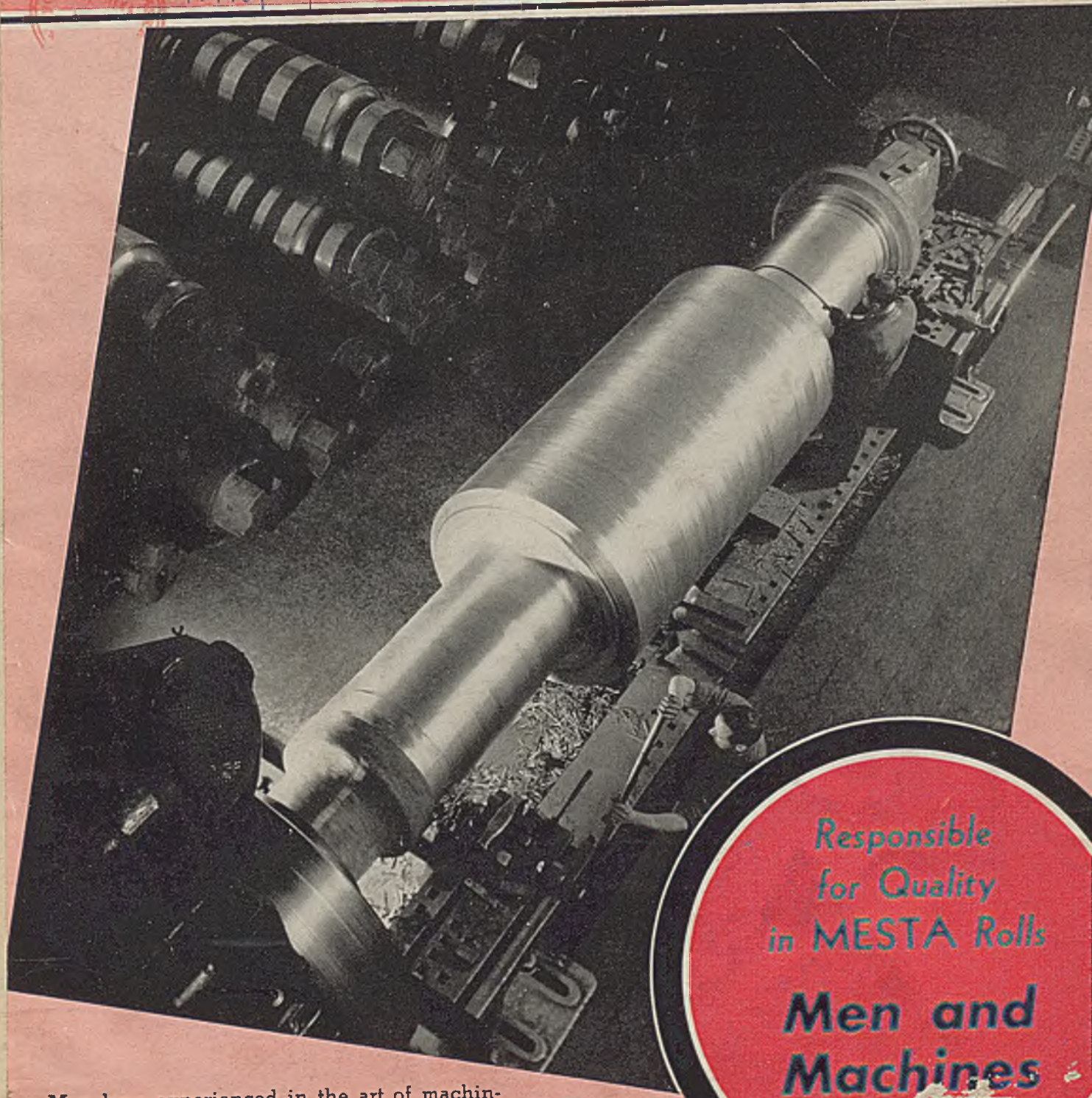
June 30, 1941

STEEL

PRODUCTION • PROCESSING • DISTRIBUTION • USE

ESTABLISHED 1882



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STEEL

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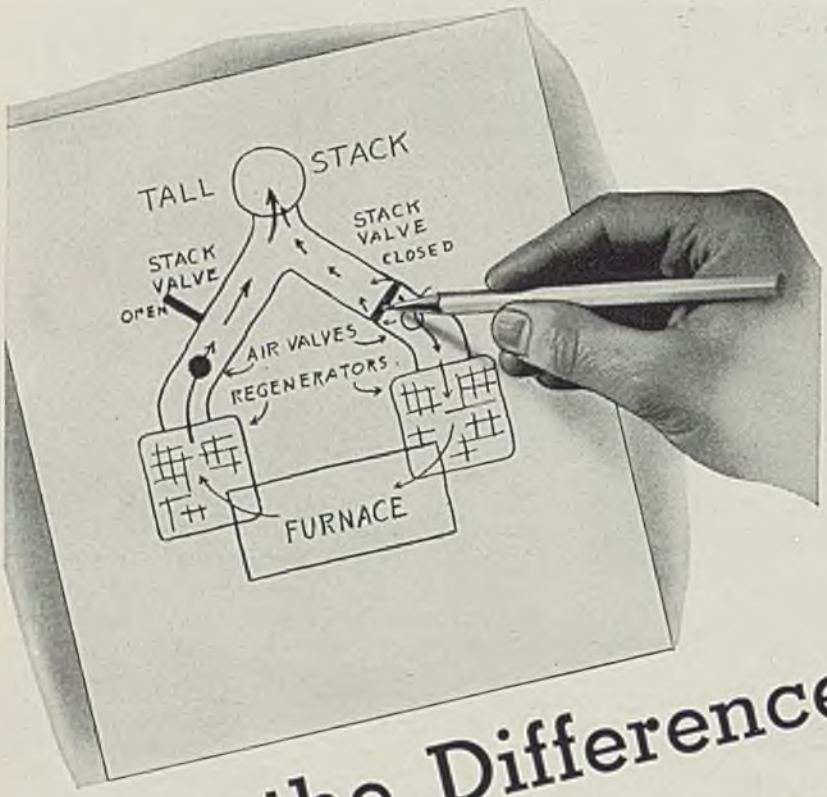
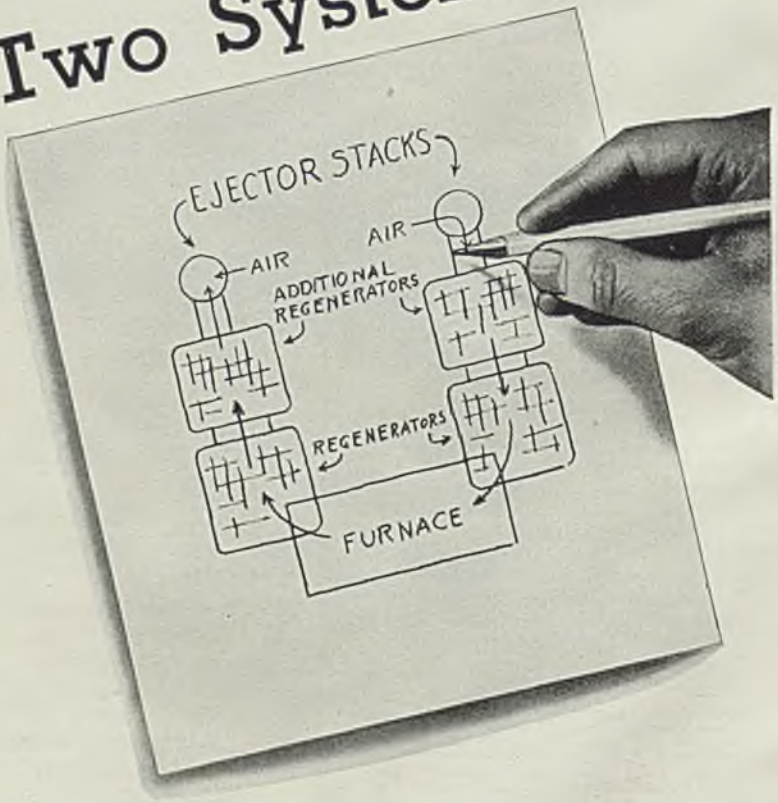
Volume 108—No. 14 **April 7, 1941**



NATURAL DRAFT capacity is limited by the height of the chimney, its diameter, and the temperature of the waste gas. This last is variable under *normal* conditions, and is upset completely when we add the ever-present danger of *leaky valves*. If cold air passes the stack valve and enters directly into the chimney, its effect is to reduce the draft by lowering gas temperature and increasing the gas volume to be exhausted. A lowered draft results in poor combustion, with lower temperature in the checkers; poor control, slow pick-up, low capacity, low flame temperature, poor fuel economy.

Note the Difference in these Two Systems



ISLEY SYSTEM produces adequate and dependable draft and air volume by means of "push and pull" ejectors. There can be no cross leakage between the air supply and the waste gas because these two ends are separated and do not discharge into a common chimney.

Each unit consists of a relatively short ejector equipped with nozzle connected to a fan handling only cool air. A simple damper is located in the throat of each ejector, above the mouth of the air nozzle. When this damper is closed, the air passes down around the nozzle, through the enlarged checker system, and into the furnace. When the damper is open, the air passes through the throat of the ejector and pulls furnace gases out through the regenerators. Thus a constant and ample weight of heated air passes through the combustion port, resulting in uniform flame temperature and maximum fuel efficiency.

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V-27

ISLEY Furnace Control System

HIGHLIGHTING
THIS ISSUE OF
STEEL

■ MOST important development in the metals field last week was the establishment of ceiling prices on scrap iron and steel (p. 23) by the Price Stabilization Division. In some quarters it is feared that the new level, based on $20, delivered at Pittsburgh district consuming plants, for No. 1 heavy melting steel, is too low to encourage scrap collection on the large scale that is essential to support steelmaking at its present record rate. Too, dealers protest that the limit of April 10 for closing out old contracts at prices previously prevailing does not allow sufficient time. . . . Maximum prices on zinc scrap and secondary zinc (p. 42) also were announced last week.

• • •

Current nickel demand exceeds real current consumption, says the National Academy of Sciences, which predicts (p. 43) 1941 nickel production will be sufficient to meet all requirements. . . . A deposit of high-grade tungsten ore (p. 47) is reported discovered in Idaho. . . . C. Donald Dallas (p. 28) urges removal of the 4-cent excise tax on copper. . . . J. E. Jackson urges high-copper, high-manganese cast irons as substitutes for nickel alloys (p. 28) in many applications. . . . Some dealers ask premiums of 60 to 80 cents a pound (p. 28) on cadmium. . . . A 40-cent minimum wage (p. 32) is recommended for the gray iron jobbing foundry industry. . . . Machine tool exports to England (p. 29) are declining.

Nickel To be Sufficient

• • •

Largely because of the Ford strike steel production last week dropped 1½ points to 98 per cent of ingot capacity (p. 27). . . . Some concern is felt by the steel industry over the coal strike. Most steelmakers have enough coal on hand (p. 21) to last 30 to 45 days but a 30-day shutdown of mines would affect some blast furnaces. . . . March steel output (p. 27) established a new record. . . . Due to the need for conserving available cargo space for the most essential shipments Britain has requested steelmakers to ship no more carbon steel over the next couple of months (p. 125); special steels, however, continue to be needed urgently. . . . Aside from firmer extras, steel prices (p. 103) are unchanged.

Coal Supply 30 to 45 Days

• • •

In this week's article in his series on the production of high-explosive shell, Prof. Arthur F. Macconochie (p. 52) discusses feeds and speeds in machining 40-millimeter shells on Bullard Mult-Au-Matics; twice as many machines are required for nose operations as for base operations. . . . An intelligently planned and engineered incentive plan, developed through cooperation between management and the workman—and wholeheartedly accepted by the latter—can work wonders in raising production, and can increase wages while actually lowering costs. STEEL (p. 54) presents an analysis of the features of various incentive systems. . . . A new H-beam (p. 82) provides a superior track tie.

Feeds, Speeds For Shells

• • •

E. H. Dafter (p. 58) describes a recently installed heat removal and evaporative cooling system which produces superior working conditions in a tin mill. It prevents the sheets from becoming tacky in humid weather, thus resulting in a more uniform product and production rate. No refrigeration is employed. . . . F. L. Spangler (p. 71) concludes his article on efficient handling methods to facilitate field erection of steel tanks. . . . Taylor-Winfield Corp. (p. 62) has devised an efficient system for correctly estimating costs of welded work. . . . R. W. Wright (p. 76) describes an improved system for synchronizing the speed of motors driving continuous cold-reducing mills.

Cooling System In Tin Mills

Ryerson Night Loading Assures Quicker Deliveries

IT'S after hours, at any of the ten Ryerson steel plants, almost any night of the year!

The Ryerson night shift is putting the finishing touches on today's orders; loading out the fleet of big, red Ryerson trucks for tomorrow's deliveries.

The entire Ryerson organization is geared up to handle *quickly* the steel requirements, simple or involved, of thousands of customers the country over. Special telephone order desks, hourly mail pick-ups at the post office, telegraph and teletype lines right into our offices—all help to speed delivery, even *before* the order reaches us.

Night loading to "clear the decks" for tomorrow's new crop of orders is the regular course of business. Every order is RUSH at Ryerson—most are shipped the day received.

Ryerson Steel Service is fast and sure; Ryerson Certified quality is your assurance of uniformity and exactness. Make the Ryerson Stock List your unfailing source for all steel requirements. If you haven't the latest Stock List we'll send one gladly.

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RYERSON CERTIFIED STEELS

RYERSON

Ice and Men: Lake Boats Battle for Ore, While Strikes Impede Steel

Important Developments in Week Focus on Raw Materials and Labor . . . Coal Suspension Felt at Some Blast Furnaces . . . Ford Trouble Cuts Steel Rate . . . Government Fixes Scrap Prices

■ MARSHALING an adequate supply of raw materials to produce a record tonnage of iron and steel to supply greatly increased export and national defense demands last week held the attention of steel producers and transportation interests.

On the Great Lakes was being staged a drama that might well be called "Men and Ships Against Ice." First ore carriers left lower lake ports April 1 to battle windrowed ice in an effort to reach upper lake ports and effect one of the earliest openings of lake shipping seasons in history. The ore fleet of 291 vessels must move from 72,000,000 to 75,000,000 tons of ore during the season which means full capacity operations.

First ore vessels to clear lower lake ports were those of Cleveland-Cliffs Iron Co. Battling slush ice 20 inches or more deep the vessels made slow progress to Sault Ste. Marie and in some cases were assisted by Coast Guard cutters.

Pittsburgh Steamship Co. sent out seven vessels last week and announced its entire fleet of 70 vessels probably would be in commission by the end of the current week.

Present plans call for the beginning of full ore carrying operations from the head of the lakes by April 10.

Two Coast Guard cutters and the car ferry SAINTE MARIE were engaged most of last week in breaking ice in Whitefish Bay, the St. Mary's river, the Soo locks, the straits of Mackinac and other strategic channels.

Many of the early vessels are going up the lakes light as it is easier to maneuver unloaded vessels through the ice.

While steelmakers looked with satisfaction on early opening of lake shipping, some concern was expressed over the shutdown of bituminous coal mines as result of failure of mine operators and the United Mine Workers of America to reach an agreement to supplant

■ Windrowed ice in the lower lakes slowed progress of the first ore carriers that steamed out of ports last week, while weather conditions in the upper lakes threatened to make the movement still more hazardous. Three miles an hour was considered a fair speed for the freighters in some ice fields. Carl McDow photo

that which expired on March 31.

The majority of iron and steel companies have stocks sufficient to last 30 to 45 days and it is believed no great hardship will be experienced if the strike is not prolonged. A 30-day shutdown, however, would pinch many blast furnace plants. Isolated instances of blast furnace stoppages or impending stoppages were reported at week's end.

Actual or threatened stoppages of blast furnace operations came on the heels of new high records in pig iron production during March. Total output was 4,702,905 tons, or 36,672 tons more than was produced in the previous peak month, January this year.

Strikes also caused steel production to decline last week from 99½ to 98 per cent of capacity. Lower rate was caused almost entirely by the walkout at Ford Motor Co.'s River Rouge plant, which caused Detroit district operations to drop from 95 to 74 per cent.

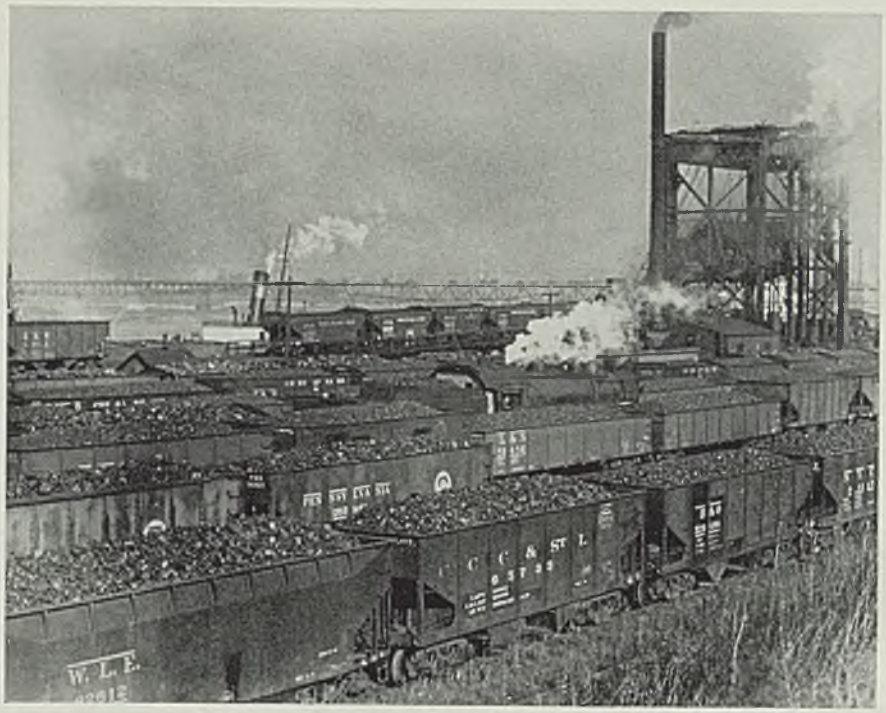
Steel and coal executives generally were optimistic over prospects for a coal agreement. On Friday, the government, through Dr. John R. Steelman, director of the conciliation service, demanded that the mines be reopened by April 7. "The public," he said, "cannot condone quibbling while 400,000 men and 85 per cent of the nation's bituminous mines stand idle."

The stoppage involved about 330,000 miners in the eight-state Appalachian area, including Pennsylvania, Virginia, West Virginia, Maryland, Kentucky, Michigan, Ohio and Tennessee. Some 70,000 others in Illinois, Indiana, Alabama and Utah, whose contracts are based on those of the Appalachian area, also are idle.

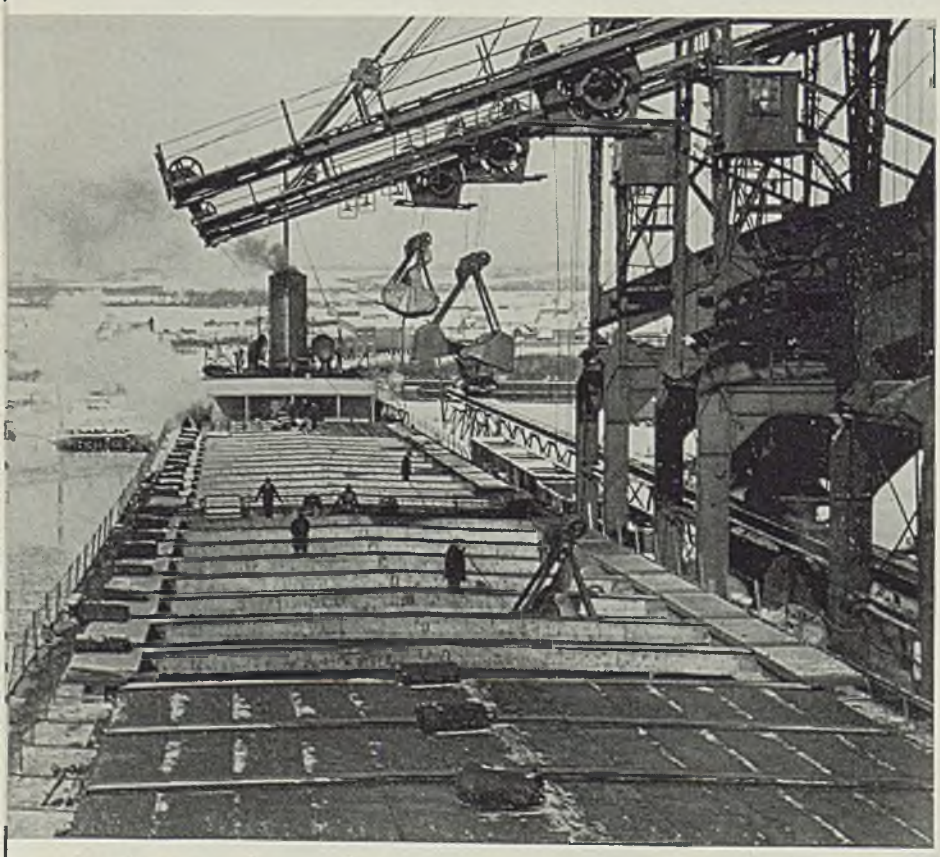
The UMW is asking a $1 a day increase in wages to $7, elimination of a 40-cent differential between southern and northern rates, guarantee of 200 paid working days to the year and two weeks' vacation with pay. Last week it was reported unofficially that the miners might drop demands for vacations and the guarantee of 200 working days if granted a wage increase.

The situation, however, appears to be complicated by the enmity between John L. Lewis, head of the UMW, and the national administration, and by his antipathy for the national defense program. At week's end he continued to spurn mediation efforts.

To prevent runaway or excessive prices due to the coal strike, Price Commissioner Leon Henderson, of the National Defense Advisory Commission, last week issued a price schedule freezing soft coal prices at or below the March 28 prices. The



■ Millions of tons of coal will be moved to the upper lake ports in ore carriers during 1941. Scenes such as this, showing coal awaiting transfer to vessels, are typical of Lake Erie ports



■ Unloading coal at the head of the Great Lakes, action which begins almost as soon as the ore season opens and boats get through with their upbound cargoes. Duluth-Superior are important distributing points for the Northwest's supplies of coal

ceiling prices apply to producers, retailers and all other sellers. Mr. Henderson said the ceiling prices will be revoked as soon as practical after the mines are reopened.

Mr. Henderson explained he had acted expeditiously to make sure that coal prices do not get out of hand and to prevent repetition of World war experiences when soft coal soared to "fantastic heights."

"Stabilizing bituminous coal prices is doubly important," he added, "because bituminous coal has a dual character and is a basic industrial commodity, as well as a commodity entering into the cost of practically every other commodity and because it affects the cost of living of the average consumer . . . Runaway coal prices might touch off a spark leading to other price increases and having spiraling and inflationary results."

Any retardation of the defense program due to a coal shortage would be about the most artificial "bottleneck" imaginable as coal production capacity is more than adequate for all foreseeable needs.

While little coal was being sent up the lakes on the early ore vessels, shippers were not concerned. Vessel movement of coal to the upper lakes is not expected to increase in proportion to the ore movement.

Administration leaders last week were attempting to speed extension of the bituminous coal regulation act for two years. Although the act will not expire until April 26, it was held renewal of the measure might expedite settlement of the industry's current strike.

Scrap, the third essential raw material for the steel industry, also was placed under price control by the price stabilization section of the defense commission.

Mr. Henderson set a price of $20, delivered Pittsburgh consumers, on No. 1 heavy melting steel, other than railroad, plus a 3 per cent commission for brokers (see page 25).

This ceiling is $10 lower than the $30 maximum established Nov. 5, 1917, during the World war, after prices had gotten out of hand. The World war ceiling was reduced to $29 for No. 1 heavy melting steel on April 1, 1918.

Reports to STEEL from important scrap consuming centers indicated dealers are working to comply with the order but that they protest the limit of April 10 for closing out standing contracts and applying the new prices. Substantial losses are said to be involved in deals on which scrap has been purchased to apply on contracts not filled.

Some uncertainty remains over prices to be applied on grades on which no price has been set by the announcement. Adjustment will be necessary to establish equitable relationships. Doubt as to whether sufficient scrap will be brought out at the low prices also exists.

OPM Sets Scrap Price Ceilings, Based On $20 for Heavy Melting, Pittsburgh

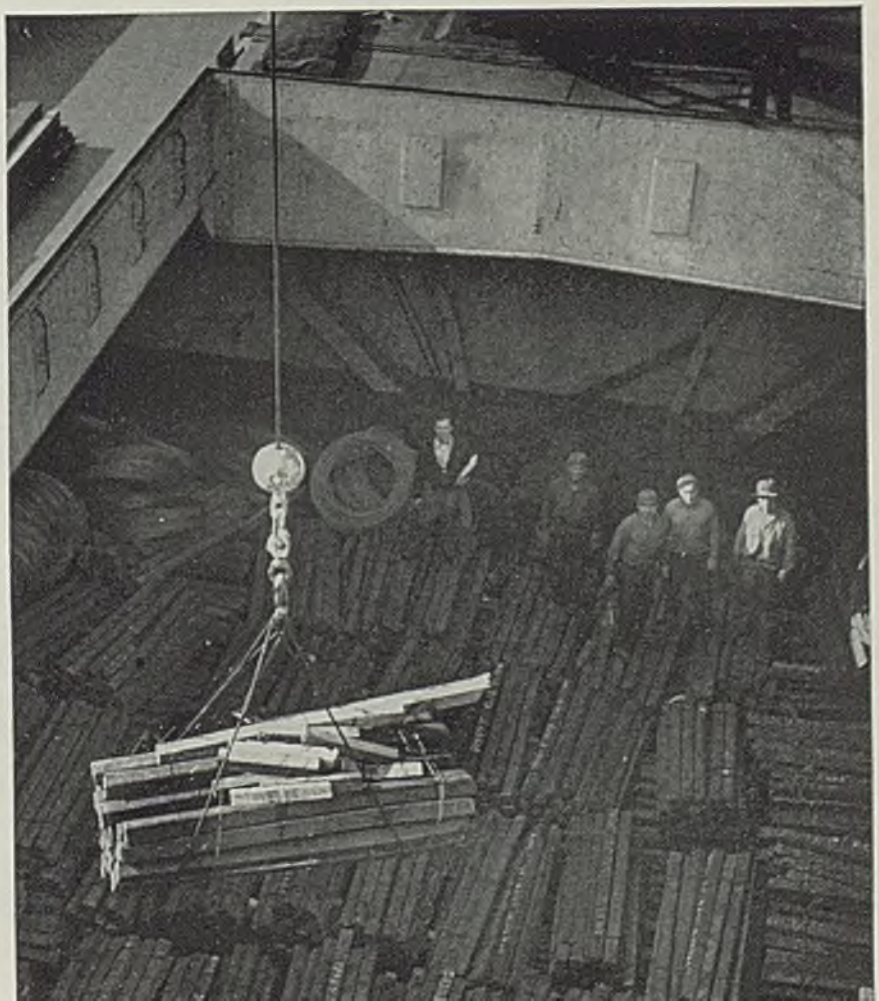
■ The schedule which establishes ceiling prices for iron and steel scrap was issued last Thursday by Leon Henderson, commissioner of price stabilization, National Defense Advisory Commission.

This was made necessary, he explained, by speculative activity which has put inflationary pressure on iron and steel scrap prices during the last few months.

"For more than six months, the price stabilization division has been making a survey of the iron and steel scrap industry, and in the course of its study representatives of all branches of the industry have been consulted," he said. "It has been apparent that many practices of the industry, particularly with respect to the maintenance of price differentials and with respect to distribution, are badly in need of change. This schedule, however, does not attempt to correct or endorse existing practices.

"In January, I asked the industry to co-operate with the government in its effort to prevent runaway prices. For the most part, the response to my request has been whole-hearted. Some persons in the industry, however, have been continuing their speculative practices at the expense of those who have co-operated. This price schedule is our answer to the speculators. (The schedule is reproduced in full, page 25.)

"Some of the large makers of scrap have been demanding from the dealer prices so high that it



■ STEEL IN THE HOLD: Not only raw materials but steel itself is transported regularly by lake vessels. Shown here are billets being unloaded from a bulk carrier

was impossible to get the scrap to the open hearth at a reasonable figure. The ceilings fixed in this schedule will discourage hoarding and thus aid in securing the needed supply of scrap. The ceilings are established at a level which will insure a fair return to all persons in the industry, requiring the maker to stand a reduction from the prices which have prevailed."

The new schedule establishes three schedules of maximum prices: First, for iron and steel scrap other than scrap of railroad origin; second, for iron and steel railroad scrap; third, for iron and steel scrap for export.

For iron and steel scrap other than scrap of railroad origin, the ceiling—using No. 1 heavy melting as an example—is $20 per gross ton, Pittsburgh, with differentials below that base fixed for each point of major consumption, and with corresponding arrangements made for the various other grades.

3 Per Cent Commission Allowed

The maximum price for unprepared yard scrap is established at $2.50 less than the prices fixed for each grade. The ceiling applies to any sale to the consumer.

