. Here the same electrode is used but the position is changed from flat to tilted. There is marked increase in the speed of production within the range indicated as position of the weld is changed gradually from flat to tilted.

Use of another type of electrode shown as No. 8 in Fig. 2 reveals a similar increase for the tilted position. In this, the No. 8 in *flat* position is practically a continuation of the No. 5 in *tilted* position, whereas the No. 8 *tilted* results in a still further increase of welding speed.

Assume, for the sake of example, that it is desired to make a ½-inch fillet weld. Depending upon the rod and position chosen, this may be made at an arc speed of 10 feet, 26 feet or 33.3 feet an hour, according to the curves in Fig. 2. It is obvious that in obtaining the latter speed of approximately three times the first (33.3 instead of 10) that an important cost reduction would result. It must be noted that even though the speeds referred to are *arc* speeds, actual production rates would be in the same percentage, and consequently direct comparisons are possible.

If the factors pointed out here were applied to a machine base, it would be necessary merely to shift the base on some kind of a triangular device which would permit it to be welded in the *tilted* position, rather than in the *flat* with an increase in speed as indicated. Fig. 3, 3A, shows the conventional flat position. If the part is placed as in Fig. 3, 3B, then one bead is made as shown. Bead 3C, Fig. 3, is then made by shifting to the opposite position.

Making a comparison on the basis of good position and proper electrode for that position yields startling results. Assume an operating factor of 50 per cent, which means that the arc is in actual operation half of the time. Production, in one case, would be 5 feet an hour and, in the other case, 16.6 feet an hour. This would mean that in one case the cost would be 20 cents a foot (for direct labor at $1.00 per hour), in the other case 6 cents a foot—a saving of 14 cents a foot. This is direct labor without overhead, power or electrode which of course would increase the advantage.

With a production of 16.6 feet per hour and a cost reduction of 14 cents per foot, the cost reduction would be at the rate of $2.33 an hour. Based on a 2000-hour year, this amounts to $4660, part of which could be used for writing off cost of required equipment. And this would be done in the first year. To put it another way, the production under these conditions would be more than three times the output for the flat position.

Increased production is very great where both best position and best electrodes are taken into account. This is illustrated in Fig. 4, where increase from flat No. 5 rod values to tilted No. 8 rod are compared on a percentage basis according to plate thicknesses from ¼ to 1 inch.

Study and use of *position* and *positioning* are thus seen to be productive of faster production and lower costs. Thus be sure you give these factors the consideration they deserve when you start to figure how to get the most from your arc welding operations.

Standardized Valves on Nitrogen Bottles Sought

■ Campaign for mandatory standardization of valves used on industrial nitrogen bottles was recently launched by G & N Mfg. Co., Cleveland, manufacturer of diecasting machinery. Action came after an explosion in a Cleveland diecasting plant, in which three were killed and one injured.

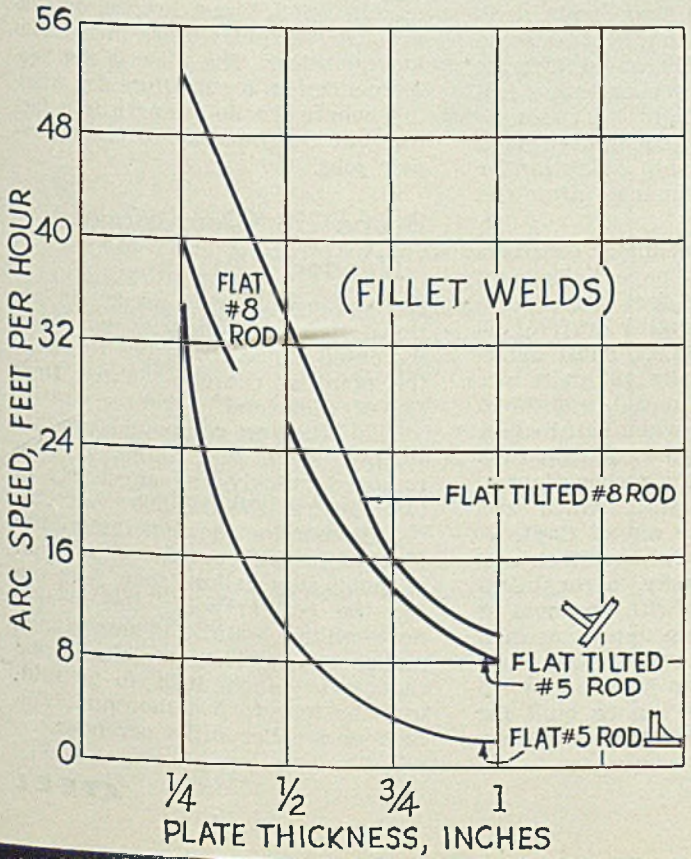
The explosion occurred after the accumulator tank on a diecasting machine had been accidentally filled with oxygen instead of nitrogen and the oxygen came into contact, under pressure, with hydraulic fluid used in operation of the machine.

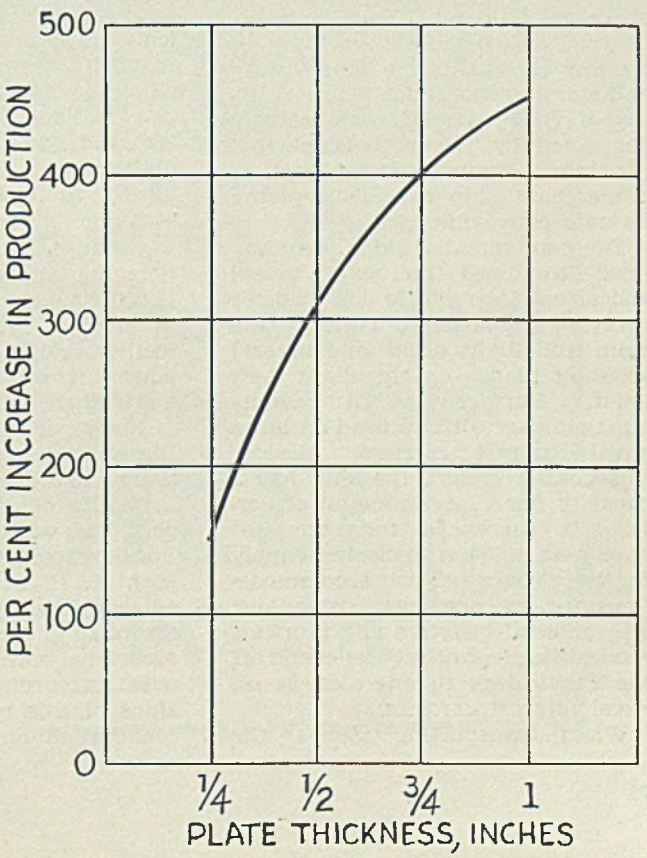
G & N is seeking to have the Bureau of Standards introduce a regulation making it necessary for nitrogen producers to sell nitrogen only in bottles with left-hand threads on the valve fittings. All nitrogen inlets thus would have corresponding threads and it would be impossible to attach them to an oxygen bottle.

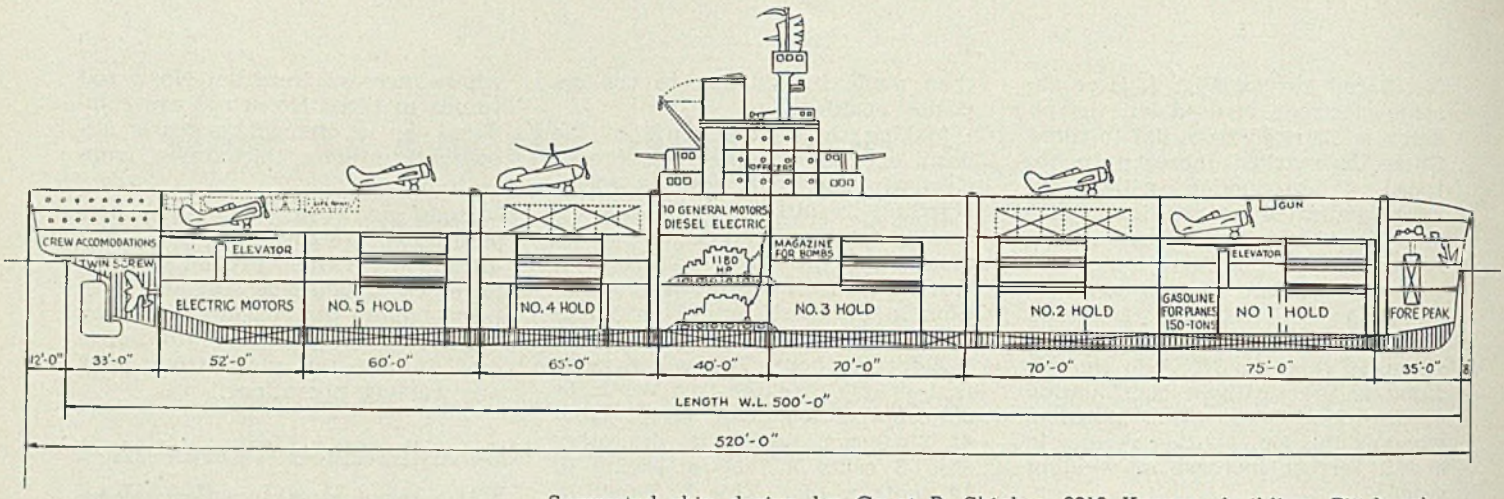
Appeal for action in this matter also has been made to the International Acetylene Association.

Fig. 2—Comparison of speeds, left below, of producing fillet welds flat and in the tilted position

Fig. 4—Per cent increase in production by using filler electrode and tilted position as compared with general purpose electrode in flat position, right below







Suggested ship design by Grant B. Shipley, 3010 Koppers building, Pittsburgh, for freeing warships from convoy duty: Note elevators fore and aft

NEW DESIGN FOR

FREIGHTER and AIRCRAFT CARRIER

. . . . frees warships from convoy duty

■ ONE OF TODAY'S paramount topics is ships—ships for transporting material aid to war-torn England under the lend-lease bill—ships for convoying freighters and ships designed as floating bases for war aircraft.

To convoy a group of transports successfully, the government must, of necessity, employ a large complement of various warships—and even with such a formidable escort there is always danger of a submarine or bomber slipping through and destroying one of the supply-laden transports and its badly needed cargo.

A "double-barreled" method of freeing war craft from convoy duty and simultaneously hastening delivery of vital materials was recently suggested by Grant B. Shipley, a Pittsburgh engineer, in the form of a merchant ship capable of doing its own convoying.

The contemplated ship, a streamlined combined merchant vessel and aircraft carrier, is designed for carrying 25 bombers between the main and flight decks and several scouting planes on the flight deck itself. Furthermore, it mounts guns similar to those used on large naval aircraft carriers. Besides this "battle dress", the ship has a capacity for a large amount of cargo. It carries a magazine for bombs, a 150-ton gasoline supply for the planes and has accommodations for officers, crew and pilots. The officers' quarters and gun turrets are located about the center of the flight deck to one side as on naval aircraft carriers.

When transporting planes, the ship enables aircraft, now being crated by manufacturers and shipped to seaports, to be simply flown directly to the deck from the factory, placed on elevators, as shown in the accompanying illustration, and stored between the main and flight decks. To expedite matters more, the planes can be lifted to the flight deck and flown ashore when the ship is within several hundred miles of its destination.

May Be Used as a Sea Base

In emergencies, the vessel can be used as a sea base for aircraft, servicing battle areas in much the same manner as regular naval aircraft carriers. An important design feature is that its flight deck can be removed and the vessel used as a high-speed cargo ship or oil tanker for the merchant marine after the war.

Although not yet under construction, the ship on "paper" displaces 11,000 tons, is 520 feet long, has a beam of 68 feet and a draft of 26 feet. Developing 11,000 shaft horsepower, it will make 18 knots per hour when fully loaded, and 20 to 21 knots per hour when half loaded. Diesel electric engines driving twin screws make up the power plant.

Details of the ship, which was perfected with the aid of Capt. V. Yourkevitch, a naval architect, and Maj. A. P. Seversky, aeronautical advisor, have met with approval of the navy and many important men associated with the shipping business. According to Mr. Shipley, 15 ships of this type can be built for the cost of one modern naval aircraft carrier. The cost of the ship is estimated to be about $3,000,000 as against $50,000,000 for the naval vessel.

New Repair Metal Has Machining Qualities

■ Conrad, Marsh & Korte Inc., 1520 Locust street, Philadelphia, announces a new type of metallic filler or repair metal called Ceko, which fuses with damaged metal surfaces. It features *two* critical temperatures—low for initial melting to apply as a filler of blow holes, cracks, breaks or chips and a higher secondary melting point after once fused in place. The latter melting point, ranging from 500 to 600 degrees Fahr., permits machining, filing or drilling.

The filler will not dry out or crumble and works equally well with cast or malleable iron, cast or forged steel, stainless steel, monel metal, nickel, brass, bronze, or copper. It resembles brass in machining qualities. The filler is not recommended as a substitute for welding, where tensile strength is a factor, but can be used for many repair jobs.

Steps Up Cleaning of "Needed" Drills

□ Cleaning of drills needed in national defense industries has been increased more than five times in the plant of Cleveland Twist Drill Co. of Cleveland.

The brushing compound used to remove spots and stains is now removed quickly and effectively in two General Electric 5000-watt Calrod immersion heated tanks, the first of which contains a solution of potassium tallow soap just under the boiling point, the second, near-boiling water. These tanks make it possible to clean one thousand ⅛-inch drills in 20 minutes, or four to five thousand 1/16-inch or smaller drills per hour.

HEAT TREATING GEARS

For Aircraft Engines

Maintaining the accuracy of intricate, fragile aircraft-engine gears involves a number of special problems—especially in heat-treating operations. Here is detailed the practice of one company which has been highly successful in this work. Of course, the things learned also are applicable to a wide range of other work

By JOHN L. BUEHLER
Indiana Gear Works
1458 East Nineteenth street
Indianapolis

ALMOST all aircraft engine gears must be hardened without pitting, scale, decarburization, or serious distortion. Only the most accurate of heat-treating equipment is at all suitable.

Many times spurs or helicals, which cannot be ground, are made of oil-hardening steel and treated to 50 to 52 rockwell C. These can be shaved. Often we finish cut at that high hardness on a Fellows gear shaper, removing up to 0.020-inch on a side with ordinary high-speed cutters stroking at approximately 10 feet per minute.

Excellent finishes are obtained—comparable in quality to ground teeth.

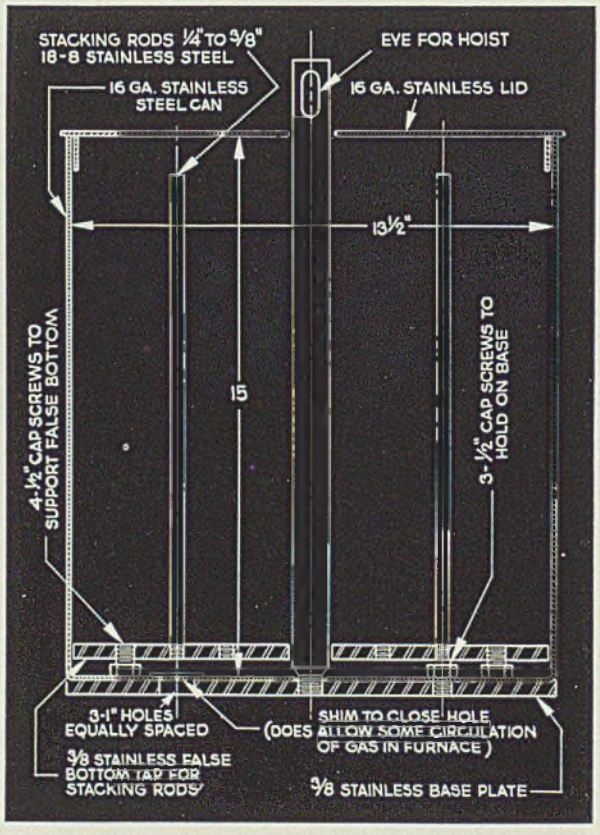
Gears which carburize must be cut in a fairly soft state. Annealed or normalized steel, however, cannot often be cut satisfactorily, particularly if the material has a banded structure. Grains or bands of pearlite tear out and roll under the tool.

Gummy ferrite builds up on the tool. The resultant streaks are never acceptable.

Our machinability practice on carburizing steel usually involves quenching in oil after an hour's soak around 1500 degrees Fahr., then tempering at from 800 to 1200 degrees Fahr. for several hours, depending on the analysis of the material. The result is a finely spherodized sorbite, homogeneous and crisp. It machines with clean hard chips that spring away and do not mar the tooth surfaces.

In all hardening operations heating rates must be carefully controlled. In general practice, most of the distortion that is blamed on the steel, on improper quench, on machining strains, and many quaint, obscure other causes occurs principally in heating. As steel heats, it expands. This expansion proceeds at a rather uniform rate until the Ac_1 is reached. As the steel is further heated, it contracts until such time as the Ac_3 is reached. After that, further heating produces expansion.

Therefore, if we heat too rapidly a piece with appreciable variation in section thickness, we have heavy sections cold—below the critical range and expanding; medium sections warmer—in the critical range and contracting; while thin sections already fully in solution will be expanding. If the simultaneous expansion and contraction is severe enough to load the material beyond its hot yield point, a permanent set occurs and the material is warped.



Special parts container for hardening: For method of operation see accompanying text

On cooling, when the material is at equal temperature throughout, parts that have been stretched by distortion will be under compression, and parts that have been hot compressed will be too short and will be under tension. Thus the part will be internally preloaded. This preload must be subtracted from the normal ultimate strength of the material to obtain the working strength of the part.

If, for example, the internal load is greater than the ultimate strength of the part, then it fails in the load—flies apart in the quench or shortly after. This is not the fault of the quench in any typical case as the material does not go through a critical period in quick cooling and hence does not have some sections contracting and some expanding.

If a difference of no more than 5 or 10 degrees is maintained between thick and thin sections during heating, little distortion will occur in very fragile parts and no quenching press or fixture need be used. Such means are not infallible on fragile parts anyhow, as they can easily prevent the natural thermal contraction of the part, thus stretching it somewhat.

However, some distortion does occur in some parts during quenching. This, with high alloys, can be mitigated greatly by quenching on a falling heat. As material starts to furnace-cool, it may drop several degrees before any structural change begins to occur. With high alloys this lag is considerable. Thus, it is possible to heat steel until the desired structure is obtained and then before quenching let it cool in the furnace to the lowest point at which the structure will be retained. The

From paper presented at 25th annual meeting of the American Gear Manufacturers' Association, Hot Springs, Va., May, 1941.

quench will then be less drastic. For example, we produce maximum refinement, maximum hardness, maximum physical properties and minimum distortion in a number of representative steels by treating as follows:

SAE 4140: Heat to 1425 degrees Fahr., cool to 1325 degrees Fahr. and quench.

SAE 3312: Heat to 1450 degrees Fahr., cool to 1175 degrees Fahr. and quench.

SAE 2512: Heat to 1420 degrees Fahr., cool to 975 degrees Fahr., and quench.

SAE 4340: Heat to 1425 degrees Fahr., cool to 725 degrees Fahr. and quench.

The latter steels are, of course, not even red when quenched. Yet the results are perfectly successful.

The above data does not apply to furnace temperature, which is too often deceptive, but is actual temperature of the work. No accurate processing of this type can be done unless a thermocouple actually touches the load. We use Leeds & Northrup Vapocarb equipment for hardening and are able to record both temperatures of the work and of furnace wall, and to control their difference.

As steel transforms from the annealed pearlitic condition through austenite to the final martensite of the hard state, a volumetric change occurs. This volumetric change is in part dependent upon quenching temperature. Most alloys have a tendency to grow when quenched from a high temperature and to shrink a little when quenched near the recalescent point. By playing with this variation, it is possible on many parts to avert volumetric change almost entirely by varying the quenching temperature. No sensitive hardening can be performed in accordance with handbook rules. Critical points on various heats of steel of the same nominal analysis may vary 50 degrees. A time-temperature diagram should be made on a coupon from each mill heat, charting the Ac_1, the Ac_3, the Ar_1 and the Ar_3 before any fragile parts from that heat are hardened.

For hardening, we use a slightly carburizing and lightly reducing atmosphere. To prevent discoloration and paper scale between the furnace and the oil, shielding is necessary. A container like that shown in the accompanying illustration is used.

A can of 16-gage 26 to 20 chromium nickel alloy rests on a ⅜-inch plate of 18-8 stainless. Plate and can have three coinciding 1-inch holes. Over these is laid shim stock. The load rests on an inside false bottom which has a number of tapped holes into which stacking spikes can be screwed. The lid fits loosely enough to allow slow circulation of furnace atmosphere. On quenching the oil knocks away the shim stock, gas in the can condenses, creates a vacuum. Oil fills the can almost instantly. The thermal circulation is great. The lid lifts with the rising oil current.

No loss of hardness is experienced with this method and find a more uniform circulation than can be obtained by any other method. On repeated quenching the can warps a little and occasionally cracks. If it is kept straight and the cracks welded with 18-8 rod, the work comes out clean and bright, and in the drawing operation will take the blue or straw temper color, depending on the draw temperature. This container is so effective for clean hardening that sometimes hard parts have become confused with untreated ones and only a hardness test has determined the difference.

Gas Carburizing Satisfactory

Only gas carburizing appears satisfactory, particularly on medium and high-alloy steels with an austenitic tendency. Box carburizing is wholly inaccurate. On heating, no one can say when a given batch of compound will crack and start carburizing; or on cooling, when carburizing will cease and the compound become a strong active decarburizer to destroy the valuable hyper-eutectoid skin on the parts. No one can predict the carbon content or depth of a case produced in this manner until the box is open.

About six years ago we recognized our need for definite standards for case carbon content. We were just beginning to realize that only a very narrow range was satisfactory—that a little too much carbon in alloys with 3½ to 5 per cent nickel produced retained austenitic —that the case would not subsequently harden uniformly, and that a little less carbon would not be sufficient to allow peak hardness. The International Nickel Co. generously lent us the very comprehensive data they were accumulating on hardenability and various other properties of 5 per cent nickel steel of from 0.08 to 1.40 per cent carbon. With this excellent material as a background, we found that we would have to keep our outer case carbon content between 0.70 and about 0.90 per cent carbon.