For iron and steel railroad scrap, ceiling prices are established at which each of six specified grades may be sold to or purchased by a consumer. Formulas are set up by which prices of other grades of railroad scrap may be computed, based on a railroad's experience.

Maximum export prices from Atlantic coast ports are the maximum prices established for the domestic consumer at the nearest consuming point, less transportation charges f.a.s. point of export and plus charge of one dollar to cover expenses incident to exporting.

Persons who acquired scrap before April 3, 1941, at prices higher than the maximum prices established by the schedule, for carrying out contracts entered into before April 3, are given one week to complete their contracts. On and after April 10, schedule will apply to all such transactions.

All persons in the iron and steel scrap industry are required to keep complete records of all transactions, and monthly inventories. Consumers of scrap are required to file monthly reports concerning purchases of scrap, the amount melted, and the relationship of the scrap purchased during the month to the ingot production for that month.

A commission not exceeding 3 per cent of the maximum prices established is the limit allowable to agents or brokers. Thus the ceiling price remains available for transportation handling, and purchase from maker and dealers.

"The price schedule for iron and steel scrap will be rigorously enforced," Mr. Henderson said. "The powers of the government to place compulsory orders, to condemn or requisition properties, to issue priorities and to use other powers available for carrying out the defense program will be exerted to the utmost against any person who may venture to disregard the maximum ceiling prices established by this schedule."

This is the fourth price schedule to be issued by the price stabilization division. Prior ones have been issued for second-hand machine tools; for aluminum scrap and secondary aluminum ingot; and for zinc scrap materials and secondary slab zinc (page 42).

Scrap Institute Urges Prices That Will Bring Out Material

It will require time to determine whether the scrap price reductions ordered by the government and the setting of grade and geographical differentials will impede a steady supply to steel mills and foundries, according to Edwin C. Barringer, executive secretary, Institute of Scrap Iron and Steel Inc.

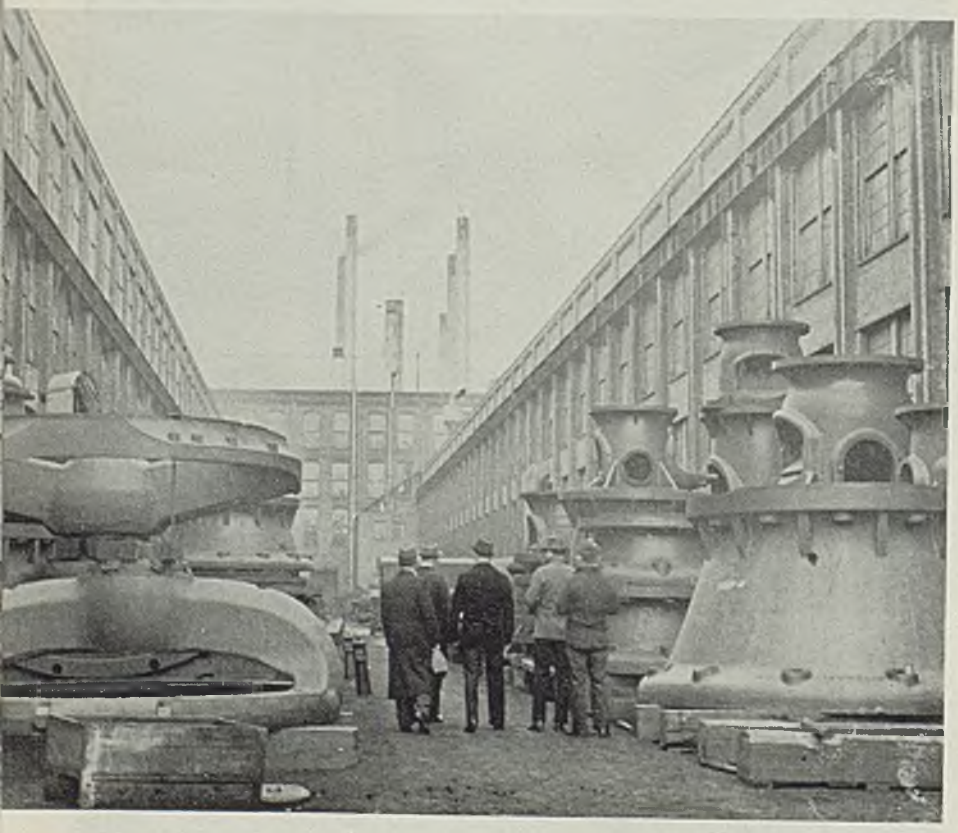
"We are not advocating an upward spiral in prices, but do urge a level that will be adequate to bring out the tonnage required to maintain peak operations by the mills.

"The combination of reduced ceiling prices on iron and steel scrap with the differentials will take $1 to $3 per ton from the price paid to the producers, depending on the area, and this may do much to discourage reclamation."

Founders Ask Reconsideration Of Several Provisions

W. W. Rose, executive vice president, Gray Iron Founders Society, Cleveland, last Friday wired C. A. Bishop, of the price stabilization division, National Defense Advisory Commission, asking that certain provisions of the order establishing ceiling on scrap prices be reconsidered.

Especially Mr. Rose asked reexamination of those provisions which tend to isolate certain districts, dependent largely on scrap imported from other districts, and the provisions relating to railroad scrap which might encourage railroads to divert old rail almost entirely to rerollers rather than sell them for scrap.



■ Inspectors going through plant of Allis-Chalmers Mfg. Co. last week, after all appeals from Knox and Knudsen and offers of mediation by the President's board failed to restore order. The President at his press conference last Friday referred to the situation there as "very bad" and indicated that something will have to be done about it in the near future. NEA photo

Official Scrap Iron and Steel Price Differential Schedule

APPENDIX A

MAXIMUM PRICES FOR IRON AND STEEL SCRAP OTHER THAN RAILROAD SCRAP

For Use in Steelworks and Blast Furnaces

Per Gross Ton, Delivered to Consuming Point

The grades specified are, except Dealers' No. 1 and No. 2 bundles and uncut structural and plate scrap, as named and defined in the simplified practice recommendations R-580-36 of the Department of Commerce which shall be the governing specifications for iron and steel scrap hereunder. These grades represent the major classifications of iron and steel scrap. The maximum prices of subordinate grades within these major grade classifications shall not exceed the differentials established for major grades. Consumers located at any consuming district not listed shall be subject to the differential established for the nearest consuming district set out in the schedule. All unprepared yard scrap shall be sold at prices not exceeding $2.50 less than the maximum prices below.

	Pittsburgh	Youngstown	Chicago	Eastern Pa.	Cleveland	Buffalo	Southern Ohio	St. Louis	Detroit	Duluth	Birmingham	New England	Pacific Coast
No. 1 heavy melting steel other than railroad	$20.00	$20.00	$18.75	$18.75	$19.50	$19.25	$18.50	$17.50	$17.85	$18.00	$17.00	$15.50	$14.50
No. 1 compressed sheets	20.00	20.00	18.75	18.75	19.50	19.25	18.50	17.50	17.85	18.00	17.00	15.50	14.50
No. 2 heavy melting steel	19.00	19.00	17.75	17.75	18.50	18.25	17.50	16.50	16.85	17.00	16.00	14.50	13.50
Dealer No. 1 bundles	19.00	19.00	17.75	17.75	18.50	18.25	17.50	16.50	16.85	17.00	16.00	14.50	13.50
Dealer No. 2 bundles	18.00	18.00	16.75	16.75	17.50	17.25	16.50	15.50	15.85	16.00	15.00	13.50	12.50
Mixed borings and turnings	15.50	15.50	14.25	14.25	15.00	14.75	14.00	13.00	13.35	13.50	12.50	11.00	10.00
Machine shop turnings	15.50	15.50	14.25	14.25	15.00	14.75	14.00	13.00	13.35	13.50	12.50	11.00	10.00
Shoveling turnings	16.50	16.50	15.25	15.25	16.00	15.75	15.00	14.00	14.35	14.50	13.50	12.00	11.00
No. 1 busheling	19.50	19.50	18.25	18.25	19.00	18.75	18.00	17.00	17.35	17.50	16.50	15.00	14.00
No. 2 busheling	15 50	15.50	14.25	14.25	15.00	14.75	14.00	13.00	13.35	13.50	12.50	11.00	10.00
Cast iron borings	15.50	15.50	14.25	14.25	15.00	14.75	14.00	13.00	13.35	13.50	12.50	11.00	10.00
Uncut structurals & plate	19.00	19.00	17.75	17.75	18.50	18.25	17.50	16.50	16.85	17.00	16.00	14.50	13.50
Low phos. billet and bar crops and punchings	25.00	25.00	23.75	23.75	24.50	24.25	23.50	22.50	22.85	23.00	22.00	20.50	19.50
No. 1 cupola cast	Maximum price not to be more than $2 per gross ton under price of No. 2 foundry pig iron delivered at the same point.												
Heavy breakable cast	Maximum price not to be more than $3.50 per gross ton under the price of No. 2 foundry pig iron delivered at the same point.												
Stove plate	Maximum price not to be more than $7 per gross ton under the price of No. 2 foundry pig iron delivered at the same point.												

APPENDIX B

MAXIMUM PRICES FOR IRON AND STEEL SCRAP ORIGINATING FROM RAILROADS

Per Gross Ton, Delivered to Consuming Point

The grade differentials set out in appendix A are not applicable to iron or steel railroad scrap. Where a consumer is located in a consuming district not named below the maximum price applicable to such consumer shall be the price listed for the nearest consuming district set out below. Where the railroad maker operates in 2 or more consuming districts, the maximum applicable to the sale of railroad scrap on the line shall be the highest maximum for any consuming point on the line.

	Pittsburgh	Youngstown	Chicago	Eastern Pa.	Cleveland	Buffalo	Southern Ohio	St. Louis	Detroit	Duluth	Birmingham	New England	Pacific Coast
No. 1 railroad steel	21.00	21.00	19.75	19.75	20.50	20.25	19.50	18.50	18.85	19.00	18.00	16.50	15.50
Scrap rails	22.00	22.00	20.75	20.75	21.50	21.50	20.50	19.50	19.85	20.00	19.00	17.50	16.50
Rerolling rails	23.50	23.50	22.25	22.25	23.00	22.75	22.00	21.00	21.35	21.50	20.50	19.00	18.00
Rails, 3 ft. and under	24.00	24.00	22.75	22.75	23.50	23.25	22.50	21.50	21.85	22.00	21.00	19.50	18.50
Rails, 2 ft. and under	24.50	24.50	23.25	23.25	24.00	23.75	23.00	22.00	22.35	22.50	21.50	20.00	19.00
Rails, 18 inches and under	25.00	25.00	23.75	23.75	24.50	24.25	23.50	22.50	22.85	23.00	22.00	20.50	19.50

Pittsburgh district includes all consuming points in the Pittsburgh switching district and in Wheeling, W. Va.; Follansbee, W. Va.; Toronto, Steubenville, and Martins Ferry, O.

Youngstown district includes all consuming points in the Youngstown switching district and in Farrell and Sharon, Pa.; Lowellville, Warren, Canton and Massillon, O.

Chicago district includes all consuming points in Chicago switching district and in Kokomo, Ind., Peoria, and Sterling, Ill.

Eastern Pennsylvania district includes all consuming points in this area and in Delaware and Maryland.

Southern Ohio district includes all consuming points in the switching districts of Portsmouth and Middletown, O.; Newport and Ashland, Ky.

Birmingham district includes all consuming points in the Birmingham switching area. Scrap for Birmingham consumption originating west of the Mississippi river takes prices $1 higher than indicated above.

New England district includes Worcester, Mass.; Bridgeport, Conn.; Phillipsdale, R. I., and all other consuming points in New England.

Pacific coast district includes all consuming points in California, Oregon and Washington.

All other districts include consuming points within their respective switching areas.

Daily Average Pig Iron Production at New Peak; March Rate 96.3 Per Cent

■ RECORD output of coke pig iron and ferroalloys in United States in March increased the daily average 1463 net tons or 0.97 per cent above February's daily production as the operating rate climbed one point to 96.3 per cent of capacity and three more stacks were blown in.

Greater by 1183 tons than previous daily average high of 150,524 tons in January, 1941, daily output last month was 151,507 tons and compared with 150,244 tons in February. Daily production in March was 43.8 per cent above that in March last year, when output averaged 105,502 tons. It compared with daily averages of 125,385 tons and 134,021 tons, respectively, in 1937 and 1929.

Total production in the month, 4,702,905 tons, was 496,079 tons or 11.8 per cent larger than in February, when aggregate was 4,206,826 tons. Increase in total, however, was primarily due to the fact March was three days longer. Combined production last month was 36,672 tons higher than in January. It was 43.8 per cent above 3,270,575 tons produced in March, 1940, and compared with total output of 3,886,926 tons in March, 1937. Total output in March was 13.2 per cent up from 4,154,660 tons produced in the month in 1929, when 213 furnaces were in blast against 205 active at the end of last month.

Combined production in the first quarter this year was 13,575,964 tons, 28 per cent greater than in the period last year and nearly double output in the first three months of 1939. First quarter total in 1937 was 10,875,443 tons, 11,606,232 tons in 1929.

Average daily output in the three months was 150,844 tons, greater by 29.5 per cent than 116,478 tons average daily in the first quarter last year. In the period in 1937 daily output averaged 119,510 tons, and 127,541 tons for the quarter in 1929.

Rate of operations in March, based on the new capacity figures for the industry recently published by the American Iron and Steel Institute, was 96.3 per cent. This compared with rate of 95.3 per cent in February and 95.5 per cent in January this year. Rates for latter two months have been revised to conform to the new capacity figures. In March, 1940, the operating rate was 69.5 per cent of capacity, and 82.5 per cent for the month in 1937.

Total capacity for production of coke pig iron and ferroalloys as of Dec. 31, 1940, was established by the Institute at 57,503,030 net tons. This compared with rated combined capacity of 55,628,060 tons as of Dec. 31, 1939. Increase in rating was made although no new blast furnaces were completed in 1940. Several stacks were rebuilt, including one that had been reported slated for dismantlement.

Stacks Active Total 205

Furnaces in blast March 31 totaled 205, a net gain of three from the preceding month. Total, the same as in January, was highest since August, 1929, when 209 were active and aggregate output was 4,195,742 net tons. In March, last year, stacks active totaled 152; in the month in 1939 aggregate was 123. One hundred eighty-two were in blast March 31, 1937, and 213 for the month in 1929.

Four stacks were put into blast last month and one was blown out for relining. All were of the steelworks or nonmerchant classification. Stacks blown in during March:

In Illinois: South Chicago No. 4, Youngstown Sheet & Tube Co. In New York: Lackawanna A, Bethlehem Steel Co. In Ohio: Ohio No. 6, Carnegie-Illinois Steel Corp.; and Lorain No. 3, National Tube Co.

Tennessee Coal, Iron & Railroad Co. blew out its Fairfield No. 5 stack, in Alabama.

Anna furnace of Struthers Iron & Steel Co., in Ohio, down for relining since Feb. 16, is scheduled to be blown in shortly.

Production of merchant iron last month totaled 711,833 tons, against aggregate of 3,991,072 tons nonmerchant. Former was 17.8 per cent of the total output in March. In February merchant iron comprised 14 per cent of the combined total, 14 per cent in January, and in March last year, 14 per cent.

PIG IRON STATISTICS

RATE OF FURNACE OPERATION
(Relation of Production to Capacity)

	1941[1]	1940[2]	1939[3]	1938[4]
Jan.	95.5	85.4	51.0	33.6
Feb.	95.3	75.0	53.5	33.6
March	96.3	69.5	56.1	34.2
April	....	68.9	49.8	33.4
May	....	74.2	40.2	29.4
June	....	83.6	51.4	25.5
July	....	86.1	55.0	28.2
Aug.	....	89.9	62.4	34.8
Sept.	....	91.5	69.7	40.5
Oct.	....	94.2	85.2	48.0
Nov.	....	96.4	90.3	55.0
Dec.	....	96.4	88.5	51.4

[1] Based on capacity of 57,503,030 net tons, Dec. 31, 1940; [2] capacity of 55,628,060 net tons, Dec. 31, 1939; [3] capacity of 56,222,790 net tons, Dec. 31, 1938; [4] capacity of 56,679,168 net tons, Dec. 31, 1937. Capacities by American Iron and Steel Institute.

MARCH IRON PRODUCTION
Net Tons

	No. in blast last day of Mar.	No. in blast last day of Feb.	—Total Tonnages— Merchant	Nonmerchant
Alabama	17	18	127,551*	186,057
Illinois	17	16	114,457	318,431
Indiana	18	18	22,100	518,386
New York	13	12	112,739	179,558
Ohio	47	45	163,544	948,941
Penna.	68	68	139,610*	1,328,448*
Colorado	3	3		
Michigan	5	5		
Minnesota	2	2	12,299*	202,882
Tennessee	1	1		
Utah	1	1		
Kentucky	2	2		
Maryland	6	6		
Mass.	1	1	19,533*	308,369
Virginia	1	1		
West Va.	3	3		
Total	205	202	711,833*	3,991,072*

*Includes ferromanganese and spiegeleisen.

MONTHLY IRON PRODUCTION
Net Tons

	1941	1940	1939
Jan.	4,666,233	4,024,556	2,436,474
Feb.	4,206,826	3,304,368	2,307,405
March	4,702,905	3,270,575	2,680,446
Tot. 3 mo.	13,575,964	10,599,499	7,424,325
April	.....	3,139,043	2,301,965
May	.....	3,497,157	1,923,625
June	.....	3,813,092	2,373,753
July	.....	4,060,513	2,638,760
Aug.	.....	4,234,576	2,979,774
Sept.	.....	4,172,551	3,218,940
Oct.	.....	4,437,725	4,062,670
Nov.	.....	4,397,656	4,166,512
Dec.	.....	4,542,864	4,219,718
Total	.....	46,894,676	35,310,042

AVERAGE DAILY PRODUCTION
Net Tons

	1941	1940	1939	1938
Jan.	150,524	129,825	78,596	52,201
Feb.	150,244	113,943	82,407	52,254
March	151,707	105,502	86,465	53,117
April	.....	104,635	76,732	51,819
May	.....	112,811	62,052	45,556
June	.....	127,103	79,125	39,601
July	.....	130,984	85,121	43,827
Aug.	.....	136,599	96,122	54,031
Sept.	.....	139,085	107,298	62,835
Oct.	.....	143,152	131,053	74,697
Nov.	.....	146,589	138,883	85,369
Dec.	.....	146,544	136,119	79,943
Ave.	150,844	128,128	96,740	57,962

Lake Carriers Association Re-elects All Officers

Lake Carriers Association, Cleveland, re-elected all its officers for 1941 at its annual meeting in Cleveland last week. They are: President, Alexander T. Wood, vice president, Wilson Transit Co.; vice president, L. C. Sabin; treasurer, George A. Marr; secretary, Oliver T. Burnham; counsel, Gilbert R. Johnson.

H. C. Strom, vice president, Pittsburgh Steamship Co., was elected to the executive committee, replacing A. F. Harvey, former president of Pittsburgh Steamship. Other committee members were re-elected.

Steel Companies Set New Output Records in March

■ STEELMAKERS last week were proud of their March production records.

The industry as a whole operated at about 99 per cent of capacity for the period. A higher rate—101 per cent—was attained in 1929. In tonnage, however, the month apparently established a new high, official figures to be reported this week.

STEEL received from companies the following statements. It is probable many others made similarly high records in comparison with their prior performances.

Bethlehem

A new all-time record of monthly steel production by Bethlehem Steel Co. plants was made in March, 1941, with a total output of 1,024,026 tons. The previous high was in January, 1941, when production was 1,017,346 tons.

The Bethlehem plant at Bethlehem, Pa., set a new record with March production higher than any prior month by 7000 tons. The operating rate of the company for March was 101.2 per cent of rated capacity.

Inland

Inland Steel Co.'s ingot production again established a new record in March. Ingots aggregated 301,386 net tons which was at the rate of 107.5 per cent of rated capacity of 3,300,000 net tons per annum. The previous record of 297,381 net tons was established in January. Shipments during the month also exceeded all previous records.

Republic

All its previous records for steel ingot production were broken by Republic Steel Corp. during March. In responding to the need for steel for national defense and for Great Britain, as well as to take care of normal requirements of industry, every single steel-producing department in Republic is reported by company executives to have established new production records for the month.

Employment and payrolls were likewise at record peaks, the latter approximately $10,500,000 for March.

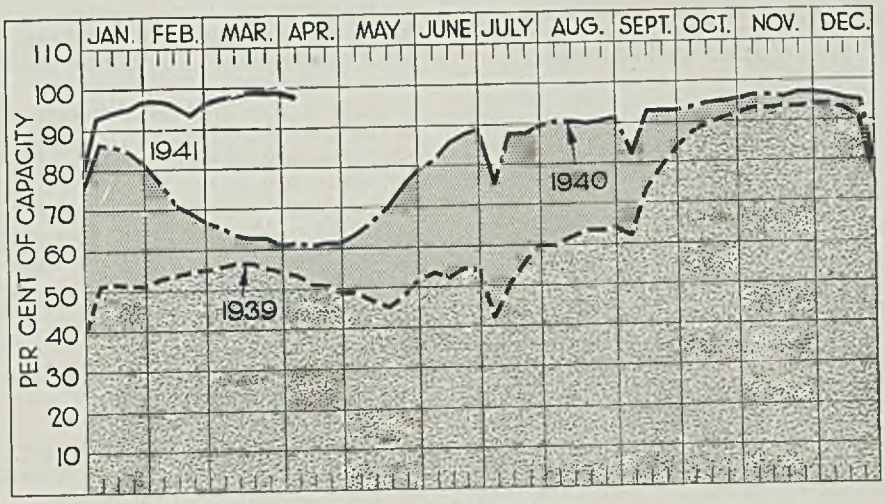
Output totaled 721,243 net tons of steel ingots, a greater tonnage than during any single month since the corporation was organized in April, 1930.

This record shattered one established only two months previously, in January, 1941, when the production reached a peak of 672,729. The record previous to this had been made in October, 1940, with 589,121 net tons.

During March the corporation shipped approximately 540,000 tons of finished steel, another all-time record.

Otis

Otis Steel Co., Cleveland, established four all-time tonnage records in March, company officials announced last week. Company produced 96,311 tons of steel during the month, an increase of 5600 tons over the previous record established in January. New records also were established by the blooming mill, the plate mill and the 77-inch hot strip mill.



PRODUCTION . . . . Down

■ STEELWORKS operations last week declined 1½ points to 98 per cent as a result of strike interruption at Detroit and necessity for furnace repairs elsewhere. Six districts declined, one increased and five were unchanged. A year ago the rate was 61½ per cent; two years ago it was 53½ per cent.

St. Louis—Slight readjustment caused the rate to drop 1 point to 98 per cent, all open hearths except one being active.

Cincinnati—Declined 4 points to 93½ per cent, due to interruptions for repairs. When possible all open hearths are kept in production.

Wheeling—Maintained production at 88 per cent, which has prevailed since the final week of February.

Pittsburgh—Dropped 1 point to 102 per cent on slight shift in furnaces.

Central eastern seaboard—Unchanged at 96 per cent for the third week.

Detroit—Interruption of Ford Motor Co. open hearths due to labor trouble caused a drop of 21 points to 74 per cent. Ford open-hearth capacity is about 35 per cent of the district's.

Chicago—Continued at 101½ per cent for the third week. All producers but one are at 100 per cent or better.

Birmingham, Ala.—Held at 90 per cent, with 22 open hearths in production.

New England—Addition of an open-hearth increased the rate 7 point to 92 per cent.

Buffalo—Receded 4½ points to 88½ per cent as two open hearths were taken off for repair. They are to be relighted this week.

Cleveland—Repairs forced open hearths down at two important mills, the rate dropping 3½ points to 96 per cent. A rise is scheduled this week.

Youngstown, O.—Steady at 97 per cent, 72 open hearths and three bessemers producing. Youngstown Sheet & Tube Co. added one furnace at Campbell, O., and Republic Steel Corp. took one off at Warren, O. Carnegie-Illinois Steel Corp. relighted its relined blast furnace last week.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Apr. 5	Change	Same week 1940	Same week 1939
Pittsburgh	102	— 1	57.5	49
Chicago	101.5	None	57.5	53.5
Eastern Pa.	96	None	59	40
Youngstown	97	None	42	48
Wheeling	88	None	61	66
Cleveland	96	— 3.5	68	52.5
Buffalo	88.5	— 4.5	46.5	44.5
Birmingham	90	None	81	62
New England	92	+ 7	65	35
Cincinnati	93.5	— 4	53	44
St. Louis	98	— 1	51	42
Detroit	74	—21	79	69
Average	98	— 1.5	61.5	53.5

Repeal of Excise Tax On Copper Advocated

■ Elimination of the 4-cent excise tax on copper as a means to avoid higher copper prices and to insure an adequate supply for national defense needs was advocated last week by C. Donald Dallas, president, Revere Copper & Brass Inc., New York, at the company's annual stockholders' meeting. Priorities, he insisted, would not solve the problem for the copper fabricating industry.

"For over six months, Revere has bought every available pound of copper and zinc that we were able to obtain, but at the present greatly increased copper and brass production, we are already facing a potential shortage of both metals. There are now no domestic offerings of copper at any price or for any delivery."

Mr. Dallas said the excise tax "is supposed to serve as a protective measure for domestic copper producers against the inroads of foreign copper. However, in normal years of free competition, the foreign price and the domestic price have been practically on a parity, so that the 4-cent excise tax has failed to maintain a higher price for copper in the United States than abroad. Its only effect has been to prevent a free market for copper in the United States, which is needed at the present time if production schedules are to be increased and prices kept at reasonable levels. In addition, it would help forward the 'good neighbor' policy in Chile —the third most important country in South America."

Suggests Use of Copper In Place of Nickel

■ J. E. Jackson, director, Copper, Iron and Steel Development Association, Cleveland, which has been studying and promoting the use of copper in the foundry and steel industries, states he has received many requests for advice on how to use copper as a substitute for nickel. Most of them come from consumers who heretofore have used large quantities of nickel.

Mr. Jackson has been giving advice to foundrymen to the effect that a high-copper, high-manganese cast iron often can be used in place of castings containing much nickel alloys. By such substitution the content of nickel in these special castings can be reduced from 4½ per cent to 1¼ per cent.

Cadmium Rationed; Premiums Asked

■ Cadmium has joined the ranks of scarce metals and is being rationed like aluminum, zinc, nickel and copper. Market price is 95 cents a pound but it is almost impossible for buyers to obtain the metal at that figure, unless they are old customers. A premium of from 60 to 80 cents a pound is being asked by some dealers.

Scarcity is caused mainly by demands for national defense, many Army and Navy contracts specifying cadmium. The metal is used extensively as an electroplated corrosion-resisting coating and also as alloying element in bearing metals.

■ United States exports of farm implements and machinery in February totaled $5,418,683, a gain of 21 per cent over $4,496,638 exported in February, 1940, Department of Commerce reports.

Tool and Gage Companies Merge To Expedite Defense Orders

■ O. M. Poock, Dayton, O., president, Cimatool Co., and C. H. Reynolds, Detroit, president, Sheffield Gage Corp., announced last week that stockholders had voted to merge in the interest of national defense. The new company's name is Sheffield Corp.

O. M. Poock was elected chairman of the board. Louis Poock, previously general manager of both companies, was elected president and general manager, and C. H. Reynolds was elected vice president. No other personnel changes are contemplated at present. Other officials continuing their former capacities are Milt Ahlers, comptroller; Paul Poock, in charge of sales in machine tool and gage division: W. D. Creider, manufacturing manager; Al Poock, engineering administrator; Bob Laughter, sales manager, special tool and die division; Fred Marwick and Ray Mahlmeister, superintendents.

O. M. Poock in 1914 became associated with what was then known as the City Machine & Tool Works and later the Cimatool Co. In 1922 he became president of the Cimatool Co. and in 1933, treasurer of the Sheffield Gage Corp.

Louis Poock has been general manager of Sheffield Gage Corp. since 1933 and of Cimatool Co. since 1931. Mr. Reynolds will continue to devote the major portion of his time to sales in the Detroit area.

A $1,000,000 plant addition is nearing completion. Combined floor space will total more than 110,000 square feet. Present employment of 600 is expected to increase to 700.

Sheffield will continue production of the same products, including precision measuring instruments and gages, standard machine tools and special tools and dies. A major portion of its output is used directly in the national defense program.

Louis Poock, Sheffield Corp.'s President, General Manager

Machine Tool Exports To Britain Reduced

■ Exports of power-driven metalworking machinery in February were 32 per cent lower than in January, owing chiefly to reduced exports to Great Britain, according to the machinery division, Department of Commerce. Exports of all classes of industrial machinery in February were only 13 per cent below January, $37,493,575 against $42,931,123, due to substantial gains in power generating, textile and construction equipment.

Machine tool exports to England dropped from $16,902,862 in January to $8,674,766 in February and England's share in total machine tool exports fell from 77 to 58 per cent. Shipments to Canada continued to increase, totaling $4,272,527 in February, compared with $3,806,043 in January. Exports to Japan dropped from $217,268 in January to $16,930 in the following month, while movement to Russia was $484,572 in February, compared with $95,238 in January.

Power-driven metalworking machinery exports, lowest since July, 1940, totaled $16,544,102, compared with $24,400,387 in January and $28,753,334 in December, when the all-time record was made. Metalworking machinery, other than power-driven, increased to $1,374,332 in February from $1,039,620 in January.

Construction and conveying machinery increased 20 per cent and power-generating equipment 46 per cent, the latter largely due to larger shipments of mechanically-driven turbines. Textile, sewing and shoe machinery showed 25 per cent gain over January.

Canada's February Steel, Iron Production Lower

■ Steel ingot and castings production in Canada in February totaled 172,698 gross tons, compared with the all-time high of 186,303 tons in January, and with 140,343 tons in February, 1940. This included 166,847 tons of steel ingots and 5851 tons of direct steel castings.

Canadian pig iron output in February was 91,165 tons, a daily average of 3256 tons, compared with 103,085 tons in January, a daily average of 3327 tons. Ferroalloy output in February was 11,471 tons, in January, 15,231 tons, and in February last year, 7711 tons. Comparisons follow:

	Gross Tons		
	Steel ingots, castings	Pig iron	Ferro-alloys
Feb., 1941....	172,698	91,165	11,471
Jan., 1941....	186,303	103,085	15,231
Feb., 1940 ...	140,343	87,032	7,711
2 mos., 1941..	359,001	194,250	26,702
2 mos., 1940..	306,839	191,735	15,776

Capacity for Arc Welding Rod Declared Adequate

■ Manufacturers of electric arc welding rods stated at a recent meeting in Cleveland that with the installation of a relatively small amount of new equipment the industry will have capacity to produce approximately 400,000,000 pounds of welding rods annually.

This is about twice the quantity used during 1940. Consumption increased 40 per cent in 1940 and may gain 50 per cent more in 1941. However, even with the defense requirements taken into consideration there will be no lack of electric arc welding rods.

Steel Employment Equals Previous All-Time Record

■ Steel industry employment rose sharply during February to equal the highest figure ever recorded, according to the American Iron and Steel Institute.

More than 603,000 employes were at work in steel mills during February, a total exactly equaling the previous peaks established in August and September, 1937. In January of this year, steel employment averaged 598,000, while in February, 1940, the average was 538,000.

Reflecting the shorter month, total steel payrolls of $89,586,000 in February were down somewhat from the total of $96,234,000 paid out in January.

Wage-earnings employes in the industry earned an average of 86.9 cents per hour in February, compared with 86.6 cents in January and 83.4 cents in February of last year.

An average of 39.4 hours per week was worked by wage earners in February.

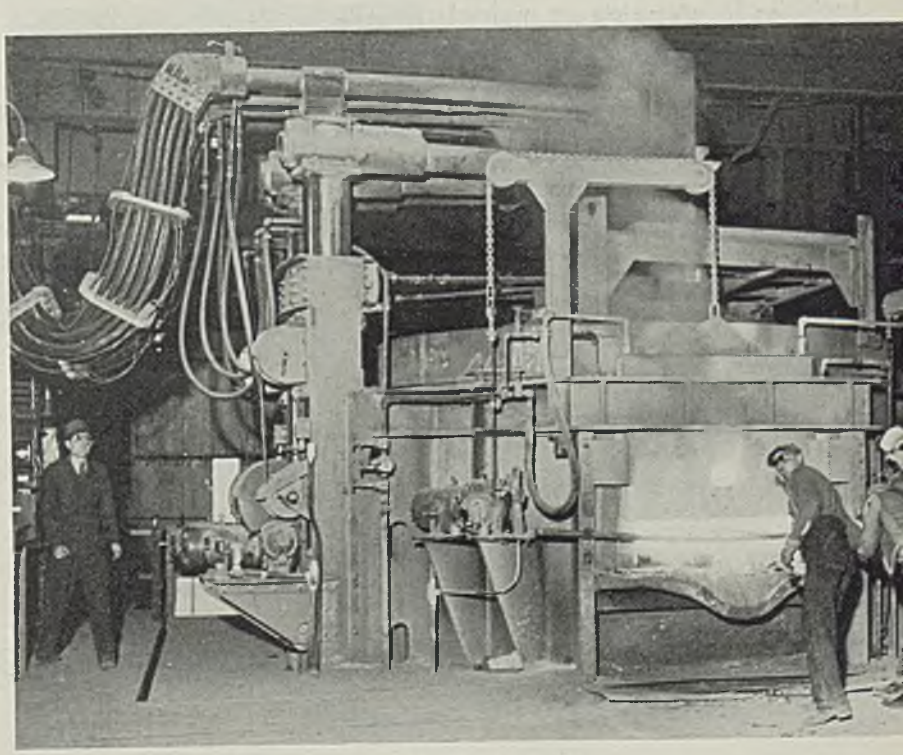
First Electric Steel Furnace Installed in Youngstown District

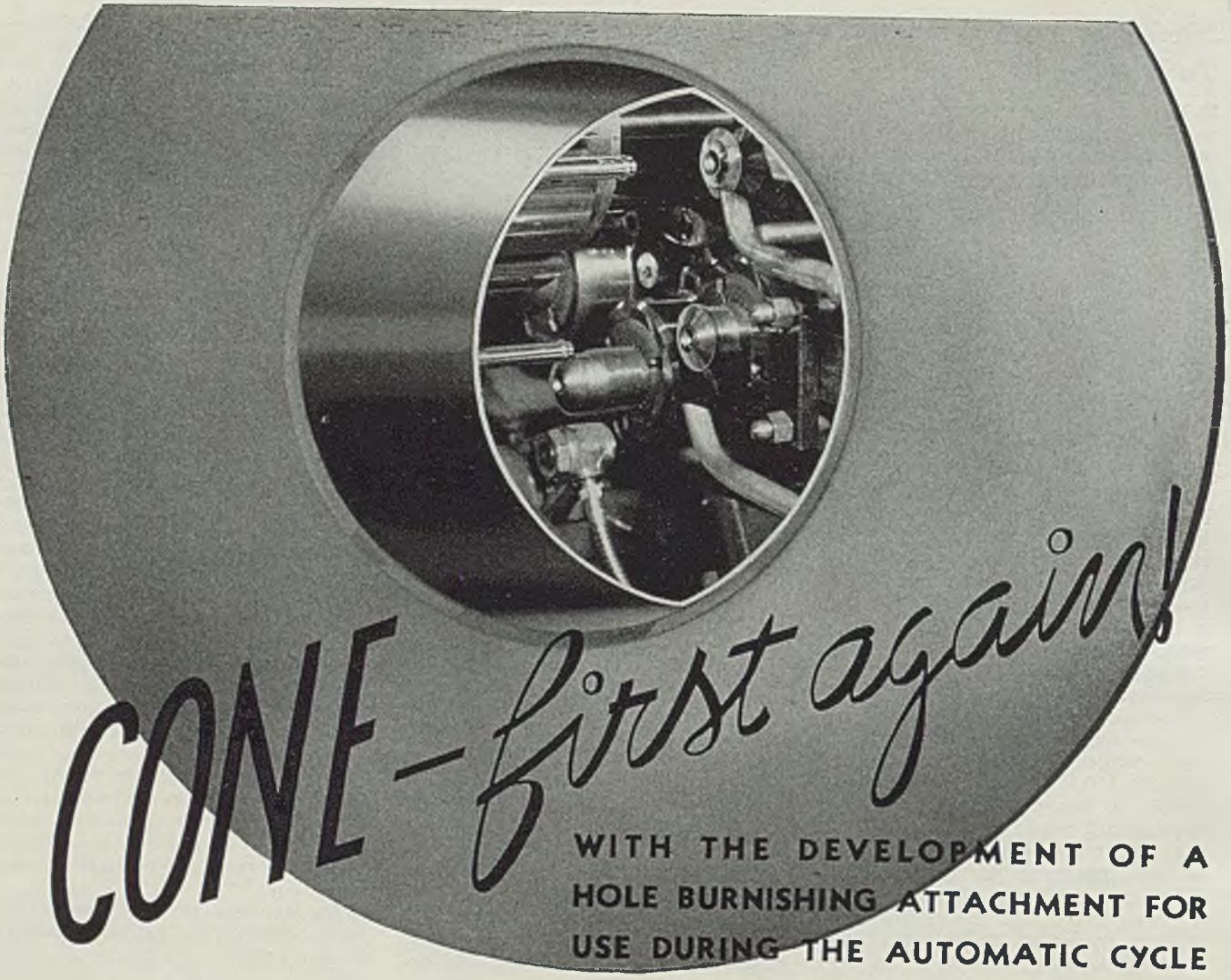
■ The first electric steelmaking furnace ever installed in the Youngstown district by any of the large steel companies was put in operation last week by Sharon Steel Corp.

The furnace, costing several hundred thousand dollars, is part of a $1,000,000 expansion program. It was ordered last fall, built and put into operation in record time.

It is a 20-ton unit, with monthly capacity for about 3000 tons of alloy, stainless and high-carbon steel, and will aid Sharon in its plan to develop further in the high-grade steel field. Stainless steel has been purchased from other makers and finished in its own mills.

Steel will be rolled into slabs and billets at the company's Lowellville, O., rolling plant and shipped to Sharon for finishing.





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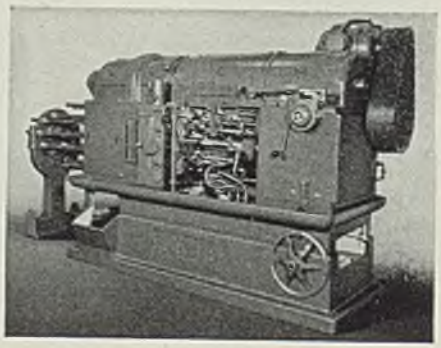


CONE AUTOMATIC MACHINE CO., INC.
Windsor, Vermont, U. S. A.

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

Legislation outlawing basing point pricing systems recommended by Temporary National Economic Committee in final report . . . Defense plants built under government supervision cost $2,138,000,000 . . . OPM suggests solution of micrometer shortage . . . 40-cent minimum wage recommended for gray iron jobbing foundries

WASHINGTON

■ TEMPORARY National Economic Committee made its final report last week, recommending that Congress "enact legislation declaring such pricing (basing point) systems to be illegal."

The committee stated extensive hearings revealed basing point systems are used in many industries "as an effective device for eliminating price competition." During the last 20 years basing point systems and variations known as zone pricing systems and freight equalization systems have spread widely.

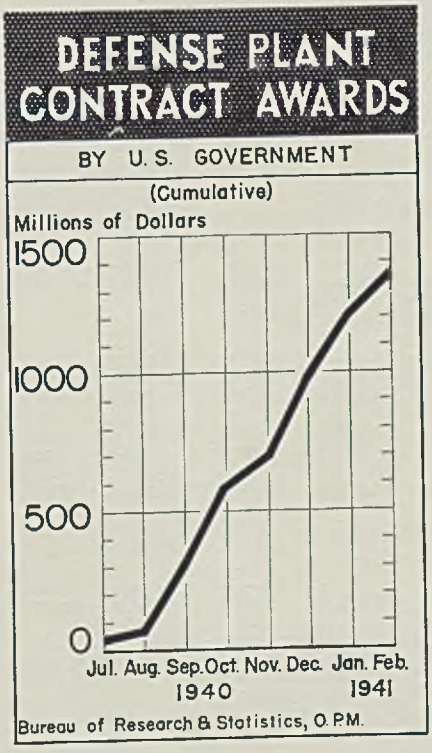
It says many products of important industries, including steel, are priced by basing point or analogous systems. Elimination under existing law would involve a costly process of prosecuting separately and individually many industries and place a heavy burden upon antitrust enforcement appropriations. Because such systems "have resulted in uneconomic and often wasteful location of plant equipment" it is recognized by the committee that "the abolition of basing point systems should provide for a brief period of time for industries to divest themselves of this monopolistic practice."

The committee is not impressed with the argument that outlawing basing point systems will cause serious disturbances in rearrangement of business through a restoration of competitive market conditions.

"Such disturbances may be costly to those who have been practicing monopoly. But the long-run gain to the public interest by a restoration of competition in many important industries is clearly more advantageous."

Defense Plants Under U. S. Supervision Cost $2,138,000,000

Contract awards for government financed plant expansions in the national defense program through February totaled $1,350,445,281, the Office of Production Management announced last week. In addition, letters of intent covering plant facilities estimated to cost $244,000,000 have been issued.



Plants for which certificates of necessity have been issued, but which are being financed by private borrowing, will cost $393,000,000. Add to this $171,000,000, which is the cost of plants financed by the British government, and a total of $2,138,000,000 is arrived at as an overall cost of defense plant financing in the United States under government supervision, Feb. 28.

In addition, several hundred millions of dollars is being spent privately on defense plant facilities without government supervision. There is, as yet, no reliable estimate of this amount.

The contracts totaling $1,350,445,281 include plants for which the government will pay in 60 equal instalments over a five-year period, and those which it is building with public funds and will own outright from the start.

Micrometer Production Up 25 Per Cent, and Still a Shortage

OPM last week suggested to manufacturers that a shortage in the supply of micrometer calipers can be minimized by two methods.

First, in cases where micrometer calipers are essential to accurate work it was suggested that they be made available to more workmen.

Second, where caliper gages or other tools of secondary precision will result in satisfactory workmanship, such instruments, which are more plentiful, should be used.

In factories where more men are being added and where old employes own micrometers but do not use them constantly the operating company should purchase or borrow these tools and issue them to the men when needed.

"This would eliminate the necessity of additional purchases and the company could reissue the micrometers or replace them at a later date," it was stated by the industrial sup-

ply section of the Production Division, OPM.

Officials of the section said production of micrometers had increased about 25 per cent in the last 90 days, due largely to the training of additional employes. Further expansion is scheduled.

Gray Iron Foundry Committee Recommends 40-Cent Minimum

A 40-cent minimum wage for the gray iron jobbing foundry industry was recommended in a report filed last week with the administrator of the Wage and Hour Division by a committee, of which Sidney E. Sweet, St. Louis, dean of the Episcopal church, is chairman.

The gray iron jobbing foundry committee, composed of 15 members representing the public, employers and employes, voted unanimously for the 40-cent hourly minimum.

The recommendation, if approved by Gen. Philip B. Fleming, the administrator, after a public hearing, will raise the hourly wages of an estimated 8 per cent of the 150,000 to 200,000 workers in the industry.

The gray iron jobbing foundry industry is defined as the "manufacture of ferrous or ferrous base castings, rough and finished, except malleable iron castings, steel castings, pipe and pipe fittings, for sale by the producer but not the manufacture of the same for use by the producer in the fabrication of other products or parts thereof."

Foundries which are operated solely for the production of castings which are used by the same concern in the manufacture of other products, are not within the definition.

The minimum wage recommendations of the committee, if approved by the administrator, will apply to all occupations necessary to the production of the articles specified in the definition, including clerical, maintenance, shipping and selling occupations, but does not include employes of a manufacturer who are engaged exclusively in marketing and distributing products of the industry which have been purchased for resale.

Portal-to-Portal Mine Pay Basis Postponed to May 1

After a conference with representatives of mine operators, Gen. Philip B. Fleming, administrator of the Wage and Hour Division, last week decided to sustain portal-to-portal hours for subsurface metal miners, but to postpone the effective date of this construction of "hours worked" until May 1. More than 100,000 miners are affected.

A report by Harold Stein, assistant director of the hearings branch of the division, recommending a portal-to-portal instead of face-of-mine basis for miners' pay was approved by the administrator in March to be effective April 1. Under this construction miners are to be paid for all time underground, except for lunch periods.

Statements by mine operators showed that there would be some difficulty in revising practices so promptly to bring them into line with this interpretation of the law, General Fleming said, indicating his reason for postponement. (See also STEEL, March 31, p. 24.)

Conference Called for April 16 To Discuss Conserving Tin

Tin can manufacturers were asked to meet with R. E. McConnell, chief of OPM's conservation unit, on April 16 to discuss elimination of tin cans for nonessential civilian uses in event of an "emergency." Substitutes for tin and changes that would be necessary in related industries if tin consumption is curtailed also will be considered.

Mr. McConnell said it will be first of a series of meetings to explore possibilities of conservation of defense metals by voluntary co-operation. Others will deal with aluminum, nickel, tungsten, zinc, chromite, graphite, manganese, quartz crystals, bauxite and copper. OPM will appeal to consumers to buy goods made only of plentiful materials.

How Many More Beehive Coke Ovens Are Available?

Samuel E. Hackett, chief of OPM's iron and steel production division, last week began a survey to determine the additional beehive coke ovens that can be brought into operation.

Defense orders placed with the steel industry have revived a large part of the beehive coke industry. Approximately 10,000 of old style beehive ovens in Pennsylvania, West Virginia, Maryland, Alabama and Colorado have been rehabilitated and returned to service.

The object of Mr. Hackett's trip and of surveys to be made later in other states is to determine how many of the 4000 additional beehive ovens known to be in existence can be brought into operation. Defense officials believe it may be possible for beehive coke production to reach 9,000,000 tons per year.

Recent Appointments in Defense Administrative Offices

Sidney Hillman, associate director general, OPM, has appointed J. C. Lewis, Des Moines, Iowa, as a labor consultant on the staff of OPM's Labor Division.

Mr. Lewis will devote the major

(*Please turn to Page* 126)

Actual and Estimated Defense Funds, June '40-Mar. '41

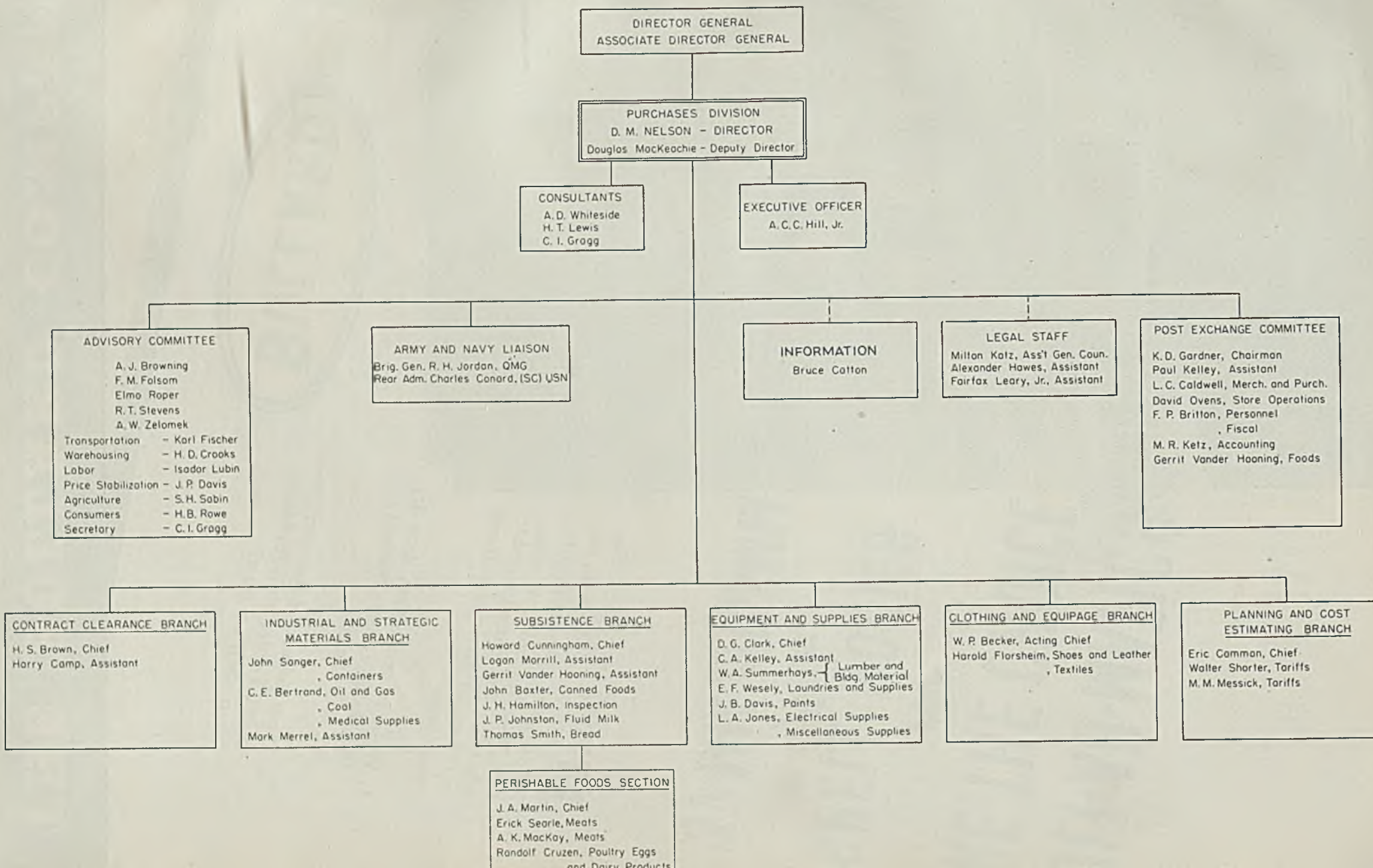
(In millions of dollars)

Status and agency	Appropriation or loan	Contract authorization	Liquidation of prior year contract authorization	Net funds
Fiscal year 1941 appropriation acts:				
War Department	6,482.8	2,913.1	[1] 157.6	9,238.3
Navy Department	3,178.4	[2] 8,354.6	567.0	10,966.0
Other United States agencies	676.4	284.9	.....	961.3
Loan agreements:				
RFC facilities and stockpile	[3] 1,175.7	.....	.....	1,175.7
Export-Import Bank	500.0	.....	.....	500.0
Other defense agencies	71.3	.....	.....	71.3
Lend-Lease Act	7,000.0	.....	.....	7,000.0
Total authorized United States program	19,084.6	11,552.6	724.6	29,912.6
Proposed additional fiscal year 1941 and fiscal year 1942 bills now before Congress (preliminary):				
War Department	1,716.2	2,096.1	195.2	3,617.1
Navy Department	3,415.5	31.1	2,100.0	1,346.6
Other United States agencies	1,189.4	205.0	175.0	1,219.4
Fiscal year 1942 estimates submitted to Congress				
War Department	5,665.3	187.1	2,921.0	2,931.4
Other United States agencies	108.9	81.2	39.4	150.7
Total pending United States program	12,095.3	2,600.5	5,430.6	9,265.2
Total authorized and pending United States program	31,179.9	14,153.1	6,155.2	39,177.8
British orders in United States	[4] 3,511.0	....	.....	3,511.0
United States program plus British orders	34,179.9	14,153.1	6,155.2	42,688.8

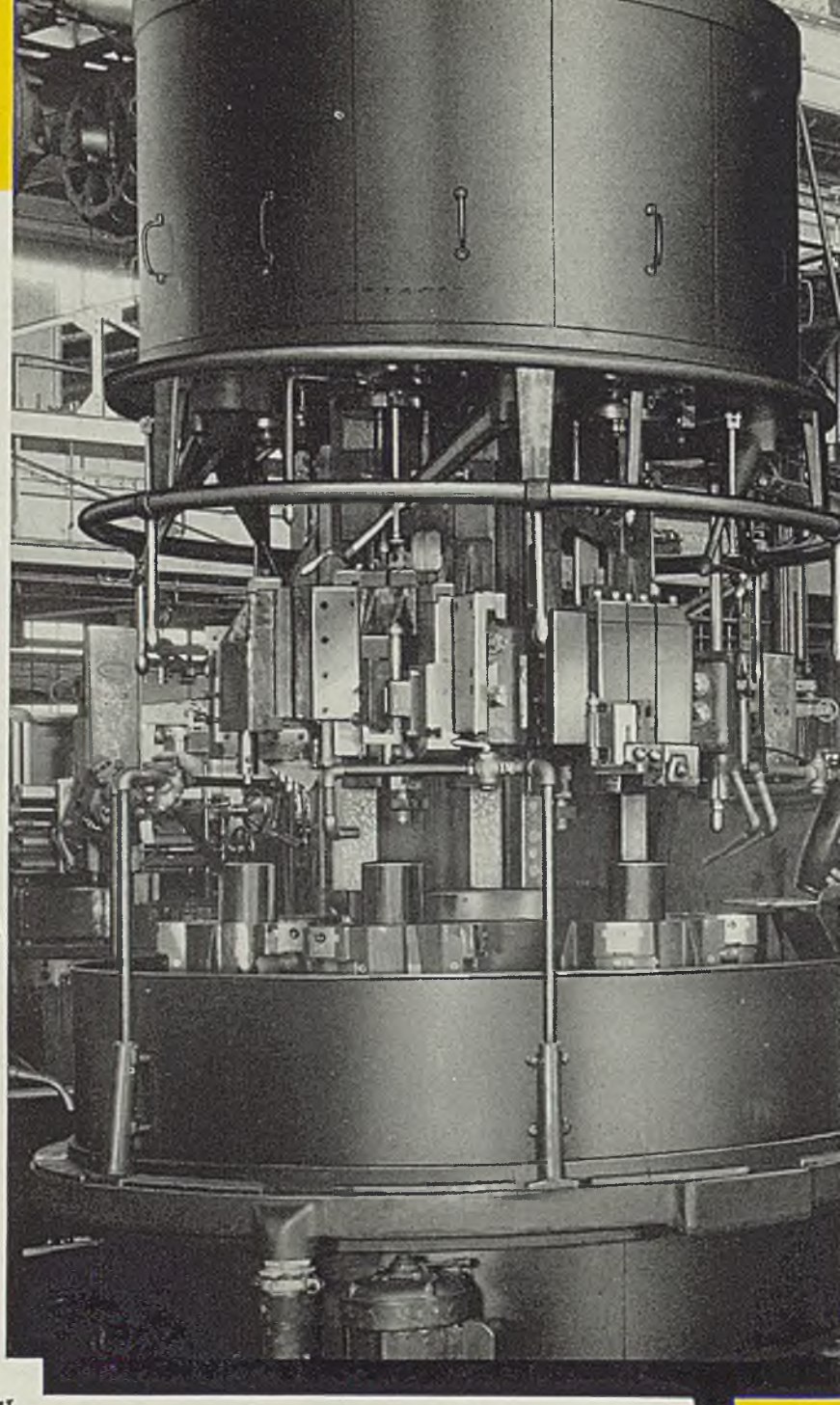
[1] Includes liquidation of fiscal year 1941 contract authorizations.
[2] Includes $7,442.9 million estimated cost of tonnage authorizations which must be paid for after June 1941.
[3] RFC loan commitments for June 25, 1940, to Feb. 15, 1941.
[4] Orders placed through Mar. 1, 1941. Possible duplication between this and the 7-billion-dollar estimate has not been eliminated.

Purchases Division, Office of Production Management

(Latest organization, designed to expedite defense procurement)



ULT-AU-MATICS ARE THE CHOICE *for* SHELL BODIES *from* 37 MM *to* 155MM



MANUFACTURERS who are or expect to be engaged in shell manufacture, and who are not now using Mult-Au-Matics are invited to write us for answers to these questions:

1. What is production time by the Mult-Au-Matic Method on my size shells?

2. What delivery dates can I expect if I order Mult-Au-Matics for a shell contract?

BULLARD

THE BULLARD COMPANY

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

Ford plant closed by first strike in its history. Possibly 200,000 idle as suppliers' plants shut down. Work on $120,000,000 defense orders halted. Blast furnaces banked and heat kept on in open hearths . . . Packard introduces Clipper model, with many style innovations. Fenders built "into" body panels. Automobile production slightly lower

DETROIT

■ HELL broke loose last Tuesday afternoon at the 1200-acre River Rouge plant of Ford Motor Co. in Dearborn and by Wednesday morning every department of the plant which currently employs about 90,000 was closed, with a few maintenance men admitted by picketing unionists to keep fires going in open-hearth, foundry, glass and certain other continuously operating divisions.

Thus, after successfully staving off an unending series of vicious attacks by the UAW-CIO over a period of four years, during which time almost every other motor company was forced to accede to unionization, Ford experienced the first walkout in its 38-year history.

When sitdowns were the topic of the day here back four years ago, it was popularly believed that it would be impossible to close the Ford plant because it is confined to a single area, well fenced in and well policed. An attempt to distribute union leaflets to workmen going into the plant resulted disastrously for the union, so Ford was thought to have had the situation well in hand.

But last week the union adopted different tactics in closing the plant. While work stoppages did occur in the rolling mill and pressed steel plant and union parades were started inside the gates in the effort to shut down other departments, the really serious trouble did not develop until the union blocked highways leading to the plant by driving up hundreds of cars and leaving them parked on the roads. Meanwhile mobs of pickets and hoodlums (many not even Ford employes) gathered around the plant gates, large numbers of them drunk, and armed with clubs, stones, nuts and bolts.

Fighting quickly developed between striking and nonstriking groups and casualties were numerous. The union set up a "field hospital" while a stream of cars was reported carrying injured to the Ford hospital in Detroit.