Production carburizing of this type can only be done under laboratory conditions. As the load is heated to the carburizing temperature, the atmosphere *must* be kept neutral. At the moment carburizing temperature is reached, an atmosphere emperically predetermined for the given steel, load density and desired case depth, and carbon content is applied. If the load is to carburize for, say, 2½ hours, then at 2 hours one of several included test coupons is removed from the furnace through a suitable small opening.

This is immediately examined in the laboratory for case depth and approximate case carbon content. If the load has carburized too rapidly, it is stopped immediately. If it has carburized too slowly, more time can be allowed. If the carbon content is too low the atmosphere can be enriched. If it is too high, the atmosphere can be made almost neutral as the carbon diffuses.

We believe no delicate parts may under any circumstances be quenched from the carburizing temperature. A cooling pit should always be used—one which will allow the load to cool at a rate sufficiently slow to insure machinability in subsequent operations, but which will not be so well insulated as to cool the load so slowly that the case will diffuse.

We feel a double quench is never desirable. The core on highly stressed parts must always be in complete solution. No free core ferrite is ever permitted by the Air Corps. For maximum overall refinement, the quench on the falling heat a few degrees above the Ar_3 of the core as mentioned above is the best we have yet found.

Quenching oil should always be kept above 100 degrees Fahr. The top limit is usually the flash point of the oil. Very hot oil may cause the loss of a point or two of hardness in low alloys, but is conducive to great uniformity.

Forced circulation of quenching oil is almost never in the right direction. Natural thermal circulation is greatest at the hottest points of a load—where circulation is most needed. Our practice is quickly to submerge the load, then very slowly lower it to within no less than 6 inches of the bottom, without any agitation whatsoever.

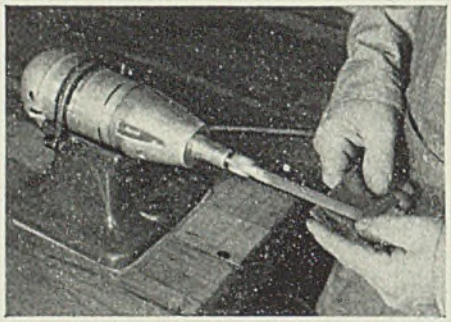
Tempering is a very important and often improperly executed operation, the one upon which the integrity of the manufacturer must most be relied. The major purpose of tempering is to relieve strain, yet too often it is only used to meet blue-print hardness specifications. Strain relief is a function of time and temperature. Hardness is primarily a function of draw temperature and can usually be achieved in a few minutes. Yet strain relief is not complete in thin sections after 5 hours at 300 degrees Fahr. or after 3 hours at 500 degrees Fahr.

Too often leaving urgently needed parts in a busy furnace for 6 or 8 hours is considered a prodigal waste of time. Yet one unrelieved strain in one small part can easily cause an engine failure. Thus time is essential.

Industrial Equipment

New Accessory for Multi-Purpose Tool

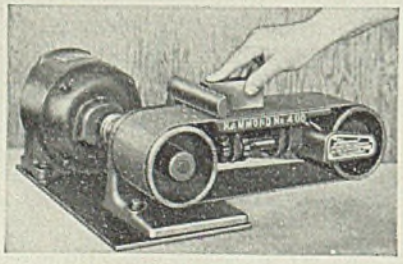
■ H & H Research Co., 12540 Twelfth street, Detroit, has introduced a stand into which the senior model Multi-Purpose tool may be clamped—greatly broadening its use



with reciprocating action. Clamped into position in the stand, the tool may be used generally in cases where the work is lighter than the tool by bringing the work to the tool instead of taking the tool to the work, thus eliminating necessity of clamping each piece into stationary position on burring and filing operations.

Belt Surfacer

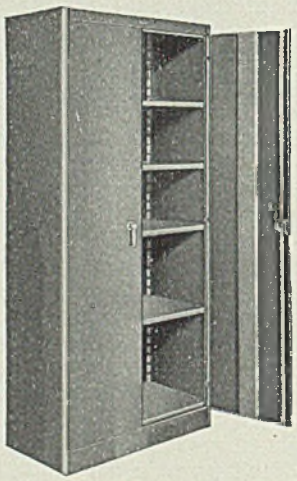
■ Hammond Machinery Builders Inc., 1611 Douglas avenue, Kalamazoo, Mich., has introduced a new No. 400 bench-type belt surfacer for wet or dry buffing, burring, surfacing or polishing. It enables finishing of stainless steel, plastics, ceramics, hard rubber, stone, lead, aluminum, wood and many other types of materials. With the proper abrasive belt, it may be used for



rough work such as removing sprues and flash from rough castings. Base of the machine is heavy cast iron. Belts, of which a wide variety may be used are of the endless type, running over 4-inch drive and idler pulleys with 4½-inch face. Two opposing thumb screws facilitate adjustment of the belt. Power is furnished either by direct or V-belt drive from a 1/3-horsepower motor operating at 1725 revolutions per minute. The surfacer operates in any position between horizontal and vertical, pivoting on center of the drive pulley and locking into position by means of a positive clamp on the base of the machine. For wet surfacing operations, a sheet metal casing is fitted around the machine. Coolant is piped to the belt by a tube inserted through the side of the hood.

Storage Cabinet

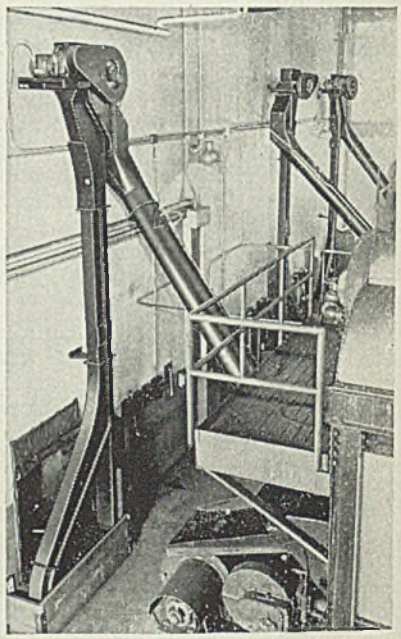
■ Lyon Metal Products Inc., Aurora, Ill., has placed on the market a line of storage and wardrobe cabinets which features "modernized" construction. The line includes both double-door and single-door storage, wardrobe, combination cabinets, desk-hi, counter-hi and janitor's cabinets. Round-cornered construction of these units enable them to harmonize with other modernistic office furniture. Other features include greater capacity, bigger hinges, improved door stops, grooved key and lock and hand ad-



justable shelves. The cabinets are finished with green baked-on enamel. Other finishes available include white, grained walnut, grained oak, grained mahogany, walnutone, flat brown and flat gray.

Bulk Conveying System

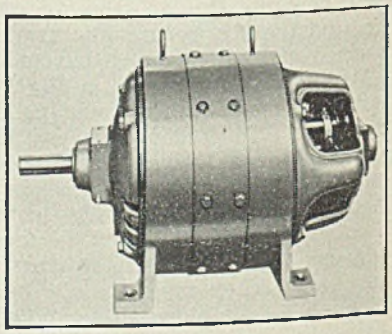
■ Link-Belt Co., 307 North Michigan avenue, Chicago, has introduced a new Bulk-Flo conveyor—a power-operated system for continuous conveying of flowable granular crushed, ground or pulverized materials of a noncorrosive, nonabrasive nature, in capacities of 1 to 140 tons per hour. It is self feeding and clearing, operates slowly within a dust-tight casing and moves the material gently and quietly. The unit uses a specially designed chain to which solid peak-top flights are rigidly attached at every pitch. These divide the material in the conveyor duct into a continuous series



of batches. The conveyor can be made to follow almost any desired path—horizontal, inclined, vertical or curvilinear. It loads itself uniformly from hoppers, bins or chutes, without flooding or overloading. Inspection windows permit observation of conveyor operation. The peak-top flights are formed at such an angle that, without pivoting or tripping, there is a clean outward discharge at the conveyor head.

Machine Exciter

■ Allis-Chalmers Mfg. Co., Milwaukee, announces a new Regulex exciter which provides efficient quick-response regulation for automatically holding constant output on direct and alternating current machines. Both exciter and regulator are combined in one unit. Originally developed for steel mill use—



for providing constant tension on winding and unwinding coils, it is now being applied to other steel mill drives and mine hoists. The exciters are being developed for all sizes of direct current machines, and are applicable to alternating

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*

Copper "Wallpaper" Protects Laboratory

Copper screen so fine it will hold water covers the four walls, ceiling, and even the space beneath the floor at the new Westinghouse radio interference laboratory, Derry, Pa. The reason for employing exceptionally fine copper screen in this way is to keep electrical interference from entering the room, which is used to test high voltage insulators for freedom from sparking that would cause radio interference.

Fine copper screen prevents electrical interference from entering this insulator test room.

Memos on Brass—No. 22

The ease with which brass can be fabricated and its adaptability to a wide range of forming processes are advantages of special importance when it is necessary to maintain high-speed production.

Find Copper Is Best Termite Protection

Cold rolled copper sheeting is recommended by workers at Connecticut State Agricultural Station as the most complete and permanent protection available against the devastations caused by termites.

The copper shields consist of continuous sheets of metal installed completely through or over the foundation of a building. They are located between the ground and the first floor framework, and they project into the open on both sides of the foundation. The lower edge of the shield outside the building should be not less than six inches above the ground.

So effective are such copper shields said to be when properly installed, that they operate admirably well even in test installations within heavily infested buildings.

Correct Cleaning Procedures Are Important in Metal Fabrication

Choice of Method is Determined by Materials to be Removed, Equipment Available, and Degree of Cleanliness Necessary

During the processing and fabricating of metals, it is often necessary to remove oil, grease, scale, dirt, or other foreign matter before further processing. The selection of a cleaning procedure depends chiefly on three factors: (1) material to be removed; (2) equipment available; (3) degree of cleanliness desired.

The materials to be removed may be classified in three groups. The first (and most common) class includes lubricants made from animal or vegetable oils or grease, such as tallow, lard oil, palm oil, and olive oil. These materials are usually removed by a saponification process, consisting in washing the metal in an alkaline solution, where the oils or greases react with the alkalis to form water-soluble soap compounds.

The second class includes unsaponifiable mineral oils, such as kerosene, machine oil, cylinder oil, and lubricating oils. These materials are usually removed by emulsification processes, employing soaps, wetting agents, and dispersing media.

The third group includes dirt particles, which are often removed by one of the two processes already mentioned, and scale from annealing, which requires acid treatment.

For alkaline cleaning of metals, the simplest equipment usually consists of an iron tank containing from 2 to 8 ounces of cleaner dissolved in water and heated to a temperature of 160-200° F. This treatment is followed by cold water and hot water rinses. Additional tanks, known as still tank units and containing cyanides or acids may also be used, with rinses following the treatment.

In removing mineral oils, degreasing units of the three-compartment type, employing organic solvents such as carbon tetrachloride, are frequently used. The work comes from these units clean and dry. Spiral conveyors may be used to carry work through lines of tanks.

Degree of Cleanliness Needed

Work coated with soap or similar lubricating compounds can usually be cleaned sufficiently by immersion in hot water or by spraying with water before annealing. After annealing, which produces oxide or scale on the surface, these substances are removed by immersion in 5% sulphuric acid in water. The metal is then rinsed and dipped in 1 ounce neutral soap to remove the last traces of acid and assist in the rinsing operation. Parts are then rinsed in cold and hot water.

After passing through all operations, parts may be desired as clean finish, bright dip, bichromate dip, polished or plated.

When parts are to be plated, chemically clean surfaces are necessary, and, where possible, electric cleaning is used to aid the action of the cleaners. The action of the gases liberated at the surface of the work is similar to a mechanical scrubbing effect, actually pushing the dirt particles from the surface.

A solution for bright dip can be prepared using the following proportions by volume:

Sulphuric acid	60%
Nitric acid	30%
Water	10%

1 ounce of hydrochloric acid is added for every 5 gallons of the solution.

The proportions for a bichromate dip are: 5% by volume of sulphuric acid; 2 to 5% by weight of sodium bichromate; water to make 1 gallon.

Additional Considerations

The following points may prove helpful in the selection of cleaners:

The cleaner should be free rinsing.

Oils and other materials should be removed without darkening the metal.

Volatile solvents, such as carbon tetrachloride, do not cause tarnishing, as may result with alkali cleaners; but they are considerably more expensive, and may not leave grease-free surfaces unless they are carefully used.

Time in alkaline solutions should be as short as possible.

Work should always be rinsed, preferably twice, after immersion or other treatment with chemical solutions.

In the selection of a particular cleaner, it is advisable to consult sources of cleaning materials and profit by their suggestions. Frequently a combination of saponification and emulsification is needed, and can be obtained with cleaners designed for this purpose.

It should also be noted that brass and copper do not require, and should not be subjected to, the strong alkalis used for iron and steel. Solutions that are too strongly alkaline may result in darkening, thus requiring further treatment of the work to restore the original color and luster.

In planning production, it will prove advantageous to give consideration to the kind of oil and grease used in manufacturing and polishing operations, with particular reference to the ease with which they can subsequently be removed with the cleaning equipment available or to be obtained.

ALLOYS OF COPPER

This is the twenty-sixth of a series of articles on the properties and uses of copper alloys, and continues the subject of modifications of the copper-zinc alloys.

ADDITIONS OF LEAD TO COPPER-ZINC ALLOYS

So vital to industry are the leaded copper-zinc alloys that it is considered desirable to refer here to other published work on the machinability of these alloys. This is in addition to the recent discussion of this subject in this column and also other more detailed reviews of these alloys in COPPER ALLOY BULLETIN, November, 1940.

Some years ago, Dr. Morris published in the A.I.M.M.E. a paper* showing the results of machinability tests on brass containing various quantities of lead. It also told of the effect of cold work on the 3% leaded alloys. The measure of machinability used was the power consumed by a cut of fixed depth made by a single tooth milling cutter of standard shape.

Curves taken from Dr. Morris' paper are shown. Fig. 1 illustrates the effect of lead content in copper-zinc alloys containing from 60.0% to 63.5% copper. The effect of the first ½% of lead is much more pronounced in improving machinability than the further additions. It is for this reason that so many of the leaded alloys contain considerably less lead than the 3% usual in Free Cutting Rod. A very considerable improvement is brought about by the lesser quantities, and at the same time the manufacturing difficulties are decreased.

Fig. 2 indicates the desirability of machining leaded alloys after some cold working. However, increases in cold working greater than about 30% do not result in greater machinability.

*A.I.M.M.E.—Vol. 99, 1932, page 323.

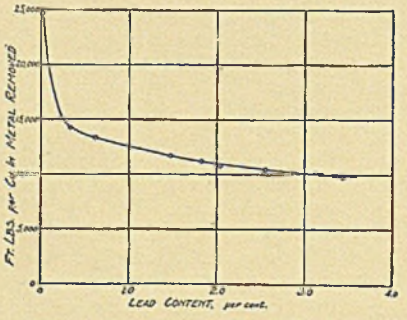


Fig. 1—Results of tests on samples of leaded copper-zinc alloys.

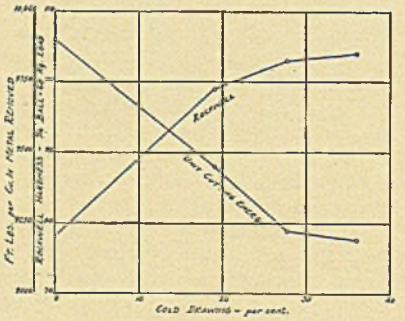
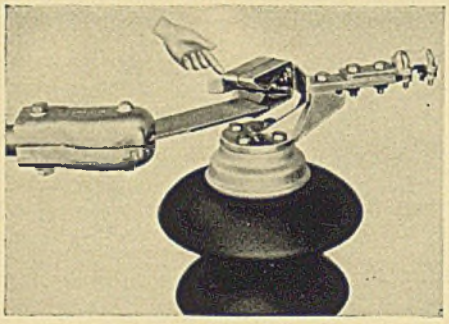


Fig. 2—Relation between unit cutting energy and degree of cold drawing.

Bridgeport Phosphor Bronze Has Lasting Resilient Qualities

Selection of the most suitable contact material for high tension electrical equipment is especially difficult, yet of great importance to the manufacturer of outdoor switching apparatus that must withstand atmospheric corrosion over long periods of time with little or no maintenance.

Bridgeport New Phosphor Bronze was chosen for this type of work by Delta-Star Electric Company. It was selected because it resists corrosion and season cracking while maintaining necessary lasting spring qualities at temperatures well above the practical limits in switch operation. In addition, the exceptional workable qualities of Bridgeport New Phosphor Bronze enable it to be readily formed to varied shapes without structural injury or impairment of required spring characteristics, offering fabrication as well as service economies.



Multi-finger, high pressure, button type contact switch made by Delta-Star with Bridgeport New Phosphor Bronze innerspring.

NEW DEVELOPMENTS

An optical centering device is reported to locate lines, edges or points to the exact center of the spindle shaft of any machine tool. The maker states that it is fast, accurate and is not subject to any human or mechanical error. **(No. 240)**

An oil conditioner automatically sterilizes cutting oils and precipitates the entrained sediment. This is said to mark a substantial improvement over previous devices of this type because it eliminates attention on the part of an operator. **(No. 241)**

A magnifying glass for visual inspection of flaws in materials is equipped with a 2X or 3X lens and a light weight housing containing one or a pair of electric lamps. **(No. 242)**

A cutting tool for cutting-off service on lathes has a holder which disengages the blade if a jam should occur, it is reported, and also has a support which provides a chatter-eliminating solid seat. **(No. 243)**

A bench center for inspecting a variety of small work up to 6½-inch diameter by 18 inches long is said to provide an accurate, rapid method for inspecting cylindrical and circular pieces. Standard and other types of indicators are quickly attached. **(No. 244)**

A free wheeling clutch takes the place of a ratchet in feed mechanisms that require measured, non-reversing operation. Power is transmitted through a set of gear-actuated, positive cams. These are said to maintain light contact while the drive is idling or free wheeling. They grip without lost motion when torque is applied, yet have no tendency to lock, so release is without drag, the maker states. **(No. 245)**

A fastener of sheet metal parts, designed originally to secure the cowl sheet and other parts in place on an airplane, is said to be valuable for many applications where one metal sheet is to be held to another in an arrangement which requires frequent removal. **(No. 246)**

A burring machine is reported to be capable of production speeds up to 1200 pieces per hour. This horizontal spindle equipment reams, burrs, faces, threads and hones tubing and rods. **(No. 247)**

A portable acetylene generator delivers 30 cu. ft. per hour and is suitable for welding metal up to ⅜-inch thick and for cutting steel up to 5 inches thick. **(No. 248)**

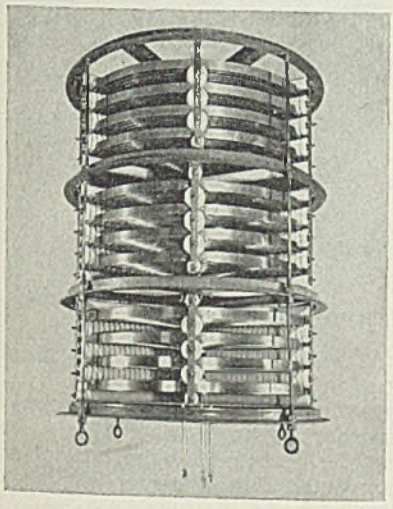
A belt lacer said to be the first portable lacer which can exert a pressure as high as 30,000 lbs. This permits embedding the belt hooks flush with the belt surface and clinching the points. **(No. 249)**

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.

synchronous motors, generators and condensers. Each exciter consists of a differential amplifier for controlling the excitation on direct current motors and generators to give constant voltage, current, speed or tension.

Booster Heaters

■ H. O. Swoboda Inc., 178 Thirteenth street, New Brighton, Pa., announces production of a new line of Falcon electric immersion type booster heaters for maintaining and increasing temperatures of a wide range of materials. These are available in capacities ranging from 10 to as much as 1000 kilowatt. Consisting of spirally coiled heater strips arranged to form a compact unit, each heater is installed in a sealed tank built in the pipe line between storage vessel and coating or saturating tank. Uniform



temperature is maintained by means of automatic controls, either thermostat or pyrometer with thermocouple. In operation, the bare electric coils are immersed in the material to be heated. Due to the large surface area of the heating elements, no temperature gradient is set up between heater and material. The booster heater can be furnished in numerous sizes and heat capacities according to specifications.

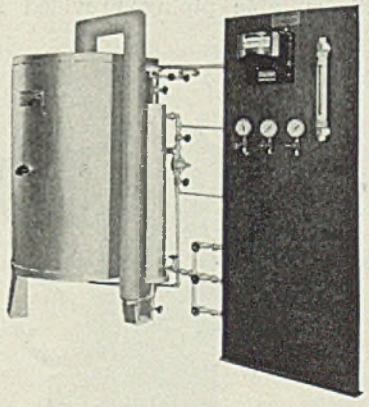
Water Heater

■ Johnson Corp., Three Rivers, Mich., announces a new all steel Instant water heater for heating water and other liquids with steam. It can be hooked up to high pressure steam lines without use of reducing valves. The unit consists of an outer shell of heavy wrought steel pipe with two concentric smaller pipes centered within. This forms a steam chamber between the outer wall of the smaller pipe and the inner wall of the surrounding pipe. Water is admitted to the central pipe, where it encounters a spiral baffle which creates turbulence and also increases the length of travel in contact with the heated wall. The water then returns back to the outlet through the outer chamber, where another spiral baffle multiplies its length of travel and velocity along the surface of the hot steam chamber. This design is said to achieve

a high rate of heat transfer. It will withstand steam pressures as high as 150 pounds in standard types. The close cast iron heads are easily removable so the heater can be quickly disassembled for inspection or cleaning. In addition to the steam inlet, and water inlet and outlet, two drains are provided—one for water, one for condensate.

Ammonia Dissociator

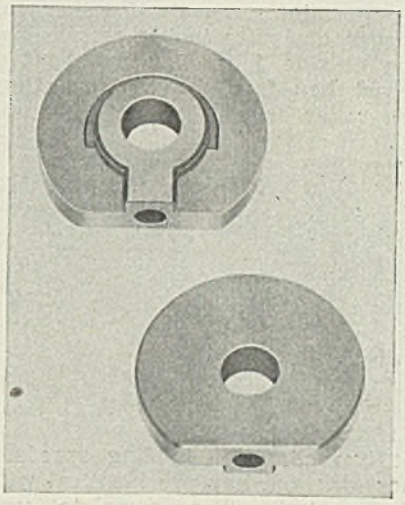
■ Drever Co., 748 East Venango street, Philadelphia, has introduced a new ammonia dissociator which provides a protective atmosphere for metal treating furnaces. The composition of its dissociated gas is 75 per cent hydrogen and 25 per cent nitrogen, by volume, with a dew point less than 55 degrees Cent. The unit is an electrically heated, vertical cylindrical furnace, refractory lined and surrounded by heat insulating material encased in a fabricated steel shell, supported on cast iron legs. The heating elements are rugged nickel-chromium ribbon



with low resistance terminals extending through the wall in insulating refractory terminal bushings. Two additional bushings protrude through the wall for thermocouple and temperature limit fuse. A heat exchanger is mounted on the side of the unit. The power supplied is controlled by a magnetically operated contactor, governed in accordance with the temperature requirements. The temperature is determined by an indicating type pyrometer, having its control circuit connected in series with the temperature limit fuse. All pressure gages, pyrometer and visual rotameter are mounted on a separate panel.

Bronze Bearings

■ Keystone Carbon Co., 1935 State street, Saint Marys, Pa., has developed several new shapes and sizes for its line of Selflube porous bronze bearings. The accompanying illustration shows top and bottom views of one of these new designs. The bearings are made from powdered alloys, which are molded to size, baked, and finally quenched in oil. They have an average porosity of 35 per cent, enabling them to



store a large amount of oil. They also have tensile strength of over 35,000 pounds per square inch, making them suitable for carrying maximum loads without distorting or breaking.

Transmitting System

■ Brown Instrument Co., Wayne and Roberts avenues, Philadelphia, announces a differential New-Matic transmitting system which measures differences in temperatures, flows, levels and pressures. It consists of two measuring elements equipped with pneumatic transmitters, each of which delivers an air pressure proportional to measured variable, and a differential pressure detector employing a mercury filled U-tube and a float actuating a recording or indicating pointer.

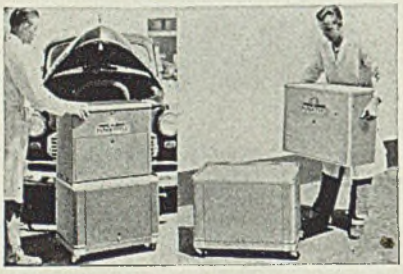
The two transmitters may be as much as 500 feet apart, yet indications will only lag 20 seconds for full scale movement. The actual values of either or both of the measured variables also may be recorded on the chart of the differential pressure detector.

This system is useful for many applications such as controlling, and indicating or recording: dif-

ference in inlet and outlet temperature on feed water heaters, condensers, air preheaters and heat exchangers. Difference in inlet and outlet temperatures on bearings, lubrication systems on turbines, diesel engines and rolling mills; and difference in wet and dry bulb temperatures (combined with the dry bulb record).

Tool Cabinet

■ Plomb Tool Co., 2209 Santa Fe avenue, announces the Wheel About—a mobile tool cabinet built on the principle of the "add-a-shelf" book case. It consists of a roller cabinet, on top of which may be mounted, the master tool chest. The assembly permits moving the complete tool set from job to job, or permits removal of either the upper or lower tool chest for use on outside jobs. The master tool chest has four drawers operating on roller slides. Top lifts up, and



it has clips for holding speeders. Its lock and key are identical with lower unit. The complete unit measures 44 by 27 inches.

Automatic Spray for Graphite Lubricants

■ Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, has placed on the market automatic spray type lubricating devices for use with lubrications containing dispersions of colloidal graphite. They are designed to spray the lubricant on working surfaces automatically, and are provided with a universal mounting making it possible to adjust the lubricator to any desired position.

A feature of the air-operated airbrushes is that the pistons controlling the spraying action can be started and stopped virtually instantaneously. Furthermore, the design allows intermittent operations as high as 150 shots per minute. The units operate on a minimum of 35 pounds air pressure. A double action valve allows air to be discharged before the fluid needle valve is opened and air remains on until after the fluid needle seats.

Seating of the fluid needle is positive, sealing the lubricant in so well that it can be retained in the gun and fluid line indefinitely without congealing. The airbrushes can be supplied with any one of three sizes of fluid assemblies for light, average or fast application, and with various sizes of multipleheads. The latter are adjustable for fan or cone spray.

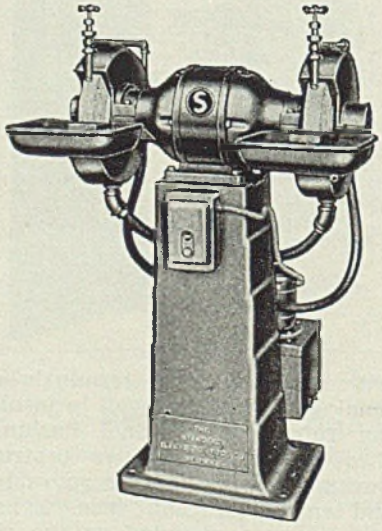
Heavy Duty Wrench

■ J. H. Williams & Co., 225 Lafayette street, New York, have placed on the market a new striking face box Superrench particularly adapted for heavy work in close-quarters

where large nuts must be set up tight or "frozen" nuts loosened. Available in ten sizes with 12-point openings—1 1/16 to 2¾ inches, for United States standard nuts ⅝ to 1¾ inches—it is drop-forged from chromium-molybdenum steel, heat-treated to withstand shock loads.

Wet Grinders

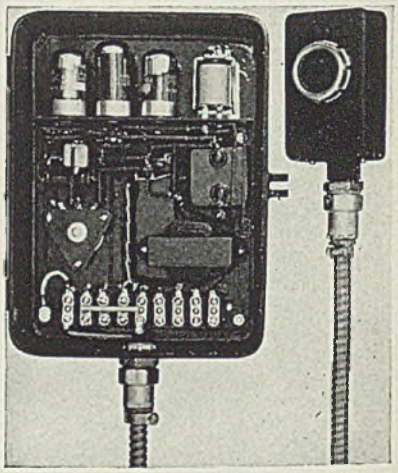
■ Standard Electrical Tool Co., 1932 West Eighth street, Cincinnati, has introduced a line of 12 and 14-inch heavy duty wet grinders. Each unit consists of wet grinding hood with integral splash bowl and adjustable work rest. Each guard is provided with a valve for controlling the flow of water, adjustable nozzle and suitable piping. Bottom of guard trough is fitted with hose connection for gravity return of water to the tank. A motor-driven 10-gallon per minute pump with tank is secured to the back of pedestal with suitable piping provided for



carrying the water to each guard. Both the grinder and pump motor are operated simultaneously through a push button safety starter. This machine is also available as a combination wet and dry grinder.

Inspection and Registration Control

■ Photoswitch Inc., Cambridge, Mass., announces a new type A80 photoelectric inspection and registration control for accurately controlling or inspecting cutting and printing operations on cellophane, paper, cloth, tin and metalfoil. It also is used for detecting presence and absence of labels on cans and the proper location of labels on goods and other similar applications. All of its amplifying tubes are of the vacuum type. The unit observes registration marks from penetration of reflection from



opaque materials. An impulse of as short a duration as 0.001 second can be detected by the control and converted into a controlling operation.

Vibration Insulators

■ B. F. Goodrich Co., Akron, O., has placed on the market three new Vibro-Insulators designed to dampen vibration and noise in machinery. Consisting of rubber and metal, the devices are listed as types 14, 33 and 36. The first is recommended for a load in vertical shear of 80 pounds per square inch, deflection in shear of one inch at a loading of 80 pounds, and minimum disturbing frequency at this deflection 470 per minute. It also is supplied with the rubber in compression, by placing the metals in a horizontal position. The maximum recommended load under compression is 250 pounds per inch.

In type 33 the rubber is applied only in compression, with the maximum loading 150 pounds and deflection at that point 5/32-inch, with the minimum disturbing frequency at that deflection 1200 per minute. Type 36 is best adapted for work with the rubber in compression, although it can also be applied in shear.

Making Cannon

(*Concluded from Page* 60)

This gage consists of three points extending through a suitable head and inclined to one another at 120 degrees, the length of the points, of course, being suited to the diameter of the cylinder being measured. This head is mounted on the end of a light tube within which lies a cone of low apex angle which bears against the bases of the "points", springs being employed to maintain contact. The use of a vernier near the handle of the tube and connected to the cone by a rod enables the operator to determine the amount by which the bore of the cylinder departs from that of a standard ring. In operation two readings are taken, the first with one leg of the star vertically up and the second vertically down, thus checking six points.

Progressive Shrinkage: The several parts of the built-up gun having been made ready, they are now assembled in the shrinkage pit; or perhaps it is a question of insertion of a new liner as happened to be the case on the occasion of the writer's visit. Liner insertion is carried out somewhat as follows: First the gun is heated in the furnace to a temperature around 600 degrees Fahr. The liner, having previously been fitted with a watertight muzzle plug, is suspended from the crane and filled with water to avoid undue absorption of heat and consequent expansion while being lowered into position in the gun. After removal of the center section of the furnace top, the liner is carefully centered over the bore of the gun and then slowly lowered until it is seated. A holding down yoke and hydraulic jack then are applied to hold the liner against the shoulder in the tube during cooling.

Not only diametral but longitudinal expansion took place when the gun was heated. Thus relative movement takes place as the liner is permitted to warm up to gun temperature as the gun cools. Therefore, if the liner were permitted to engage the tube indifferently, severe longitudinal strains would be set up. To prevent this, the water level in the liner is lowered on a predetermined time schedule by opening flap valves in the central stand pipe one after another all the way down. Thus the upper section seizes first, and thereafter the rest of the liner seizes progressively toward the muzzle.

Liners are removed in similar fashion. For this purpose the worn liner has a thread cut in it and a plug with hose attached. The muzzle is then plugged and water circulated while the rest of the gun is being heated up. This process may take some 24 to 36 hours, depending on the gun size. Temperatures used in relining operations are about 600 degrees Fahr. at the muzzle and 550 at the breech, the liner during removal being unseated by hydraulic jacks and lifted clear by a crane. Fig. 3 shows a partly assembled gun of large caliber being lowered into the shrinkage pit, which is 102 feet deep. This means overhead clearance must also be at least 102 feet.

Finally we come to a series of finishing operations to which reference already has been made in this and in previous articles in this series.

8500-Part Assembly

(*Concluded from Page* 72)

racks equipped with rollers designed especially for transporting supercharger sections to the assembly line. Notice that the shelves are removable. Various racks of similar design are employed to make parts readily available at the other assembly stations.

Heavy parts such as the crankcase sections are stored and moved about on wood-faced steel skids such as that shown in Fig. 11 with either handlift trucks or power trucks being used to transport them about the plant.

The steel pallets are all faced with wood to assure that none of the parts will be damaged by contacting the top of the skid.

Completing assembly of 8500 parts in a complicated precision product such as the Cyclone 14 double-row engine is dependent upon a steady flow of material to the assembly line as well as upon a carefully planned procedure in assembling. Actual production of a completed assembly every 24 minutes shows what has been done in this plant in the development of efficient handling methods.

Plating Process Gives Smooth Copper Deposits

■ United Chromium Inc., 51 East Forty-second street, New York, announces a new Unichrome alkaline copper process which gives a fine-grained, smooth copper deposit. The bath in the process is easily handled and consists of a mildly alkaline bivalent copper solution, operated at a pH of about 8.5 electrometric. It is operated at moderate temperatures from about 100 to 140 degrees Fahr. Current densities from 20 to 40 amperes per square foot at a tank voltage of 1 to 2 volts are normally used. Time of plating, however, depends on thickness required and current density used.

Steel Plant Lighting

(*Concluded from Page 67*)

for. The distribution of light from a fluorescent unit is similar to an RLM reflector and is not suitable for high bays. Also the interception factor is greater for a fluorescent installation because the contribution at high angles is of greater magnitude.

Table II shows a comparison of cost between mercury, incandescent and fluorescent lighting for a high bay.

Localized lighting on the machine is used to good advantage to secure a higher footcandle value at important parts of production. Often interception of machine parts is unusually great and the most economical solution is to use locally applied light. Illumination on vertical surfaces is approximately one-half of the horizontal surface value and is subject to unusually heavy interception loss, and candlepower value at high angles does not help matters due to interception loss. Where high footcandle values are required on vertical surfaces such as rolls, gages, dials, etc., localized illumination should be resorted to. Fig. 3 shows an example of how both horizontal and vertical footcandles may be augmented by an application of localized lighting on the machine. Care should be taken however not to allow any localized lighting equipment to interfere with the free operation of the crane.

Another application of local lighting is the use of crane lights mounted along the catwalk of the crane to give plus lighting directly under the crane and to compensate for the interception of over crane lights by the crane. A new crane light that is now in general use in the steel mills is shown in Fig. 7.

In any industry good practice is represented by the average of the newer modern plants. With this in mind a lighting survey was made of the following new steel mills:*

Youngstown Sheet & Tube, Youngstown, O.
Carnegie-Illinois Steel Corp., Homestead, Pa.
Carnegie-Illinois Steel Corp., Braddock, Pa.
Carnegie-Illinois Steel Corp., Gary, Ind.
Carnegie-Illinois Steel Corp., Clairton, Pa.
Carnegie-Illinois Steel Corp., S. Chicago, Ill.
Jones & Laughlin Steel Corp., Pittsburgh.
Bethlehem Steel Co., Buffalo.
Bethlehem Steel Co., Sparrows Point, Md.
Great Lakes Steel Corp., Detroit.
T. C. I. & R. R., Birmingham, Ala.
Republic Steel Corp., Cleveland.
Republic Steel Corp., Youngstown, O.

The illumination for the various departments is shown in Table III. The footcandles shown are actual measured values and include varying degrees of depreciation and interception. These actual working values can be used as a guide to good practice on future jobs. The watts per square foot of floor area method of calculations, which includes depreciation and interception losses, or the other methods of calculation with depreciation and interception losses deducted can be used to find the wattage required to produce the illumination values shown in Table III.

The walkways, roadways and boundary fence are lighted for safety, convenience and protection. During the present national emergency the protective angle has gained in importance due to the possibility of sabotage.

Walkways, and roadways are lighted by asymmetric refractor units with 500-watt multiple lamps spaced on approximately 150-foot centers. These are mounted on brackets fastened to building sides or poles at a height of 25 feet above the ground. It is customary to equip these lights with disconnecting hangers to facilitate maintenance.

The boundary fence is lighted by asymmetric refractor units with 500-watt multiple or 10,000 lumen 20-ampere series lamps spaced on 150-foot centers and mounted on poles 25 feet above the ground. The pole is set back 4 feet inside the fence line and a 4-foot bracket is used to bring the light directly over the fence. See Fig. 8. The illumination is 0.25-footcandles or 10 times full moonlight. This is the same specification that is used on the new national defense plants.

*The author would appreciate receiving from steel mill electrical departments illumination measurements on new construction, type of reflector, lamp size, spacing, mounting height and actual measured footcandles in the work, horizontal or vertical as the work requires.

Table III—Actual Footcandles in the Newer Steel Mills

Location	No. of Jobs	Footcandles Average	Max.	Min.
Assorting	4	17	21	13
Blue annealing	5	4	7	3
Box annealing	9	3.5	6	2.5
Chipping	6	29	32	26
Continuous pickler	10	6.5	12	25
Cold mill	13	7.5	10.5	4.5
Cold mill finishing	6	7.5	12	4.5
Furnace building, slabs	6	4.5	8.5	2.5
Galvanizing	2	3.0	4	2.5
Hot mill	9	5	9	3
Hot strip finishing	11	6	12	2.5
Hot strip runout	9	6	18	4
Motor room	15	7	14	25
Processing hot strip	2	3.5	4	3
Reheating furnace	2	3.5	4	3
Roll shop	10	8	24	3
Storage	28	4	7.5	2
Shear building	6	5	6	3.5
Slab delivery	3	4	5.5	3
Shop	6	4.5	5	4
Skelp mill	2	3	3	3
Transfer	2	5	6	4.5
Temper mill	2	6	8	4.5
Warehouse	7	3.5	9	3

To Conduct Specialized Courses in Metallurgy

■ Specialized courses in electroplating and metallurgy will be offered by the Institute of Electrochemistry and Metallurgy, 59 East Fourth street, New York, during the remainder of this year and all of next year. According to the institute's announcement, registration for the fall term will take place Sept. 15 to 19, with the first class meeting Sept. 23.

Electroplating I, metallurgy I, research I and industrial microscopy I are the courses being offered this fall. A correspondence course also is being offered to men outside the New York area. Full information regarding the classes and the correspondence courses may be obtained by addressing Dr. C. B. F. Young, box 292, Flushing, N. Y.

New Compound Eliminates Weld Spatter

■ A neat welded job, free from spatter, is possible with the application of Anti-Spatter, a product recently introduced by Thompson & Co., P. O. box 6757, Pittsburgh. It enables spatter to be brushed off readily and is furnished for jobs that are to be pickled, and also for use where the work is to be painted over. The compound can either be sprayed or painted on the area to be welded. It does not interfere with the solidity of the weld, and being combustible it can readily be burned off.

Hand Cream Forms Protective Covering

■ A water soluble hand cream that acts as an invisible glove, guarding the hands from grease, paint, ink and other matter is reported by Mitts Mfg. Co., 367 East Forty-fifth street, Brooklyn, N. Y. It is applied to the skin before starting work and dries quickly.

Besides making it easy to keep the hands clean, the product protects the hands from irritating materials which cause industrial skin trouble.

Steel Priority Brings Confusion to Market

Scarcity of steel for civilian use may prove temporary. Government cracks down on scrap. Production continued through Labor Day

MARKET IN TABLOID ★

Demand
Defense orders crowd out civilian needs.

Prices
Ceiling on scrap to be enforced

Production
Gained ½-point to 96½.

BREAKING precedent of many years, steelmaking units generally are operating through Labor Day, though some finishing capacity will be idle. This action attests clearly appreciation of necessity for full production, since Labor Day has been a "sacred" holiday. One effect will be to assure consumers that every effort is being made to provide for their needs.

Great confusion exists as to application of full priority on steel, which goes into effect today. Reclassification of orders to conform to the new situation is going forward as rapidly as possible but is far from completed. It appears definitely that defense will absorb so much tonnage on high priorities that civilian consumers will have little chance to obtain shipments for some time.

Some steelmakers, after study of the priority order and observation of its preliminary workings, believe it will clear the situation materially. They expect civilian supplies will be severely restricted for perhaps 60 days and after that be in better position than during the past few months, with more steel available for such use. Application of Form PD-73 is expected to ration steel more equitably than formerly.

Many consumers have sent in orders without necessary forms attached and in other cases not fully executed. These orders must be sent back. Consumers covered far in advance have failed to file Form PD-73 and have been notified of the requirement.

Mill difficulty varies with the proportion of defense business on books. Makers of special steels find distribution relatively easy as practically all their production goes to defense. Mills making a wide variety of common steel have heavy orders from customers in the H class and difficulty is being experienced in deciding how much of this tonnage can be released.

Consumers without defense or essential civilian business, who have been able to get by until now, face the necessity of obtaining prime contracts or subcontracts carrying priority. Probably considerable delay in switching to defense work will result in dislocation of labor, at least temporarily.

A shift in demand for shapes and plates is evident as plant construction nears completion and production gets under way. The accent is shifting from building material to steel for fabrication in the new plants, a trend to be intensified in the future.

Outlook for pig iron for use outside defense work is dark, although possession of large stocks by some consumers has been revealed by reports to OPM and this may bring adjustment to relieve needs of other melters less happily situated.

Notice that ceiling prices on scrap will be enforced after today by application of full government powers is the outcome of a conference with suppliers and consumers last week. This results from widespread disregard of price schedules in the effort to obtain larger supplies in the present period of scarcity.

Exports of steel and iron products in June fell off for the fourteenth consecutive month. Excluding scrap, shipments totaled only 398,667 gross tons, compared with 617,181 tons a year ago. However, exports for first half, at 3,016,668 tons, is somewhat above 2,764,943 tons shipped in first half last year.

Production of automobiles continues at a high rate, 39,965 units being made last week, compared with 45,525 the preceding week and 27,645 the corresponding week last year.

Ingot production last week gained ½-point over the revised rate of the preceding week, to 96½ per cent. Birmingham, Ala., showed an increase of 5 points to 95 per cent and Wheeling 1 point to 93 per cent. The remainder were unchanged; Chicago, 101½; Cincinnati, 88; St. Louis, 98; Eastern Pennsylvania, 95½; Buffalo, 93; Pittsburgh, 100; New England, 90; Detroit, 92; Cleveland, 93; Youngstown, 98.

Revision of steelmaking capacity figures by the American Iron and Steel Institute from 84,152,000 net tons, the base during first half, to 86,148,000 tons as of June 30, the base for second half, has had the effect of reducing the per cent of capacity operated about two points. Rates have been revised from the beginning of July to give effect to the new base.

Composites are unchanged, prices being frozen at OPACS levels. Finished steel composite is $56.60, iron and steel $38.15 and steelworks scrap $19.16.

COMPOSITE MARKET AVERAGES

	Aug. 30	Aug. 23	Aug. 16	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. 30, 1941	July 1941	May 1941	Aug. 1940
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv. Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

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 ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Aug. 30, 1941	July 1941	May 1941	Aug. 1940
Bessemer, del. Pittsburgh	$25.34	$25.34	$25.34	$24.34
Basic, Valley	23.50	23.50	23.50	22.50
Basic, eastern, del. Philadelphia	25.34	25.34	25.34	24.34
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	23.69
No. 2 foundry, Chicago	24.00	24.00	24.00	23.00
Southern No. 2, Birmingham	20.38	20.38	20.38	19.38
Southern No. 2, del. Cincinnati	24.06	24.06	24.06	23.06
No. 2X, del. Phila. (differ. av.)	26.215	26.215	26.215	25.215
Malleable, Valley	24.00	24.00	24.00	23.00
Malleable, Chicago	24.00	24.00	24.00	23.00
Lake Sup., charcoal, del. Chicago	31.34	31.34	31.09	30.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	23.17
Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	125.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.00	$18.75
Heavy melt. steel, No. 2, E. Pa.	17.75	17.75	17.75	18.35
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

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. mill, carloads.