Engineers and salesmen seeking to enter the plant on Wednesday were turned back before they even got near plant entrances. Ford executives and office workers could not reach their posts and it was virtually impossible to reach anyone in the plant by telephone.

Parts Suppliers Closed

With machine-gun rapidity, parts suppliers shut down plants or laid off forces working on Ford parts. In addition to the 100,000 idle Ford employes, there are probably 100,000 more thrown out of work by stoppage of Ford assemblies. Defense work, both in the planning and production stages, to the tune of $120,000,000 was halted. Steel production, which had been running better than 15,000 tons a week, was stopped.

Open hearths were tapped Tuesday evening and heat is being kept on. Blast furnaces were banked.

Rioting and fighting in Dearborn reached such proportions that the mayor called upon the state governor to send state police, only 250 of whom were available for service. The Michigan national guard has been called up for service and only three companies remain within call, these artillery groups and not equipped for strike duty.

The Ford strike is unquestionably the most serious ever to hit the automobile industry because of its concentration in one area, because of the large number of men affected and because of the immediate repercussions on hundreds of supply sources. Some observers see in the dispute the beginnings of either industrial chaos or a complete nationalization of industry. The President's unwillingness to take steps to end rapidly spreading defense plant walkouts is interpreted by some as a clever means of letting public opinion become so incensed that government control of all industry and labor would be welcomed. In fact, certain business men guess the New Deal actually may be encouraging strikes solely for the purpose of creating an emergency which would result in the government taking command of industry.

One of the appalling factors of the situation is the close resemblance of the pattern of events in this country to those in Germany and Italy just prior to the establishment of totalitarian forms of government there.

The Ford strike was no surprise, despite union claims that it was a spontaneous affair resulting from the discharge of *eight* workmen. Several weeks ago a federal labor conciliator told a friend here that a strike at the Ford plant was certain and that it would be one of the most deadly ever to hit industry. And ten days ago a union committeeman told a former Ford workman that "we're calling the boys out at midnight Tuesday." Even visitors to Ford plants have spotted instances of work stoppages and similar disturbances engineered by

union agitators on the production line.

Incidentally, the eight workmen referred to above were reinstated after a previous discharge, at the suggestion of a labor department conciliator to avoid further trouble. No sooner were they back on the job than they began circulating through the plant harassing non-union members and calling on the men to strike. Pointing out this fact, Harry H. Bennett, Ford personnel director, said Wednesday he had been in touch with Mr. Ford and that under no circumstances would these men ever be returned to the Ford payroll.

Packard Introduces New Eight-Cylinder Model

Long-heralded Packard Clipper made its bow to Detroit last week after an earlier unveiling at Atlanta, Ga., March 28. The car represents an addition to the present Packard line, is an 8-cylinder model on 127-inch wheelbase, weighing 3725 pounds and priced at $1375. (The model was incorrectly described here as a six several weeks ago. Report now is that the six in the Clipper style will appear late in August).

Style innovations are numerous, although some of them have been used by other cars in slightly modified form. Fenders are unique in that both front and rear units are made integral with adjoining body panels in single steel stampings, a real tribute to Briggs die designers and pressed steel engineers. Front fender is exceptionally long and telescopes into a so-called "fender blister" on the front door which in effect carries the fender sweep far back into the body side.

Hood is a single steel stamping, likewise no cinch to form. It raises from either side as does the 1941 Buick hood, and is locked by handles located under the dash inside the front compartment. A new design of double-drop frame permits lowering floor level of the car to less than 13 inches, loaded, and contributes to the low overall height—64 inches—which, incidentally, is just over 1 foot under the overall width of the car.

Windshield—51½ inches wide and 16½ inches high—is claimed to provide more vision area than that of any other car; it is set at an angle of 49 degrees from the vertical, about the maximum rake yet attained anywhere. Bumpers, gravel deflectors, hardware, radiator grille, in fact practically every detail of the car is of new design and reflects a sharp break with tradition as far as Packard is concerned. Even engine horsepower is stepped up to 125.

General styling was supervised by the Packard styling department with the help of outside design consultants, including George W. Walker, erstwhile Nash stylist. In the adaptation of flat-rolled steel to the smooth-flowing curves and contours of the artist, an excellent job has been done. It cannot be said in all fairness that there are any startlingly original ideas expressed, but rather a refinement and extension of automobile appearance as it is known today.

In presenting the car to dealers, M. M. Gilman, president of Packard, said the company was embarking upon the most pretentious car manufacturing program in its history, at the same time keeping defense manufacture, of which Packard now has $200,000,000 on the books, in the No. 1 position. The company this year is faced with the task of "digesting" some 32,000,000 hours of production labor, and the effect on overall costs is no small item. Car production for the year will approximate 67,000 in 41 different types. Mr. Gilman observed that for best efficiency this figure ought to be boosted to 200,000 in a maximum of five types, which is no doubt the goal toward which the company is moving.

The Packard president showed no great concern over the possible effect of materials shortages on car production. Emphasizing that automobiles are essential equipment, he said that substitutes might be called for in some parts, but that the replacements likely would be better than the originals. Another Packard spokesman pointed out that if most of the larger companies went to substitutes in the fear of shortages, there might be ample supplies of critical materials left to accommodate Packard production.

Lest anyone rush out and try to buy a Packard Clipper, it should be mentioned that production for April has been set at only 2640, so it will be a couple of months before dealers can be stocked fully. Only one body style will be produced for the present. In the "20" series of cars to appear this fall, the Clipper styling likely will be reflected in other models.

The idea of designing fenders "into" body panels, originated on Buick front fenders in 1940 models, is an interesting one. Die design and press practice are complicated and sheet steel is really put to the test to stand up under the severe working it receives. But the result, from an appearance standpoint, is highly effective. One deterring argument has been the matter of repair and replacement costs, the charge having been made that when repairs are required it becomes necessary practically to buy a "whole side" of the car.

Packard answers this charge in the following way: "In practically all cases the fender may be repaired in exactly the same manner as a conventional fender and the expense is no greater. If the damage done is so severe as to require replacement of the fender, then the whole stamping is supplied at a cost no greater than that of an ordinary fender. In such major accidents the body panel in any car is almost invariably damaged to an extent that requires replacement anyway."

And as a final touch, to clinch the modern motif, the Clipper comes equipped with a soft whistle on the gas tank filler pipe which goes into action when gasoline first enters the empty tank and ceases when the tank is just about full.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1939	1940	1941
Jan.	356,962	449,492	524,126
Feb.	317,520	422,225	509,233
2 mos.	674,482	871,717	1,033,359
March	389,499	440,232	.....
April	354,266	452,433	.....
May	313,248	412,492	.....
June	324,253	362,566	.....
July	218,600	246,171	.....
Aug.	103,343	89,866	.....
Sept.	192,679	284,583	.....
Oct.	324,689	514,374	.....
Nov.	368,541	510,973	.....
Dec.	469,118	506,931	.....
Year	3,732,718	4,692,338	.....

Estimated by Ward's Reports

Week ended:	1941	1940†
March 8	125,915	103,560
March 15	131,620	105,720
March 22	124,805	103,395
March 29	124,405	103,370
April 5	120,055	101,655

†Comparable week

Aircraft Manufacturing Capacity Up 28 Per Cent

■ United States aircraft manufacturing industry, under spur of national defense and British aid requirements, increased its productive capacity 28 per cent in the 59 days between Jan. 1 and March 1, according to Col. John H. Jouett, president, Aeronautical Chamber of Commerce of America, Washington.

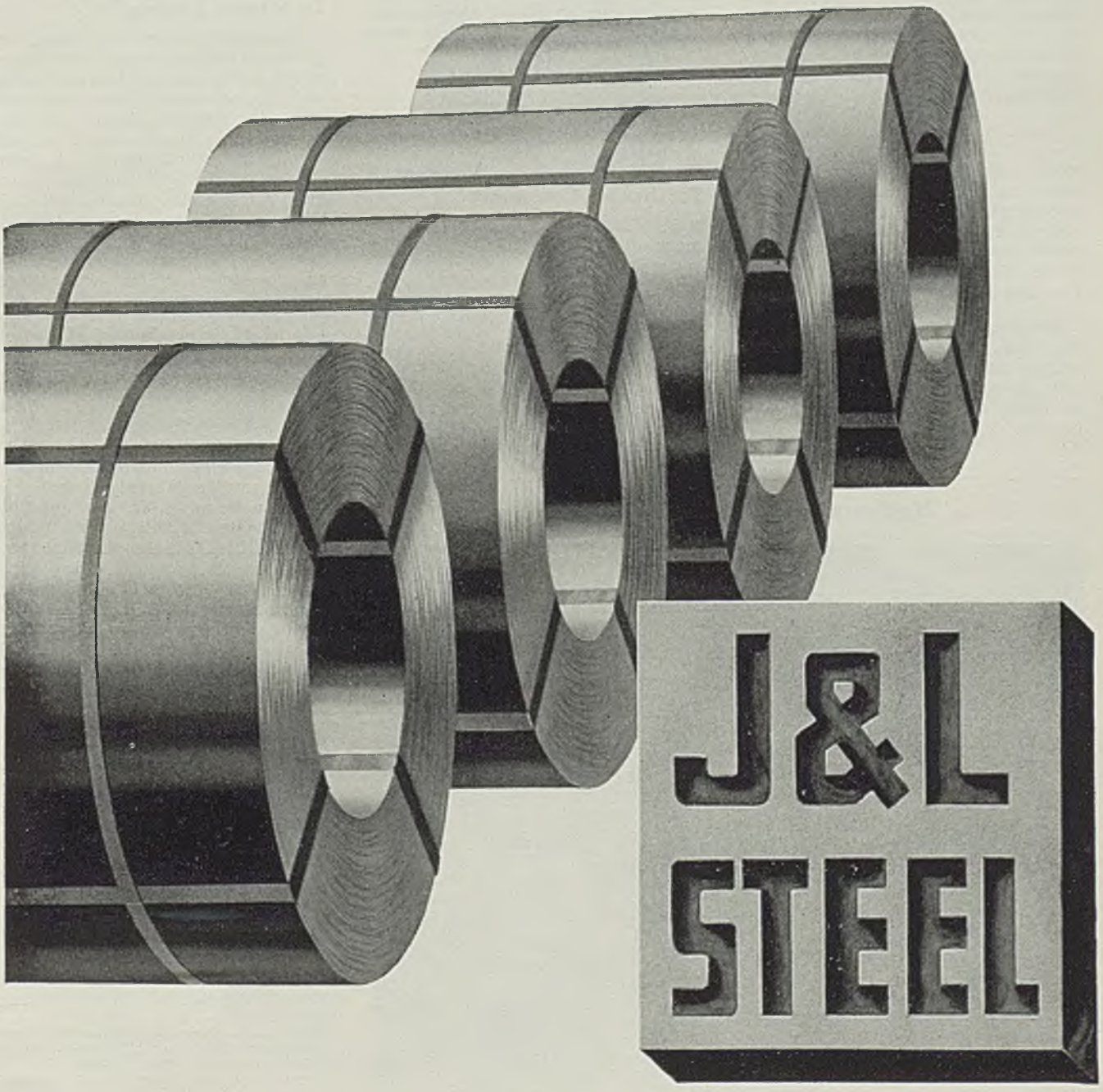
A new survey of facilities shows 24,122,230 square feet of productive floor space in operation by plane, engine and propeller companies on March 1, compared with 18,782,879 square feet on Jan. 1.

During the same period, 27,261 additional shop workers were employed, and in many cases placed in training by the companies. This brought aircraft shop employment to 173,076, as compared to 145,815 on Jan. 1, an increase of 19 per cent.

CONTROLLED QUALITY

SHEETS

Uniformity — coil after coil — foot after foot — maintained in J&L sheets by constant tests and inspections.



JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

Activities of Steel Users, Makers

■ NEW facilities at American Steel & Wire Co.'s Collins street, Joliet, Ill., plant will be placed in operation this spring, possibly by mid-April. Equipment is being installed to permit rolling stainless steel and other special high quality rods, as reported in STEEL, Jan. 27.

♦

B. F. Goodrich Co., Akron, O., has appointed the following distributors to handle its mechanical goods line: Industrial Service Co., Decatur, Ga.; J. A. McCoy, Des Moines, Iowa; Transmission Supply Co., St. Louis; Lovett & Tharpe Hardware Co., Dublin, Ga.; and Industrial Rubber Products Co., Wheeling, W. Va.

♦

Steel Products Sales Corp., New York, has been appointed New York representative for Downingtown Mfg. Co., foundry division, Downingtown, Pa. Steel Products Sales Corp. also represents Key Co., steel castings division, East St. Louis, Ill., and Union Boiler & Mfg. Co., Lebanon, Pa.

♦

Hanson-Van Winkle-Munning Co., Matawan, N. J., is expanding and improving its plant and facilities. The laboratory is being enlarged, to include new offices, a library and conference room, and plant revisions include increased space for the engineering department, additions to the foundry and two short bays to the electrical department and machine shop.

♦

Allied Engineering division, Ferro Enamel Corp., Cleveland, has begun erection of a new circular kiln for the Bengal Potteries Ltd., Calcutta, India.

♦

Pettibone Mulliken Corp., Chicago, reports sales of welded dippers for use on power shovels during the first quarter this year were nearly four times those in the corresponding period in 1940.

MEETINGS

Engineers Announce Program For Spring Conference

■ PAPERS to be presented at the morning session of the annual spring conference, Association of Iron and Steel Engineers, Ohio hotel, Youngstown, O., April 28, include "Stoker Applications for Combination Firing of Boilers", by Otto de Lorenzi, Combustion Engineering Co. Inc., New York; and "Maintenance of Instruments and Control in the Steel Plant", by A. E. Krogh, Brown Instrument Co., Philadelphia. In the afternoon the engineers will visit Sharon Steel Hoop Co.'s plant in Sharon, Pa.

After dinner in the ball room at 8:00 o'clock H. A. Travers and L. L. Fountain, power system engineers, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will discuss "Grounded Direct-Current Systems for Steel Mills", and W. H. Bennett, superintendent, Gautier division, Bethlehem Steel Co., Johnstown, Pa., will speak on "Operating Problems in Bar Mills."

Furnacemen and Steelmakers To Meet in Chicago

Open-hearth steel and blast furnace and raw materials committees of the American Institute of Mining and Metallurgical Engineers will meet in Palmer House, Chicago, April 23-25. Sessions will be held throughout Wednesday. A joint session will be held Thursday morning. A trip to the Inland Steel Co.'s plant at Indiana Harbor, Ind., is scheduled for the afternoon. Friday the open-hearth group will discuss questions dealing with operation, construction and quality.

World's Largest Boring Mill To Be Exhibited at Forum

Principal feature of the 1941 Machine Tool Electrification Forum, at Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., April 14-16, will be discussion of production and design problems created by the defense emergency in the machine tool industry. Subjects include: Responsibilities of the machine tool industry; design and electrical apparatus considerations for heavy-duty gun boring lathes; prefabricated wiring methods for machine tools; metal cutting carbide tools, etc. The recently completed 40-foot boring mill, world's largest, will be shown in operation.

"National Defense Can't Wait!"

■ "National Defense Can't Wait," is the slogan at Monarch Machine Tool Co., Sidney, O., where this $150,000 plant addition was completed within 60 days after ground was broken. Machines in foreground, put into productive operation as soon as installed, are vanguard of $500,000 worth of equipment "earmarked" for this building. In 1940 Monarch produced two and a half times as many lathes as in 1939 and expects to build over twice as many in 1941 as were made in 1940

Convention Calendar

April 14-16—Machine Tool Electrification Forum. Sixth annual meeting, Westinghouse Electric & Mfg. Co., E. Pittsburgh.

April 16-19—Electrochemical Society Inc. Seventy-ninth annual meeting at Cleveland hotel, Cleveland. Dr. C. G. Fink, Columbia University, 3000 Broadway, New York, is secretary.

April 17-18—Porcelain Enamel Institute. Tenth annual meeting at French Lick Springs hotel, French Lick Springs, Ind. Charles S. Pearce, 612 N. Michigan avenue, Chicago, is managing director.

April 23-25—Concrete Reinforcing Steel Institute. Seventeenth annual meeting, The Homestead, Hot Springs, Va. H C. Delzell, 228 N. LaSalle street, Chicago, is executive secretary.

April 28-29—American Zinc Institute. Twenty-third annual meeting at Hotel Chase, St. Louis. E. V. Gent, 60 E. 42nd street, New York, is secretary.

April 28—Association of Iron and Steel Engineers. Annual spring meeting, Ohio hotel, Youngstown, O.

MEN of INDUSTRY

■ **J. K. BEESON,** heretofore assistant general manager of sales, Pittsburgh Steel Co., Pittsburgh, has been elected vice president in charge of sales. Associated with the company since 1929 he has successively served as manager of manufacturers' products sales, assistant general superintendent and assistant manager of sales.

♦

George L. Todd, comptroller, Bullard Co., Bridgeport, Conn., has been elected a director to fill the vacancy created by resignation of Thomas E. Dunn.

♦

Joseph D. Walsh, associated with Scullin Steel Co., St. Louis, 33 years and for a number of years assistant to the works manager, has been promoted to manager.

♦

A. C. Danekind, of General Electric Co.'s executive department, Schenectady, N. Y., has been assigned to the Office of Production Management, Washington.

♦

Reese F. Clifford, associated with Western Electric Co. Inc., New York, 30 years, and since January of this year serving as assistant personnel director, has been promoted to personnel director.

♦

Edwin J. Appel has been appointed manager of the new Longview, Wash., aluminum reduction plant of Reynolds Metals Co. Inc., Richmond, Va. Mr. Appel has been production engineer for the company at Lister, Ala., since last December.

♦

Robert F. Moody, of the sales engineering staff, Wolverine Tube Co., Detroit, has been moved to the home office at Detroit. The past year he has traveled in the middlewestern states, making his headquarters in Chicago.

♦

George T. Ladd, president and chairman, United Engineering & Foundry Co., Pittsburgh, has been named general chairman of the foundry group of the British War Relief Society Inc. This group forms a section of the Commerce and Industry division of the society.

♦

Walter T. Norris, Oakland, Calif., has been appointed district engineer on the Pacific coast by American Institute of Steel Construction, New York. A graduate of the University of Detroit, he has been sales and designing engineer for the Moore Dry Dock Co., Oakland, and was engaged in steel construction work in Birmingham, Ala., before going to the Pacific coast in 1938.

J. K. Beeson

♦

George E. Biscaye, head of the metal department and a director, C. Tennant Sons & Co. of New York, has been elected president, American Tin Trade Association, New York. Other officers are: Vice president, **H. A. Manderson;** treasurer, **M. H. Wehncke.**

♦

E. B. Nisbet, heretofore purchasing agent and treasurer, Laminated Shim Co. Inc., Glenbrook, Conn., has been elected executive vice president. **E. R. Young,** formerly factory manager, has become vice president in charge of production, and **Richard Seipt,** vice president in charge of sales.

♦

Henry W. Phelps has resigned as chairman of the board, American Can Co., New York. The office of chairman will be abolished. Mr. Phelps was president of the company many years before assuming the chairmanship and has been with the company since its formation in 1901. He will continue in an advisory capacity.

♦

John A. Coe, since 1920 president, American Brass Co., Waterbury, Conn., a subsidiary of Anaconda Copper Mining Co., has been elected chairman of the board. He has been succeeded as president by **Clark S. Judd,** heretofore vice president in charge of manufacturing operations. **Arthur H. Quigley,** formerly vice president in charge of the Detroit branch, has been elected executive vice president; **Edwin J. Rockwell,** secretary-treasurer; **W. Kenneth Daly,** comptroller; and **Charles E. Steele,** assistant secretary.

♦

Charles E. Perkins has been named general superintendent of the Buffalo Arms Corp. plant in Cheektowaga, N. Y., which is being built to fill a large order for machine guns and arms for Great Britain. Mr. Perkins is now plant superintendent of the Houde Engineering Corp. plant in Buffalo. Both companies are controlled by Houdaille-Hershey Corp.

♦

Harry L. Strube has been appointed chief engineer of Link Belt Co.'s eastern division, with headquarters at Philadelphia. He succeeds **F. F. Waechter,** who has resigned after 43 years of service. Assistant chief engineer at Philadelphia since 1934, Mr. Strube began his Link-Belt service in the engineering department of the company's Chicago plant in 1910. Subsequently he served as sales engineer at Chicago and then in Philadelphia.

♦

F. A. Bancroft has retired as chief accountant at the Worcester, Mass., works of American Steel & Wire Co., Cleveland, after 49 years of service. He started with Washburn & Moen Co., a predecessor of American Steel & Wire, in 1892, and in 1931 was appointed chief accountant.

F. G. Peterson, assistant chief clerk at Worcester works, has been named chief clerk, and **F. V. Bentley,** general clerk at South works, has been named to succeed Mr. Peterson.

♦

L. M. Lindsey has joined General Alloys Co., Boston, as engineering sales manager. The past six years he was associated with Surface Combustion Corp., Toledo, O., in charge of the malleable iron annealing, nonferrous wire open flame annealing, and vitreous enameling furnaces divisions. Previous to that he was sales engineering executive with Holcroft & Co., Detroit.

Roger Sutton, formerly metallurgist, Chrysler Corp., Detroit, has become director of engineering and metallurgy of General Alloys.

Hal G. Chase has been transferred from the western territory to Boston as assistant to president.

Investors' 1940 Steel Profits $258,688,663; Government Takes $208,644,842

■ STEEL industry's net earnings in 1940, for the first year since 1937, were greater than aggregate of taxes accrued and paid in the period.

Twenty-three major producers, representing more than 90 per cent of the industry, reported combined net income before dividend requirements on preferred stock was $258,688,663; taxes, $208,644,842. Total of taxes paid by the same companies in 1939 was $134,762,731, more than 3 per cent greater than their combined net income of $130,408,462. In 1938 taxes were more than four times as great as net income before dividends and interest on bonds, and about three-fourths of the aggregate net income in 1937.

Taxes paid last year by 21 companies reporting ingot production for the period were equal to $3.32 per ton, compared with net income of $4.14 per ton. These compared with taxes aggregating $2.78 per ton and net income of $2.54 per ton of ingots produced in 1939. In 1937 taxes per ton ingots produced totaled $3.45; net income per ton, $3.91. Tax burden per common share last year was equal to $6.18. It compared with $3.98 in 1939 and $4.78 per share on common in 1937.

Total net income available to holders of preferred and common stocks through dividends last year was $121,621,543. This was only 47 per cent as much as was paid to the government in taxes. In 1939 investors received in dividends a total of $60,765,873 or only 45 per cent as much as was paid in taxes to various governmental agencies. Remainder of net income each year was added to surplus.

Highest Rate of Return Since 1929

Per cent on capitalization of total income before dividends and interest on bonds in 1940 was 7.61, against 4.27 in the preceding year. This compared with 9.88 per cent in 1929, the highest since STEEL started its annual financial analysis.

Net return on capitalization in 1940, best since 1929, was 6.6 per cent, and compared with 3.4 per cent in 1939. Profits in the four best years of the past 11, however, have been insufficient by far to compensate for the extremely low earnings and deficits incurred in the other seven.

The industry's aggregate deficits in 1932 and 1933, its worst years in the decade, were respectively equal to 2.85 per cent and 0.9 per cent of capitalization. Total capitalization, as computed for the summary, included valuation on common and preferred stocks, funded debt and total surplus.

Average income per common share, after allowance for preferred stock requirements, was equal to $6.25 per share last year. It compared with net income of $2.42 per share on common in 1939 and $4.92 in 1937.

Net sales of 21 companies last year aggregated $2,037,928,833, an increase of nearly 33 per cent over $1,547,423,682 in 1939. Two producers, including the largest, did not report net sales. Net profit margin on the net sales reported was 7.52 per cent last year, and compared with 5.66 per cent in 1939. In 1937 net profit margin on sales was 6.87 per cent.

Total Capitalization $3,907,382,607

Total capitalization of the 23 companies last year was $3,907,382,607. It was $35,865,703 greater than the aggregate in 1939. Combined assets of the companies totaled $4,574,823,066, up $212,789,120 or nearly 5 per cent from 1939's total. All but one of the producers reported an increase in total surplus in the year. Although funded indebtedness of six companies was increased in 1940, combined long term debt decreased from $816,380,291 to $798,320,778.

Current assets likewise showed substantial increase, from $1,432,851,532 in 1939 to $1,654,319,038 in 1940. Current liabilities last year totaled $451,121,251, against $336,666,471 in the preceding year. Total surplus, capital and earned, was $858,329,082, against $757,305,890 in 1939.

Operating rate of 21 companies last year was 81.5 per cent, up 17 points from 64.5 per cent in 1939. Almost all the companies reported operations at beginning and in the latter part of the year were near capacity. Several declared actual operating rate at the year's end was greater than theoretical capacity.

Ingot production of the companies reporting output last year totaled 60,732,757 tons. This was an increase of nearly 36 per cent over 44,771,768 tons produced in 1939. Increase in output from 1938 to 1939 was nearly 18,000,000 tons, more than 65 per cent.

Number of shares of common stock outstanding, common stock valuation and preferred stock valuation of the 23 companies decreased during the year. Several companies called in stock, some converted one class of preferred into another and a number carried through extensive refinancing to decrease interest charges.

STEEL wishes to acknowledge with sincere thanks the co-operation of company executives who supplied detailed material used in the accompanying tabulation summary. Additional copies of the table at the right may be secured from Readers' Service department, STEEL.