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

	Pittsburgh Base	Pacific Ports	Granite City	Base Deliv. Mahoning Valley Points
Field gr.	3.20c	3.95c	3.30c	3.275c
Armat.	3.55c	4.30c	3.65c	3.625c
Elect.	4.05c	4.80c	4.15c	4.125c
Motor	4.95c	5.70c	5.05c	5.025c
Dynamo	5.65c	6.40c	5.75c	5.725c
Transformer				
72	6.15c	6.90c	.....	6.225c
65	7.15c	7.90c	.....	7.225c
58	7.65c	8.40c	.....	7.725c
52	8.45c	9.20c	.....	.....

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
Worcester, base 3.35c

Cold-Finished Spring Steel

Pittsburgh, Cleveland, base; add 20 cents for Worcester.
.26-.50 Carbon 2.80c
.51-.75 Carbon 4.30c
.76-1.00 Carbon 6.15c
Over 1.00 Carbon 8.35c

Chromium-Nickel Steels

Pittsburgh base, cents per lb.

No.	302	303	304	20% Clad 304
Bars	24.00	26.00	25.00	.....
Plates	27.00	29.00	29.00	*18.00
Sheets	34.00	36.00	36.00	19.00
H. R. strip	21.50	27.00	23.50	.....
C. R. strip	28.00	33.00	30.00	.....

Straight Chromium Steels

Pittsburgh base, cents per lb.

No.	410	416	430	442	446
Bars	18.50	19.00	19.00	22.50	27.50
Plates	21.50	22.00	22.00	25.50	30.50
Sheets	26.50	27.00	29.00	32.50	36.50
H. R. Strip	17.00	18.25	17.50	24.00	35.00
C. R. strip	22.00	23.50	22.50	32.00	52.00

*Includes annealing and pickling.

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	25-lb.	$16.00
15-lb.	14.00	30-lb.	17.25
20-lb.	15.00	40-lb.	19.50

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. 2.21½c
New York, del. 2.27c
Boston, delivered 2.41c
Bethlehem 2.10c
Chicago 2.10c
Cleveland, del. 2.30c
Buffalo 2.10c
Gulf ports 2.45c
Birmingham 2.10c
St. Louis, del. 2.34c
Pacific Coast 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, Houston from Birmingham 2.59c
Pac. ports, dock 2.80c
All-rail from Chicago.. 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, Houston from Birmingham 2.59c
Pac. ports, dock 2.80c
All-rail from Chicago.. 3.25c

Hot-Rolled Alloy Bars

Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size 2.70c
Detroit 2.80c

Alloy		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
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 2.50c
All-rail, Houston from Birmingham 2.59c
Pacific ports, dock 2.80c
All-rail from Chicago.. 3.25c
Detroit, del. 2.25c

Reinforcing Bars (*Rail Steel*)

Pittsburgh, Chicago, Gary, Cleveland, Birm., base. 2.15c
Gulf ports, dock 2.50c
All-rail, Houston from Birmingham 2.59c
Pacific ports, dock..... 2.80c
All-rail from Chicago.. 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..... $2.55

(Per Pound)

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

½ x 6 and smaller.....65½ off
Do., ⅛ and ⅝ x 6-in. and shorter.....63½ off
Do., ¾ to 1 x 6-in. and shorter .....61 off
1⅛ 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.
½-inch and less.	62	64
⅝-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger..	56	..

Hexagon Cap Screws

Upset 1-in., smaller ....60 off

Square Head Set Screws

Upset, 1-in., smaller ....68 off
Headless, ¼-in., larger ..55 off
No. 10, smaller .....60 off

Piling

Pitts., Chgo., Buffalo .. 2.40c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural 3.75c
⅞ inch and under.....65-5 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. .....$4.00 off

Tool Steels

Pittsburgh, Bethlehem, Syracuse, base, cents per lb.

Carb. Reg. 14.00 Oil-hardening .. 24.00
Carb. Ext. 18.00
Carb. Spec. 22.00 High car.-chr. 43.00

High Speed Tool Steels

Tung.	Chr.	Van.	Moly.	
18.00	4	1	...	67.00
18.00	4	2	1	77.00
18.00	4	3	1	87.00
1.50	4	1	8.50	54.00
.....	4	2	8	54.00
5.50	4	1.50	4	57.50
5.50	4.50	4	4.50	70.00

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut-lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½" O.D.	13	$ 9.72	$23.71
1¾" O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼" O.D.	13	13.79	21.68
2¼" O.D.	12	15.16	....
2½" O.D.	12	16.58	26.57
2¾" O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½" O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	...

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1" O.D.	13	$ 7.82	$ 9.01
1¼" O.D.	13	9.26	10.67
1½" O.D.	13	10.23	11.79
1¾" O.D.	13	11.64	13.42
2" O.D.	13	13 04	15.03
2¼" O.D.	13	14.54	16.76
2¼" O.D.	12	16.01	18.45
2½" O.D.	12	17.54	20.21
2¾" O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½" O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½" O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Welded Iron, Steel, Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
⅛	63½	51
¼	66½	55
1—3	68½	57½

Iron

¾	30	10
1—1¼	34	16
1½	38	18½
2	37½	18

Lap Weld

Steel

2	61	49½
2½—3	64	52½
3½—6	66	54½
7 and 8	65	52½

Iron

2	30½	12
2½—3½	31½	14½
4	33½	18
4½—8	32½	17
9—12	28½	12

Line Pipe, Plain Ends

Steel

1 to 3, butt weld..... 71½
2, lap weld 64
2½ to 3, lap weld..... 67
3½ 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. fitgs., 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., Chi., Gary, Cleve., Young, Buffalo, Birm.. 40.00
Duluth 42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point Buffalo, Canton, Chicago. 34.00
Detroit, delivered 36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl. (per 100 lbs.) $2.00
Do., over ⅜ to ¾-in. incl. 2.15
Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.50.

Skelp

Pitts., Chi., 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
Milwaukee, 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, bbls. 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.	{24.00–24.50	24.00–24.50	23.50–24.50	24.50–25.00
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.	{24.00–24.50	24.00–24.50	23.50–24.50	24.50–25.00

§Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	25.39	25.39	24.89	25.89
Baltimore from Birmingham†	25.61	.....	25.11	.....
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	24.50	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

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$64.60

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00

Second Quality

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

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	nominal
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	$22.00-23.00
Do. barge	22.00-23.00
No. 2 lump	22.00-23.00

Ferroalloy Prices

Ferromanganese, 78-82%, Carlots, duty paid, sbd. $120.00; Carlots, del. Pitts. 125.33; Carlots, f.o.b. Southern furn. 145.00. For ton lots add $10, for less-than-ton lots $13.50, for less than 200-lb. lots $18.

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 36.00

Ferrosilicon, 50%, freight allowed, c.l. 74.50; Do., ton lot 87.00; Do., 75 per cent 135.00; Do., ton lots 151.00. Spot, $5 a ton higher.

Silicomanganese, c.l., 2½ per cent carbon 118.00; 1½% carbon 128.00. Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.90-2.00

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electric furn., per ton, c. l., 23-26% f.o.b. Mt. Pleasant, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c; Do., ton lots 11.75c; Do., less-ton lots 12.00c; less than 200 lb. lots 12.25c

67-72% low carbon:

	Carloads	Ton lots	Less ton
2% carb.	17.50c	18.25c	18.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Molybdenum Oxide, lb. Molyb. cont., 5-20-lb. containers, f. o. b., Washington, Pa., lb. 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23; Do., less-ton lots 1.25; 20-25% carbon, 0.10 max., ton lots, lb. 1.35; Do., less-ton lots 1.40. Spot 5c higher

Ferrocolumbium, 50-60% contract, lb. con. col., f.o.b. Niagara Falls $2.25; Do., less-ton lots 2.30. Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50; Do., spot 145.00; Do., contract, ton lots 145.00; Do., spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50; Do., spot 160.00; Do., contract, ton lots 160.00; Do., spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c; Do., ton lots 8.00c; Do., less-ton lots 8.50c. Spot ½c lb. higher

Chromium Briquets, contract, freight allowed, lb. carlots, bulk 7.00c; Do., ton lots 7.50c; Do., less-ton lots 7.75c; Do., less 200 lbs. 8.00c. Spot ¼c lb. higher

Tungsten Metal Powder, 98-99 per cent, per lb., depending upon quantity $2.50-2.60

Vanadium Pentoxide, contract, lb. contained $1.10; Do., spot 1.15

Chromium Metal, 98% cr., contract, lb. con. chrome, ton lots 80.00c; Do., spot 85.00c

88% chrome, cont. tons 79.00c; Do., spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.50c; Do., 2% 13.00c. Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $74.50; Ton lots 84.50; Less-ton lots, lb. 4.00c; Less 200 lb. lots, lb. 4.25c. Spot ¼-cent higher

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.50c; Ton lots 6.00c; Less-ton lots 6.25c. Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton 102.50; Do., ton 108.00

35-40%, contract, carloads, lb., alloy 14.00c; Do., ton lots 15.00c; Do., less-ton lots 16.00c. Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60; Do., 100-200 lb. lots 2.75; Do., under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets Hot Rolled	Sheets Cold Rolled	Sheets Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars Carbon	Cold Drawn Bars S.A.E. 2300	Cold Drawn Bars 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	....	5.75	....	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	....	7.15	....	....
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	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	$66.50	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	4.00c	22	5	0
Sheets, galvanized, corrugated, 24 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. Middlesbrough 5s rebate to approved customers. ††Rebate 15s on certain conditions.

Ores

Lake Superior Iron Ore

Gross ton, 51½%

Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	10.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Chinese wolframite, net ton, duty pd.	$24.00-25.00
Brazil iron ore, 68-69%, ord.	7.50c
Low phos. (.02 max.)	8.00c

F.O.B. Rio Janeiro.

Scheelite, imp.	23.50-24.00
Chrome ore, Indian, 48% gross ton	.....

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	.....
So. African, 48%	70.00-72.00
Brazilian, 46%	69.00-71.00
Chilean, 47%	65.00-70.00
Cuban, 50-51%, duty free	.....

Molybdenum

Sulphide conc., lb., 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)	Youngstown, Canton, Warren, Sharon	Chicago	Bethlehem	*East. Pa.	Sparrows Pt.	Cleveland	Buffalo	Ashland, Ky., Cincinnati, Portsmouth, Middletown, 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***	[1]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‡‡	[1]22.00	22.00	20.75	20.25	20.75	20.75	21.50	21.25	20.50	20.75
Punchings and plate scrap§§	[1]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	[1]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	[1]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	Birmingham	[2]Alabama City, Ala., Atlanta	Chattanooga	Radford, Va.	New England‡	Pacific Coast§
No. 1 heavy melting	$17.50	$.....	$17.85	$18.00	$17.00	$17.00	$.....	$.....	$16.50	[4]$14.50
No. 1 hyd. comp. black sheets	17.50	.....	17.85	18.00	17.00	17.00	.....	.....	.....	[4]14.50
No. 2 heavy melting	16.50	.....	16.85	17.00	16.00	16.00	.....	.....	.....	[4]13.50
Dealer No. 1 bundles	16.50	.....	16.85	17.00	16.00	16.00	.....	.....	.....	[4]13.50
Dealer No. 2 bundles	15.50	.....	15.85	16.00	15.00	15.00	.....	.....	.....	[4]12.50
Mixed borings and turnings	12.75	13.10	13.10	.....	12.25	12.25	.....	.....	.....	[4]9.75
Machine shop turnings	13.00	13.35	13.35	15.50	15.00	15.00	.....	.....	.....	[4]10.00
Shoveling turnings	14.00	14.35	14.35	16.50	16.00	16.00	.....	.....	.....	[4]11.00
No. 1 busheling	17.00	.....	17.35	17.50	16.50	16.50	.....	.....	.....	[4]14.00
No. 2 busheling	13.00	.....	13.35	13.50	12.50	12.50	.....	.....	.....	[4]10.00
Cast iron borings	13.25	13.60	13.60	13.75	12.75	12.75	.....	.....	.....	[4]10.25
Uncut structurals and plate	18.50	.....	16.85	17.00	16.00	16.00	.....	.....	.....	[4]13.50
No. 1 cupola	20.00	.....	20.35	[3]19.00	20.00	.....	20.50	21.00	22.00	18.00
Heavy breakable cast	18.50	.....	18.85	[3]17.50	18.50	.....	.....	.....	20.50	17.00
Stove plate	17.00	15.60	14.10	[3]16.00	17.00	.....	17.50	18.00	17.50	14.00
Low phos. billet and bloom crops	22.50	.....	22.85	23.00	22.00	.....	.....	.....	.....	19.50
Low phos. bar crops and smaller	20.50	.....	20.85	21.00	20.00	.....	.....	.....	.....	19.50
Low phos. punch. and plate scrap***	20.50	.....	20.85	21.00	20.00	.....	.....	.....	.....	17.50
Machinery cast cupola size††	21.00	.....	21.35	[3]20.00	21.00	.....	21.50	22.00	23.00	19.00
No. 1 machine cast, drop broken, 150 pounds and under	21.50	.....	21.85	[3]20.50	21.50	.....	22.00	22.50	23.50	19.50
Clean auto cast	21.50	.....	21.85	[3]20.50	21.50	.....	22.00	22.50	23.50	19.50
Punchings and plate scrap‡‡	19.50	.....	19.85	20.00	19.00	.....	.....	.....	.....	16.50
Punchings and plate scrap§§	18.50	.....	18.85	19.00	18.00	.....	.....	.....	.....	15.50
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, Conshohocken, Phoenixville, Harrisburg, Pa. ‡Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I. §Los Angeles, San Francisco, Portland, Seattle; ***¾-inch and heavier, cut 12 inches and under; ††may include clean agricultural cast; ‡‡under ¾-inch to ¼-inch, cut 12 inches and under; §§under ¼-inch to No. 12 gage, cut 12 inches and under. **Alloy, W. Va., base $17.60. †Base price at Portsmouth and Ashland; Cincinnati and Middletown 25 cents less. [1]Add $1.75 at Pittsburgh. [2]Atlanta base only on Nos. 1 and 2 H.M. steel, No. 1 comp. sheets and Nos. 1 and 2 dealer bundles. [3]Also base prices at Minneapolis and St. Paul. [4]Add $2 at Minnequa, Colo.

Maximum Prices for Iron and Steel Scrap Originating from Railroads

	Pittsburgh, Wheeling, Steubenville	Youngstown, Canton, Sharon	Chicago	Kokomo, Ind.	*East. Pa.	Sparrows Pt.	Cleveland	Ashland, Ky., Portsmouth, Middletown, O.
No. 1 Railroad grade heavy melting steel	$21.00	$21.00	$19.75	$19.25	$19.75	$19.75	$20.50	$20.50
Scrap rails	22.00	22.00	20.75	20.25	20.75	20.75	21.50	21.50
Rerolling quality rails (a)	23.50	23.50	22.25	21.75	22.25	22.25	23.00	23.00
Scrap rails 3 feet and under	24.00	24.00	22.75	22.25	22.75	22.75	23.50	23.50
Scrap rails 2 feet and under	24.25	24.25	23.00	22.50	23.00	23.00	23.75	23.75
Scrap rails 18 inches and under	24.50	24.50	23.25	22.75	23.25	23.25	24.00	24.00

	Buffalo	St. Louis	Kansas City	Detroit	Duluth	Birmingham	Pacific Coast§
No. 1 Railroad grade heavy melting steel	$20.25	$18.50	$17.00	$18.85	$19.00	$18.00	$15.50
Scrap rails	21.25	19.50	18.00	19.85	20.00	19.00	16.50
Rerolling quality rails (a)	22.75	21.00	19.50	21.35	21.50	20.50	18.00
Scrap rails 3 feet and under	23.25	21.50	20.00	21.85	22.00	21.00	18.50
Scrap rails 2 feet and under	23.50	21.75	20.25	22.10	22.25	21.25	18.75
Scrap rails 18 inches and under	23.75	22.00	20.50	22.35	22.50	21.50	19.00

*Philadelphia, Wilmington, Del.; §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.

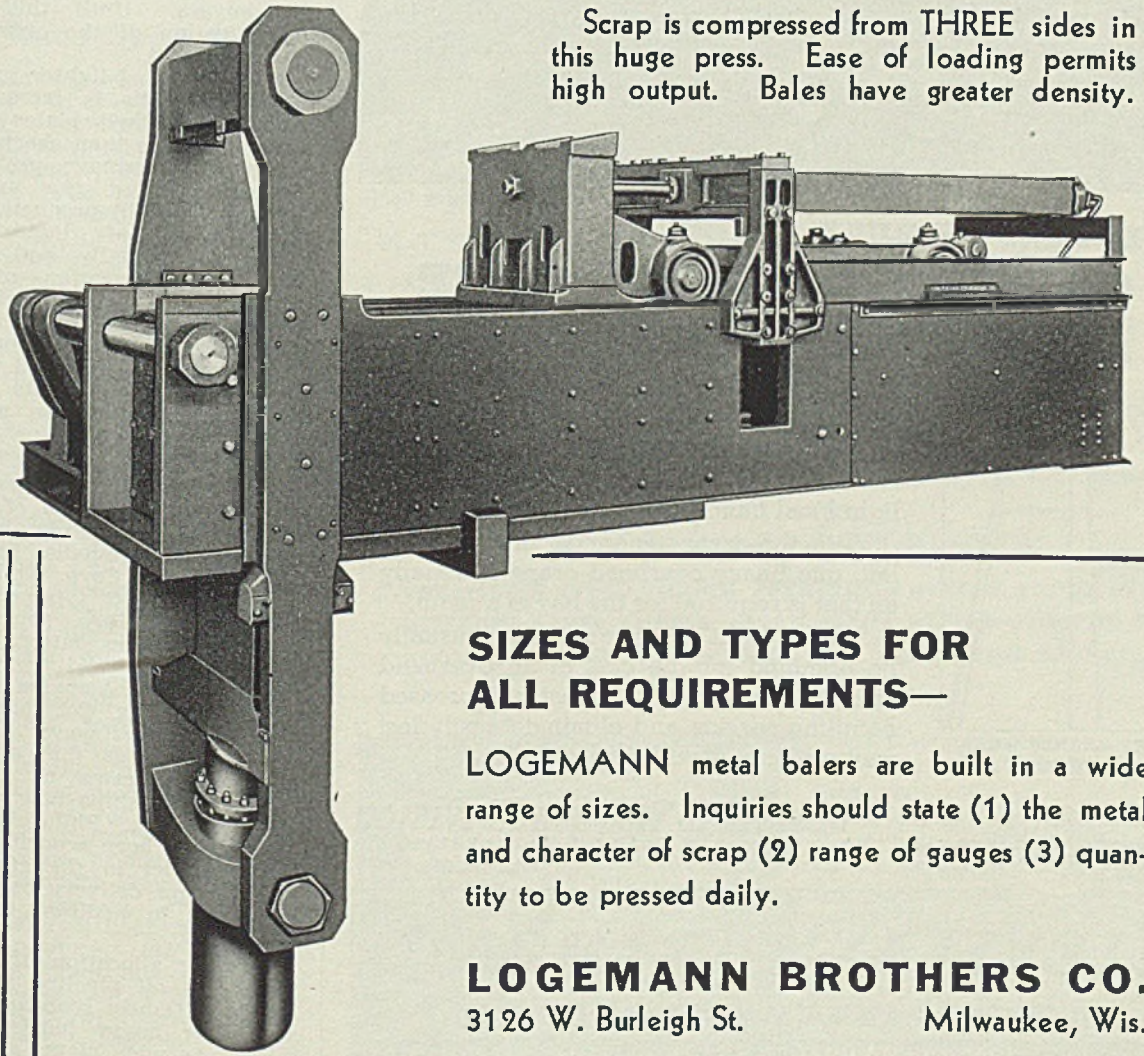
SHEET SCRAP?

Bale it in a LOGEMANN SCRAP PRESS

"Hydraulic-compressed" scrap pressed in LOGEMANN metal balers, commands the best price at all times. It can be more conveniently stored and more economically handled.

It can be readily held for favorable markets. It practically eliminates corrosion, saves much heat in remelting. It easily loads cars to capacity.

Scrap is compressed from THREE sides in this huge press. Ease of loading permits high output. Bales have greater density.



SIZES AND TYPES FOR ALL REQUIREMENTS—

LOGEMANN metal balers are built in a wide range of sizes. Inquiries should state (1) the metal and character of scrap (2) range of gauges (3) quantity to be pressed daily.

LOGEMANN BROTHERS CO.
3126 W. Burleigh St. Milwaukee, Wis.

Sheets, Strip

Sheet & Strip Prices, Page 88

With full priority on steel in effect today under order M-21 the situation is far from clear and sheetmakers, in common with producers of other steel material, find their schedules confused. It seems possible that much of September will pass before revision of orders has progressed to the point where deliveries are conforming exactly to the new order.

All orders submitted to mills after today must be accompanied by Form PD-73, filled out as fully as possible, or they will be returned. Mills are faced with the problem of disposition of orders now on books, on which reports must be filed before Oct. 15. Reclassification of this tonnage cannot be done completely as in a large number of instances the use of the material is not specified. Copies of PD-73 have been received slowly and probably considerable tonnage will be dropped by Oct. 15, due to lack of information thus required.

Scheduling under the priorities order probably will result in wiping out some tonnage as sheet consumers have been specifying for several months ahead, asking early delivery. Duplicate orders will also be dropped under the priority plan.

With all these uncertainties the situation is greatly confused and neither consumer nor supplier can be certain of the outcome until the various angles have been solved. One thing appears certain, that shipments to nondefense consumers will be cut sharply while defense needs continue high.

Galvanized sheet production is steady at 53 per cent of capacity and zinc is in better supply than recently. It still is insufficient for all civilian needs but pressure is much less. One large producer of galvanized material has suspended this department for the present and is taking no more orders.

Narrow cold-rolled strip shipments in August were slightly greater than in July and bookings continue in excess of deliveries. Orders for defense material are on the increase. Strip production is hampered by supply of raw material and some mills have not approached capacity for this reason.

Plates

Plate Prices, Page 88

Steel plate production continues at a high rate but mills are handicapped by uncertainties involved in application of the full priority plan, a condition which will continue until all orders have been covered by filing of proper forms by buyers. Until this is done classification of the orders cannot be completed.

Production of lighter gage plates on sheet mills is increasing and as it seems likely plates will carry higher ratings than sheets in many cases plate tonnage probably will be enlarged at the expense of other sheet mill products.

Character of inquiries has changed gradually and more orders for fabrication of defense products are being received, with some diminution in demand for plates to be used in construction. This change is expected to develop progressively as plants are completed and production started on war materials.

Southern mills expect heavy additions to plate backlogs as a result of recent award of 26 cargo vessels to shipyards at Mobile, Ala., and Pascagoula, Miss. Gulf Shipbuilding Corp. has been awarded 16 C-2 type and Ingalls Shipbuilding Corp. ten additional C-3 type. The latter has been authorized to build two additional shipways and Alabama Dry Dock & Shipbuilding Co., Mobile, Ala., eight additional ways. Mills serving these yards find difficulty in making deliveries as rapidly as required for ships now under construction. A Philadelphia shipbuilder has been scouring the New York district in the effort to obtain prompt delivery on small lots of plates in addition to his mill shipments.

Pending allocation of plates for the crude oil pipeline from Texas to the Atlantic seaboard will put a further heavy burden on plate mills. As wide plates are required for the large pipe in the main line

only four producers are able to participate in the division.

Bars

Bar Prices, Page 89

Priorities on steel bars received by barmakers indicate that a heavy proportion of production over the next few weeks will be for defense purposes, some steelmakers indicating 75 per cent. The situation is changing constantly as shell production grows, forging manufacturers increase output and agricultural implement manufacturers move into a better priority classification. Some forging shops have tripled consumption of alloy bars over the corresponding period last year.

Alloy bar requirements for numerous defense uses exceed original estimates and are expanding steadily. Time-consuming heat treating and limited stocks of semifinished tend to create a choke point in spite of steadily increasing capacity for electric furnace steels. Practically all alloy bar orders accepted by makers carry high priority.

Buyers are confused as to priority procedure and proper forms are missing in many cases and others are inaccurately filled out. Until this situation is cleared the proportion available for civilian needs will be in doubt.

OPM Needs Special Bars

The following requirement was announced last week by Herman H. Lind, Deputy Co-ordinator, OPM, Federal Reserve Bank building, Cleveland: Special accuracy steel bars, SAE 1335, 5/8-inch diameter and 3/4-inch diameter, 500 feet of each, turned and ground. They may be in short lengths of 3 feet or under. Priority is A-1-a.

Pipe

Pipe Prices, Page 89

Priority ratings are being applied to steel pipe sales in increasing degree and backlogs are being reclassified accordingly. Deliveries are falling back in many cases, galvanized pipe being shipped almost entirely from current production. Some mill stocks of black pipe furnish opportunity for quick shipment but not all sizes are available. Casing and line pipe demand is brisk. Allocation of plates for the Texas-Atlantic Coast pipe line is expected to be made soon.

Shipbuilding requirements have top priority in steel pipe and needs for this purpose are mounting. Demand for boiler tubes is heavy and most orders are of high priority, shipyards having first call. Railroads have no priority for tubes and this hampers them somewhat.

In New England, where much pipe normally is bought from distributors, producers are taking on no new accounts and advise distributors to refrain also. Replacement of stock in future must be on priorities. Distributors who have depended on regular sources

of supply without preference rating now must obtain a priority order.

Cast iron pipe production is heavy, limited only by supply of raw materials, much going into defense construction. Many municipal projects have been held back or abandoned in favor of defense needs.

CAST PIPE PLACED

200 tons, 6 to 10-inch, Sacramento, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

CAST PIPE PENDING

307 tons, Vallejo, Calif., United States Pipe & Foundry Co., Burlington, N. J., low.

220 tons, 10-inch, harbor defenses, Boston; bids in to constructing quartermaster.

100 tons, 8-inch, Sand Point Way, Seattle; Argentieri & Colarossi, Seattle, low.

STEEL PIPE PENDING

Unstated, 10,500 feet, 12 to 36-inch corrugated metal pipe; bids to E. P. Brennan, state purchasing agent, Boise, Idaho, Aug. 27.

Unstated, 441-foot length, 10-foot diameter, welded plate steel pipe, Crooked river crossing, Deschutes project, near Terrebonne, Oreg.; bids to bureau of reclamation, Bend, Oreg., Sept. 15.

Wire

Wire Prices, Page 89

Wiremakers are confronted by many problems in scheduling production and, while accepting orders for nondefense users, no promise of delivery is being made. Customers are advised that delivery will depend on supply of semi-finished steel and on volume of defense work. Classification of backlogs and new orders reveals more defense work than had been thought, some consumers being late in filing priorities.

Substantial finishing mill capacity exists for civilian needs after defense orders are cared for and the choke point is supply of wire rods, lack of which often limits production. Nonintegrated wiremakers feel the pinch severely at times.

In a few instances pressure for deliveries to the automobile trade has been lessened but this is not general.

Rails, Cars

Track Material Prices, Page 89

Freight car buying is light after the heavy orders placed during the past few months, although various small lots are being distributed and some important purchases are being considered. Locomotive orders continue in good volume as carriers prepare for heavy demands on motive power the coming winter. Diesel-electric types predominate, with steam locomotives in less number.

Rail buying is almost absent though considerable tonnage is under consideration by leading roads. How much priority can be obtained for this purpose is not clear and rail production may be set aside in favor of heavy structurals and shell steel.

Priority on steel for freight cars has aided to some degree but builders are not receiving sufficient to keep up to schedule and production is hampered by lack of material.

LOCOMOTIVES PLACED

Atchison, Topeka & Santa Fe, 15 diesel-electric freight of 5400-horsepower each, to Electro Motive Corp., La Grange, Ill.

Bethlehem Steel Co., five 300-horsepower 50-ton diesel-electrics, to Whitcomb Locomotive Co., Rochelle, Ill.

Sheffield Steel Corp. of Texas, two 50-ton diesel-electric, 320-horsepower each, to Whitcomb Locomotive Co., Rochelle, Ill.

U. S. army, Edgewood, Md., arsenal, one 65-ton diesel-electric, to General Electric Co., Schenectady, N. Y.

U. S. War Department, ten 20-ton gasoline-mechanical locomotives of 190 horsepower each and one 45-ton diesel-electric of 250 horsepower to Whitcomb Locomotive Co., Rochelle, Ill.

Westinghouse Electric & Mfg. Co., one 50-ton diesel-electric, 300 horsepower, to Whitcomb Locomotive Co., Rochelle, Ill.

RAIL ORDERS PLACED

Bangor & Aroostook, 3190 tons, to Bethlehem Steel Co., Bethlehem, Pa.

LOCOMOTIVES PENDING

U. S. Navy, delivery Charleston, S. C., one steam-operated fireless locomotive; schd. 8426, bids Sept. 5, Washington.

CAR ORDERS PLACED

Atchison, Topeka & Santa Fe, 200 seventy-ton tank cars, 16,000-gallon capacity, and 75 seventy-ton steel hoppers, to General American Transportation Corp., Chicago.

General American Transportation Corp., Chicago, 25 experimental tank cars of riveted Toncan iron for sulfuric acid transportation, to own shops.

Southern Pacific, 165 cabooses, 90 seventy-ton gondolas, 10 seventy-ton depressed center flats and 130 seventy-ton flats, to own shops.

U. S. Army engineers, three tank cars to General American Transportation Corp., Chicago.

CAR ORDERS PENDING

U. S. Navy, delivery San Diego, Calif., four flat cars; schd. 8428, bids Sept. 12, Washington.

BUSES BOOKED

A.c.f. Motors Co., New York: Twenty for Eastern Massachusetts Street Railway Co., Boston; four for Denver, Colorado Springs & Pueblo Motorway Inc., Denver; two for Norfolk-Southern Bus Corp. Norfolk, Va.; ten, air conditioned, for Bowen Motor Coaches, Fort Worth, Tex.; six, air conditioned, for Dixie Motor Coach Corp., Dallas, Tex.

Structural Shapes

Structural Shape Prices, Page 89

A fairly large portion of current projects finds no bidders. These are usually cases where prospective builders have no priority ratings. Many such projects are being abandoned for the time being. Though fabricated business is much lighter because of many restrictions order books are still well filled and delivery promises usually run four to five months. Likelihood of some tonnage being shipped ahead of original schedule at the expense of other orders with lower ratings is probable. Not before late next month will the present confusion be cleared with most mills, it is believed.

Chicago reports that structural orders are the lightest of any period this year. Cleveland reports a host of small tonnage inquiries, one fabricator having 20 to 25 before him, a class of work wanted now to balance production.

Bookings of fabricated structural shapes during July, at 202,584 tons, were slightly less than average bookings so far this year, comparing with 246,910 tons in June and with 194,940 tons in July, 1940, according to the American Institute of Steel Construction. However, shipments of 187,082 tons in July were slightly better than the average for the first seven months of this year and compare with 200,509 tons in June and 127,120 tons in July, 1940.

Bookings for seven months were 1,508,262 tons, 71 per cent of those during a like period of 1929, a logical year for comparison. Shipments for seven months have been 1,265,352 tons, against 782,132 tons for the corresponding portion of 1940. Tonnage contracted for and available for fabrication within the next four months is 802,753 tons.

SHAPE AWARDS COMPARED

	Tons
Week ended Aug. 30	5,761
Week ended Aug. 23	25,160
Week ended Aug. 16	21,057
This week, 1940	29,909
Weekly average, 1941	28,690
Weekly average, 1940	21,326
Weekly average, July, 1941	26,273
Total to date, 1940	754,990
Total to date, 1941	1,032,849

Includes awards of 100 tons or more.

SHAPE CONTRACTS PLACED

1800 tons, Cheesequake bridge, route 35, section 38, Middlesex county, New Jersey, state project, to Bethlehem Steel Co., Bethlehem, Pa., through Fehlhaber Pile Co., New York.

822 tons, building, American Steel Foundries, Alliance, O., to American Bridge Co., Pittsburgh; Arthur J. T. Bennett Jr., Chicago, contractor; bids Aug. 22.

660 tons, grade separation bridges, Queens, N. Y., to American Bridge Co., Pittsburgh, through Garafano Construction Co., New York.

640 tons, pier and transit shed, port of embarkation, New Orleans, to Jones & Laughlin Steel Corp., Pittsburgh, through Stevens Bros. & Miller-Hutchinson Co., New Orleans.

450 tons, ordnance warehouse, Schenectady, N. Y., to Bethlehem Steel Co., Bethlehem, Pa., through William G. Sheehan Construction Co., Albany, N. Y., contractor.

400 tons, state bridge FAP-307-B, over Little Missouri river, Medora, N. Dak., to Bethlehem Steel Co., Bethlehem, Pa.; Northwestern Engineering Co., Rapid City, S. Dak., contractor.

200 tons, transmission tower crossing, Willamette river, Bonneville Dam, Ore., to Bethlenem Steel Co., San Francisco.

180 tons, bridge 35.11 over Lieutenant river, Lyme, Conn., New York, New Haven & Hartford railroad, to American Bridge Co., Pittsburgh.

171 tons, girder span, Adams, Minn., Chicago, Milwaukee, St. Paul & Pacific railroad, to American Bridge Co., Pittsburgh; bids Aug. 8.

120 tons, grade separation PSC-9778, Long Island railroad, Mineola, N. Y., for state, to American Bridge Co., Pittsburgh.

110 tons, laboratory, Electro Metallurgical Co., Niagara Falls, N. Y., to the Bethlehem Steel Co., Buffalo.

108 tons, grade crossing elimination, Nassau county, New York, to American Bridge Co., through Andrew Weston Inc., Woodmere, N. Y.

100 tons, state bridges, Waterford and Belgrade, Me., to American Bridge Co., Pittsburgh; Hector J. Cyr Co. Inc., Waterville, Me., contractor.

SHAPE CONTRACTS PENDING

11,000 tons, additional Boeing Aircraft Co. plant, Seattle.

5000 tons, foundry, Rouge plant, Ford Motor Co., Dearborn, Mich.

3000 tons, power house, Utah Copper Co., Garfield, Utah.

2730 tons, unfabricated material, extension of pump and blower and sludge disposal building, West-Southwest sewage treatment works, division Q, Stickney, Ill., for City of Chicago sanitary district; bids Aug. 21; none received.

2700 tons, factory buildings 114, 115 and 70, A. O. Smith Corp., Milwaukee, Wis.

2400 tons, subway connections, Thirteenth street, W. Willow street, and Hermitage avenue, Chicago.

2200 tons, lift bridge over entrance to reserve basin, Philadelphia, for navy.

1950 tons, 1942 bridge requirements, various locations, Chicago, Rock Island & Pacific railway.

1800 tons, also 200 tons concrete bars, tube mill, Revere Copper & Brass Co., Baltimore; James Stewart Co., New York, contractor.

1575 tons, also 320 tons, reinforcing bars, Cheesequake bridge, bascule, route 35, section 38, New Jersey; Fehlhaber Pile Co., New York, low, $942,893.70, bids Aug. 22, Trenton.

1000 tons, vertical lift bridge, Philadelphia navy yard, Philadelphia; bids Sept. 9.

1000 tons, 16 intake gates for Bonneville powerhouse; Willamette Iron & Steel Works, Portland, low $495,040, to U. S. engineer, Portland.

950 tons, pier shed, pier 82, South Philadelphia, Pa., Pennsylvania railroad.

700 tons, tunnel supports, Apalachia tunnel, Tennessee Valley authority.

610 tons, paint shop, aircraft manufacturing and assembly plant, Ft. Crook, Nebr., for army engineers, Omaha Steel Works, Omaha, Nebr., low.

575 tons, compressor houses and furnace units, Hercules Powder Co., Louisiana, Mo.

321 tons, two buildings, Farm Bureau Cooperative Association Inc., Columbus, O.; one, 221 tons; the other, addition to warehouse, 100 tons, both at Maumee, O.

310 tons, extension to building 33, General Electric Co., Pittsfield, Mass.

300 tons, transfer shed, Naval supply depot, Oakland, Calif.

275 tons, overpass bridge, Wayne county, Pennsylvania; bids to state highway department, Harrisburg, Pa., Sept. 12.

250 tons, dial center, Chesapeake & Potomac Telephone Co., Hyattsville, Md.

210 tons, house construction, location unknown, Pan-American Airways.

200 tons, building, Bell Telephone Co., Lansdowne, Pa.

190 tons, state highway bridge, Pierre, S. Dak.

180 tons, addition, Montgomery, Ward & Co., Springfield, O.

170 tons, recreation building, naval base, Norfolk, Va.

165 tons, underpass, Woodbury, N. J.; no bids received Aug. 22, Trenton.

160 tons, exhauster and booster building, Weirton Steel Co., Weirton, W. Va.

150 tons, building addition, Lake Erie Engineering Corporation, Buffalo, N. Y.

140 tons, bridge, Lancaster county, Pennsylvania; bids to state highway department, Harrisburg, Pa., Sept. 12.

130 tons, plant addition, High Standard Mfg. Co., Hamden, Conn.

125 tons, beams for crane runways, South Portland Shipbuilding Co., South Portland, Me.

116 tons, state bridge, contract 2212, Ladoga, Montgomery county, Indiana; original bids Aug. 5 rejected, new bids Aug. 26 produced only one bidder.

103 tons, state bridge FAP-124 (4), Sapinero, Colo.; bids July 29; project abandoned.

Unstated, 230-kv switchyard at Coulee powerhouse; bids to Denver, Sept. 12, spec. 1557-D.

Unstated, reconstruction Morrison street bridge, Portland, state project; bids to highway commission, Portland, Oreg., Sept. 4.

Unstated, 125-foot high structure for

steel pipe line, Crooked river crossing, Deschutes project, near Terrebonne, Oreg.; bids to Bureau of Reclamation, Bend, Oreg., Sept. 15.

Reinforcing Bars

Reinforcing Bar Prices, Page 89

Steel mesh deliveries for highway reinforcing work have lengthened to about two months, but are relatively ahead of concrete reinforcing bars. Uncertain outlook is holding up some highway construction in the East. Material now up for estimates will probably not be available this fall and may go over until spring.

REINFORCING STEEL AWARDS

1900 tons, 800-foot pier, Puget Sound navy yard, to Bethlehem Steel Co., Seattle; Sound Construction & Engineering Co., and Peter Kiewitt Co., Seattle, joint contractors.

1639 tons; also 40 tons miscellaneous, pier and transit shed, port of embarkation, New Orleans, to Jones & Laughlin Steel Corp., Pittsburgh, through Stevens Bros. and Miller-Hutchinson Co., New Orleans.

675 tons, building, Bridgeport Brass Co., Bridgeport, Conn., to Concrete Steel Co., New York, through Stone & Webster Engineering Corp., Boston.

500 tons, mesh state highway project RC-4129, Oswego county, New York, to Bethlehem Steel Co., Bethlehem, Pa.; Madison County Construction Co., Inc., Madison, N. Y., contractor, $457,745.30.

350 tons, seaplane ramps for U. S. engineers, Alaska bases, to Bethlehem Steel Co., Seattle.

300 tons, gear plant, General Electric Co., West Lynn, Mass., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, ammonia plant, Henderson, Ky., to Truscon Steel Co., Youngstown, O. and Republic Steel Corp., Cleveland; Pioneer Construction Co., contractor.

300 tons, mesh, state highway project RC-41-30, Allegany county, New York, to Bethlehem Steel Co., Bethlehem, Pa.; C. P. Ward Inc., Rochester, N. Y., contractor, $576,784.30.

280 tons, 14 units, McClelland Field, Sacramento, Calif., to Ceco Steel Products Corp., San Francisco.

200 tons, miscellaneous defense projects, to Northwest Steel Rolling Mills, Seattle.

200 tons, women's dormitory, University of California, Berkeley, Calif., to Gilmore Fabricators Inc., San Francisco.

175 tons, Bureau of Reclamation, inv. A-33,295-A, Redding, Calif., to Columbia Steel Co., San Francisco.

162 tons, building, Michigan Bell Telephone Co., Royal Oak, Mich., to Taylor & Gaskin Inc., Detroit, and Great Lakes Steel Corp., Detroit.

151 tons, Bureau of Reclamation, inv. 44,313-A, Earp, Calif., to Bethlehem Steel Co., San Francisco.

150 tons, Cowles dormitory, Grinnell College, Grinnell, Iowa, to Pittsburgh-Des Moines Steel Co., Des Moines, Iowa and Laclede Steel Co., St. Louis; Welts Construction Co., contractor.

140 tons, building, Continental Can Co., Mankato, Minn., to Truscon Steel Co., Youngstown, O.; Austin Co., Chicago, contractor.

125 tons, barracks and storehouse, naval base, San Diego, Calif., to Truscon Steel Co., Los Angeles.

125 tons, job 9201, Washington county, Arkansas, to Jones & Laughlin Steel Corp., Pittsburgh; Vincennes Steel Co., contractor.

100 tons, housing project, Cherry Street, Long Beach, Calif., to Blue Diamond Corp., Los Angeles.

100 tons, mesh, state highway project, RC-41-27, Jefferson county, New York to American Steel & Wire Co., New York; Belmar Company, Troy, N. Y., contractor, $106,626.40.

CONCRETE BARS COMPARED

	Tons
Week ended Aug. 30	7,912
Week ended Aug. 23	21,523
Week ended Aug. 16	22,430
This week, 1940	23,817
Weekly average, 1941	12,376
Weekly average, 1940	8,814
Weekly average, July, 1941	16,563
Total to date, 1940	323,498
Total to date, 1941	445,520

Includes awards of 100 tons or more.

REINFORCING STEEL PENDING

36,000 tons, national defense work in various parts of Pacific Ocean; bids to Pacific Naval Constructors, Alameda, Calif.

4000 tons, storehouse, Philadelphia navy yard, Philadelphia; bids Sept. 5.

1000 tons, additional Boeing Aircraft Co. plant, Seattle.

600 tons, Battery-Brooklyn tunnel, contract 6, partial requirements; bids Sept. 4.

350 tons, addition, North American Cement Co., Catskill, N. Y.; Nicholson Co., New York, contractor.

250 tons, optical building, Frankford arsenal, Philadelphia, quartermaster de-

partment.

200 tons, bridge, Lincoln, R. I.

200 tons, mesh, state highway project RC-41-32, Rensselaer county, New York; no bids received.

150 tons, municipal courthouse, Brookline, Mass.

125 tons, alternate, highway project Holyoke, Mass.; readvertised bids Sept. 2, department of public works, Boston.

100 tons, water reservoir, Bucoda, Wash.; bids Aug. 25.

100 tons, Bureau of Roads bridge, Curry county, Oregon; bids at Portland, Aug. 27.

100 tons, 170-foot girder bridge, Chelan county, Washington; new bids Sept. 2, at Wenatchee.

100 tons, two state highway bridges, Indiana and Cambria counties, Pennsylvania; bids to state highway department, Harrisburg, Pa., Sept. 5.

Unstated, approaches, walls and subways, Morrison street bridge, Portland; bids to Highway Commission, Portland, Oreg., Sept. 4.

Pig Iron

Pig Iron Prices, Page 90

Little pig iron is being shipped except on priority orders and nondefense users are getting practically none. In many cases melters with defense work find it difficult to obtain sufficient iron to maintain operations. Silveries and ferrosilicon are in light supply and more difficult to obtain than pig iron.

Iron and steel branch of OPM has notified consumers that Form PD-70 must be filed at once in cases where this has been neglected. These were ordered filed by Aug. 15 but some melters have delayed. The form is to be sent in whether pig iron is being bought for that month or not, as a necessary factor in administering the order.

Two Cleveland suppliers have figured from their returns that their September allottments will be available to priorities from A-9 upward but none will be available for holders of A-10 and lower ratings.

A development resulting from the questionnaires is that some foundries have normal inventories, sufficient for several months operations, while others have been close to shutting down because of scant supply. Some equalization of these conditions will be undertaken.

No definite ruling has been made as to disposition of the 2 per cent pool, set aside for emergency allocation.

Brooklyn navy yard is calling for bids on 445 tons of low phos Sept. 5. This grade is difficult to obtain, due to the small number of producers, and this tonnage probably will be allocated.

The latest inquiry for supply to Great Britain, 250,000 tons, has not been fully met. This probably will be supplied under the same rating as applies to army and navy tonnage.