Financial Analysis of the Steel Industry for 1940

Official Returns from Twenty-Three Producers, Representing 90 Per Cent of Total Ingot Capacity

	No. Shares Common Stock Outstanding 1940	1939	Common Stock Valuation 1940	1939	Preferred Stock Valuation 1940	1939	Funded Debt 1940	1939	Surplus 1940	1939	Total Capitalization 1940	1939	Total Income Before Dividends and Interest on Bonds 1940	1939	Per Cent Total Income on Capitalization 1940	1939	Net Sales 1940	1939	Net Profit Margin Per Cent 1940	1939	Net Income Before Dividends 1940	1939	
United States Steel Corp.	8,703,252	8,703,252	$652,743,900	$652,743,900	$360,281,100	$360,281,100	$191,696,268	$216,502,209	$343,960,668	$301,782,071	$1,553,932,319	$1,536,454,215	$115,849,432	$50,432,865	7.46	3.28	.....	.....	...	...	$102,211,282	$41,119,934	United States Steel Corp.
Bethlehem Steel Corp.	2,984,994	2,984,994	283,574,430	283,574,430	93,388,700	112,066,440	185,774,684	189,886,700	96,252,049	78,229,111	658,989,863	663,756,681	56,293,656	32,132,998	8.54	4.84	$602,202,618	$414,141,087	8.08	5.95	48,677,524	24,638,384	Bethlehem Steel Corp.
Republic Steel Corp.	5,670,628	5,833,066	130,309,141	132,520,020	37,693,450	40,190,050	95,829,105	87,527,872	80,670,038	66,387,346	344,501,734	326,625,288	25,351,588	14,956,751	7.36	4.58	303,303,447	230,340,805	6.96	4.63	21,113,507	10,671,343	Republic Steel Corp.
Jones & Laughlin Steel Corp.	576,320	576,320	57,632,000	57,632,000	58,713,900	58,713,900	42,224,118	45,408,235	56,797,684	48,380,391	215,367,702	210,134,526	12,359,823	5,428,000	5.74	2.58	153,052,249	113,323,602	6.71	2.81	10,277,029	3,188,944	Jones & Laughlin Steel Corp.
National Steel Corp.	2,204,667	2,202,167	55,116,675	55,054,175	None	None	62,445,890	64,103,940	85,743,737	76,145,939	203,306,302	195,304,054	16,927,205	14,992,545	8.33	7.68	157,905,721	132,061,908	9.54	9.53	15,066,341	12,581,636	National Steel Corp.
Youngstown Sheet & Tube Co.	1,675,008	1,675,008	105,088,053	105,074,076	15,000,000	15,000,000	82,500,000	85,500,000	27,024,414	24,022,975	229,612,467	229,597,051	14,266,613	8,744,086	6.21	3.81	143,054,028	117,027,997	7.56	4.28	10,815,468	5,004,484	Youngstown Sheet & Tube Co.
Inland Steel Co.	1,628,625	1,624,265	60,755,310	60,537,310	None	None	48,200,000	50,700,000	42,566,447	38,516,030	151,521,757	149,753,340	16,312,398	12,770,570	10.77	8.53	142,173,338	115,346,665	10.16	9.48	14,450,385	10,931,016	Inland Steel Co.
American Rolling Mill Co.	2,868,637	2,868,610	71,739,009	71,739,009	45,000,000	45,000,000	9,500,000	2,000,000	13,623,808	10,397,164	139,862,816	129,136,173	7,816,244	4,095,837	5.59	3.16	112,363,529	95,351,230	6.80	4.21	7,642,714	4,011,909	American Rolling Mill Co.
Wheeling Steel Corp.	569,674	569,617	28,483,700	28,480,825	37,795,200	37,933,500	30,800,000	31,500,000	18,940,004	15,566,898	116,018,904	113,481,223	7,151,650	7,041,646	6.16	6.21	93,095,627	85,716,689	6.11	6.49	5,685,848	5,560,753	Wheeling Steel Corp.
Pittsburgh Steel Co.	508,917	504,292	4,862,190	4,815,940	15,471,000	15,471,000	6,029,000	4,733,000	15,910,861	14,729,047	42,273,051	39,748,987	1,891,368	894,473	4.47	2.25	34,798,430	28,570,638	4.47	1.98	1,556,000	564,870	Pittsburgh Steel Co.
Crucible Steel Co. of America	445,198	445,198	11,129,943	44,519,773	33,432,000**	23,880,000§§	16,000,000	10,800,000	14,190,090	28,915,092	74,752,033	108,114,865	6,740,664	3,330,680	9.02	3.08	77,689,477	47,967,538	8.02	5.84	6,230,180	2,803,596	Crucible Steel Co. of America
Otis Steel Co.	916,579	915,979	4,582,895	4,579,895	10,294,890	10,309,890	13,417,000	13,945,000	6,013,655	5,285,098	34,308,440	34,119,883	1,336,856	847,350	3.90	2.48	29,072,621	24,500,022	2.47	0.88	717,007	214,965	Otis Steel Co.
Alan Wood Steel Co.	200,000	200,000	4,388,889	4,388,889	7,186,133	7,186,133	None	770,000	3,561,686	2,890,165	15,136,708	15,235,187	1,233,403	720,326	8.15	4.73	23,625,563	14,742,070	5.12	4.61	1,210,202	678,921	Alan Wood Steel Co.
Lukens Steel Co.††	317,976	317,976	3,179,760	3,179,760	None	None	3,502,700	3,534,400	4,069,878	3,571,423	10,752,338	10,285,583	827,114	294,512	7.69	2.84	15,902,649	11,929,582	3.13	0.70	498,454	83,127	††Lukens Steel Co.
Sharon Steel Corp.	392,331	392,331	3,974,530	3,974,530	5,972,000	5,972,000	2,000,000	550,000	6,469,674	5,594,977	18,416,204	16,091,507	1,365,246	296,858	7.41	1.84	21,573,295	16,178,598	6.20	1.58	1,336,822	255,497	Sharon Steel Corp.
Allegheny Ludlum Steel Corp.	1,256,922	1,256,722	7,855,763	7,854,513	3,342,600	3,342,600	None	None	17,609,689	15,911,393	28,808,052	27,108,506	3,722,107	2,093,518	12.92	7.72	54,702,998	37,332,142	6.80	5.61	3,722,107	2,093,518	Allegheny Ludlum Steel Corp.
Granite City Steel Co.	382,488	382,488	8,483,821	8,483,821	None	None	3,643,401	3,576,030	3,539,922	3,320,286	15,667,144	15,380,137	462,987	519,428	2.96	3.38	11,647,814	10,212,477	2.70	3.41	315,259	347,940	Granite City Steel Co.
Northwestern Steel & Wire Co.	163,564	163,502	817,820	817,510	75,000	75,000	908,612	1,042,905	1,983,494	1,670,385	3,784,926	3,605,800	367,174	114,342	9.70	3.17	7,813,991	5,843,473	3.99	0.92	311,396	53,966	Northwestern Steel & Wire Co.
Continental Steel Corp.	200,561	200,561	5,276,243	5,276,243	1,870,264	1,885,500	1,600,000	1,800,000	5,094,315	4,777,721	13,840,822	13,939,464	834,988	1,266,805	6.03	9.09	18,426,391	18,559,294	4.23	6.51	778,738	1,208,200	Continental Steel Corp.
The Midvale Co.	200,000	200,000	10,574,621	10,574,621	None	None	None	None	3,728,668	2,298,805	14,303,289	12,873,426	3,227,737	1,703,771	22.57	13.23	.....	.....	....	....	3,227,737	1,703,771	The Midvale Co.
Laclede Steel Co.	206,250	206,250	4,125,000	4,125,000	None	None	750,000	750,000	1,811,743	1,796,071	6,686,743	6,671,071	295,771	230,678	4.42	3.46	10,242,815	8,605,822	2.67	2.44	273,485	210,053	Laclede Steel Co.
Keystone Steel & Wire Co.	757,632	757,632	3,156,800	3,156,800	None	None	1,500,000	1,750,000	5,779,589	5,242,036	10,436,389	10,148,836	1,344,014	1,442,753	12.88	14.22	13,698,308	13,283,547	9.45	10.47	1,295,185	1,390,759	Keystone Steel & Wire Co.
Rustless Iron & Steel Corp.	926,547	886,547	926,547	886,547	1,189,088	1,189,088	None	None	2,986,969	1,875,466	5,102,604	3,951,101	1,275,993	1,090,876	24.99	27.62	11,583,924	6,388,496	...	....	1,275,993	1,090,876	Rustless Iron & Steel Corp.
Total (or average)	33,756,770	33,866,777	$1,518,777,040	$1,553,989,587	$726,705,325	$738,496,201	$798,320,778	$816,380,291	$858,329,082	$757,305,890	$3,907,382,607	$3,871,516,904	$297,254,031	$165,441,673	7.61	4.27	**$2,037,928,883**	**$1,547,423,682**	**7.52**	**5.66**	$258,688,663	$130,408,462	Total (or average)

	Preferred Stock Dividend Requirements 1940	1939	Dividends Paid Per Share on Preferred 1940	1939	Income Per Common Share 1940	1939	Dividends Paid Per Share on Common 1940	1939	Rated Ingot Capacity Net Tons 1940	1939	Ingot Production Net Tons 1940	1939	Operating Rate Per Cent 1940	1939	Net Income Per Ton Ingots Produced 1940	1939	Total Taxes 1940	1939	Total Assets 1940	1939	Current Assets 1940	1939	Current Liabilities 1940	1939	
United States Steel Corp.	$25,219,677	$25,219,677	$7.00	$7.00	$8.84	$1.82	$4.00	None	29,720,000	28,885,000	22,933,653	17,625,676	80.2	60.7	$4.46	$2.33	$85,420,545	$67,017,086	$1,854,585,741	$1,768,523,663	$634,634,454	$575,877,137	$163,304,305	$143,888,691	United States Steel Corp.
Bethlehem Steel Corp.	6,770,680	7,471,096	5.25†	8.75†	14.04	5.75	5.00	$1.50	11,468,800	11,247,040	10,704,741	7,958,636	93.3	70.8	4.55	3.10	39,739,381	19,919,900	763,724,034	732,932,382	287,322,031	244,186,346	91,619,927	56,886,601	Bethlehem Steel Corp.
Republic Steel Corp.	2,411,403	2,411,403	6.00‡	10.50‡	3.30	1.42	0.40	None	7,840,000	7,280,000	6,111,678	4,817,867	78.0	66.2	3.45	2.21	16,034,921	9,561,985	405,317,763	365,049,972	141,765,593	110,255,374	35,775,031	20,454,420	Republic Steel Corp.
Jones & Laughlin Steel Corp.	4,109,973	4,109,973	4.00	None	10.70	1.60*	None	None	3,931,200	4,099,200	3,338,983	2,443,064	84.9	59.6	3.08	1.31	9,327,344	5,797,715	240,478,022	230,865,299	80,396,220	70,202,084	18,883,701	14,354,897	Jones & Laughlin Steel Corp.
National Steel Corp.	None	None	None	None	6.83	5.71	2.50	1.70	3,808,000	3,808,000	3,398,209	.....	89.2	...	4.43	...	12,528,619	6,337,541	237,349,710	218,028,076	69,177,571	59,099,986	29,620,158	16,796,327	National Steel Corp.
Youngstown Sheet & Tube Co.	825,000	825,000	5.50	5.50	5.96	2.50	1.25	None	3,494,400	3,494,400	2,869,867	2,250,951	82.1	64.4	3.77	2.22	5,497,000	4,297,206	251,239,106	247,655,013	95,517,039	86,209,968	17,139,576	13,836,154	Youngstown Sheet & Tube Co.
Inland Steel Co.	None	None	None	None	8.87	6.73	5.00	4.00	3,100,000	3,091,200	2,906,540	2,408,192	93.7	77.9	4.97	4.54	9,209,459	5,158,640	173,691,939	166,811,738	66,895,053	58,497,125	16,535,893	11,695,416	Inland Steel Co.
American Rolling Mill Co.	2,025,000	2,025,000	7.38	2.75	1.96	0.69	0.25	None	3,030,182	3,030,182	2,093,143	1,934,987	69.1	63.9	3.65	2.07	4,734,425	3,046,873	157,021,944	144,316,643	64,776,580	52,113,070	15,307,388	12,899,053	American Rolling Mill Co.
Wheeling Steel Corp.	1,904,546	1,912,959	5.00§	5.75§	6.64	6.40	None	None	1,960,000	1,960,000	1,670,339	1,465,987	85.2	74.8	3.40	3.79	4,003,876	3,202,912	130,064,944	124,021,444	49,281,800	45,229,106	11,982,207	8,136,991	Wheeling Steel Corp.
Pittsburgh Steel Co.	869,162	869,162	None	None	1.35	0.60*	None	None	1,072,000	906,460	800,061	586,451	74.6	64.7	1.94	0.96	1,458,736	1,015,437	48,113,473	45,794,350	18,140,182	15,868,851	4,991,000	5,205,536	Pittsburgh Steel Co.
Crucible Steel Co. of America	1,671,600	1,671,600	2.50	None	10.24	2.54	None	None	1,055,800	980,000	.....	.....	....	....	....	....	5,543,602	2,329,717	91,263,835	115,333,652	41,843,738	27,810,970	10,338,487	6,701,832	Crucible Steel Co. of America
Otis Steel Co.	754,958	756,058	None	None	0.04*	0.59*	None	None	977,000	977,000	898,338	744,081	92.0	76.2	0.80	0.29	1,099,716	887,703	39,106,077	37,543,323	13,135,310	11,499,474	2,821,094	2,446,158	Otis Steel Co.
Alan Wood Steel Co.	503,029	503,029	7.50	3.50	3.54	0.88	None	None	.....	.....	395,597	315,248	...	...	...	...	1,169,651	469,891	18,351,786	17,681,412	8,365,638	10,532,246	2,524,224	1,921,668	Alan Wood Steel Co.
Lukens Steel Co.††	None	None	None	None	1.57	0.26	None	None	714,560	714,560	429,401	317,244	60.1	44.4	1.16	0.26	377,770	331,771	13,614,755	13,900,073	4,642,934	4,061,189	2,938,514	2,994,635	††Lukens Steel Co.
Sharon Steel Corp.	298,600	298,600	5.00	5.00	2.64	0.11*	0.25	None	560,000	560,000	530,000	443,636	94.6	79.2	2.52	0.58	829,487	357,364	21,013,193	18,573,566	10,759,625	7,888,837	2,219,989	2,150,059	Sharon Steel Corp.
Allegheny Ludlum Steel Corp.	233,982	233,982	7.00	7.00	2.78	1.49	1.50	0.50	433,020	433,020	246,082	239,074	56.9	55.2	15.13	8.76	3,799,608	1,509,019	37,891,386	33,637,798	21,127,294	16,742,725	8,285,069	5,789,690	Allegheny Ludlum Steel Corp.
Granite City Steel Co.	None	None	None	None	0.82	0.91	0.25	0.13	403,200	403,200	296,395	257,273	73.5	63.8	1.06	1.35	307,705	296,705	17,345,495	16,946,342	6,470,818	5,764,977	1,451,656	1,297,131	Granite City Steel Co.
Northwestern Steel & Wire Co.	5,250	5,250	14.00	None	1.87	0.30	None	None	369,600	369,600	121,425	96,141	32.8	26.0	2.56	0.56	172,685	113,121	5,460,996	5,366,478	1,986,961	1,761,436	1,030,666	1,618,510	Northwestern Steel & Wire Co.
Continental Steel Corp.	131,303	148,418	7.00	7.00	3.23	5.28	1.50	2.00	364,000	364,000	346,615	363,198	95.2	99.8	2.25	3.33	807,000	791,000	16,584,314	15,899,857	8,016,019	7,454,971	1,713,677	1,357,136	Continental Steel Corp.
The Midvale Co.	None	None	None	None	16.14	8.52	9.00	6.50	300,160	300,160	143,695	97,810	47.9	32.6	22.46	17.42	4,221,718	1,246,527	23,085,283	17,592,498	15,806,274	10,617,049	6,668,998	3,294,103	The Midvale Co.
Laclede Steel Co.	None	None	None	None	1.33	1.02	1.25	1.00	283,000	295,357	220,980	152,494	78.1	51.6	1.24	1.38	267,086	182,536	8,070,109	7,259,015	3,979,248	3,153,675	1,249,082	493,810	Laclede Steel Co.
Keystone Steel & Wire Co.	None	None	None	None	1.71	1.84	1.00	0.80	276,500	264,580	276,515	253,758	100.0	95.9	4.68	5.48	629,326	522,722	12,653,450	11,538,069	5,534,076	4,892,409	2,075,933	1,233,833	Keystone Steel & Wire Co.
Rustless Iron & Steel Corp.	91,291	91,292	2.50	2.50	1.28	1.13	0.60	0.25	75,000	44,800	.....	.....	....	....	....	....	1,465,182	369,360	9,795,711	6,763,283	4,744,580	3,132,527	2,644,676	1,213,820	Rustless Iron & Steel Corp.
Total (or average)	$47,825,454	$48,552,499	....	....	$6.25	$2.42	....	....	**75,236,422**	**73,507,759**	**60,732,757**	**44,771,768**	**81.5**	**64.5**	**$4.14**	**$2.54**	$208,644,842	$134,762,731	$4,574,823,066	$4,362,033,946	$1,654,319,038	$1,432,851,532	$451,121,251	$336,666,471	Total (or average)

*Loss.
†Payments on 7 per cent cumulative; on 5 per cent cumulative, redeemed April 1, 1940, payments were 25 cents per share in 1940 and $1.25 per share in 1939.
‡Payments on prior preference stock; payments per share on preferred were $24 in 1940 and $7.50 in 1939.
§Payments on 55 cumulative convertible preferred; on 6 per cent cumulative preferred, payment in 1940 was $6, in 1939, nothing.
**5 per cent preferred, cumulative convertible.
§§7 per cent preferred, cumulative.
††Fiscal year ended Oct. 12, 1940, and Oct. 14, 1939.

"Net Income Before Dividends" columns and totals do not take into consideration requirements (not actual payments) for preferred dividends. In computing earnings per common share these totals, adjusted for preferred dividend requirements, are used. In arriving at earnings per common share for individual companies the same method is followed.

Boldface type is used under those columns in which figures from all 23 companies were not available.

Per Cent Earned on Capitalization

1926	6.86	1931	0.40	1936	4.40	
1927	5.22	1932	2.85*	1937	6.07	
1928	6.55	1933	0.90*	1938	0.59	
1929	9.88	1934	0.36	1939	4.27	
1930	4.54	1935	2.09	1940	7.61	

*Loss.

Higher Taxes Reflected In Profit-Sharing Checks

■ Fairbanks, Morse & Co., Chicago, last week distributed to employes profit-sharing checks amounting to $217,818.39, equal to 3.141 per cent of $6,934,700.98 paid in wages during 1940. Salesmen, branch managers, and others on bonus contracts were not included in the distribution.

A year ago Fairbanks, Morse employes received 2.7396 per cent of their 1939 wages. If 1939 federal corporation tax rates had remained in effect for 1940 earnings, the company would have distributed 7.154 per cent of employes' 1940 wages, Col. Robert H. Morse, president, announced.

Cleveland-Cliffs Iron Earns $8.99 a Share

■ Cleveland-Cliffs Iron Co., Cleveland, reports net profit of $4,382,079.25 for 1940, equal to $8.99 per preferred share. This compares with net earnings of $3,378,394.20 for 1939, or $6.93 per preferred share.

Because the company believed it necessary to maintain a strong cash position, due to uncertainties of the times and probable need for additions and extensions to facilities, directors declared the annual dividend of $5 only. Accumulated unpaid dividends on preferred shares Dec. 31 totaled $14,207,860.08, or $29.16 a share.

The company, which manages a fleet of 23 vessels, shipped from properties it owns or operates 6,180,197 tons of ore during the past season, an increase of 29 per cent over 1939 shipments, and 9.61 per cent of total ore shipments.

"We think it reasonable to expect that in 1941 the volume of our business will reach a peak, but in these uncertain times no definite prediction can be confidently made concerning the result of our operations," says the report.

International Harvester Reports to Employes

■ International Harvester Co. employes were credited with 2.1 per cent of their wages in 1940 under the company's extra compensation plan, S. G. McAllister, president, announced in his annual report to employes issued last week.

The plan provides that whenever the company's earnings amount to more than $3 per share on common stock, an amount equal to 25 per cent of the balance be paid to employes as extra compensation. Any employe may withdraw in cash at any time one-half of his extra compensation for the year. The other half is restricted and can be withdrawn only during unemployment or retirement.

The report to employes is profusely illustrated and explains in detail the company's business and policies, with particular emphasis on the effects and demands of the national defense program.

More Iron, Steel Consumers Show Upturn in Net Income

■ AGGREGATE net income earned by 270 iron and steel consumers in 1940 was $437,097,304, compared with combined net profit of $289,467,056 realized by the same companies in 1939. Total profit last year was 51 per cent greater than in the preceding year. Eight companies reported net deficits in 1940, against 25 that incurred a loss in 1939. Prior tabulations in STEEL (Feb. 17, p. 26; Feb. 24, p. 28; March 10, p. 22; and March 17, p. 29) included 197 consumers; accompanying compilation lists 73 companies. All figures below are net earnings, except where asterisk denotes net loss:

	1940	1939
Addressograph-Multigraph Corp., Cleveland	$1,081,376	$964,748
Air-Way Electric Appliance Corp., Toledo, O.	39,609	*51,462
Alamo Iron Works, San Antonio, Tex.	127,067	115,179
American Chain & Cable Co. Inc., Bridgeport, Conn.	3,009,476	2,252,483
American Locomotive Co., New York	2,850,913	*950,376
American Machine & Metals Inc., New York	106,376	*134,491
American Safety Razor Corp., New York	383,443	806,238
American Stove Co., St. Louis	1,173,343	1,501,848
Anchor Post Fence Co., Baltimore	127,161	64,707
Apex Electrical Mfg. Co., Cleveland	252,601	173,517
Autocar Co., Ardmore, Pa.	421,834	319,173
Automatic Signal Corp., East Norwalk, Conn.	51,104	35,248
Automatic Washer Co., Newton, Iowa	*15,307	*26,620
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.	268,400	69,824
Breeze Corps. Inc., Newark, N. J.	801,235	177,126
Brill, J. G., Co., Philadelphia	258,745	*331,309
Canada Wire & Cable Co. Ltd., Leaside, Ont.	743,186	690,806
Carrier Corp., Syracuse, N. Y.	526,628	18,788
Chicago Pneumatic Tool Co., New York	1,717,602	823,587
Cleveland Hobbing Machine Co., Cleveland	169,485	147,619
Consolidated Aircraft Corp., San Diego, Calif.	1,400,645	1,104,326
Crane Co., Chicago	5,134,850	4,444,194
Crosley Corp., Cincinnati	*1,589,288	84,949
Dexter Co., Fairfield, Iowa	66,041	54,073
Diamond Iron Works, Minneapolis	92,231	896
Doehler Die Casting Co., Toledo, O.	1,032,504	682,043
Dominion Foundries & Steel Ltd., Hamilton, Ont.	501,166	1,212,633
Electric Auto-Lite Co., Toledo, O.	6,001,718	5,658,840
Electric Household Utilities Corp., Chicago	247,320	113,765
Fafnir Bearing Co., New Britain, Conn.	2,051,678	1,430,542
Federal Mogul Corp., Detroit	593,987	648,325
Fyr-Fyter Co., Dayton, O.	64,806	29,933
Gardner-Denver Co., Quincy, Ill.	1,118,985	1,123,558
General Machinery Corp., Hamilton, O.	972,831	629,181
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.	495,165	395,728
Hobart Mfg. Co., Troy, O.	970,023	1,029,284
Holland Furnace Co., Holland, Mich.	1,616,506	1,455,185
Jackson, Byron, Co., Huntington Park, Calif.	405,617	511,747
Johns-Manville Corp., New York	5,882,071	4,127,691
Koppers Co., Pittsburgh	3,934,832	2,374,650
Lockheed Aircraft Corp., Burbank, Calif.	3,165,675	3,132,918
Lynch Corp., Anderson, Ind.	290,846	363,583
Marchant Calculating Machine Co., Oakland, Calif.	741,883	674,958
Maytag Co., Newton, Iowa	1,787,085	1,398,981
Muskegon Piston Ring Co., Muskegon, Mich.	294,743	400,782
National Cash Register Co., Dayton, O.	2,051,727	1,805,086
Neptune Meter Co., New York	788,810	357,384
Nineteen Hundred Corp., Binghamton, N. Y.	615,384	452,779
Oliver Farm Equipment Co., Chicago	866,445	430,267
Parkersburg Rig & Reel Co., Parkersburg, W. Va.	221,115	340,054
Pressed Steel Car Co., Pittsburgh	1,526,970	*688,603
Reda Pump Co., Bartlesville, Okla.	453,474	446,269
Reece Folding Machine Co., East Cambridge, Mass.	11,791	9,796
Reliance Electric & Engineering Co., Cleveland	356,741	205,007
Rheem Mfg. Co., Richmond, Calif.	511,592	863,954
Richmond Radiator Co., Uniontown, Pa.	170,415	127,473
Scovill Mfg. Co., Waterbury, Conn.	2,829,054	1,630,851
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.	353,289	207,381
Simmons Co., New York	2,702,298	2,446,681
Simonds Saw & Steel Co., Fitchburg, Mass.	1,553,866	1,167,047
Soss Mfg. Co., Roselle, N. J.	119,618	130,745
South Bend Lathe Works, South Bend, Ind.	634,305	386,870
Standard Tube Co., Detroit	120,793	*67,572
Stewart-Warner Corp., Chicago	1,470,804	553,224
Studebaker Corp., South Bend, Ind.	2,124,628	2,923,251
Symington-Gould Corp., Rochester, N. Y.	942,855	489,251
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.	233,320	*46,121
Thompson Products Inc., Cleveland	1,670,844	1,232,199
Underwood-Elliott-Fisher Co., New York	2,226,255	1,857,080
Union Tank Car Co., Chicago	2,446,316	2,410,666
United Engineering & Foundry Co., Pittsburgh	3,724,460	2,149,328
Van Dorn Iron Works Co., Cleveland	113,562	48,381
White Motor Co., Cleveland	1,952,728	107,473

*Loss.

Price Ceilings Established for Zinc Scrap Materials and Secondary Slab

■ MAXIMUM prices for zinc scrap materials and secondary slab zinc, pegged to the prices of primary slab zinc, were established last week in the third price schedule issued by Leon Henderson, director, price stabilization division, National Defense Advisory Commission.

The two earlier schedules fixed maximum prices for second-hand machine tools, aluminum scrap and secondary aluminum ingot.

Under normal conditions, Mr. Henderson said, prices for secondary slab zinc are below prices for primary slab zinc. For some time, however, despite the fact prices of primary slab zinc have remained stable, prices of secondary slab zinc, and zinc scrap materials have risen to exceed and in some cases even to double the prices of primary slab zinc, "levels which are fantastic in relation to the primary price."

Price schedule No. 3 establishes maximum prices at which zinc scrap materials and secondary slab zinc may be sold by any person to any other person.

"These ceiling prices," Mr. Henderson stated, "should give ample allowance for reasonable profit to the industry.

"We do not believe it necessary in this industry to fix margins for dealers in zinc scrap materials. Since a ceiling has been put on the prices at which dealers and any other persons may sell zinc scrap materials, dealers will naturally pay less than the ceiling prices for the scrap materials they buy.

Maximum prices established for zinc scrap are delivered prices or f.o.b. prices depending upon the kind and grade of zinc scrap material involved.

Higher Ceiling for Small Lots

Maximum prices for secondary slab zinc in carload lots have been established on an f.o.b., East St. Louis, basis, Mr. Henderson explained. Thus, for example, if secondary slab zinc of prime western grade is sold and delivered in carload lots to a buyer in New York, the maximum price that may be charged, regardless of where the seller is located, is 7.25 cents plus freight from East St. Louis to the buyer's customary rail receiving point in New York.

"This is the practice in the industry," Mr. Henderson declared. "Both primary and secondary slab zinc prices are quoted on this basis. This does not mean, however, that our action should be taken as indicating approval of the basing point system in the industry. Nor should this statement be taken as indicating disapproval. The purpose of price schedule No. 3 is to bring the prices of secondary zinc into line with the prices of primary zinc. For this purpose we took the practice of the industry as we found it."

Maximum prices for secondary slab zinc sold and shipped or carried away in less than carload lots are slightly higher than the prices for sales or shipments in carload lots. For example, the maximum price for secondary slab zinc sold to and trucked away by a buyer in New York, in less than carload lots, is 7.25 cents plus a flat premium of ¾-cent, plus carload freight from East St. Louis to the seller's plant or warehouse, wherever it may be located. This maximum price is f.o.b. the seller's plant or warehouse and the buyer will pay for trucking the zinc away.

Protects Small Consumers

"We have been informed," Mr. Henderson explained, "that unless a premium is allowed for sales and shipments of secondary slab zinc in less than carload lots, sellers of secondary slab zinc, because of the extra expense involved in small lot business, would not sell secondary slab zinc in less than carload lots. This, of course, would seriously affect small consumers of secondary slab zinc who do not need and cannot afford to buy in carload lots. To protect the small consumer a premium has been allowed on sales and shipments in less than carload lots, sufficient in our opinion to encourage sellers of secondary slab zinc to continue to sell to small consumers. The issuance of this price schedule should not give anyone an excuse to discontinue sales to small consumers."

Schedule requires that complete and accurate records be kept of every purchase and sale of zinc scrap materials and secondary slab zinc. Furthermore, to keep the price stabilization division informed as to the movement of zinc scrap materials into the hands of persons other than distillers and remelters, any galvanizer, brass mill or foundry which purchases 4000 pounds or more of zinc scrap in any single week is required to report such purchase to the division. Thereafter such galvanizer, brass mill or foundry is required to make weekly reports of every purchase of zinc scrap materials, regardless of the amount.

"Price schedule No. 3, as well as the two other price schedules we have issued, will be fully enforced," Mr. Henderson said.

Maximum Prices for Zinc Scrap Materials

	(cents per pound)
New zinc clippings and trimmings	6.75, delivered buyer's plant
Engravers' and lithographers' plates	6.75, delivered buyer's plant
Old zinc scrap	5.10, delivered buyer's plant
Unsweated zinc dross	5.10, f.o.b. point of shipment
Die cast slab	4.95, f.o.b. point of shipment
New die cast scrap	4.60, f.o.b. point of shipment
Radiator grills, old and new	4.60, f.o.b. point of shipment
Old die cast scrap	4.25, f.o.b. point of shipment

The maximum prices herein established are the maximum prices to be paid for the zinc scrap materials herein enumerated after the free iron and other foreign materials are removed.

Maximum Prices for Secondary Slab Zinc

Grade**	Carload Lots* (per pound, delivered buyer's customary rail receiving point)
Prime western or poorer grade	7.25 cents plus carload freight from East St. Louis to buyer's customary rail receiving point.
Brass special	7.35 cents plus carload freight from East St. Louis to buyer's customary rail receiving point.
Intermediate	7.50 cents plus carload freight from East St. Louis to buyer's customary rail receiving point.
Grade**	**Less Than Carload Lots*** (per pound, f.o.b. seller's plant or warehouse)
Prime western or poorer grade	8 cents plus carload freight from East St. Louis to seller's plant or warehouse.
Brass special	8.10 cents plus carload freight from East St. Louis to seller's plant or warehouse.
Intermediate	8.25 cents plus carload freight from East St. Louis to seller's plant or warehouse.

*The minimum quantity making up a carload lot for purposes of this schedule will be the minimum quantity required to obtain railroad carload lot rates from the point of shipment to the point of destination.

**The grade of secondary slab zinc is to be determined in accordance with A.S.T.M. specifications for primary slab zinc.

Scientists' Advisory Committee Holds Nickel Supplies Adequate

■ NICKEL supplies are adequate for both defense and civilian purposes, the advisory committee on metals and minerals of the National Academy of Sciences indicated last week in a report to the materials branch of the Office of Production Management's production division.

The supply of nickel to the United States market is currently at an all-time peak and is more than double that of any year prior to 1939 when purchasing in anticipation of the defense program became manifest. This year, about 175,000,000 pounds will be made available from Canadian and other British Empire sources. In addition, about 5,000,000 pounds of secondary nickel are produced annually.

British requirements in this market in 1941 are estimated at about 30,000,000 pounds, leaving a balance of 145,000,000 pounds for defense and general industrial demands. Accurate estimates of defense requirements are not yet available but it is observed that the balance of 145,000,000 pounds is adequate to provide for industrial requirements at the highest rate ever experienced in a normal year (83,000,000 pounds in 1937) and leave 62,000,000 pounds for defense.

Since 62,000,000 pounds alone constitutes about 75 per cent of the largest nickel consumption in a normal year and appears to be fairly ample for defense requirements, the committee asks this question: "Why is there a shortage of nickel?"

In answering its own question, the committee says there is little questioning the fact that demand exceeds real current consumption, partly inflated by the natural desire to improve inventory position. The amount of nickel in process also is increasing due to the sharp rise in manufacturing operations. About three pounds of nickel are in process for each pound delivered in a manufactured product. This situation will be relieved when manufacturing channels are filled.

Current Distribution of Nickel Consumption

	% Total
Steel mills	63
Electroplaters' supplies	8
Iron foundries	6
Brass mills	6
Heat-resisting and electrical	5
Rolled nickel and high nickel alloys	5
Steel foundries	3
Nonferrous foundries	2
Miscellaneous	1.5
Aluminum alloy mfrs.	0.5

In discussing substitutes, the committee observes: "Except in a few cases there would not appear to be any simple types of substitution for nickel products which could be broadly or generally followed. Therefore only a few general proposals can at this time be suggested."

Some of these are:

Nickel Electroplating — Larger plating establishments already are using less nickel by substituting copper for most of the nickel. Smaller platers, it is suggested, could use more copper or lacquers and paint finishes.

Nickel Silver—Leading manufacturers already have taken steps to reduce nickel content from about 18-20 per cent to 15 and even 10 per cent. If necessary, brass and bronze could be substituted.

The committee observes that no simple programs of substitution are applicable to other fields, including:

Malleable nickel and chromium-nickel heat-resisting and electrical resistance alloys—A considerable proportion of this nickel is used directly for essential defense equipment such as airplane manifolds or for heat-treating equipment in the steel industry. Chromium-aluminum-iron alloy could be substituted for chromium-nickel in making resistance wire for electrical appliances but availability of aluminum and chromium is questioned. Redesigning products also is a problem.

Alloy Steels—Nickel steels are in active competition with other alloy steels and there are undoubtedly many individual applications and cases in which substitution can be appropriately made. A common proposal is use of 4100 chromium-molybdenum series for 3100 nickel-chromium series but such substitutions must be made intelligently. A 3100 series steel also could be replaced with a 3000 series steel, saving about half the nickel content. Such substitutions cannot be recommended uncritically or over a wide front, since there are individual circumstances under which experience has shown that such substitutions bring undesirable manufacturing or service complications, the committee observes. In general, there is no clear-cut rule for substituting other alloy steels.

Stainless Steels—About 20 per cent of the nickel supplied to steel mills goes into stainless, against normal figure of 25 per cent. Steel mills are recommending 16-18 chomium steels for 18-8 but there are certain limitations, particularly by severity of forming operations required.

■ Employes in the Navy yard and gun factory, Washington, are being trained to work while wearing gas masks. Here a chemical warfare officer conducts a drill in the 16-inch gun plant. NEA photo

Week's Defense Awards $37,925,078; Expansion Contracts Authorized

■ PLANT expansion and construction contracts figured prominently in awards announced last week by the War and Navy Departments. Awards totaled $37,925,078. Most contracts were comparatively small.

Pontiac Division of General Motors Corp., Pontiac, Mich., was authorized by the Defense Plant Corp. to acquire machinery and equipment to cost $5,700,000 for the manufacture of ordnance material. Crucible Steel Co. of America, New York, and the Navy Department entered into a contract for installation of additional equipment and extension of buildings to cost $2,466,512.20.

Other construction awards included air base facilities at the Meridian, Miss., airport to Alfred B. Friend, Wolz Construction Co., Rock City Construction Co. and the Flint-Jordan Construction Co. Inc., all of Jackson, Miss., for $1,408,535. Three contracts for expansion of shipbuilding facilities, totaling $1,278,800, were awarded as follows: Tampa Shipbuilding Co., Tampa, Fla., $238,800; American Bosch Co., Providence, R. I., $825,000; Busch-Sulzer Bros., St. Louis, $215,000.

War Department announced the following awards:

Ordnance Department Awards

Ace Drill Co., Detroit, drills, $1926.24.
Advance Pressure Castings Inc., Brooklyn, N. Y., booster cups, $4704.
Alan Wood Steel Co., Mine Hill, N. J., portland cement concrete, $5100.
American Car & Foundry Co., New York, automotive equipment, castings, $7346.70.
American Gas Machine Co., Albert Lea, Minn., primer bodies, $154,000.
American Machine & Metals Inc., East Moline, Ill., machine, $1025.
American Rolling Mill Co., Ashland, Ky., steel, $60,513.30.
American Shim Steel Co., New Kensington, Pa., strip steel, $22,283.75.
Ampco Metals Inc., Milwaukee, welding rods, $2498.73.
Armstrong Bros. Tool Co., Chicago, hardware, $2533.44.
Arrow Tool & Reamer Co., Detroit, end mills, cutters, $2861.20.
Auto-Ordnance Corp., Bridgeport, Conn., small arms materiel, $2342.50.
Baker Wood Preserving Co., Marion, O., switch ties, $4895.25.
Barber-Colman Co., Machine & Small Tool division, Rockford, Ill., high speed steel hobs, reamers, $12,949.92.
Barker Tool Die & Gauge Co., Detroit, gages, $4466.
Bay State Abrasive Co., Westboro, Mass., grinding wheels, $1076.
Belmet Products Inc., Brooklyn, N. Y., fuse tubes, $10,698.47.
Bennell Machine Co. Inc., Brooklyn, N. Y., pneumatic machines, $2027.
Besly, Charles H., & Co., Chicago, taps, $1583.
Bliss, E. W., Co., Brooklyn, N. Y., presses, $25,431.
Bliss & Laughlin Inc., Harvey, Ill., carbon steel, $1218.27.
Boston & Lockport Block Co., Boston, blocks and tackle, $4100.
Boyar-Schultz Corp., Chicago, gages, $2350.
Breeze Corporations Inc., Newark, N. J., hardware, starters, $8973.
Brown & Sharpe Mfg. Co., Providence, R. I., services in connection with modification of miscellaneous gages for artillery ammunition, hobs, end mills, $7102.09.
Candler-Hill Corp., Detroit, fuel pumps, $1123.
Canvas Specialty Co. Inc., New York, small arms materiel, $1857.96.
Carboloy Co. Inc., Detroit, tools, $8352.
Carnegie-Illinois Steel Corp., Chicago, chromium vanadium and nickel steel, $10,498.03.
Carson Machine & Supply Co., Oklahoma City, Okla., oil fillers, $11,450.
Carrier Corp., Syracuse, N. Y., air conditioning units, $18,744.
Central Engineering & Supply Co., Passaic, N. J., fountains and lavatories, $1240.
Central Foundry Co., Holt, Ala., cast iron pipe, $5752.50.
Charles Bruning Co. Inc., Long Island City, N. Y., file units, $1988.60.
Chase Brass & Copper Co. Inc., Waterbury, Conn., brass, $6699.33.
Chicago Screw Co., Chicago, hardware, $1722.33.
Christiansen, C. B., Newark, N. J., tools, $5880.
Cleveland Twist Drill Co., Cleveland, tools, $5312.58.
Cleveland Universal Jig Co., Cleveland, machine fixtures, $1732.
Cogbill, Joseph A., Inc., Newark, N. J., tools, $1843.96.
Columbus Bolt Works Co., Columbus, O., automotive equipment, $1386.
Continental Motors Corp., Muskegon, Mich., hardware, $119,596.85.
Continental Tool Works, Detroit, cutters, $2120.75.
County Supply Co., Plainfield, N. J., hardware, $1542.80.
Crane Co., Davenport, Iowa, valves, $1065.50.
Crawford Mfg. Co., Kansas City, Mo., small arms materiel, steam condensing case, $23,351.88.
Crucible Steel Co. of America, New York, steel, $6885.69.
DeLaval Separator Co., New York, portable purifiers, $1638.
Diamond Specialty & Supply Co., Philadelphia, drills, $1357.20.
Disston, Henry, & Sons, Philadelphia, saw steel, $3581.25.
Eclipse Air Brush Co. Inc., Newark, N. J., motors, $1790.
Edmos Products Co., Brooklyn, N. Y., artillery materiel, $20,424.
Electroloy Co. Inc., Philadelphia, welding machines, $1191.25.
Elliott-Lewis Electrical Co. Inc., Philadelphia, cable, $3628.55.
Englewood Plumbing Supply Co., Inc., Englewood, N. J., wash fountains, $1280.
Equipment Co., Detroit, cutters, $4935.
Ex-Cell-O Corp., Continental Tool Works division, Detroit, high speed steel hollow mills, $3580.
Federal Products Corp., Chicago, indicators, $1162.50.
Fellows Gear Shaper Co., Springfield, Vt., gear cutting hobs, $1370.40.
Ferracute Machine Co. Inc., Bridgeton, N. J., measuring equipment, $1939.
Firth-Sterling Steel Co., Philadelphia, dies, $5700.
Frasse, Peter A., & Co., Philadelphia, drill rods, $1821.12.
Gardner Denver Co., Quincy, Ill., air compressors, $16,440.
General Electric Co., Philadelphia, motor starters, $2246.64.
General Engineering & Model Works, Pittsburgh, gages, $1304.
G. M. Mfg. Co. Inc., Long Island City, N. Y., tubes for fuses, $32,158.10.
Greeff, R. W., & Co. Inc., New York, magnesium, $15,650.
Greenfield Tap & Die Corp., Greenfield, Mass., gages, $1874.58.
Gulberson Diesel Engine Co., Chicago, hardware, $1350.54.
Hadley Special Tool Co. Inc., Boston, adapters, $4504.50.
Hanssen's, Louis, Sons, Davenport, Iowa, screws and wrenches, $1301.49.
Hanson-Whitney Co., Hartford, Conn., gages, $19,625.45.
Hardware & Supply Corp., New York, hardware, $3425.
Harnischfeger Corp., Milwaukee, cranes, $10,505.
Heald Machine Co., Worcester, Mass., grinding machines, $9425.
Harshaw Chemical Co., Philadelphia, artillery ammunition, $2345.63.
Homelite Corp., Port Chester, N. Y., generators, $1043.82.
Johns-Manville Sales Corp., New York, corrugated roofing sheets, $1248.06.
Kilby Steel Co., Anniston, Ala., machining shell, $803,000.
Kingsway Plumbing Supply Co., Floral Park, N. Y., steam radiators, $1989.80.
Lake City Malleable Co., Cleveland, thumb nuts, malleable iron or steel castings, $1890.
LaSalle Steel Co., Hammond, Ind., carbon steel, $2130.10.
Lewis, John T., & Bros. Co., Philadelphia, solder, $12,012.
Lincoln Park Tool & Gage Co., Lincoln Park, Mich., gages, $8022.17.
Lindberg Engineering Co., Chicago, furnaces, $6955.
Lloyd & Arms Inc., Philadelphia, internal surface grinding machine, $7744.
Lynch, Edward A., Machinery Co., Philadelphia, brakes, $6130.
Machinery Builders Inc., Long Island City, N. Y., machines, $11,851.14.
Magnus Tool & Die Co., Newark, N. J., anvils, $77,017.80.
Master Metal Products Inc., Buffalo, steel chests, $2946.72.
McKiernan-Terry Corp., Dover, N. J., cutters, $2599.
Merillat Road Supply Co., Monmouth, Ill., parts for tractors, $3584.90.
Micromatic Hone Corp., Detroit, tools, $1730.
Miller Engineering Machine Co., Newark, N. J., assembling machines, $1960.
Modern Tool & Die Co., Philadelphia, gages, $8856.
Morris, Daniel, Co. Inc., New York, wrought iron pipe, $1212.14.
Nasco Awnings Inc., Brooklyn, N. Y., small arms materiel, $3411.03.
National Can Corp., Maspeth plant, Maspeth, Long Island, N. Y., containers, $6433.88.
National Forge & Ordnance Co., Irvine, Pa., steel, $2400.
National Mineral Co., Chicago, cranks, $4506.53.
Niles-Bement-Pond Co., Pratt & Whitney division, West Hartford, Con., drilling machines, gages, $49,927.75.
Norton Co., Philadelphia, wheels, $2577.60.
Nutley Engineering Works, Nutley, N. J., painting machines, $2591.
Parent Metal Products Inc., Philadelphia, steel cabinets, $1504.54.
Parker Rust Proof Co., Detroit, "parkerizing" equipment, $1194.
Peoples Light Co., Davenport, Iowa, material for installing transformers and motor generator set, $2410.59.
Peerless Machine Co., Racine, Wis., hacksaw machines, $1112.60.
Phoenix Mfg. Co., Catasauqua, Pa., forgings, $7273.63.
Poor Co., Canton Forge & Axle Works

division, Canton, O., drop forgings, $1079.39.
Precise Tool & Mfg. Co., Farmington, Mich., gages, $1065.
Putnam Tool Co., Detroit, cutting tools, $3750.
Reliable Tool Co., Irvington, N. J., anvils, tools, $71,731.75.
Rehberger, Arthur, & Son Inc., Newark, N. J., trailers, $3792.
Remington Arms Co. Inc., Bridgeport, Conn., skeet outfits, $2485.
Revere Copper & Brass Inc., Baltimore, brass, $77,200.
R & M Mfg. Co., Royal Oak, Mich., gages, $4258.26.
Rockwell, Stanley P., Co. Inc., Hartford, Conn., furnace, $3525.
Roller-Smith Co., Bethlehem, Pa., milligram balances, $1435.
Rumsey Electric Co., Philadelphia, copper wire, $1000.50.
Ryerson, Joseph T., & Son Inc., Chicago, steel machine brake, $4894.
Seagram Stamping & Mfg. Co., New York City, washers, $1508.
Scovill Mfg. Co., Waterbury, Conn., artillery materiel, $2,197,765.
Scully Steel Products Co., Chicago, carbon steel, $1272.79.
Singer Sewing Machine Co., Bridgeport, Conn., sewing machines, $2350.
Smith & Wesson Inc., Springfield, Mass., small arms materiel, $139,640.
Snap-On Tools Corp., Kenosha, Wis., wrenches, $1008.
Somerville Machine & Foundry Co., Somerville, Mass., bronze castings, $1323.
Standard Gage Co. Inc., Poughkeepsie, N. Y., gage blocks, $1030.
Standard Pressed Steel Co., Jenkintown, Pa., stools, $1422.70.
Stanworth Tool Mfg. Co., Lebanon, Ind., cutters, $1740.
Star Engineering Works, Newark, N. J., drill jigs, $1720.
Sterling Products Co., Chicago, wrenches, $1320.
Stevens Walden Inc., Worcester, Mass., cartridge holders, $6988.80.
Sturtevant, B. F., Co., Springfield, Mass., dust collectors, $2048.
Swind Machinery Co., Philadelphia, shapers, $3065.
Taft-Peirce Mfg. Co., Woonsocket, R. I., gages, $1445.26.
Talon Inc., Meadville, Pa., gages, $3777.75.
Thew Shovel Co., Philadelphia, revolving cranes, $9425.
Thinsheet Metals Co., Waterbury, Conn., cartridge brass, $21,060.
Threadwell Tap & Die Co., Greenfield, Mass., cutters, $24,000.
Thurston Mfg. Co., Providence, R. I., cutting tools, $2109.60.
Timken Roller Bearing Co., Steel & Tube division, Canton, O., steel, $5832.53.
Titeflex Metal Hose Co., Newark, N. J., hardware, $6000.50.
Transue & Williams Steel Forging Corp., Alliance, O., end connections, $6480.
Tools & Gages Inc., Cleveland, gages, $3440.
Torq Electric Mfg. Co., Cleveland, motor drive attachments, $4321.
Trotter, Nathan & Co., Philadelphia, pig tin, $5298.
Union Twist Drill Co., Athol, Mass., cutting tools, $1620.
Unique Specialties Inc., New York, punch guide holders, $3125.
Verduin, John, Machine Corp., Paterson, N. J., machines, $7695.
Vinco Corp., Detroit, gages, $3106.35.
Wallace Supplies Mfg. Co., Chicago, manifold exhausts, $1338.50.
Warner & Swasey Co., Cleveland, tools, $2019.
Weinstein Supply Co., New York, hardware, assemblies, $31,234.11.
Weldon Tool Co., Cleveland, tools, $8938.50.
Wellman Engineering Co., Cleveland, clamshell buckets, $1140.
Western Cartridge Co., Winchester Repeating Arms division, New Haven, Conn., primers, $35,805.
Weston Electrical Instrument Corp., Newark, N. J., ammeters, $1824.50.
Wiedemann Machine Co., Philadelphia, gages, $2221.50.
York Ice Machinery Corp., York, Pa., fire control equipment, $9480.
Zimmerman Steel Co., Bettendorf, Iowa, steel castings, $17,737.44.

Corps of Engineers Awards

Areweld Mfg. Co. Inc., Seattle, hot air heating units, $2920.
Campbell-Norquist & Co., Portland, Oreg., fuel oil burners, $2711.70.
Clyde Equipment Co., Seattle, air compressors, receiver tanks, $11,692.
Couse & Saunders, Detroit, Construction of water system, sewer system and gas mains for the U. S. Army Air Corps cantonment, Ft. Wayne Airport, Allen county, Indiana, $293,011.50.
Finkbeiner, E. A., Portland, Oreg., boiler feed pump units and condensate pump assembly, $3480.
Foote Co. Inc., Nunda, N. Y., paver, $9730.
Graybar Electric Co., Portland, Oreg., parkway cable, $4652.24.
Hobart Mfg. Co., Portland, Oreg., kitchen equipment, $9989.31.
International General Electric Co. Inc., New York, generator set, $8043.37.
Longwill-Scott Inc., St. Louis, construction of a railroad spur, Jefferson barracks, St. Louis, $19,974.
Marhoefer, E. H., Jr., Co., Chicago, construction of sewage disposal plant and sewage pumping plant, Brookley field, Mobile, Ala., and sewage disposal plant at Eglin field, Valparlso, Fla., $65,930.
McGowin-Lyons Hardware & Supply Co., Mobile, Ala., electric cable and equipment, $7628.21.
National Cast Iron Pipe Co., Birmingham, Ala., cast iron water pipe, $2730.58.
Northwest Stove Works Inc., Portland, Oreg., hot air heating units, $7952.25.
Pittsburgh Water Heater Co., San Francisco, gas water heaters, $2167.74.
Sawtooth Co., Boise, Idaho, diesel oil storage tanks, $6141.24.
Starkweather Engineering Co. Inc., Newtonville, Mass., furnishing and installing pumping equipment for booster pumping station, Bangor airport, Bangor, Me., $5100.
Todd-Johnson Dry Docks Inc., New Orleans, repairing U. S. Dredge Gulfport, $3312.07.
Warnard Constructors Inc., Dorchester, Mass., construction of Circuit avenue pumping station, Westfield river, West Springfield, Mass., $32.198.
Whitney, J. O., Portland, Oreg., hot air heating units, $2771.92.

Signal Corps Awards

American Radio Hardware Co. Inc., New York, keys, $1020.80.
Auth Electrical Specialty Co. Inc., New York, annunciators, $607.60.
Bendix Aviation Corp., Julian P. Friez & Sons division, Baltimore, bearings, $900.
Boston & Lockport Block Co., East Boston, Mass., aerial cable cars, $720.
Cornelius, H. M., Co., Garwood, N. J., rings, $622.69.
Edison, Thomas, Inc., West Orange, N. J., code transmitters and recorders, $16,740.
Federal Stamping & Engineering Co., Brooklyn, N. Y., connector clamps, $6300.
Indiana Steel & Wire Co., Muncie, Ind., wire, $722.06.
Joslyn Co., Cleveland, rings, $1260.
Lundquist Tool & Mfg. Co., Worcester, Mass., parts for reels, $59,481.
O'Leary, Arthur J., & Son Co., Chicago, anchor rods, $830.79.
Roebling's, John A., Sons Co., Trenton, N. J., cable, $1343.25.
Roller Smith Co., Bethlehem, Pa., ammeters, $950.
United States Motor Corp., Oshkosh, Wis., power units, $72,555.

Coast Artillery Awards

Smith-Courtney Co., Richmond, Va., 16-inch metal shaping machine, $3090.48.

Medical Corps Awards

Case Crane & Kilbourne Jacobs Co., Columbus, O., platform trucks, $10,356.
Ideal Restaurant Supply Co., New York, toasters, $635.10.
Kelley Koett Mfg. Co. Inc., New York, X-ray equipment, $177,450.
National Mfg. Corp., New York, hospital beds, $129,615.

Quartermaster Corps Awards

Giles Drilling Corp., New York, wash borings, army base, Boston, $11,996.16.
Hammond, Alonzo J., Chicago, engineering consulting services, various posts and stations, $2000.
Jansson, John A., Great Neck, N. Y., construction and completion of office building, national cemetery, Pine Lawn, L. I., N. Y., $10,794.
Larsen, C. W., Seattle, construction of additions and repairs, South Pier, Seattle QM depot, $128,300.
Otis Elevator Co., Boston, alterations to freight elevator No. 1 Army base, Boston, $3030.
Packard Motor Car Co., Detroit, medium sedan cars, $7199.82.
Smith, A., & Co. of Illinois, Chicago, construction of 14 temporary hospital buildings and utilities pertaining thereto, Ft. Sheridan, Ill., $225,750.
Twaits, Ford J., & Morrison-Knudsen Inc., Los Angeles, Ft. Ord, California, standard ordnance shop, $67,370.

Air Corps Awards

Bendix Aviation Corp., Pioneer Instrument division, Bendix, N. J., gage and indicator assemblies, maintenance parts, $308,479.23.
Buffalo Forge Co., Buffalo, centrifugal fan cooling system, Wright field, Dayton, O., $88,043.
Galion Iron Works & Mfg. Co., Galion, O., road rollers, $70,119.
General Electric Supply Corp., Dayton, O., fluorescent lamp fixtures, $24,454.10.
Gosiger, C. H., Machinery Co., Dayton, O., drill presses, $23,800.
Moore Eastwood & Co., Dayton, O., post assemblies, generators, $66,209.
Plomb Tool Co., Los Angeles, tools, $40,661.44.

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Navy Department announced the following:

Bureau of Yards and Docks Awards

Daddario, A. D., Mattapan, Mass., sewer, drainage and water systems for Navy Yard housing development at Kittery, Me., $77,180.
Herman, Charles, Contracting Co., New York, remodeling main building and ward buildings at hospital, Naval Academy, Annapolis, Md., $91,930.
Kaufman Construction Co., Philadelphia, repairs to sea wall at Naval Academy, Annapolis, Md., $68,400.
MacDougald Construction Co., Charleston, S. C., extension of piers, Charleston Navy Yard, on cost plus fixed fee basis, $718,000.

Shipbuilding Facilities Expansions

American Bosch Co., Providence, R. I., $825,000.
Busch-Sulzer Bros., St. Louis, $215,000.
Tampa Shipbuilding Co., Tampa, Fla., $238,800.

Ordnance

Ford Instrument Co. Inc., Long Island City, N. Y., ordnance equipment, $1,587,350.

Bureau of Supplies and Accounts Awards

Aldrich Pump Co., Allentown, Pa., seawater pumps, $8892.
American Brass Co., Waterbury, Conn.,

copper pipe and tubing, $66,879.08.
American Brass Co., Waterbury, Conn., copper-nickel-alloy tubing, $162,590.93.
American Chain & Cable Co. Inc., Bridgeport, Conn., valves, wire rope, $79,514.60.
American Steel & Wire Co., Cleveland, corrosion-resisting bar steel, cable, nails, $138,907.91.
Anaconda Wire & Cable Co., New York, electric cable, $592,649.93.
Anderson, Dorsey C., Philadelphia, arc welding machines, $14,130.
Argo Lamp Co., Philadelphia, floor lamps, $13,859.37.
Baker-Raulang Co., Cleveland, electric crane truck, $8545.
Baldt Anchor, Chain & Forge Co., Chester, Pa., anchor chains, $48,137.50
Bantam Bearings Corp., South Bend, Ind., steel roller bearings, $5216.
Bendix Aviation Corp., Marine division, Brooklyn, N. Y., equipment, $11,620.
Boston Insulated Wire & Cable Co., Boston, electric cable, $61,823.49.
Chapman Valve Mfg. Co., Indian Orchard, Mass., steel gate valves, $19,975.
Chase Brass & Copper Co., Waterbury, Conn., copper and brass pipe and tubing, $223,448.04.
Cincinnati Shaper Co., Cincinnati, squaring power shear, $18,980.
Collyer Insulated Wire Co., Pawtucket, R. I., electric cable, $129,593.37.
Columbia Steel Co., San Francisco, steel wire nails, $8718.50.
Crane Co., Chicago, pipe fittings and composition unions, valves, $272,572.46.
Crucible Steel Co. of America, New York, alloy bar steel, $11,442.23.
Danforth, Richard S., Berkeley, Calif., 100-pound anchors, $21,350.
Debevoise-Anderson Co. Inc., New York, coke: grade "B," sizes 1 & 3; grade "A," size 1, $14,603.20.
Diamond Power Specialty Corp., Detroit, boiler water gages, $38,160.60.
Dravo Corp., Pittsburgh, steel bents, $85,700.
Electric Storage Battery Co., Philadelphia, storage batteries, and spare parts, $279,994.10.
Elwell-Parker Electric Co., Cleveland, trucks, $12,677.
Engineering & Research Corp., Riverdale, Md., blades and propellers, $76,000.
Gardner-Denver Co., Quincy, Ill., low pressure air compressors, $16,341.51.
General Electric Co., Schenectady, N. Y., electric cable, diesel locomotive, $329,075.69.
Gisholt Machine Co., Madison, Wis., dynamic balancing machine, $11,350.
Gray, G. A., Co., Cincinnati, openside planer, $32,510.
Graybar Electric Co. Inc., New York, pin shackles, $83,413.75.
Jones & Laughlin Steel Corp., Pittsburgh, steel wire nails, $18,020.63.
LeBlond, R. K., Machine Tool Co., Cincinnati, medium duty lathes, $37,345.
Lidgerwood Mfg. Co., Elizabeth, N. J., diesel, engine driven diesel winches, $73,229.
Lietz, A., Co., San Francisco, magnetic boat compasses, $7200.
Lights Inc., Alhambra, Calif., motor boat bells, $39,060.
Maine Steel Inc., South Portland, Me., pin shackles, $22,921.60.
McKissick Products Corp., Tulsa, Okla., wire rope blocks, $19,338.
Monarch Machine Tool Co., Sidney, O., precision lathes, $42,474.
Mcund Tool Co., St. Louis, packing, extracting packing tools, $15,191.50.
National Electric Products Corp., Pittsburgh, electric cable, $52,810.90.
Ohio Pattern Works & Foundry Co., Cincinnati, hand bilge pumps, $10,464.
Okonite Co., Passaic, N. J., electric cable, $73,850.30.
Pacific Wire Rope Co., Los Angeles, steel wire rope, $31,997.40.
Phelps Dodge Copper Products Corp., New York, seamless brass pipe, cable,

(*Please turn to Page* 47)

PURCHASES UNDER WALSH-HEALEY ACT

(Week Ended March 22)