Gray iron foundry operations in the Philadelphia Federal Reserve district declined 1.7 per cent during July, according to the industrial research department, University of Pennsylvania. Output of jobbing plants was steady, the drop being accounted for by other foundries. Production was 41.4 per cent ahead of last year. Shipments were 14 per cent above June and 53.2 per cent larger than a year ago.

Steel foundry operations reached a new high in July, 11.5 percent ahead of June. Shipments rose 9 per cent and backlogs 15.7 per cent. Unfilled orders will keep foundries at present output more than five months.

Scrap

Scrap Prices, Page 92

Insistence that ceiling prices on steel and iron scrap now in effect will be enforced strictly after Sept. 1 by OPM and OPACS was the high light of the scrap situation last week. The two government agencies met with representatives of producers, buyers and sellers of scrap and Leon Henderson, price administrator, minced no words in asserting the full power of the government would be exerted in enforcing the schedule. Additional powers would be sought, if necessary, he asserted. (See page 23.)

OPACS has established Cincinnati as a basing point for scrap, at the same prices as Portsmouth and Middletown, O., and Ashland, Ky., to apply also to the switching district of Newport, Ky. It also has established net f. o. b. line prices

for rerolling rail on certain railroads and provides uniform shipping prices at various Gulf ports.

Demoralization of trade in scrap had reached a point where upgrading and higher prices than provided in the OPACS schedule had made impossible trading at the schedule. Reports of sales as much as $4 over ceiling had been made and also that classification of scrap grades had been practically discarded as long as some tonnage could be furnished.

Scarcity continues in the Pittsburgh district, despite the higher prices offered, this apparently having little effect on gathering and preparing material. At Chicago somewhat better receipts have been noted, attributed to better price, but the increase is not sufficient to allow accumulation for winter use, when shipments normally are less than in good weather.

A leading Buffalo consumer is estimated to have 60,000 to 70,000 tons in stockpiles but assure capacity steel production through the winter the reserve should be 150,000 to 175,000 tons, a total not attainable under present conditions. Similar conditions exist in other consuming centers.

New England melters are not obtaining sufficient new scrap to balance their melt and are using such reserves as they have, depleting accumulations provided for winter. Steel turnings production of Watertown, Mass., arsenal for the next six months has been allocated to Crucible Steel Co. of America, Midland, Pa., at the ceiling price, $9.56, f. o. b.

Pacific Coast

San Francisco—Demand for steel products continues unabated and industries making steel products for civilian use find themselves in a tighter position in regard to priorities. Those in close touch with the situation are of the opinion that many small producers will be forced to discontinue business during the national emergency.

Awards of reinforcing bars aggregated 1494 tons and brought the total to date to 97,844 tons, compared with 121,969 tons for the corresponding period in 1940. Ceco Steel Products Corp. took 280 tons for 14 units at McClelland Field, Sacramento, Calif. Gilmore Fabricators Inc., booked 200 tons for a women's dormitory at the University of California, Berkeley. Bureau of reclamation placed 175 tons for delivery at Redding, Calif., with Columbia Steel Co. and 150 tons for delivery at Earp, Calif., with Bethlehem Steel Co. Numerous small projects have come out for figures and pending business exceeds 40,000 tons.

United States Pipe & Foundry Co. took 200 tons of cast iron pipe for Sacramento, Calif. United States Pipe & Foundry Co. were low on 307 tons for Vallejo, Calif. Pending business includes 650 tons for San Diego, Calif., and 214 tons for Burbank, Calif. Awards totaled 644 tons, bringing the aggregate for the year to 38,100 tons, compared with 32,161 tons for the same period a year ago.

Most structural fabricators are operating at near capacity on national defense projects and evidence little interest in inquiries from private sources. Bethlehem Steel Co. secured 200 tons for transmission tower crossing across the Willamette river in Oregon in connection with the Bonneville dam project. Pending business exceeds 45,000 tons. Awards totaled 470 tons and brought the aggregate to date to 464,709 tons, compared with 214,450 tons for the same period last year.

Seattle—Priorities dominate the

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%....1.60
Turnings, millings containing over 12% 1.40
Turnings, millings, solids under 5% .1.25

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

market, non-defense projects getting small attention. In some instances municipalities are revising plans to eliminate use of steel as far as possible. The situation is working a hardship on the smaller shops with defense project subcontracts. They depend on their supplies on warehouses who in turn are unable to obtain deliveries. Wholesalers report stocks are low and replacements difficult, strongest demand being for plates and galvanized sheets, although all items are selling in volume.

Contracts for 11,000 tons of shapes and 1000 tons of concrete bars involved in the new Boeing plant to be erected here, are immediately pending. In about 30 days contracts will be placed for the new forging plant of Isaacson Iron Works.

Demand for cast iron pipe has decreased, due to inability of dealers to guarantee deliveries and unwillingness to quote. Business pending is not large but several sizeable projects are expected to be out for figures as soon as the emergency passes.

State highway commissions are limiting their improvements as far as possible to those requiring little or no steel.

Stringency in intercoastal steamship space has diverted steel shipments largely to overland routes, both heavy materials and smaller items coming by rail.

The scrap market continues confused, cast increasingly scarce and steel scrap receipts dropping so that this item also will soon be a problem unless the supervisory setup is revised, which dealers claim is necessary to stabilize the situation and afford a free flow to centers where defense work is under way. Present prices are not stimulating shipments from the interior.

Canada

Toronto, Ont.—Owing to sharp increase in demand for steel in connection with an expanding war program, Canada, during the past few weeks, has developed an acute shortage. In an effort to turn larger quantities of steel into direct war channels, the government has announced action that will greatly curtail deliveries to civilian industries, and freeze consumer stocks. Supply of plate for war needs is one of the more critical spots and it is stated that some branches of industry are being held up, due to difficulty in obtaining delivery.

No change is reported in the sheet situation. Demand is heavy and inquiries numerous, but mills are not accepting orders. Representatives of United States mills state they are being deluged with orders for sheets and strip, a large part of which has to be turned down. It is expected, that Canadian producers will open books next month for early 1942 delivery, although they already have some carry-over business into next year.

Persistently heavy demand continues for merchant bars, and some producers, with books filled to the

end of the year, have withdrawn from the market, while others are accepting orders for only certain sizes. Bar rolling has increased in volume in recent weeks, but a number of sizes formerly rolled have been suspended.

Structural steel lettings totaled about 11,000 tons for the week. It is reported that through government action, a number of large private construction jobs have been suspended to release tonnage for war needs. Fabricators are working at capacity to handle new business, and several are enlarging plants.

Demand for foundry and malleable pig iron is well in excess of supply and difficulty in obtaining supplies by non-war industry is becoming more acute.

Shortage of cast scrap has resulted in a number of dealers increasing bid prices 50 cents per ton, and have been offering $18.50 against a maximum selling price delivered consumers' yards of $22 gross ton for No. 1 cast scrap. Raising of the price failed to stimulate offerings to any great extent. Stove plate has entirely disappeared. Supply of steel scrap is holding well and no actual shortage is reported although there seems to be some question of dealers' ability to meet all demands during the winter.

Semifinished Steel

Semifinished Prices, Page 89

Nonintegrated steel producers welcome complete priorities control, as it will assure them of a better position in semi-finished material. On the other hand, it will vastly increase their difficulties as far as paper work is concerned, because they must first secure ratings and order numbers from customers before they will be able to place their own tonnage.

In some cases at least this difficulty will be eliminated by allowing nonintegrated mills to place blanket orders without preference ratings attached, and then to apply ratings received from customers against the following month's shipments. This will provide smaller mills with a supply of steel and will not require them to wait until after receiving orders before placing orders for steel with integrated mills.

Effects of the M-21 order will probably be more noticeable on semifinished steel than in any other product. A larger percentage of semifinished will be covered by preference ratings than on any finished product, with a few minor exceptions, since finishing capacity is larger than semifinished supply.

Tin Plate

Tin Plate Prices, Page 88

Scattered shutdowns of tin mills have appeared at several points, due principally to misalignments in shipping schedules of semifinished material. It is to be expected that these temporary suspensions, none of which lasted more than a few days, will continue because the mills are operating at peak rates on extremely low inventories.

Because of pressure for sheet mill products, as well as for semifinished steel for sheet mills, it is virtually impossible to increase inventories. However, there is no reason to believe that any prolonged shutdowns will be necessary.

Demand continues unabated, and consumption now is running ahead of production because of the heavy packing season in domestic markets plus heavy buying in the export market. Operations were off two points last week to 92 per cent of capacity, as a result of the shutdowns.

Metallurgical Coke

Coke Prices, Page 89

Priorities on coke, mainly on foundry grades of beehive and to some extent on by-product coke, are being discussed. Premium grades are most difficult to obtain as most by-product operators are out of the market. These ovens for the most part are owned by steel producers and the coke never reaches the market. In fact, many steelmakers with coke ovens have been in the market for additional tonnage. Excess of beehive coke

is still available. Foundry consumers believe blast furnaces should use this grade and make more premium coke available for cupola use.

In some cases foundry coke users, curtailing operations because of scrap shortage, have asked postponement of shipments until they can resume full production.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 89

Bolt and nut shops are placing bar orders on a 100 per cent priority basis. Current operations are maintained on material ordered early in first quarter, some of which was secured by supplemental preferential ratings after the original orders were booked. Construction demands, notably for government bases, are heavy, reflected in high ratio of large sizes. Production is as high as possible under lagging bar deliveries, alloys being tighter than carbon steel.

One of the largest inquiries in the East in recent years includes a tonnage for the Brooklyn-Battery tunnel, New York, closing Sept. 4. This project does not carry a high priority, but as bolt production for the tunnel will not appear until next year, this is not an immediate problem of supply. Despite large use of welding in ship construction, this continues among the leading consumers of bolts and nuts.

Fluorspar

Fluorspar Prices, Page 90

Fluorspar has been advanced $1 to $2 per ton to a range of $22 to $23. Though the lower figure is more prevalent sales have been made recently at the higher price, justifying a quotable range. The advance has been due to heavy demand, sellers stating that fluorspar had been out of line with other raw materials used in the steel industry.

Steel in Europe

Foreign Steel Prices, Page 91

London—(*By Cable*)—Semifinished supply position in Great Britain is satisfactory, with some tonnage in stock. Some descriptions of finished steel are also available. Domestic iron ore production is expanding for basic steelmaking. Pig iron and coke supplies are sufficient for current needs. Demand is increasing for special steels and shipbuilding and railroad maintenance material. Wire mills are fully occupied. Sheets, including galvanized, are quiet.

Warehouses Need Much Steel To Rebuild Stocks

According to a recent survey iron and steel warehouse distributors throughout the country need 750,000 tons of steel, exclusive of merchant products, to bring stocks back to normal. Merchant products, in the sense of this survey, are those in finished form, ready to use, such as nails, fencing, and pipe. Thus the figure above applies only to heavy steel, or steel products which are to be further fabricated before use.

Equipment

Seattle—Priorities are generally in effect, contractors on private projects meeting delay in deliveries of needed items. Largest bid opening of the week was by Bonneville power administration for conductor and accessories, Bonneville-Midway section of Bonneville-Grand Coulee transmission line, Phelps-Dodge Products Corp., New York, low at $818,437, alternates, $867,037 and $725,222. Same office has called bids Sept. 2 for 527,000 feet of conductor and accessories for Midway-Coulee section, and Sept. 8 for a 30,000-kva condenser for Midway. Puget Sound navy yard opened figures Aug. 26 for three air compressors and will receive tenders Sept. 4 for two mobile cranes of 20-ton capacity. U. S. engineer, Portland, Oreg., received bids Aug. 29 for woven wire fence at Portland airbase. Fort Lewis is considering bids for six transformers, opened Aug. 26.

Nonferrous Metals

New York—Allocation of domestic and imported metals to the various classes of consumers is proceeding rather smoothly now, although considerable confusion still persists in copper. Late reports from Washington indicated that an amendment to the copper schedule is being prepared and a statement on cadmium prices is pending. An announcement regarding scrap is also expected soon.

Copper—OPM still is not co-ordinating defense demand for electrolytic and fire-refined copper in the various commercial shapes with the type of copper and shapes which fabricators need to operate their plants. The OPM "copper" order which went into effect as of Aug. 7 is applicable to secondary brass and bronze ingot, according to John A. Church, chief of the copper-zinc section.

Lead — Producers are shipping metal as quickly as it is available and are keeping consumers' needs fairly well covered. Domestic supplies are still being augmented by importations.

Zinc—Production from domestic ores is up 29 per cent over a year ago while output from all sources is up about 50 per cent. Although some consumers still report prolonged shipment delays on defense orders, producers claim that 50 per cent of all zinc is available for civilian use.

Tin—Continued advance in the Far Eastern tin price has forced importers to reduce their offerings at the maximum 52-cent level here. Metals Reserve Co. has sold moderate tonnages for prompt delivery. Larger consumers, however, still have large reserves and are not pressing for additional tonnages.

Ford Makes $132,224 Dues Payment to UAW

Checks totaling $132,224 and representing initiation fees and union dues collected through the check-off system in August were mailed last week by Ford Motor Co., Dearborn, Mich., to the United Auto Workers Union, CIO. This was the first such dues deduction from workers' pay in accordance with the contract signed June 20.

All but six domestic Ford plants were included. No deductions, it is reported, were made in plants located at Charlotte, N. C.; Cleveland; Jacksonville, Fla.; Oklahoma City, Okla.; Seattle; and Cincinnati, "because they were not approached by the union."

Amounts sent in from the various plants: Alexandria, Va., $44; Atlanta, Ga., $1498; Buffalo, $3043; Chester, Pa., $5349; Chicago, $6447; Dallas, Tex., $3932; Denver, $37; Des Moines, Iowa, $102; Edgewa-

Nonferrous Metal Prices

Aug.	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures	Lead N. Y	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
23	12.00	12.00	11.75	52.00	52.00	5.85	5.70	7.25	17.00	14.00	35.00
25	12.00	12.00	11.75	52.00	52.00	5.85	5.70	7.25	17.00	14.00	35.00
26	12.00	12.00	11.75	52.00	52.00	5.85	5.70	7.25	17.00	14.00	35.00
27	12.00	12.00	11.75	52.00	52.00	5.85	5.70	7.25	17.00	14.00	35.00
28	12.00	12.00	11.75	52.00	52.00	5.85	5.70	7.25	17.00	14.00	35.00
29	12.00	12.00	11.75	52.00	52.00	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

Dealers' Buying Prices

No. 1 Composition Red Brass

New York	10.00-10.25
Cleveland	10.00-10.25
Chicago	9.25-9.50
St. Louis	9.50

Heavy Copper and Wire

New York, No. 1	10.00
Cleveland, No. 1	10.00
Chicago, No. 1	10.00
St. Louis	10.00

Composition Brass Turnings

New York	9.25

Light Copper

New York	8.00
Cleveland	8.00
Chicago	8.00
St. Louis	8.00

Light Brass

Cleveland	5.50-5.75
Chicago	5.75-6.00
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	4.50-4.75

Old Zinc

New York	4.50
Cleveland	4.00-4.12½
St. Louis	4.50-5.00

Aluminum

Mis., 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

ter, N. J., $7080; Fargo, N. D., $21; Houston, Tex., $156; Indianapolis, $38; Kansas City, $1899; Long Beach, Calif., $2235; Louisville, Ky., $1153; Memphis, Tenn., $1389; Milwaukee, $33; New Orleans, $165; Norfolk, Va., $1427; Omaha, Nebr., $96; Richmond, Calif., $1170; St. Louis, $793; Salt Lake City, Utah, $15; Somerville, Mass., $2716; and St. Paul, $1287.

Increased collections after September are anticipated, as the union shop contract makes it mandatory for Ford workers to join the UAW within 90 days of the signing of the contract.

National Labor Relations Board hearing was held last week on the petition of the United Automobile Workers, AFL, to be certified bargaining agent for approximately 3000 employes in small Ford Motor Co. plants in 14 Michigan communities. Counsel for the company and the CIO auto workers union asserted they regarded the contract signed by Ford and the UAW as covering all Ford employes in Michigan.

Canada Organizing Steel Priorities

(*Concluded from Page* 48)

000; Victoria Machinery Depot Ltd., Victoria, B. C., $8,035,200; Yarrows Ltd., Victoria, $30,000; Foundation Maritime Co. Ltd., Montreal, $169,800; E. A. Chappell Ltd., Summerside, P. E. I., $63,000; Walter Pinaud, Baddeck, N. S., $30,000; Norman Rose Shipping Co., Lower LeHavre, N. S., $17,600; LeBlanc Shipbuilding Co. Ltd., Weymouth, N. S., $30,000; Department of Transport, John Etherington, Shelbourne, N. S., Quebec, Que., $10,460; Gordon Boat Works Ltd., Brockville, Ont., $9125.

Land transport: Ford Motor Co. of Canada Ltd., Windsor, Ont., $2,161,996; Dominion Truck Equipment Co. Ltd., Kitchener, Ont., $400,545; International Harvester Co. Ltd., Ottawa, $5525; Cusson Freres Ltd., Montreal, $60,610.

Aircraft: Canadian Pratt & Whitney Co. Ltd., Montreal, $5080; Northern Electric Co. Ltd., Ottawa, $5208; Fleet Aircraft Co. Ltd., Ft. Erie, Ont., $24,666; National Steel Car Corp. Ltd., Hamilton, $8538.

Electrical equipment: Northern Electric Co. Ltd., Ottawa, $55,766; Canadian Marconi Co. Ltd., Montreal, $16,886; Canadian National Telegraph Co. Ltd., Montreal, $7620; Canadian General Electric Co. Ltd., Ottawa, $7568; Exide Batteries Ltd., Toronto, $15,839.

Instruments: Instruments Ltd., Ottawa, $10,824; Ontario Hughes-Owens Co. Ltd., Ottawa, $68,659.

Machinery: John Bertram & Sons Ltd., Montreal, $7891; Combustion Engineering Corp. Ltd., Montreal, $6076; J. H. Ryder Machinery Co. Ltd., Toronto, $6801; A. R. Williams Machinery Co. Ltd., Toronto, $6292.

Ordnance: Dominion Bridge Co. Ltd., Lachine, Que., $32,400.

Munitions: C. P. Fabien Ltd., Montreal, $20,509; T. H. Hancock Ltd., Montreal, $7000; Moffatts Ltd., Weston, Ont., $17,332; A. S. Nicholson & Son Ltd., Burlington, Ont., $12,855.

Structural steel: Dominion Bridge Co. Ltd., Lachine, $423,838; Sarnia Bridge Co. Ltd., Sarnia, Ont., $141,906.

War construction projects: Acadia Construction Co. Ltd., Halifax, N. S., $292,000; Anglin Norcross Ltd., Montreal, $747,500; Deakin & Stewart Construction Co. Ltd., Montreal, $66,545; A. Janin Co. Ltd., Montreal, $375,000; Reid & Cambridge Co. Ltd., Westmount, Que., $79,253; Bird Construction Co. Ltd., Winnipeg, Man., $191,985; Claydon Construction Co., Winnipeg, Man., $91,000.

Miscellaneous: Four Wheel Drive Auto Co. Ltd., Kitchener, Ont., $8168; Horton Steel Works Ltd., Ft. Erie, $89,750; Universal Plumbing Co. Ltd., Toronto, $154,000; Gregg Mfg. Co. Ltd., Winnipeg, Man., $6306; American Can Co. Ltd., Montreal, $9325; Gillette Safety Razor Co. Ltd., Montreal, $12,950; Horton Steel Works Ltd., Toronto, $16,570.

7-Man Board To Allocate Available Materials

(*Concluded from Page* 22)

tem will follow on the heels of the new board's establishment. Even before SPAB was decided upon, it was reported preliminary drafts of priorities reorganization had been drawn. It is considered probable these will be made to conform closely with the new organization.

Probability that material short-

ages would necessitate further dislocation in manufacturing and employment was indicated by the White House statement announcing the reorganization.

"The necessities of granting priorities in materials of which there are present shortages will result in some dislocation—in some shutdowns or curtailment of work in some factories which manufacture nondefense materials. The OPM is seeking to alleviate the resulting hardships in two ways: First, by promoting subcontracting and farming out of defense orders among smaller industries; and second, by helping nondefense plants place themselves in a position to take defense orders by minor changes in equipment and machine tools.

"The labor division of OPM has set up committees consisting of representatives of management, labor and government to deal energetically with such situations, particularly the orderly transfer of workers from nondefense jobs to defense jobs. This program has already been put into effect among silk workers and is now being applied in the automobile industry."

May Use Insurance

To ease the hardship on workers losing their jobs as result of such shutdowns, the President last week said unemployment insurance could be used to tide them over for 30 or 60 days or until federal, state and local groups could work out a satisfactory solution. The manufacturer forced to close down apparently must look out for himself.

One problem which is bothering government procurement officers is that of manufacturers who are engaged primarily in civilian production but who also make some items essential for defense. An example quoted by an Air Corps officer last week was that of a small metalworking company whose output is only 10 per cent for defense. However, the parts made by this company are essential and at present cannot be obtained elsewhere. The company insists it must maintain 60 per cent operations or close down. The company now is unable to obtain raw materials for its civilian production and air corps officials fear it will close, cutting off supplies of the essential parts.

Another priorities headache has arisen through the granting of high ratings for more material than is available. An example is pig iron, the supply of which is said to be sufficient to satisfy only the ratings from A-1 through A-9; some officials believe there will be no pig iron for manufacturers holding A-10 or B ratings—including some defense manufacturers and essential civilian manufacturers.

Wing Tips

(*Concluded from Page* 41)

stainless steel. Solar has been making this equipment for about ten years and in that time has produced over 20,000 units. Production now has been started in the Budd plant at Philadelphia under the joint agreement between the two companies.

OPM officials estimate 267,000 tons of steel will be used in aircraft manufacturing this year, and that next year's demand will rise to 450,000 tons. Major aircraft producers have arranged with various government agencies for a pool of orders for special steels required in engines and planes, the arrangement being made to accelerate handling of such orders.

Asked about the navy's bureau of aeronautics policy of specifying nothing but virgin aluminum for aircraft use, Rear Admiral John H. Towers, states, "I have adhered to the principle of using virgin material because my technical advisers have told me it would be rather unsafe

to depart from it; that whereas some manufacturers have processes and have systems of inspection under which they could probably use secondary aluminum safely, others might not have."