Iron and Steel Products

	Commodity	Amount
Aermotor Co., Chicago	Triangulation tower	$13,022.00
Air Associates Inc., Bendix, N. J.	Bolts	15,374.38
Alexander, Lester F., Co., New Orleans	Steel barges	90,000.00
American Bridge Co., Pittsburgh	Parts for river locks	10,471.00
American Forge Division, Chicago	Shell, forging	440,000.00
American Rolling Mill Co., Middletown, O.	Steel	60,513.30
American Steel & Wire Co., Cleveland	Cable, springs	26,027.50
Appleton Electric Co., Chicago	Couplings	47,246.25
Atwood & Morrill Co., Salem, Mass.	Globe stop valves	10,042.00
Barnes Mfg. Co., Mansfield, O.	Pipe flanges	82,686.30
Bethlehem Steel Co., Bethlehem, Pa.	Steel wire rope	23,839.74
Borg-Warner Corp., Chicago	Cartridge cases	7,960,500.00
Briggs & Stratton Corp., Milwaukee	Fuses	1,174,210.00
Carnegie-Illinois Steel Corp., Pittsburgh	Steel sheets	82,771.64
Chicago Roller Skate Co., Chicago	Boosters	995,807.82
Clark Controller Co., Cleveland	Junction box straps	228,762.50
Cole, R. D., Mfg. Co., Newman, Ga.	Buoy bodies	32,250.00
Columbia Steel & Shafting Co., Pittsburgh	Bar steel	21,647.55
Commercial Acetylene Supply Co. Inc., New York	Empty cylinders	14,500.08
Continental Steel Corp., Kokomo, Ind.	Terne plate	45,816.00
Crane Co., Chicago	Valves	115,395.20
Cruse-Kemper Co., Ambler, Pa.	Anchor, track assemblies	22,330.50
Cuyahoga Steel & Wire Co., Cleveland	Steel	12,117.79
Economy Fuze & Mfg. Co., Chicago	Fuses	605,505.00
Electric Household Utilities Corp., Hurley Machine Division, Cicero, Ill.	Boosters	776,141.53
Eureka Vacuum Cleaner Co., Detroit	Brass ferrules	19,200.00
Federal Screw Works, Detroit	Fuse parts	232,725.00
Frost Co., Kenosha, Wis.	Cartridge cases	301,696.00
General Motors Corp., Guide Lamp Division, Anderson, Ind.	Ammunition—cartridge cases	4,872,900.00
Grabler Mfg. Co., Cleveland	Iron pipe fittings	85,908.67
Hunt, J. B., & Sons, Raleigh, N. C.	Joints, bars, wires	13,630.35
LaClede Steel Co., St. Louis	Steel tubing	110,183.20
Lyon Metal Products Inc., Aurora, Ill.	Benches, tool boxes	41,358.30
Manning, Maxwell & Moore Inc., Bridgeport, Conn.	High pressure valves	25,154.60
Mercer Steel Co. Inc., Portland, Oreg.	Wire mesh sheets	13,578.00
Mine & Smelter Supply Co., Denver	Thin wall tubing	51,320.00
Moline Forge Inc., Chicago	Shell, forging	496,000.99
National Cash Register Co., Dayton, O.	Fuses	174,000.00
Norris Stamping & Mfg. Co., Los Angeles	Cartridge cases	51,600.00
North American Iron & Steel Co. Inc., Brooklyn, N. Y.	Booms, cargo	15,120.00
Oklahoma Drainage Products Co., Oklahoma City, Okla.	Coated metal pipe	18,644.20
Paulson Tools Inc., Wallingford, Conn.	Chisels	10,264.00
Pressed Steel Car Co., Chicago	Shell, forging	2,191,000.00
Revere Copper & Brass Inc., Chicago	Cartridge cases	2,235,200.00
Rheem Mfg. Co., Chicago	Bodies, fins	3,174,269.50
Roebling's, John A., Sons Co., Trenton, N. J.	Wire rope	19,425.40
Russakov Can Co., Chicago	Bodies, fins for bombs	129,000.00
Simplex Wire & Cable Co., Cambridge, Mass.	Shore-use cable	16,641.00
Smith, A. O., Corp., Milwaukee	Bomb bodies	3,561,500.00
Snap-On Tools Corp., Kenosha, Wis.	Wrenches	26,250.00
Stewart-Warner Corp., Chicago	Fuses	2,798,983.00
Taylor, S. G. Chain Co., Hammond, Ind.	Chain, fittings	17,072.29
Thatcher Furnace Co., Newark, N. J.	Coal burning furnaces	172,830.00
Titan Metal Mfg. Co., Bellefonte, Pa.	Plungers for fuses	37,596.00
Truscon Steel Co., Youngstown, O.	Hangar doors	35,616.00
Washington Corrugated Culvert Co., Seattle	Culverts, fittings	39,276.28
Weaver Mfg. Co., Springfield, Ill.	Towing bars	11,508.00
Williams, J. H., & Co., New York	Wrenches, clamps	10,100.00
Winner Mfg. Co. Inc., Trenton, N. J.	Buoys	20,823.00
Wire Rope Corp. of America Inc., New Haven, Conn.	Wire rope	87,323.00
Wire Rope Mfg. & Equipment Co., Seattle	Wire rope	16,920.00

Nonferrous Metals and Alloys

American Brass Co., Waterbury, Conn.	Bronze hose, copper-nickel-alloy tubing	$172,907.95
Anaconda Sales Co., New York	Slab zinc	12,375.00
Chase Brass & Copper Co. Inc., Waterbury, Conn.	Timing disks	13,875.00
Elgin National Watch Co., Elgin, Ill.	Timers	11,025.00
General Electric Supply Corp., Dayton, O.	Lamp assembly	24,479.00
New Jersey Zinc Sales Co, Inc., New York	Zinc, plates, rolled	19,415.19
Reed & Barton Corp., Taunton, Mass.	Tableware	51,502.00
Revere Copper & Brass Inc., Baltimore	Naval brass, tubes	163,070.45
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	Airport lighting materials	19,640.30

Machinery and Other Equipment

American Brake Shoe & Foundry Co., Rochester, N. Y.	Compressors	$27,486.23
American Car & Foundry Co., New York	Flat cars	31,500.00
American Laundry Machinery Co., Cincinnati	Laundry equipment	81,749.00
American Machine & Metals Inc., East Moline, Ill.	Laundry equipment	273,277.70
Armstrong Cork Co., Pittsburgh	Machining shell	414,750.00
Bendix Aviation Corp., South Bend, Ind.	Air pumps, shell	140,634.50
Bryant Machinery & Engineering Co., Chicago	Drilling machines	12,902.00
Buda Co., Harvey, Ill.	Diesel engines, parts	27,963.63

Machinery and Other Equipment

	Commodity	Amount
Case, J. I., Co., Racine, Wis.	Shell, forging, machining	$4,696,038.10
Caterpillar Tractor Co., Peoria, Ill.	Tractors	92,162.47
Chambersburg Engineering Co., Chambersburg, Pa.	Stamping machines	12,905.00
Clark Equipment Co., Battle Creek, Mich.	Lift trucks	12,510.66
Climax Engineering Co., Clinton, Iowa	Generating plants	21,399.00
Cline, F. D., Raleigh, N. C.	Paving equipment	59,108.00
Clyde Iron Works Inc., Duluth, Minn.	Winches	33,600.00
Columbian Iron Works, Chattanooga, Tenn.	Machining shell	1,035,480.00
Condenser Service & Engineering Co. Inc., Hoboken, N. J.	Air ejectors	68,207.00
Consolidated Machine Tool Corp., Rochester, N. Y.	Planer	167,470.00
Continental Motors Corp., Muskegon, Mich.	Baffle, bars, shafts	119,596.85
Copeland Refrigeration Corp., Sidney, O.	Mortuary cabinets	15,562.00
Cummings Machine Works, Boston	Testing fixtures	35,700.00
Curtis Mfg. Co., St. Louis	Air compressors	30,951.04
Dana Tool-D. Nast Machinery Co., Philadelphia	Chain hoists	44,850.00
Dillon Supply Co., Raleigh, N. C.	Drill presses; lathe	12,950.00
Dixie Mill Supply Co. Inc., New Orleans	Cast iron pipe	10,537.32
Duro Metal Products Co., Chicago	Motor maintenance equipment	65,270.00
Earle Gear & Machine Co., Philadelphia	Racks, pinions	53,520.00
Electric Wheel Co., Quincy, Ill.	Trailers	74,500.00
Ellis Drier Co., Chicago	Extractors, ironers	28,816.00
Essley, E. L., Machinery Co., Chicago	Milling machines, shapers	78,916.00
Galion Iron Works & Mfg. Co., Galion, O.	Road rollers	70,119.00
General Motors Corp., Chevrolet division, Detroit	Tractor-trucks	112,350.49
General Motors Corp., Cleveland Diesel Engine Division, Cleveland	Diesel engines, parts	55,846.27
Giddings & Lewis, Fond du Lac, Wis.	Boring machines	8,012,500.00
Hanson-Whitney Machine Co., Hartford, Conn.	Gages	10,708.80
Hardinge Brothers Inc., Elmira, N. Y.	Horizontal milling machines	10,129.75
Harnischfeger Corp., Milwaukee	Crane	10,805.00
Homelite Corp., Port Chester, N. Y.	Portable power plants	41,975.00
Hunter, C. Kenneth, trustee of the estate of Johnson Fare Box Co., Chicago	Sight assemblies	12,979.20
Hydraulic Press Mfg. Co., Mount Gilead, O.	Machine, forging, press	26,499.00
International Harvester Co., Chicago	Shells, forging machining	2,054,400.00
Interstate Brake Testing Machine Co., Los Angeles	Brake shoe grinder	16,170.00
Kilby Steel Co., Anniston, Ala.	Spike, star cutters	155,415.37
Leece-Neville Co., Cleveland	Parts, diesel engines	147,575.20
LeTourneau Co. of Georgia, Toccoa, Ga.	Shell machining	5,876,250.00
Lidgerwood Mfg. Co., Elizabeth, N. J.	Boat winches	91,876.00
Lincoln Park Tool & Gage Co., Lincoln Park, Mich.	Gages	12,572.02
Link Belt Co., Chicago	Antiaircraft guns	212,000.00
Lummus Co., New York	Air ejectors	38,597.44
McCoy, F. W., Co., Denver	Tractor trucks	45,170.00
Machinery & Specialties Inc., Dayton, O.	Power hack saw	24,140.00
Mahr Mfg. Co., Minneapolis	Car bottom type furnace	10,530.00
Manning, Maxwell & Moore Inc., Bridgeport, Conn.	Signal assemblies	57,500.00
Marshall & Huschart Machine Co., Chicago	Straightening press	14,505.00
Mathews Conveyer Co., Ellwood City, Pa.	Filling machines	14,118.40
Meili-Blumberg Corp., New Holstein, Wis.	2-wheel trailers	27,920.00
Metal Specialty Co., Cincinnati	Adapter booster assemblies	565,972.00
Minneapolis-Moline Power Implement Co., Minneapolis	Tractors	20,315.14
Morse Chain Co., Detroit	Diesel engine parts	129,970.00
Northern Pump Co., Minneapolis	Pumping units, tools, parts	26,792.00
Norton Co., Worcester, Mass.	Grinders	13,990.00
Outboard, Marine & Mfg. Co., Waukegan, Ill.	Outboard motors	52,656.33
Pacific Marine Supply Co., Seattle	Portable pumps	16,316.25
Pacific States Cast Iron Pipe Co., Provo, Utah	Pipe & fittings	35,428.97
Pennsylvania Pump & Compressor Co., Easton, Pa.	Air compressors	11,007.00
Prescott Co., Menominee, Mich.	Shell machines	27,000.00
Proctor & Schwartz Inc., Philadelphia	Clothing processing plants	91,652.46
Prosperity Co. Inc., Syracuse, N. Y.	Laundry presses	30,240.05
Pullman-Standard Car Mfg. Co., Chicago	Shell	1,575,280.00
Remington Rand Inc., Buffalo	Key punches, sorters	37,121.11
Rooksby, E. J., & Co., Philadelphia	Portable boring bars	28,865.00
Sellers, Wm., & Co. Inc., Philadelphia	Plate planer	79,400.00
Shipley, W. E., Machinery Co., Philadelphia	Case turning machine	10,555.00
Singer Sewing Machine Co., New York	Sewing machines	10,010.00
Smith Drum & Co., Philadelphia	Laundry ironers	25,824.00
Speed Dump Inc., New York	Hoists, buckets	27,200.00
Tuthill Pump Co., Chicago	Shell	196,140.00
Tyson Roller Bearing Corp., Massillon, O.	Bearings	17,640.00
Union Twist Drill Co., Athol, Mass.	Drills	17,370.00
United States Pipe & Foundry Co., Philadelphia	Cast iron pipe	10,500.00
Vickers Inc., Waterbury, Conn.	Hydraulic pumps, motors	40,361.00
Vinco Corp., Detroit	Gages	20,235.50
Walworth Co. Inc., Chicago	Shell machining	2,088,360.00
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	Forced draft blowers	2,091,093.20
Williams, White & Co., Moline, Ill.	Rotary shear	13,450.00
Worthington Pump & Machinery Corp., Harrison, N. J.	Air compressors	406,768.00

Defense Awards

(*Concluded from Page* 46)

$194,686.46.
Pittsburgh Steel Co., Pittsburgh, steel boiler tubes, $84,214.84.
Prentiss, Henry, & Co. Inc., New York, universal turret lathe, $8793.
Republic Steel Corp., Cleveland, Steel & Tubes division, steel conduit pipe, $77,307.60.
Revere Copper & Brass Inc., Baltimore, seamless brass and copper pipe, $78,682.
Reynolds Metal Co., Louisville, Ky., soft ribbon aluminum, $7640.
Rockbestos Products Corp., New Haven, Conn., electric cable, $36,149.30.
Rockford Machine Tool Co., Rockford, Ill., openside hydraulic, motor-driven planers, $38,034.
Roebling's, John A., Sons Co., Trenton, N. J., jackstays, pendants, rope and beckets, $85,074.69.
Schutte & Koerting Co., Philadelphia, positive displacement pumps, $11,617.92.
Shipley, W. E., Machinery Corp., Philadelphia, surface grinder, $8740.
Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., grade "A," size 1, coke, $7546.50.
Sperry Gyroscope Co. Inc., Brooklyn, N. Y., equipment, $157,314.15.
Stone Heating & Ventilating Co., Washington, electric ventilating fans, $23,835.
Struthers Wells Titusville Corp., Titusville, Pa., gears, $635,742.
Sturtevant, B. F., Co., Boston, blowers, spare parts, $8052.
Tynes, Hardie, Mfg. Co., Birmingham, Ala., high pressure, motor driven compressors, $43,838.
Union Wire Rope Corp., Kansas City, Mo., steel wire rope, $53,949.20.
Vollrath Co., Sheboygan, Wis., ladles, skimmers, turners, spoons, $33,490.
Warner & Swasey Co., Cleveland, turret lathes, $54,912.
Wiegand, Edwin L., Co., Pittsburgh, electric heaters, and spare parts, $9902.
Willard Storage Battery Co., Cleveland, storage batteries, $92,825.
Williams, White & Co., Moline, Ill., self-contained rotary shears, $9200.
Wire Rope Corp. of America Inc., New Haven, Conn., towing hawsers, $235,308.60.

Tungsten Ore Deposit Discovered in Idaho

■ A deposit of high-grade tungsten ore has been discovered in the Yellow Pine district, Valley county, Idaho, by Bureau of Mines engineers and Geological Survey geologists. The district has been well known for its antimonial gold ores, but not previously known to contain tungsten ores.

Maximum dimensions of the deposit have not yet been determined and no estimate of the reserve tonnage of this strategic mineral is yet available. However, it is indicated the discovery may be one of considerable importance.

■ Mounting volume of construction for national defense was accompanied by a 5 per cent increase in average factory building costs during the first three months of 1941, according to the quarterly index compiled by The Austin Co., engineers and builders, Cleveland.

Humanity's "Balance" Reflected In Nearly Every Balance Sheet

■ United States Steel Corp. reports that income received for goods and services sold in 1940 amounted to $1,081,000,000. This approximates the $1,094,000,000 income reported for 1929 so closely that the two years are admirably suited for comparisons.

The distribution of each $100 of income in the two years is as follows:

	1940	1929
Goods and services purchased	**$34.22**	**$31.38**
Depreciation, depletion	**6.57**	**5.78**
Taxes	**7.86**	**5.03**
Interest paid	**1.30**	**1.36**
Wages and salaries	**40.62**	**38.40**
Dividends paid	**5.55**	**8.13**
Retained for surplus	**3.88**	**9.92**
Totals	**$100.00**	**$100.00**

This comparison, which unquestionably is typical of the experience of hundreds of American industrial corporations, is significant in that it shows clearly the trend in the gradual shifting of the disposition of the rewards of private enterprise that has been going on for half a century.

Note that the public, by way of its local, state and federal government taxes, received $7.86 of each $100 of income in 1940, as compared with $5.03 in the good year of 1929. In 1902 only 55 cents of each $100 of income went for taxes. In 1941 United States Steel probably will pay out $10 or $15 in taxes for each $100 of income.

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Employes who are paid by the month, week or hour take a steadily increasing share of the income. In 1902 they received $28.54 per $100 of income. In 1929 their share was $38.40; in 1940 it was $40.62. It is likely to be higher in 1941.

These gains for the public and for employes have been at the expense of the holders of stocks and bonds of the corporation. In 1902, these individuals received from each $100 of income $5.05 in interest and $13.26 in dividends, and $8.13 went back into their properties for future needs —a total of $26.44. In 1929 the corresponding items were $1.36, $8.13 and $9.92—a total of $19.41. In 1940 they were $1.30, $5.55 and $3.88—aggregating $10.73.

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Here in a nutshell we see evidence of the tremendous conflict which right now threatens to wreck the world.

In Europe and Asia the countries whose people have been persuaded that they are entitled to a larger share of the world's goods are striving by force to take their alleged share from those who now possess it.

In America, those who work for salaries and wages and the public at large are striving—thus far by peaceful methods—to take a larger percentage of the fruits of the combined earnings of capital and labor. In a broad sense, individuals living on current earnings are seeking higher compensation and it is being taken out of the return on money that has been earned, saved or inherited by others.

It is the old battle of the "have-nots" against the "haves." Both groups have erred grievously. May we hope that each will come to its senses before the system that has rewarded both so handsomely is wrecked beyond repair!

E. L. Ohaver

EDITOR-IN-CHIEF

The BUSINESS TREND

Index Average for March Reaches New Peak Level

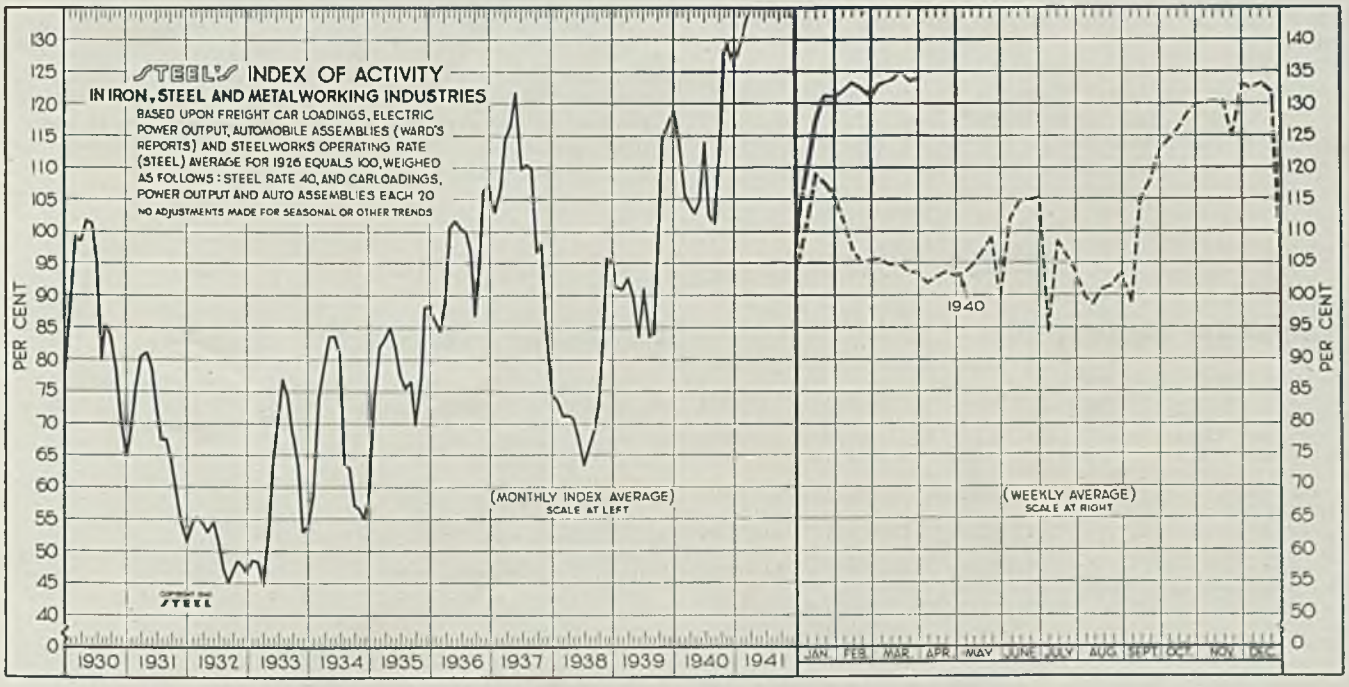
■ PACE of industrial activity continues to edge upward in some lines, while in others operating schedules are limited by the already achieved capacity level. The large volume of incoming business continues to augment record breaking order backlogs in most industrial lines. In an increasingly number of instances, deliveries cannot be had until early 1942.

Reflecting this steady inflow of incoming business and the large order backlogs accumulated in recent months, industrial activity in the iron, steel and metalworking industries was well sustained at the all-time peak during March.

STEEL'S weekly index average for March climbed to a new monthly peak of 133.9. This represents a gain of 1.6 point over the preceding record high registered during February. In March a year ago the index averaged 104.1, while in the comparable periods of 1939, 1937 and 1929 it was 92.6, 114.4 and 114.8 respectively.

For the week ended March 29, STEEL'S index gained 0.4 point to 133.9. In the same week a year ago it stood at 103.2. During the last nine weeks the index has fluctuated narrowly between the 131 and 135 level.

During March new production records for the period occurred in automobile production and steelmaking operations. In the latter instance a new all-time peak



STEEL'S index of activity gained 0.4 point to 133.9 in the week ended March 29:

Week Ended	1941	1940
Jan. 18	130.8	117.3
Jan. 25	130.7	115.4
Feb. 1	132.0	111.6
Feb. 8	132.7	107.2
Feb. 15	132.3	105.1
Feb. 22	131.2	105.4
March 1	133.0	105.6
March 8	133.1	104.7
March 15	135.0	104.9
March 22	133.5†	103.7
March 29	133.9	103.2

†Revised.

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	.....	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7
May	.....	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2
June	.....	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8
July	.....	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

was established. Revenue freight traffic expanded contraseasonally last month to reach the highest March total recorded since 1930. Reflecting the high level of industrial production, electric power output resisted the normal seasonal decline recorded during March.

The numerous industrial expansion programs now underway should lift industrial output to new record levels during the coming months. Private construction awards in the latest period were more than three times as large as recorded at this time a year ago. It is estimated by the Department of Commerce that

Where Business Stands

Monthly Averages, 1940 = 100

	Feb., 1941	Jan., 1941	Feb., 1940
Steel Ingot Output	121.9	122.3	85.3
Pig Iron Output	118.0	117.5	88.9
Building Construction	81.0	91.5	60.1
Auto Output	130.2	134.0	108.0
Freight Movement	102.5	97.3	88.1
Wholesale Prices	102.7	102.9	100.3

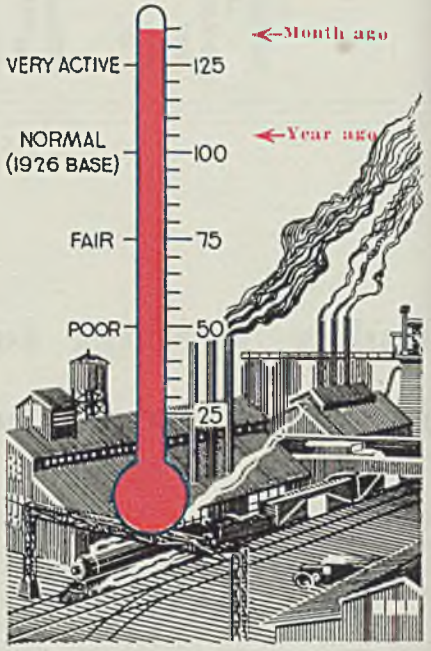
during the first three months of this year plant and equipment expansion, including both public and private, exceeded that of any previous quarter in our history. The department states that if the present high rate of expansion should continue through 1941 our defense effort in this field will involve three and a half billion dollars annually. This would be one billion dollars more than at the peak of the 1914-1918 World war period.

A survey recently completed by the National Industrial Conference board shows a steady upward trend in new orders and inventories. New orders during February, the latest month for which official figures are available, were 5 per cent above the January

Industrial Weather

TREND:

Sidewise



volume. Comparison with the February, 1940, figure shows a gain of 103 per cent. Manufacturers' inventories increased 1.8 per cent over the January level and were 14.5 per cent above the previous February total. Shipments during February were off slightly due to the short month, but were 39 per cent greater than in the comparable 1940 month.

Reflecting the current high level of industrial activity, railroad freight traffic this quarter is expected to gain 14.9 per cent over the like 1940 period. In almost every section of the country carloadings are moving in the greatest volume for this season in more than a decade. Railroad earnings are expected to benefit accordingly.

The Barometer of Business

Industrial Indicators

	Feb., 1941	Jan., 1941	Feb., 1940
Pig iron output (daily average, tons)	151,127	150,524	113,943
Iron and steel scrap consumption (tons)	4,172	4,278	2,812
Gear Sales Index	262	259	116
Foundry equipment new order index	281.1	285.3	135.7
Finished steel shipments (Net tons)	1,548,451	1,682,454	1,009,256
Ingot output (average weekly; net tons)	1,562,603	1,567,288	1,093,512
Dodge bldg. awards in 37 states ($ Valuation)	$270,373,000	$305,205,000	$200,574,000
Automobile output	509,233	524,126	422,225
Bituminous coal output, tons	4,430,000	4,977,000	3,546,000
Business failures; number.	1,129	1,124	1,042
Business failures; liabilities	$13,438,000	$11,888,000	$13,472,000
U. S. Dept. of Labor—Employment, Nonagricultural (000 omitted)	*36,584	36,319	34,381
Cement production, bbls.	8,368,000	9,025,000	5,041,000
Cotton consumption bales.	793,626	843,274	661,771
Car loadings (weekly av.)	716,634	690,884	616,067

*Preliminary.

Commodity Prices

	Feb., 1941	Jan., 1941	Feb., 1940
STEEL'S composite average of 25 iron & steel prices	$38.22	$38.38	$36.97
U. S. Bureau of Labor's index	80.6	80.8	78.7
Wheat, cash (bushel)	$0.888	$0.915	$1.10
Corn, cash (bushel)	$0.69	$0.69	$0.663

Financial Indicators

	Feb., 1941	Jan., 1941	Feb., 1940
30 Industrial Stocks‡	121.86	130.17	146.33
20 Rail stocks‡	27.58	29.01	30.41
15 Public Utilities stocks‡	19.53	20.17	24.11
Bank clear'gs† (000 omitted)	$26,155,000	$27,862,000	$24,140,000
Commercial paper rate (N. Y., per cent)	½–⅝	½–⅝	½–⅝
*Com'l. loans (000 omitted)	$9,495,000	$9,308,000	$8,528,000
Federal Reserve ratio (per cent)	91.0	91.0	87.5
Capital flotations (000 omitted)			
New Capital	$77,056	$95,321	$104,167
Refunding	$264,381	$321,876	$347,620
Federal Gross debt (mil. of dol.)	$46,090	$45,877	$42,375
Railroad earnings†	$62,357	$78,791	$46,013
Stock sales, New York stock exchange	8,969,195	13,312,960	13,469,355
Bond sales,† par value ($1,000,000)	$230.8	$211.2	$145.1

‡Dow-Jones series.

*Leading member banks Federal Reserve System.

†January, December, January.