Plans have been virtually completed for drawing into aircraft production between 85,000 and 90,000 skilled shop workers whose work is not urgently needed in railroad employment, or whose basic skills are not being fully utilized in their regular employment.

Expansion of this plan to draw on the skilled workers from other industries, whether classed as essential or not, has been forecast, as the increasing shortage of skilled men for aircraft production is felt. After the railroads, it is expected the automobile industry next will be called on to furnish men. These transfers are voluntary, but involve numerous adjustments as to wages, priority of employment, and other matters affecting individuals.

Construction and Enterprise

Michigan

ADRIAN, MICH.—American Chain & Cable Co. will build an addition 120 x 180 feet, costing $75,000, for manufacture of airplane fittings for defense. (Noted Aug. 11.)

DETROIT—Michigan Pattern & Mfg. Corp., 3641 East Milwaukee avenue, has been incorporated with $50,000 capital to manufacture metal and wood patterns, by David C. Lowe, 1771 Severn road, Grosse Points Woods, Mich.

DETROIT—American Cutter & Engineering Co., 3714 Fischer avenue, has been incorporated with 200,000 shares no par value to manufacture dies and jigs, by Gerald H. Reader, 3714 Fischer avenue.

DETROIT—Rafco Tool & Mfg. Co., 7350 Central avenue, has been incorporated with $75,000 capital to manufacture metal patterns and stampings, by Frank B. Francis, 15492 Northlawn avenue, Detroit.

DETROIT—Continental Aviation & Engineering Corp., subsidiary of Continental Motors Corp., is considering construction of an aircraft engine manufacturing plant in Muskegon, Mich.

HAMTRAMCK, MICH.—Plant of Auto City Plating Co. was burned Aug. 8 and plans are being made for rebuilding. H. J. Block is manager.

LANSING, MICH. — Christman Co., Lansing, has been given a contract to rehabilitate former Reo factory building No. 47, which is to be used as a propeller manufacturing plant for Nash-Kelvinator Corp.

Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 98 and Reinforcing Bars Pending on page 99 in this issue.

Connecticut

MERIDEN, CONN.—Connecticut Telephone & Electric Corp., 70 Britannia street, will build two additions, each 60 x 100 feet, to cost about $55,000.

Maine

SOUTH PORTLAND, ME.—South Portland Shipbuilding Corp. will build a two-story 30 x 55-foot administration building, 75 x 450-foot storage unit, 15 x 42-foot welding unit and 75 x 470-foot assembly building. General contract has been given to E. C. Snodgrass, 169 Front street. Estimated cost is $125,000.

Massachusetts

HOPEDALE, MASS.—Draper Corp. has let contract for a four-story 140 x 300-foot plant addition to Bathelt Construction Co., 380 High street, Holyoke, Mass., at estimated cost of $350,000. McClintock & Craig Inc., 458 Bridge street, Springfield, Mass., is engineer.

NORTH ADAMS, MASS. — James Hunter Machine Co., Main street, will build a two-story 42 x 135-foot plant addition, general contract to Aberthaw Co., 80 Federal street, Boston. Estimated cost is $55,000.

WALTHAM, MASS.—Judson L. Thompson Mfg. Co., South street, will build a one-story 55 x 64-foot boiler plant. bids

Sept. 9. C. T. Main Inc., 201 Devonshire street, Boston, is engineer.

WORCESTER, MASS.—St. Pierre Chain Corp., Frank street, has let contract for one-story forge shop to Donald Smith, 5 Rudolph street, to cost about $60,000 O. E. Nault & Sons, 48 Hamilton street, are architects.

WORCESTER, MASS.—Wyman-Gordon Co., 105 Madison street, will build a one-story 57 x 94-foot boiler plant addition on Lenihan street. General contract has been given to E. J. Gross Co., 160 Prescott street. Cost estimated at about $44,600.

New York

NIAGARA FALLS, N. Y.—National Carbon Co., West 117th street and Madison avenue, Lakewood, O., will let contract soon for a group of plant additions here, to cost about $600,000.

NIAGARA FALLS, N. Y.—R & H Chemical department of E. I. du Pont de Nemours & Co. Inc., has awarded contract for a two-story 80 x 90-foot plant to Laur & Mack Inc., 1400 College avenue, to cost about $50,000.

New Jersey

BOONTON, N. J.—Carbone Corp., 400 Myrtle avenue, will build a one-story 500 x 100-foot addition to its brush manufacturing plant. General contract has been given to Sterling Construction Co. Inc., 83 Dawson avenue. D. Ludlow, 332 Springfield avenue, Summit, N. J., is architect.

BRIDGEWATER, N. J.—Calco Chemical Co. Inc., Bound Brook road, has let contract for a one-story 100 x 500-foot powerhouse addition to E. DeCristofer, 214 West High street, Bound Brook, N. J. Cost estimated at about $125,000.

HANOVER, N. J.—Maltbie Chemical Co., 240 High street, Newark, N. J., will award contract soon for one-story 32 x 90-foot chemical manufacturing plant and laboratory. Victor M. Reynal, 360 Main street, East Orange, N. J., is architect.

Ohio

ALLIANCE, O.—American Steel Foundries Co., 410 North Michigan avenue, Chicago, is taking bids for a plant addition to cost over $500,000.

CLEVELAND—Artisan Metal Works Co., 11400 Madison avenue, will let contract soon for a one-story 60 x 85-foot plant addition, to cost about $40,000. W. G. Caldwell, 838 Engineers building, is architect.

CLEVELAND—Bishop & Babcock Mfg. Co., 4901 Hamilton avenue, John Watson Jr., secretary, will reopen plant at East Fifty-fifth street and New York Central railroad to provide facilities for large shell contract. Equipment to value of $900,000 will be government financed.

CLEVELAND—Sherwin Williams Defense Corp., E. E. Ware, president, has been formed to build and operate government ordnance plant at Crab Orchard Lake, Ill., to cost about $40,000,000.

PAINESVILLE, O.—Diamond Alkali Co., with plant at Fairport harbor, has approval with Defense Plant Corp. for construction of magnesium extraction plant with capacity of 30 to 40 million pounds annually. Company's main offices are in Oliver building, Pittsburgh.

Pennsylvania

BRADFORD, PA.—Kendall Refining Co., O. Koch, president, Kendall avenue, will enlarge and improve Bradford Oil Refining Co. plant, recently acquired, at cost of over $40,000.

BUTLER, PA.—American Bantam Car Co., H. E. Crist, works manager, will build a one-story 50 x 250-foot plant addition, to cost about $45,000. P. Greene, care owner, is engineer.

Alabama

BIRMINGHAM, ALA.—Ingalls Shipbuilding Corp., 720 Fourth avenue South, will build two additional ship ways and three outfitting docks at cost of several million dollars.

Maryland

BALTIMORE—Defense Plant Corp. has authorized lease agreement with Koppers Co., Pittsburgh, for construction and equipment of plant for Hammered Piston Ring division at Baltimore, to cost $350,000 for land and buildings and $900,000 for equipment, to manufacture aircraft engine parts.

District of Columbia

WASHINGTON—Bureau of supplies and accounts, navy department, will take bids as follows: Sept. 5, schedule 8463, two electric bridge cranes for Robertson, Md., and Minneapolis, Minn.; schedule 8478, gasoline engine driven portable air compressor for Annapolis, Md.; Sept. 9, schedule 8466, six motor-driven electric power hacksaws, for various deliveries; schedule 8472, six motor-driven horizontal boring, drilling and milling machines for east coast delivery; schedule 8412, two electric furnaces for

San Diego, Calif.; schedule 8440, two gasoline engine driven telescopic boom truck-type cranes for Key West, Fla., and Mare Island, Calif.; Sept. 12, schedule 8468, motor-driven drilling machine for Puget Sound, Wash.; schedule 8407, lapping machines and lapping pistons for various deliveries; Sept. 16, schedule 8482, motor-driven vertical hydraulic joggling press for Mare Island, Calif.; schedule 8497, diesel engine driven crawler tractor for Los Angeles, San Francisco or Seattle delivery.

Kentucky

LOUISVILLE, KY.—Research Corp., an affiliate of Reynolds Metals Co., has added 125,000 square feet of manufacturing space in Louisville by leasing American Oak Leather Co. plant on Eleventh street. Will spend about $250,000 for building alterations and installing machinery for manufacture of metal-capped paper containers for shipment of gunpowder.

TYRONE, KY.—Kentucky Utilities Co., Lexington, Ky., has plans under way for a steam generating station, including turbine generator units, high-pressure boilers and auxiliaries, costing $2,000,000. Sargent & Lundy, 140 South Dearborn street, Chicago, are engineers.

Georgia

ATLANTA, GA.—Plantation Pipe Line Co. will receive bids Sept. 1 for 15 pumping stations and houses for pipe line from Baton Rouge, La., to Greensboro, N. C.

Louisiana

LAKE CHARLES, LA.—Mathieson Alkali Works, 60 East Forty-second street, New York, will build magnesium plant, to be financed by Defense Plant Corp., to cost about $12,000,000.

STERLINGTON, LA.—Commercial Solvents Co., 17 East Forty-second street, New York, has let contract for an anhydrous ammonia plant near here for war department, to M. W. Kellogg Co., 225 Broadway, New York, at $16,750,000.

Virginia

STAUNTON, VA. — Staunton Textile Corp. is having plans prepared for a plant to manufacture rayon.

Missouri

ST. LOUIS—St. Louis Car Co., 8000 North Broadway, has an order from the war department for building ammunition cars, all steel, designed to carry ammunition.

Wisconsin

MILWAUKEE—J. Greenebaum Tanning Co. has let contract to Siesel Construction Co. for a two-story plant addition 67 x 140 feet. Lawrence E. Peterson, 312 East Wisconsin avenue, is engineer.

MILWAUKEE—Metal Treating Inc. has given contract to Ray Stadler Construction Co. for a one-story plant, 60 x 90 feet. George Zagel & Bro. are architects.

MILWAUKEE—Crucible Steel Casting Co. has given contract to August Priegel for a one-story factory. N. P. Backes is architect.

Minnesota

AUSTIN, MINN.—City council, J. H. Weiland, city clerk, will open bids Sept. 26 for improvements and equipment for municipal light and power plant, including steam generating unit, at cost of about $200,000. Helmick, Edeskuty & Lutz, Essex building, Minneapolis, are engineers.

BEMIDJI, MINN.—Beltrami Electric Co-operative Inc. has been allotted $249,000 by REA for 329 miles of rural transmission lines.

MINNEAPOLIS—Northern Pump Co., manufacturer of naval gun mounts, has given general contract to George F. Cook Construction Co. for two additions 150 x 1720 feet at its plant at Fridley, Minn. Pesek & Shifflet, 914 Marquette avenue, Minneapolis, are engineers. (Noted March 24.)

Texas

LONGVIEW, TEX.—United Gas Pipe Line Co. will build a 200-mile gas pipe line to supply natural gas to industries and cities in Louisiana, Mississippi and Alabama, extending to Pensacola, Fla., with lateral branches.

Kansas

BAXTER SPRINGS, KANS.—War department, Washington, plans construction of an ammonium nitrate plant at the Jayhawk ordnance works, to cost about $17,700,000.

North Dakota

MILNOR, N. DAK.—R. S. R. Electric Co-operative Inc., Ray Harens, manager, has given contract to Carl Swedberg, Wheaton, Minn., for 178 miles of rural electric lines for which REA has allotted $160,000. Banister Engineering Co., St. Paul, is engineer. (Noted June 9.)

Iowa

MALLARD, IOWA—A. H. Steil, city clerk, will open bids Sept. 15 for con-

struction of a municipal light and power plant. K. R. Brown, Valley Bank building, Des Moines, Iowa, is engineer. (Noted July 7.)

MT. AYR, IOWA—Rideta Electric Co-operative Inc., C. C. Brimmer, president, will take bids soon for 263 miles of rural transmission lines, for which REA has allotted $254,000.

MUSCATINE, IOWA—First Iowa Hydro-Electric Co-operative has applied to federal power commission for a license to build an electric generating plant near Muscatine, to cost about $13,500,000, including a dam across Cedar river at Moscow, Iowa.

SLATER, IOWA—City will hold special election Sept. 8 on construction of municipal light and power plant. Phil Rood is city clerk. Ralph W. Gearhart, Cedar Rapids, Iowa, is engineer. (Noted July 14.)

California

SAN FRANCISCO—U. S. Pipe Bending Co., 249 First avenue, will build several plant additions, at cost of about $40,000.

SAN LEANDRO, CALIF.—National Automotive Fibres Inc., Railroad avenue and Kennedy street, has let contract for a one-story 320 x 600-foot plant to A. T. Beckett, 366 Fortieth street, Oakland, Calif., to cost about $275,000.

Oregon

EUGENE, OREG.—City has plans and will ask bids soon on a sewage disposal plant at estimated cost of $156,488, for which city has $125,000 available. L. R. Stockman, Baker, Oreg., is engineer.

PORTLAND, OREG.—Pacific American Shipbuilding Corp. has been incorporated by Rudolph Kallio, George P. Grigsby and A. E. Pragg, Portland. Plans to establish plant for production of concrete barges of 6000 to 8000 tons, production to start in 60 days.

PORTLAND, OREG.—Stauffer Chemical Co., 624 California street, San Francisco, has let contract for 100 x 168-foot sulphate of alumina plant to Drake, Wyman & Voss, Fenton building, Portland, at about $100,000.

Washington

GOLDENDALE, WASH.—City will receive bids Sept. 5 for sewage treatment plant to cost about $20,000, with funds available. G. D. Hall, Yakima, Wash., is engineer.

OLYMPIA, WASH.—West Coast Shipbuilding Corp., capital $1,250,000, has been incorporated and plans construction of a shipyard at an unstated point in Washington. Incorporators include George W. Kleinfelter, Seattle, who was associated with J. F. Duthie & Co., steel shipbuilders, at Seattle, from 1915 to 1921.

SEATTLE—Markey Machinery Co., 85 Horton street, manufacturer of deck machinery and marine equipment, will build a machinery fabricating plant at 7288 Eighth avenue South. M. O. Sylliaason is structural engineer.

Canada

HAMILTON, ONT.—Hamilton Bridge Co. Ltd., 231 Bay street North, is having plans made for a plant addition 70 x 80 feet, to cost about $130,000, with equipment.

INGERSOLL, ONT.—Morrow Screw & Nut Co. Ltd. will build a plant addition costing $25,000, not including equipment. Contract has been given to H. Ogden.

LEASIDE, ONT. — Canadian Aircraft Instruments & Accessories Ltd., Vanderhoof Drive, has completed first plant unit and will start at once on second unit to provide 14,000 square feet floor space, at cost of about $75,000.

LONDON, ONT.—Kelvinator of Canada Ltd., 1152 Dundas street East, manufacturer of electric refrigerators, is having plans made for a one-story plant addition 28 x 36 feet, costing about $50,000, with equipment.

LONDON, ONT. — London Concrete Machinery Co. Ltd., Cabell and Kitchener avenues, makers of hoisting and concrete machinery, is considering plans for an addition to cost about $50,000, with equipment. Henry Pocock is manager.

MIMICO, ONT. — Canadian National Railways is taking bids through B. Wheelwright, chief engineer, 436 Union station, Toronto, Ont., for castings shop, addition to engine house and other enlargements, to cost about $100,000, with equipment.

ST. CATHARINES, ONT.—McKinnon Industries Ltd., Ontario street, maker of automobile parts, will build a plant addition to cost about $100,000, with equipment. Contract has been given to Ontario Construction Co., 31 Queen street. A. G. Nicholson, 46 Queen street, is architect.

ST. CATHARINES, ONT. — Packard Electric Co. Ltd., 13 Race street, manufacturer of electric transformers, will build a plant addition costing $16,000 without equipment. General contract has been given to Frank Monk, 399 St. Paul street.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

ABRASIVES (Blast Cleaning)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.

ABRASIVES (Polishing)
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ABRASIVES (Wheels)
Bay State Abrasive Products Co., Westboro, Mass.

ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

ACETYLENE
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

ACID-PROOF LININGS
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.
Quigley Co., 56 W. 45th St., New York City.

ACIDS (Pickling)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

AIR COMPRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

AIRLESS BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

ALKALI CLEANING COMPOUNDS
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

ALLOYS (Hard Surfacing)
Stoody Co., Whittier, Calif.

ALLOYS—See FERROALLOYS

ANGLES, CHANNELS—See BEAMS, CHANNELS, ANGLES

ANGLE IRON BENDERS
Excelsior Tool & Machine Co., Ridge & Jefferson Ave., E. St. Louis, Ill.

ANNEALING BOXES—See BOXES (Annealing)

ANNEALING COVERS
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

ANODES (All Types)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

ANODES (Nickel)
Seymour Manufacturing Co., 51 Franklin St., Seymour, Conn.

AXLES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BABBITT METAL
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BALANCING MACHINES
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.

BALING PRESSES
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BALL TRANSFERS
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

BALLS (Brass or Bronze)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Strom Steel Ball Co., 1842 S. 54th Ave., Cicero, Ill.

BALLS (Special Alloy Metals)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel)
***Also Stainless**
*Strom Steel Ball Co., 1842 S. 54th Ave., Cicero, Ill.

BAND FILES (Metal)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.

BAND SAWS (Metal Cutting)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.

BANDS—See HOOPS AND BANDS

BANDS (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BAR BENDERS
Kardong Bros. Inc., 346 Buchanan St., Minneapolis, Minn.

BARGE MOVERS
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

BARGES (Steel)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Maryland Dry Dock Co., Baltimore, Md.

BARRELS (Plating)
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

BARRELS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

BARS (Alloy)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

BARS (Brass, Bronze or Copper)
American Brass Co., The, Waterbury, Conn.
Copperweld Steel Co., Warren, O.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BARS (Concrete Reinforcing)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
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.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BARS (Iron)—See IRON (Bar)

BARS (Steel)
(*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Copperweld Steel Co., Warren, O.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BATHS (Heat Treating-High Speed)
A. F. Holden Co., The, 200 Winchester Ave., New Haven, Conn.

BATTERIES (Storage)
Edison Storage Battery Div. of Edison, Thomas A., Inc., West Orange, N. J.
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.

BATTERY CHARGING APPARATUS
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

BEAMS, CHANNELS, ANGLES, ETC.
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BEARINGS (Ball)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

BEARINGS (Brass, Bronze)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
Moraine Products Division, General Motors Corporation, Dayton, Ohio.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BEARINGS (Journal)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Needle)
Torrington Co., The, Torrington, Conn.

BEARINGS (Non-Metallic)
Moraine Products Division, General Motors Corporation, Dayton, Ohio.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BEARINGS (Oilless)
Moraine Products Division, General Motors Corporation, Dayton, Ohio.
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

BEARINGS (Quill)
Bantam Bearings Corp., South Bend, Ind.

BEARINGS (Radial)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 No. Holmes Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St., and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The Canton, O.

BEARINGS (Roll Neck)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Harrison, N. J.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Bower Roller Bearing Co., 3040 Hart St., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller Tapered)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

BEARINGS (Rolling Mill)
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Thrust)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 No. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Chain and Link)
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BENCH PLATES
Challenge Machinery Co., Grand Haven, Mich.

BENCHES
Challenge Machinery Co., Grand Haven, Mich.

BENDING AND STRAIGHTENING MACHINES
Alliance Machine Co., The, Alliance, O.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Cleveland Crane & Engineering Co., Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

BENZOL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Co., Tar & Chemical Div., 901 Koppers Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
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.
Washburn Wire Co., Phillipsdale, R. I.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Copperweld Steel Co., Warren, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
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.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
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.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
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.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BINS (Storage)
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.

BLAST CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

BLAST FURNACE CLEANING (Gas)
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACE HOT BLAST STOVES
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., First National Bk. Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACE STOCK HOUSES
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Reading Chain & Block Co., Dept. 39, Reading, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

BLOWERS
General Electric Co., Schenectady, N. Y.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
North American Mfg. Co., The, 2901 E. 75th St., Cleveland, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Oil Well Supply Co., Dallas, Texas.

BOLT AND NUT MACHINERY
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., The, Tiffin, O.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*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, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 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, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Non-Ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

BOLTS (Special)
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, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Central Screw Co., 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2934 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, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

WHERE-TO-BUY

BOLTS (Track)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9375-B, Scranton, Pa.

BORING MACHINES (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Union Steel Casting Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

BRAKE LININGS
Johns-Manville Corp., 22 E. 40th St., New York City.

BRAKES (Electric)
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.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

BRICK (Chrome)
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Silica)
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.

BROACHING CUTTERS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
American Broach & Machine Co., Ann Arbor, Mich.
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Beatty Machine & Mfg. Co., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
North American Mfg. Co., The, 2901 E. 75th St., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BUSHINGS (Jig)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

CADMIUM
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CADMIUM PLATING PROCESS
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAPSTANS (Electric, Gasoline, Diesel)
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CAR DUMPERS
Alliance Machine Co., The, Alliance, Ohio.
Industrial Brownhoist Corp., Bay City, Mich.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CARBIDE
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Dump)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT
Pangborn Corp., Hagerstown, Md.

CASTINGS (Acid Resisting)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O

CASTINGS (Alloy Iron)
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Electro Alloys Co., The, Elyria, O.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O.-Springfield, O.
Pittsburgh Rolls, Div. of Blaw-Knox Co., Pittsburgh, Pa.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 2846 Smallman St., Pittsburgh, Pa.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

CASTINGS (Corrosion Resisting)
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Brown, Inc., 456 So. Main St., Lima, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Erie Foundry Co., Erie, Pa.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango-Penn Mold Co., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Electro Alloys Co., The, Elyria, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Stel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.-Springfield, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
Standard Steel Works Div. of Baldwin Locomotive Works, The Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdry. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Wear Resisting)
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., Dept. E., Pennsalt Cleaner Div., Philadelphia, Pa.

CEMENT (High Temperature)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Eagle-Picher Lead Co., The, Cincinnati, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Norton Company, Worcester, Mass.
Quigley Company, 56 W. 45th St., New York City.

CEMENT (High Temperature Hydraulic)
Atlas Lumnite Cement Co., Dept. S-16, Chrysler Bldg., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Draw Bench)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Malleable)
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Power Transmission)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Roller)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Steel-Finished Roller)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc. Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 747 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

CHEMICALS (Industrial)
American Solder & Flux Co., 2153 E. Norris St., Philadelphia, Pa.

CHISELS (Chipping)
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCK OPERATING CYLINDERS
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, 170 E. 131st St., Cleveland, O.

CHUCKS (Automatic Closing)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANERS (Steam)
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

CLEANING SPECIALTIES
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A. Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.

CLUTCHES (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 523 E. Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Coal Co., 300 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
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.
Youngstown Sheet & Tube Co., The, Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

WHERE-TO-BUY

COAL, COKE, ORE, ASH HANDLING MACHY.—Con.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., 300 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

COLUMBIUM
Electro Metallurgical Co., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE (Heat Resistant)
Atlas Lumnite Cement Co., Dept. S-16, Chrysler Bldg., New York City.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Youngstown Sheet & Tube Co., The, Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
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.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
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.

CONTROLLERS (Electric)
Allen-Bradley Co., 1320 Sc Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Clevelanu, 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)
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.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer 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 Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Reading Chain & Block Corp., Dept. 39, Reading, Pa.

CONVEYORS (Roller—Power and Gravity)
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

COPPER (Phosphorized)
National Bearing Metals Corp., 926 Shore Ave., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

COPPERING COMPOUND
American Chemical Paint Co., Dept. 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9375-B, Scranton, Pa.

COTTER PINS
American Chain & Cable Co., Inc., York, Pa.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 436 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
American Flexible Coupling Co., 18th & Pittsburgh Aves., Erie, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
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.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa
National Tube Co., Frick Bldg., Pittsburgh, Pa.

COUPLINGS (Pipe) Con.
Oil Well Supply Co., Dallas, Texas.
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, Ohio.
Dravo Corp. (Engineering Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, Ohio.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Crawler, Erection)
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 (Electric)
Alliance Machine Co., The, Alliance, Ohio.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. 39, 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.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, Ohio.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Reading Chain & Block Corp., Dept. 39, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
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.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Hand)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
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. 39, 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.

CRANES (Jib)
Alliance Machine Co., The, Alliance, Ohio.
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.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. 39, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
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.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div., of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Reading Chain & Block Corp., Dept. 39, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Reading Chain & Block Corp., Dept. 39, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUT-OFF MACHINES (Abrasive)
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.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CUTTING-OFF MACHINES (Rotary)
Melch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Taylor-Wilson Mfg. Co., 15 Thomson Ave., McKees Rocks, Pa.

CYLINDERS (Air or Hydraulic)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 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.

CYLINDERS (Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

DESIGNERS (Industrial)
Designers for Industry, Inc. Terminal Tower, Cleveland, O.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. S-91, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

DIE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

DIE CUSHIONS
Dayton Rogers Co., Dept. "C," 2830-13th Ave., So., Minneapolis, Minn.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

DIES (Cast)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co. 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES
Basic Refractories, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRAGLINES (Crawler)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

DRAW BENCHES
Vaughn Machinery Co., Cuyahoga Falls, O.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

DRILLING MACHINERY
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

DRILLING MACHINES (Vertical)
Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
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.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

DRUMS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DRYERS (Rotary)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

DUST ARRESTING EQUIPMENT
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pangborn Corp., Hagerstown, Md.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co., Dept. 175, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.

ELECTRODES (Carbon and Graphite)
National Carbon Co., W. 117th St. at Madison Ave., Cleveland, O.

ELECTRODES (Hard Surfacing Welding)
Stoody Co., Whittier, Calif.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
C. H. Hunt, 1213 First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., First National Bank Bldg., Pittsburgh, Pa.
C. H. Hunt, 1213 First National Bank Bldg., Pittsburgh, Pa.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 140 Cedar St., New York City.
Loftus Engineering Corp., 747 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS (Lubricating Equipment)
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

ENGINES (Diesel)
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., Dept. 175, 600 So. Michigan Ave., Chicago, Ill.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., Dept. 175, 600 So. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Kerosene)
Fairbanks, Morse & Co., Dept. 175, 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

» » » WHERE-TO-BUY « « «

EXCAVATORS
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

FANS (Crane Cab)
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FANS (Exhaust Ventilating)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Wall)
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Co., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.

FERROCHROME
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.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

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.
Kidde, 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.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., 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 Eighth 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.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Alliance Machine Co., The, Alliance, Ohio.
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-91, 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)
Brassert, 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 Salt Bath Furnace Div. Commerce Pattern Fdry. & Mach. Co., 7452 Melville Ave., at Green, 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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
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.
Swindell-Dressler Corp., P. O. Box 1888, 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 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Upton Electric Salt Bath Furnace Div. Commerce Pattern Fdry. & Mach. Co., 7452 Melville Ave., at Green, 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.
Brassert, 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, Engineering Co., 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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

» » » WHERE-TO-BUY « « «

GAGE BLOCKS
Dearborn Gage Co., 22036 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.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
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 Construction 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 Construction 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-91, 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. I75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. 175, 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.
Reliance 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—FOR 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 FITTINGS
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

GREASE GUNS
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Michigan Leather Packing Co., 6301 E. Lafayette Ave., Detroit, Mich.

GRINDER CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

GRINDERS (Circular Saw)
Motch & 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 Side 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.

GRINDERS (Swing Frame)
Fox Grinders, Inc., Oliver Bldg., Pittsburgh, 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.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

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 (Chucking)
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 (Rotary 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)
Ampco Metal, Inc., Dept. S-91, 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)
Alliance Machine Co., The, Alliance, Ohio.
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)
Alliance Machine Co., The, Alliance, Ohio.
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.

WHERE-TO-BUY

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., 85 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.

HELMETS (Blast Cleaning)
Pangborn 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)
Cleveland Tramrail Div., of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. 39, 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. 39, 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.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, 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. 39, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 359 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, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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, Ohio.
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.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, 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)
Broslus, 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.

INDUSTRIAL DESIGNERS
Designers for Industry, Inc., Terminal Tower, Cleveland, O.

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.
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 Lumnite 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
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & 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.
Quigley Co., 56 W. 45th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan 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. National 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., Dreman 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 Blvd., Detroit, Mich.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

LAPPING PLATES
Challenge Machinery Co., Grand Haven, Mich.

LARRIES (Coal)
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, 890 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie 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, 890 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.

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.
Cooper-Bessemer Corp., The, Mt. Vernon, 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 Mechanical)
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.

LOCOMOTIVES (Switching and Transfer)
Cooper-Bessemer Corp., The, Mt. Vernon, O.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
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.
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.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.
Lincoln Engineering Co., 5700 Natural Bridge Ave., St. Louis, Mo.

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)
Alliance Machine Co., The, Alliance, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
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., Etna 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., 1211 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.

MANIPULATORS (Forging)
Alliance Machine Co., The, Alliance, Ohio.

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., Mishawaka, 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)
Stoody Co., Whittier, Calif.

METALS (Nonferrous)
American Brass Co., The, Waterbury, Conn.
International Nickel Co., Inc., The, 67 Wall St., New York City.

WHERE-TO-BUY

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
Climax 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 & Block Corp., Dept. 39, 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. I75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
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.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 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, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Machine Screw)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.

NUTS (Non-Ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., 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, Burdsall & 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.
Michigan Leather Packing Co., 6301 E. Lafayette Ave., Detroit, Mich.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 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.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, 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 Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Michigan Leather Packing Co., 6301 E. Lafayette Ave., Detroit, Mich.

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
Cellcote 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. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
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 (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 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.
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 THREADING 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.
Worthington Pump & Machinery Corp., Harrison, N. J.

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. & Walworth 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 Burleigh 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.
Bliss & 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 Motors 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.
Scully Steel Products Co., 1316 Wabansia Ave., 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
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 436 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.

POTENTIOMETERS
Bristol Co., The, 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.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready-Power Co., The, 3828 Grand River Ave., Detroit, Mich.

PREHEATERS
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 Burleigh 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)
Cleveland Crane & Engineering Co., Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

PRESSES (Forging)—Con.
National Machinery Co., The, Tiffin, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
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.
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.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
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.

PRESSES (Riveting)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Stamping)
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Welding)—See WELDERS

PRESSES, BRIQUETING (Turnings & Borings)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

PRESSURE VESSELS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 523 E. Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., 446 Broadway, Buffalo, N. Y.
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Sunly Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Boiler Feed)
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. I75, 600 So. Michigan Ave., Chicago, Ill.
Tomkins-Johnson Co., The, 611 N. Mechanic St., Jackson, Mich.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Fuel Injection)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PUMPS (Hydraulic)
Brown & Sharpe Mfg. Co., Providence, R. I.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Roper, The Geo. D., Corp., Rockford, Ill.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PUMPS (Reciprocating)
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Rotary)
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.

PUMPS (Vertical Turbine)
Layne & Bowler, Inc., Memphis, Tenn.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
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
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.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
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.
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. Washington Ave., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.

REBUILT EQUIPMENT
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 N. 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.

RECEIVERS
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
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.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Dolomite)
Basic Refractories, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (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 Law Bldg., Pittsburgh, Pa.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REFRACTORIES (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REFRACTORY CONCRETE
Atlas Lumnite Cement Co., Dept. S-16, Chrysler Bldg., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.

REGULATORS (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.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
Udylite 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., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

RIVETS (Non-Ferrous and Stainless)
Harper, H. M., Co., The 2646 Fletcher St., Chicago, Ill.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Roebling'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.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
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.

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 (Backed-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
Alliance Machine Co., The Alliance, Ohio
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis 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.

ROLLING MILLS (Consulting, Contracting Engineers)
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLING MILL TABLES
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine 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.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. 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.
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.
Dearborn Chemical Co. 310 S. Michigan Ave., Chicago, Ill.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
Wayne Chemical Products Co., 9502 Copeland St., 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. Suppiger 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.

SAWING MACHINES (Hot and Cold)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
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)
Disston, Henry, & Sons, Inc., Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hack)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Disston, Henry & Sons, Inc., Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hot and Cold)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

SAWS (Inserted Tooth, Cold)
Disston, Henry, & Sons, Inc., Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
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.
Disston, Henry, & Sons, Inc., Tacony, Philadelphia, Pa.
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.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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. I75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial & Recording)
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)
Fairbanks, Morse & Co., Dept. I75, 600 S. Michigan Ave., Chicago, Ill.

SCALES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Fairbanks, Morse & Co., Dept. I75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 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 & Construction 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., 97 Main St., 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.
Parker-Kalon Corp., 194-200 Varick St., New York City

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.
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.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

WHERE-TO-BUY

SCREWS (Non-Ferrous and Stainless)
Harper, H. M., Co., The
2646 Fletcher St., Chicago, Ill.

SCREWS (Self Locking)
Shakeproof 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.,
New Bedford, Mass.
Corbin Screw Corp.,
New Britain, Conn.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co.,
2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Shakeproof Lock Washer Co.,
Chicago, Ill.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thread-Cutting)
Parker-Kalon Corp.,
194-200 Varick St., New York City
Shakeproof Lock Washer Co.,
2525 N. Keeler Ave.,
Chicago, Ill.

SCREWS (Thumb)
Central Screw Company,
3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co.,
Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co.,
New Bedford, Mass.
Corbin Screw Corp.,
New Britain, Conn.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co.,
2440 E. 75th St., Cleveland, O.
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.,
16th & Rockwell Sts.,
Chicago, Ill.
Scully Steel Products Co.,
1316 Wabansia Ave., Chicago, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works,
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.
Roebling'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.
Halliden Machine Co., The,
Thomaston, Conn.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co.,
Hyde Park, Pa.
Lewis 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 (Slitting, 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-Friestedt Co., 1308 S. Kilbourn 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.

SHEET STEEL PILING—Con.
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.
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.
Ampco Metal, Inc., Dept. S-91, 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.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., 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.
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.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Worth Steel Co., Claymont, Del.
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 and 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.

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

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., 230 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)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

SLITTERS
Ohio Knife Co., Dreman 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.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

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., 97 Main St., Bristol, Conn.
Hubbard, M. D., Spring Co., 436 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.

WHERE-TO-BUY

SPRINGS (Alloy)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., 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., 97 Main St., 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., 97 Main St., 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., 97 Main St., 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., 97 Main St., 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., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

SPRUE 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., 97 Main St., 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., 486 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 117, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York City
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., 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.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.

STEEL (Cold Finished)—Con.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell S's., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., 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.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
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., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St. Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
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.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol. Conn.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., The, Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
*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 B'dg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
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.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
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.
Scully Steel Products Co., 1316 Wabansia Ave., 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.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, O.
Crucible Steel Co. of America, Room 117, 405 Lexington Ave., New York City.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
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.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Mach. Co., 5600 St. Jean, Detroit, Mich.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago. Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

STONES (Honing)
Bay State Abrasive Products Co., Westboro, Mass.

STOOLS
Superior Mold & Iron Co., Penn., Pa.

STOPPERS (Cinder Notch)
Bailey, Wm. M. Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., Dept. E. Pennsalt Cleaner Div., Philadelphia, Pa.

SWITCHES (Electric)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2670 E. 79th St., Cleveland, O.
General Electric Co., Dept. 166-S-G, Nela Park, Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TABLES (Elevating)
Lyon Iron Works, 131 Madison St., Greene, N. Y.

TACHOMETERS
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.

TANK LININGS
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
General American Transportation Corp., 135 So. LaSalle St., Chicago, Ill.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

TANKS (Wood or Steel, Rubber or Lead Lined)
Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

TANTALUM-TUNGSTEN CARBIDE
Vascoloy-Ramet Corp., No. Chicago, Ill.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

TERMINALS (Locking)
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

TESTING MACHINERY (Materials)
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

THERMOMETERS
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 Stanton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co. Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TONGS (Chain Pipe)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TOOL BITS (Tantalum Carbide)
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOL HOLDERS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOLS (Tantalum Carbide)
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOLS (Tipped, Carbide)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
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.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSMISSIONS—VARIABLE SPEED
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

TRAPS (Compressed Air)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TRAPS (High Pressure Steam)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TRAPS (Steam)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div., American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. 39, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCK CRANES
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Diesel)
Silent Hoist Winch & Crane Co. 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Gasoline Industrial)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., 127 Springfield Pl., Battle Creek, Mich.

TRUCKS (Dump-Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TRUCKS (Hydraulic Lift)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TRUCKS (Industrial)
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRUCKS (Lift)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., 127 Springfield Pl., Battle Creek, Mich.
Lyon Iron Works, 131 Madison St., Greene, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 15 Thompson Ave., McKees Rocks, Pa.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

TUBES (High Carbon)
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.

TUBING (Alloy Steel) (*Also Stainless)
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

TUBING (Copper, Brass, Aluminum)
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

TUBING (Monel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.

TUBING (Seamless Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

TUBING (Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York City
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

TUBING (Seamless Steel)—Con.
Edgar T. Ward's Sons Co., Carnegie, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBING (Square, Rectangular)
Ohio Seamless Tube Co., Shelby, O.
Steel & Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Frasse, Peter A., & Co. Inc., 17 Grand St., New York City
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ohio Seamless Tube Co., Shelby, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee B'dg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

VALVES (Blow-off)
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

VALVES (Brass, Iron and Steel)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Check)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Control—Air and Hydraulic)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

VALVES (Electrically Operated)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.
Western Gas Div. Koppers Co., Fort Wayne, Ind.

VALVES (Globe)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
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., Bridgeport, Conn.

VALVES (Open Hearth Control—Oil, Tar, Steam & Air)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

VALVES (Plug)
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

VALVES (Proportioning)
North American Mfg. Co., The, 2901 E. 75th St., Cleveland, O.

VALVES (Steam and Water)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Co., 30 E. 42nd St., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

WALKWAYS—See FLOORING—(Steel)

WAREHOUSES (Iron & Steel)
Edgar T. Ward's Sons Co., Carnegie, Pa.

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 436 Central Ave., Pontiac, Mich.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WASHERS (Non-ferrous and Stainless)
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

WASHERS (Spring)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1638 W. Hubbard St., Chicago, Ill.

WELDERS (Electric—Arc)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich.

WELDERS (Electric-Resistance)
Federal Machine & Welder Co., Dana St., Warren, O.
Taylor-Winfield Corp., Warren, Ohio

WELDING
Bartlett-Hayward Div. Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O.
Western Gas Div., Koppers Co., Ft. Wayne, Ind.

WELDING (Welded Machine Steel Bases)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction, 60 E. 42nd St., New York City,
Linde Air Products Co., The, 30 E. 42nd St., New York City.

WELDING RODS (Alloys)
American Agile Corp., 5806 Hough Ave., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

WELDING RODS (Bronze)
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

WELDING RODS (Hard Surfacing)
Stoody Co., Whittier, Calif.

WELDING RODS OR WIRE
Air Reduction, 60 E. 42nd St New York City.
American Agile Corp., 5806 Hough Ave., Cleveland, O
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Box ST81, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WELL WATER SUPPLY SYSTEMS
Layne & Bowler, Inc., Memphis, Tenn.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WHEELS (Trolley)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WINCHES (Electric, Gasoline, Diesel)
Silent Hoist Winch & Crane Co. 849 63rd St., Brooklyn, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*American Steel & Wire Co. Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Frasse, Peter A., & Co., Inc. 17 Grand St., New York City
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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WIRE (Phosphor Bronze)
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WIRE (Round, Flat, Square, Special Shapes)
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Columbia Steel Co., Los Angeles, Calif.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)
Allegheny Ludlum Steel Corp., Dept. T-125, Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
General Electric Co., Sec. CDW-1907, Appliance & Merchandise Dept., Bridgeport, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.

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Cyclone Fence Co., Waukegan, Ill.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE DIES
Vascoloy-Ramet Corp., N. Chicago, Ill.

WIRE FORMS, SHAPES AND SPECIALTIES
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 426 Central Ave., Pontiac, Mich.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., The, Bridgeport, Conn.

WIRE MILL EQUIPMENT
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Hubbard, M. D., Spring Co., 436 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5903 Kennerly Ave., St. Louis, Mo.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Broderick & Bascom Rope Co., 4203 N. Union St., St. Louis, Mo.
Hazard Wire Rope Div. of American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY
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Lewis Machine Co., 3450 E. 76th St., Cleveland, O
Shuster, F. B., Co., The, New Haven, Conn.

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35 KW., 2 bearing M.G. set, 125 v., D.C. West. type SK generator driven by 54 HP. 220 v., 3 ph., 60 cy., 1160 RPM type CS motor.
27 KW., 3 bearing M.G. set, 115 v. D.C. Gen. Elec. generator driven by 40 HP. 220 volt, 3 phase, 60 cy., 1800 RPM motor.

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BRAKE, Hand, 4'x14 ga. No. 414 Chicago Steel, with formers. Wt. 835 lbs.
DRILL, Upright, 20" Champion B.G., power feed, auto. stop, belt drive.
DRILL, Upright, 20" Prentice Plain, with 1 HP. motor.
DRILL, Mult. Sp. 15-sp. Moline, dbl. screw, oil groove base. Wt. 6000 lbs.
DRILL, Mult. Sp. 12-sp. No. 11 Natco, rated cap. 1/4", arr. for M.D.
DRILL, Mult. Sp. 8-sp. Moline, type 8D., dbl. groove, double screw, for M.D.
DRILL, Sens., No. 1/2 Avey, single spindle, ball bearing, on column.
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PLANER, 36"x36"x10' Liberty, 2-hds., power rapid traverse, M.D.
PLANER, 24"x24"x8' Gray, 1-hd on crossrail, self-contained M.D.
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PUNCH, Gang, 36"—No. 6 Niagara.
PUNCH & SHEAR, S.E., No. 7 Long & Allstatter, 4" tht, shear 7/8", for M.S.
PUNCH & SHEAR, S.E., 36" Cleve. EF., arch. jaw, T&L pulley belt dr. (C.I. frame)
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EOT—TWO (2) MOTORS

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For sale	Cap. tons	Span	Current	Motors
3	5	73'6"	DC	2
3	7½	70'0"	AC	2
1	15	64'6"	DC	2
1	20	73'6"	DC	2
2	25	70'0"	AC	2

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TURRET LATHE, 26' Libby, H.S. 7-1/2", S.P.D.
TURRET LATHE, 18" Libby, H.S. 3-9/16", M.D.
PLANERS, 30"x30"x8', 36"x36"x11', 54"x54"x10'
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No. 3 Canton Alligator Shears

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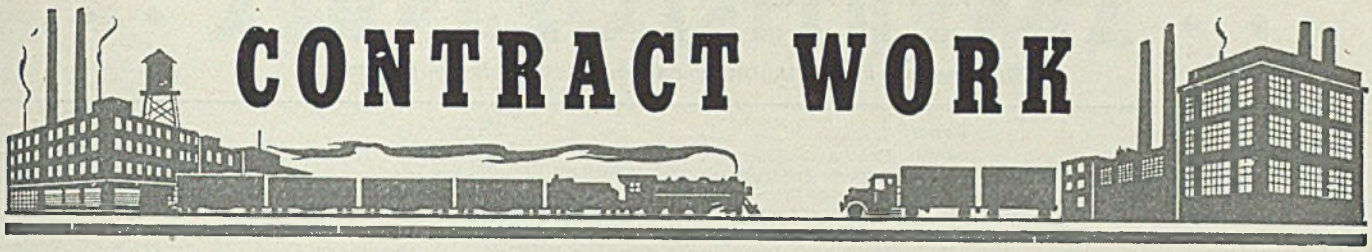

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ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

Dear Mom:

Well, here it is another week-end and I'm not a General yet. But give me time.

Matter of fact, I have too much time on my hands—on evenings and weekends.

The nearest village is 5 miles away. All you find there is a general store, a garage and a canning factory—nowhere to go for any good clean fun, unless you drop in at a smoke-filled juke joint on the way.

Well, Mom, there's a big favor you can do me. The U. S. O. is trying to raise $10,765,000 to run clubs for us, outside of camp. Places with lounge rooms, dance floors, games, writing rooms. Places you can get a bite to eat without paying a king's ransom.

I know you don't have an idle million lying around, but if you could get the family interested and some of the neighbors, and if that happened all over the country, the U. S. O. could raise $10,765,000 overnight.

I'd appreciate it a lot, Mom, and so would every other mother's son in the U. S. Army and Navy.

Love,
Bill

They're doing their bit for you. Will you do your bit for them? Send your contribution to your local U. S. O. Committee or to U. S. O., Empire State Building, New York, N. Y.

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