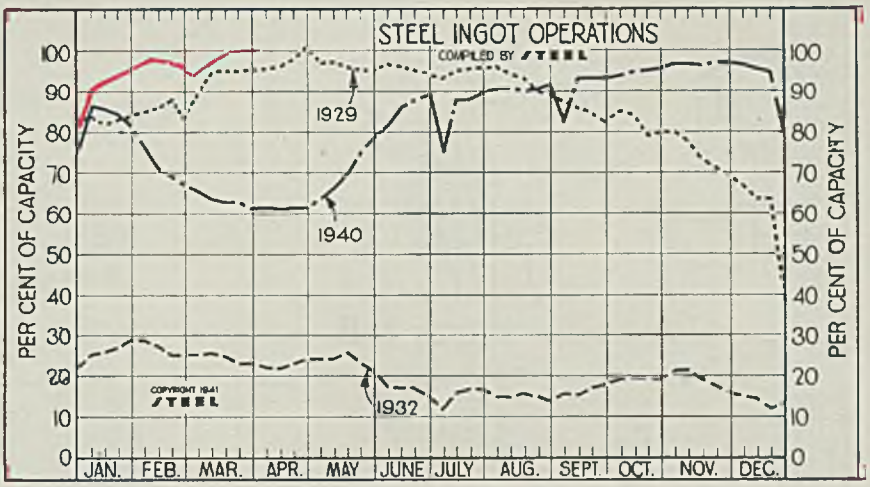
Foreign Trade

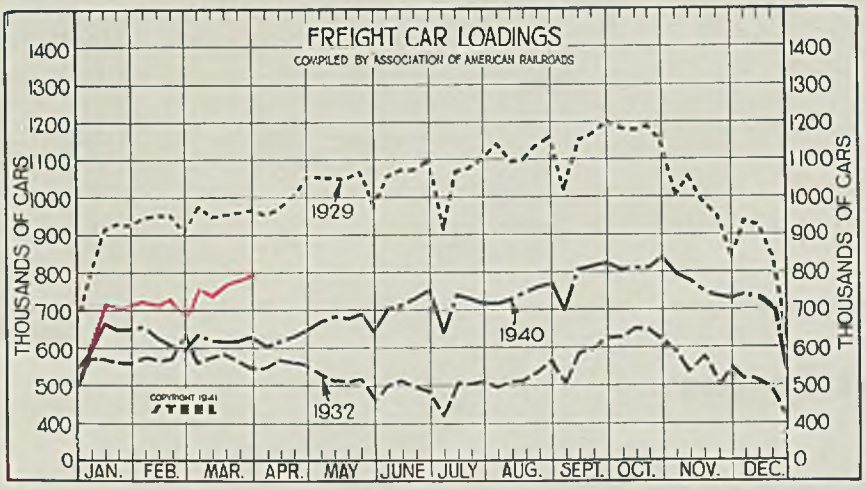
	Feb., 1941	Jan., 1941	Feb., 1940
Exports (000)	$303,413	$325,355	$347,106
Imports (000)	$233,702	$288,671	$200,068
Gold exports	$6,000	$4,000	$53,000
Gold imports (000)	$108,615	$234,246	$201,475

Steel Ingot Operations

(Per Cent)

Week ended	1941	1940	1939	1938
March 29 . .	99.5	61.0	54.5	36.0
March 22 . .	99.5	62.5	55.5	35.0
March 15 . .	98.5	62.5	56.5	32.0
March 8 . . .	97.5	63.5	56.5	30.0
March 1 . . .	96.5	65.5	56.0	29.5
Feb. 22	94.5	67.0	55.0	30.5
Feb. 15	96.5	69.0	55.0	31.0
Feb. 8	97.0	71.0	54.0	30.0
Feb. 1	97.0	76.5	53.0	31.0
Jan. 25	95.5	81.5	51.5	33.0
Jan. 18	94.5	84.5	51.5	30.5
Jan. 11	93.0	86.0	52.0	29.0
Jan. 4	92.5	86.5	51.5	26.0
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28	80.0	75.5	40.0	21.0
Dec. 21	95.0	90.5	52.0	23.0
Dec. 14	95.5	92.5	58.0	27.0





Freight Car Loadings

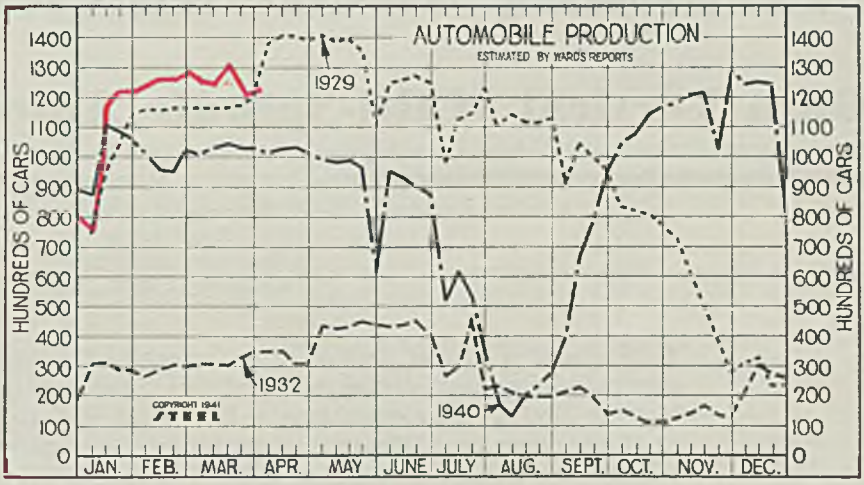
(1000 Cars)

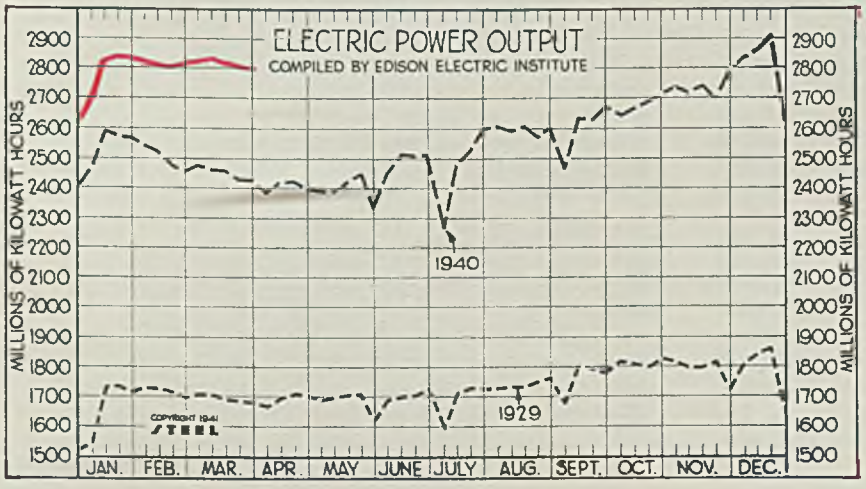
Week ended	1941	1940	1939	1938
March 29	792	628	604	523
March 22	769	619	605	573
March 15	759	619	595	540
March 8	742	620	592	557
March 1	757	634	599	553
Feb. 22	678	595	561	512
Feb. 15	721	608	580	536
Feb. 8	710	627	580	543
Feb. 1	714	657	577	565
Jan. 25	711	649	594	553
Jan. 18	703	646	590	570
Jan. 11	712	668	587	581
Jan. 4	614	592	531	552
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28	545	550	500	457
Dec. 21	700	655	574	460

Auto Production

(1000 Units)

Week ended	1941	1940	1939	1938
March 29 . .	124.2	103.4	86.0	57.5
March 22 . .	123.8	103.4	89.4	56.8
March 15 . .	131.6	105.7	86.7	57.6
March 8 . . .	125.9	103.6	84.1	57.4
March 1 . . .	126.6	100.9	78.7	54.4
Feb. 22	129.2	102.7	75.7	57.0
Feb. 15	127.5	95.1	79.9	59.1
Feb. 8	127.7	96.0	84.5	57.8
Feb. 1	124.4	101.2	79.4	51.4
Jan. 25	121.9	106.4	89.2	59.4
Jan. 18	124.0	108.5	90.2	65.4
Jan. 11	115.9	111.3	86.9	65.7
Jan. 4	76.7	87.5	76.7	54.1
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28	81.3	89.4	75.2	49.6





Electric Power Output

(Million KWH)

Week ended	1941	1940	1939	1938
March 29.	2,802	2,422	2,210	1,979
March 22.	2,809	2,424	2,199	1,975
March 15 .	2,818	2,460	2,225	2,018
March 8 . .	2,835	2,464	2,238	2,015
March 1 . .	2,826	2,479	2,244	2,036
Feb. 22 . . .	2,820	2,455	2,226	2,031
Feb. 15 . . .	2,810	2,476	2,249	2,059
Feb. 8 . . .	2,824	2,523	2,268	2,052
Feb. 1 . .	2,830	2,541	2,287	2,082
Jan. 25 . . .	2,830	2,566	2,293	2,099
Jan. 18 . . .	2,844	2,572	2,290	2,109
Jan. 11 . . .	2,835	2,593	2,270	2,115
Jan. 4 . . .	2,705	2,473	2,169	2,140
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28 . . .	2,623	2,404	2,121	1,998
Dec. 21 . . .	2,911	2,641	2,363	2,085

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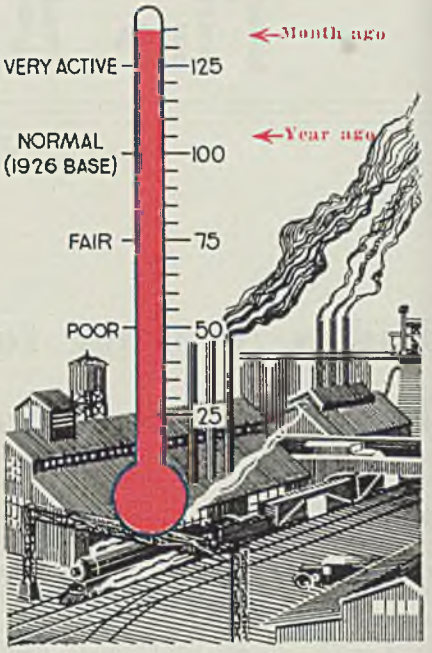

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(Per Cent)

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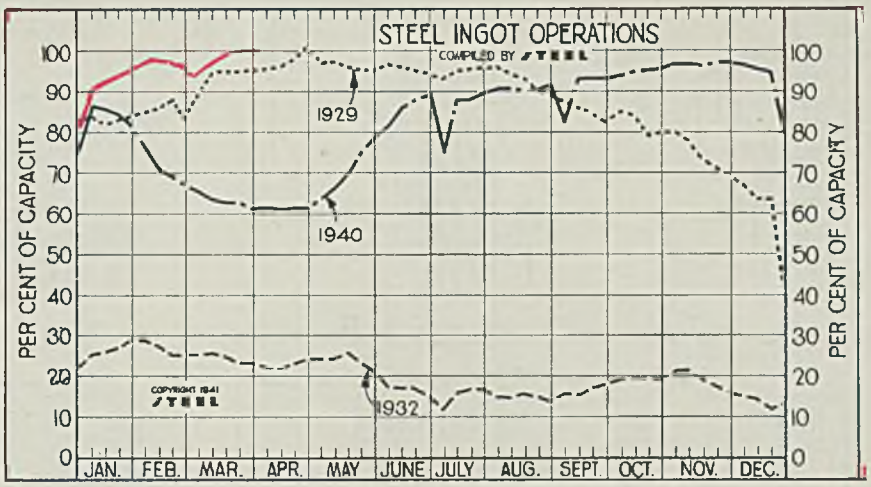
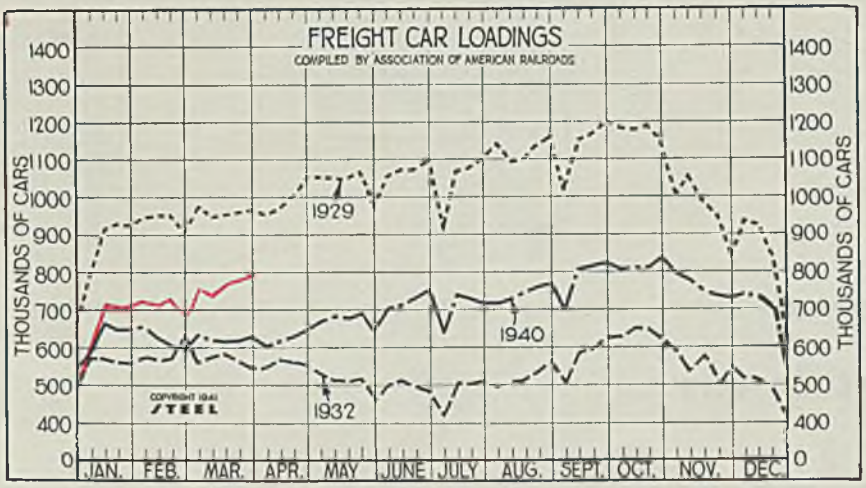
March 8...	97.5	63.5	56.5	30.0
March 1...	96.5	65.5	56.0	29.5
Feb. 22....	94.5	67.0	55.0	30.5
Feb. 15....	96.5	69.0	55.0	31.0
Feb. 8....	97.0	71.0	54.0	30.0
Feb. 1....	97.0	76.5	53.0	31.0
Jan. 25....	95.5	81.5	51.5	33.0
Jan. 18....	94.5	84.5	51.5	30.5
Jan. 11....	93.0	86.0	52.0	29.0
Jan. 4....	92.5	86.5	51.5	26.0
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28....	80.0	75.5	40.0	21.0
Dec. 21....	95.0	90.5	52.0	23.0
Dec. 14....	95.5	92.5	58.0	27.0





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(1000 Cars)

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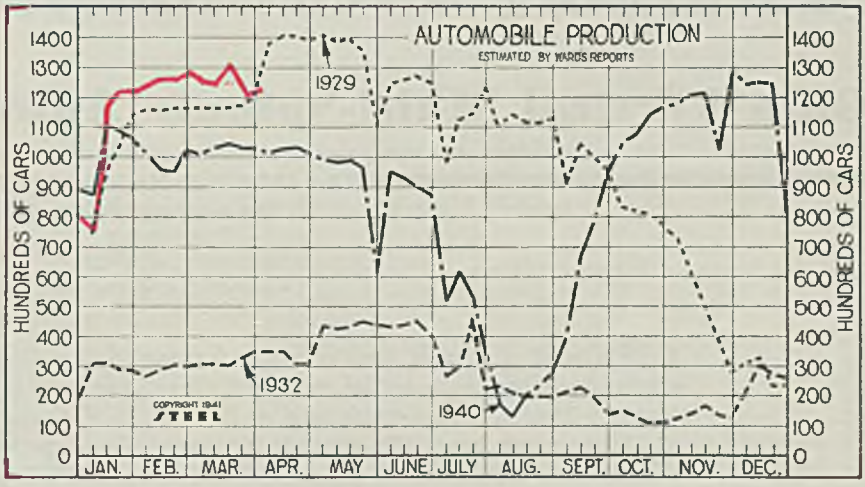
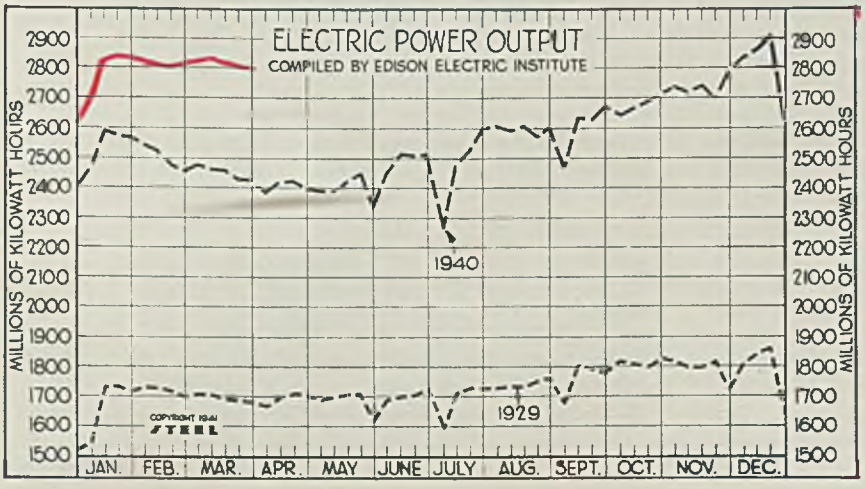
Jan. 11.....	712	668	587	581
Jan. 4.....	614	592	531	552
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28.....	545	550	500	457
Dec. 21.....	700	655	574	460

Auto Production

(1000 Units)

Week ended	1941	1940	1939	1938
March 29..	124.2	103.4	86.0	57.5
March 22..	123.8	103.4	89.4	56.8
March 15..	131.6	105.7	86.7	57.6
March 8...	125.9	103.6	84.1	57.4
March 1...	126.6	100.9	78.7	54.4
Feb. 22....	129.2	102.7	75.7	57.0
Feb. 15....	127.5	95.1	79.9	59.1
Feb. 8....	127.7	96.0	84.5	57.8
Feb. 1....	124.4	101.2	79.4	51.4
Jan. 25....	121.9	106.4	89.2	59.4
Jan. 18....	124.0	108.5	90.2	65.4
Jan. 11....	115.9	111.3	86.9	65.7
Jan. 4....	76.7	87.5	76.7	54.1
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28....	81.3	89.4	75.2	49.6





Electric Power Output

(Million KWH)

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March 1..	2,826	2,479	2,244	2,036
Feb. 22...	2,820	2,455	2,226	2,031
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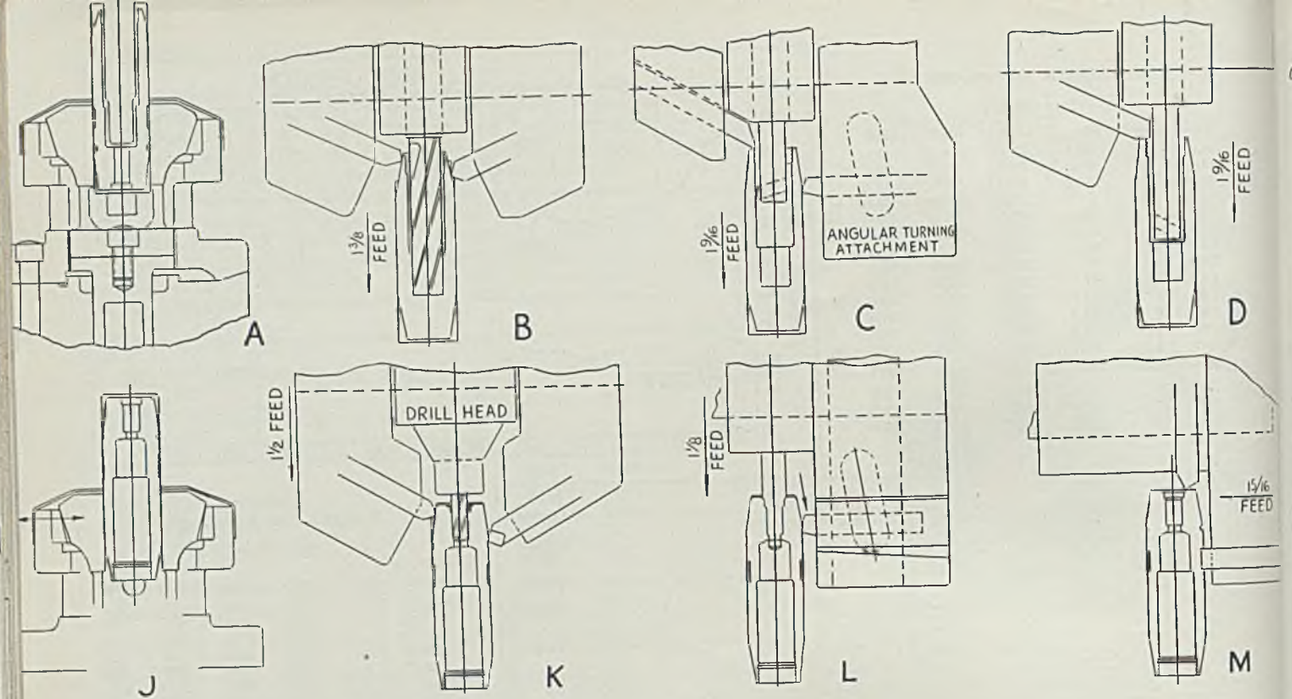
Feb. 8...	2,824	2,523	2,268	2,052
Feb. 1..	2,830	2,541	2,287	2,082
Jan. 25...	2,830	2,566	2,293	2,099
Jan. 18...	2,844	2,572	2,290	2,109
Jan. 11...	2,835	2,593	2,270	2,115
Jan. 4...	2,705	2,473	2,169	2,140
Week ended	**1940**	**1939**	**1938**	**1937**
Dec. 28...	2,623	2,404	2,121	1,998
Dec. 21...	2,911	2,641	2,363	2,085



Section 11 of a series on High-Explosive Shell

Typical Tooling Setup for Machining 40-Millimeter Shell On a Vertical Multi-Spindle Automatic Lathe

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.

■ Details of a typical tooling setup for machining 40-millimeter shell, single station indexing, with actual feeds and speeds for tools using type "J-7" Bullard Mult-Au-Matics. Nose operations A, B, C, D, E, F, G and H are handled at rate of 70 pieces per hour, 85 per cent efficiency. Base operations J, K, L, M, N, O, P and Q are handled on a second Bullard at rate of 135 pieces per hour, 85 per cent efficiency. Thus a production setup would require twice as many Bullards for nose operations as for base operations. Shells come to Bullards ground to 1.575-inch, plus or minus 0.005-inch. Here is the data:

A—Load-unload station, shell inserted nose or open end up

B—Station 2: Finish drill cavity; rough turn nose taper using two tools to get required speed. Tool feeds, 46 and 88 feet per minute. Work spindle revolves 207 revolutions per minute. Feed per revolution, 0.0107-inch

C—Station 3: Rough turn face, rough turn taper, rough turn cavity. Tool feeds, 58 and 88 f.p.m.—Work, 207 r.p.m.—Feed p.r., 0.012-inch

D—Station 4: Finish turn face, finish turn cavity. Tool feeds, 58 and 74 f.p.m.—Work, 207 r.p.m.—Feed p.r., 0.012-inch

E—Station 5: Finish turn taper, rough turn nose inside. Tool feed, 108 f.p.m.—Work, 253 r.p.m.—Feed p.r., 0.0101-inch

F—Station 6: Finish nose inside. Tool feed, 35 f.p.m.—Work, 106 r.p.m.—Feed p.r., 0.0061 and 0.0024-inch

G—Station 7: Ream cavity and round edge. Tool feed, 107 f.p.m.—Work, 329 r.p.m.—Feed p.r., 0.012-inch

H—Station 8: Thread inside of nose. Tool feed, 21 f.p.m.—Work, 71 r.p.m.—Feed p.r., 0.0592-inch. Thread chaser, 1.411-inch diameter, 1.5-millimeter pitch, right hand

J—Load-unload station for second machine, shell inserted base or closed end up

K—Station 2: Drill base cavity, rough machine boat-tail. Drill, fed 53 f.p.m., obtains effective speed of 535 r.p.m. on work by rotating 206 r.p.m. in opposite direction to spindle which revolves shell at 329 r.p.m. to finish drilling in same period as boat-tailing. Drill fed in 0.0093-inch for each of the 535 revolutions. Cutters feed 140 f.p.m. or 0.0156-inch per spindle revolution

L—Station 3: Finish drill or ream, rough turn taper. Tool feeds, 53 and 140 f.p.m.—Work, 329 r.p.m.—Feed p.r. 0.012-inch. Boat-tail cutter worked by cam

M—Station 4: Rough face, cut band seat groove. Tool feed, 70 f.p.m.—Work, 207 r.p.m.—Feed p.r., 0.0192-inch

N—Station 5: Groove band seat, rough turn outside diameter from band seat to boat-tail, finish face, undercut cavity. Tool feed, 43 f.p.m.—Work, 107 r.p.m.—Feed p.r., 0.013-inch, first ⅛-inch being fed at rate of only 0.003-inch p.r

O—Station 6: Finish taper with cam controlled cutter, finish outside diameter from band seat to boat-tail, finish turn cavity. Tool feed, 150 f.p.m.—Work, 368 r.p.m.—Feed p.r., 0.0101-inch

P—Station 7: Ream cavity. Tool feed, 73 f.p.m.—Work, 411 r.p.m.—Feed p.r., 0.007-inch

Q—Station 8: Knurl band seat. Knurling tool fed at 44 f.p.m. —Work, 107 r.p.m.—Feed p.r., 0.0275-inch

Production-Time Analysis for S. A. Woods Setup

■ Supplementing the information given in section 8 of this series, see STEEL, March 17, 1941, p. 56, describing operations at plant of S. A. Woods Machine Co., Boston, please note the following regarding production output:

The operations listed in Table I of that article are those illustrated and described pictorially on pages 58, 59, 60, 61 and 62. Since the S. A. Woods setup was designed merely to handle an educational order, only one of each machine was used. Thus, disregarding handling time, the maximum production rate obtainable here is determined by the longest single operation—70 seconds, from column three, Table I. This means a finished shell every 70 seconds or 42.86 shell bodies per 50 minute hour—total of approximately 342 completed shell bodies per 8-hour day. This is the output given on page 63 for the conveyorized layouts where handling time is eliminated by conveyors delivering the work to each station. But here, several operations have been combined in a number of places on the line, as is explained in operation sequence, page 63.

However, to show the number of machines required for a high production layout, Table I also includes, in column four, the number of machines required for each of the various operations. An output of a shell every 5 seconds is taken as the basis for figures in column four simply because this is the time of the fastest single operation—weighing, operation 19. To get maximum efficiency possible, there must be enough machines to permit moving a shell out of each operation at this same rate—one every 5 seconds.

Based on a shell progressing down the line at a rate to give a completed shell every 5 seconds—600 shells per 50-minute hour, 4800 per 8-hour day—if operation 1 requires 50 seconds, obviously at least 10 machines must be used to pass a shell through this operation every 5 seconds. To be safe, 12 machines are specified. Similarly operation 3, taking 70 seconds, requires at least 14 machines, 16 being specified. Operation 4, taking only 13 seconds, easily obtains the desired output with three machines.

Continuing to check down column four, it is obvious that the number of machines for operation 8 must be at least five instead of the two given. Also operation 9 would need 16 machines; operation 11, 4 machines; operation 15, 4 machines; operation 20, at least 10 inspection stations; operation 24, 13 stations; operation 25, 6 stations.

Of course, certain operations may not be done on each and every shell. The hydraulic pressure test, operation 9, is usually done on only a small proportion of the shell bodies; thus one machine may easily handle all the actual testing necessary. Similarly, operation 8, grind base, depends upon the smoothness of machining, thus perhaps fewer than five machines can handle the output required, in certain instances.

WAGE INCENTIVES

.....WHAT.....

.....WHY.....

.....and HOW.....

An intelligently planned and engineered incentive plan, developed by wholehearted co-operation between management and workmen, can work wonders in raising production and can increase wages while actually lowering costs. Here a leading organization of management engineers* collaborates with STEEL'S editors to analyze wage incentives, what they are, how they should be developed and what results can be expected

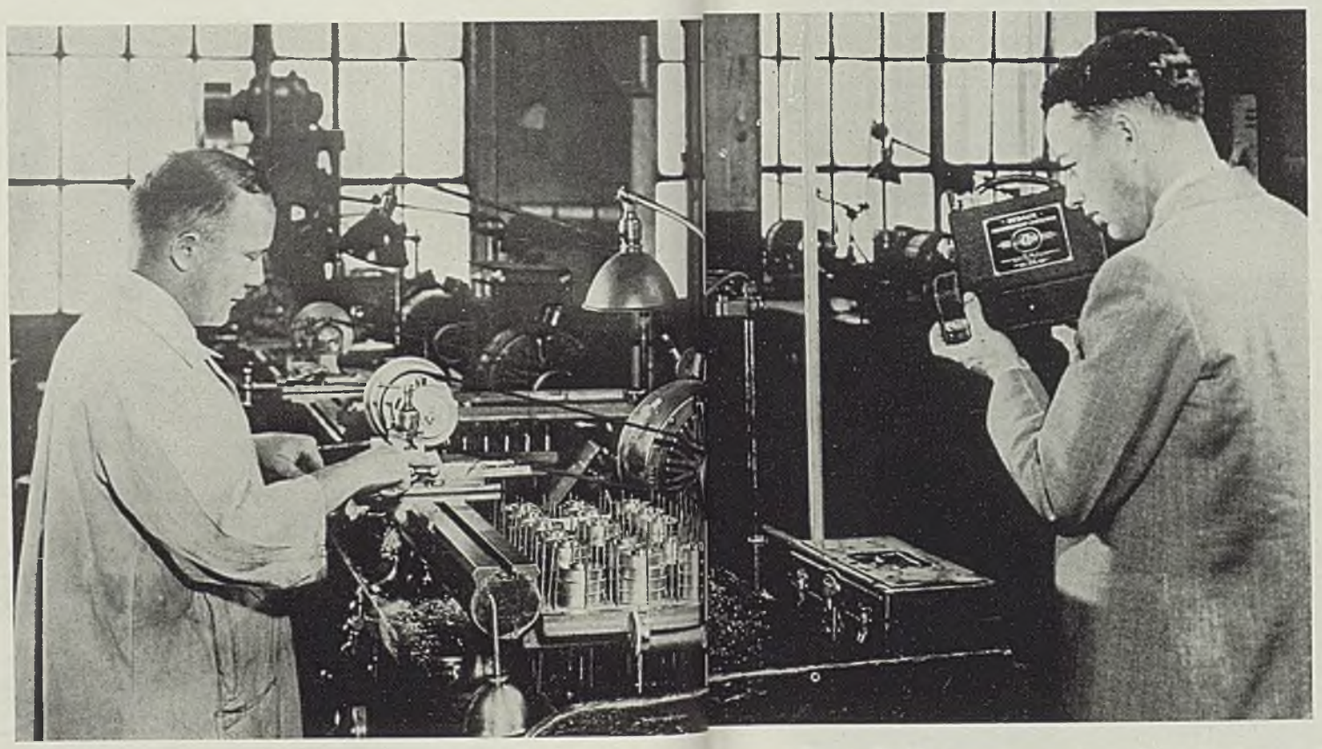


Fig. 1—Highly repetitive work can be studied most effectively by the aid of motion pictures. An electrically driven camera like this will give readings of 1/1000 and 1/4000 of a minute, adequate for motion analysis and study. The procedure is extremely simple and shop observation periods are much shorter than when using a stop watch

■ WHEREVER work is done, there must be wages. While wages in themselves might be considered sufficient, wage incentive plans have been found valuable as a reward for work over and above pure wages.

A good wage incentive plan is a form of compensation designed to promote better performance—increased production efficiency—the very thing paramount today in most plants. In addition, a well-thought-out incentive plan can be relied upon to reduce costs while permitting higher wages to be paid, to better labor relations, reduce labor turnover and create a better spirit of co-operation in the plant.

The simplest wage incentive plan, although not generally regarded as an incentive type, is a straight hourly wage with an opportunity for hourly rate increases depending on achievements. Since this involves judging performance, this plan is liable to errors and abuse. Another difficulty is that practical considerations make adjustments possible only periodically so a true relationship between the wage and performance at all times is almost impossible.

*STEEL will be glad to direct interested readers to this company upon request.

All "Incentive" Plans Not Good: Another old form of wage incentive is "straight piecework" or "tonnage." Here the relationship between wage and production is in direct proportion. Assuming rates have been set accurately and the opportunity to work at maximum rates remains permanent, this is an excellent method. However, wages earned usually fluctuate violently because of conditions over which the worker has little or no control. For example, coal-mining tonnage rates before the advent of mechanization were the same or nearly the same for an entire district even though actual mining conditions varied sharply. For the same effort, the tonnage and wages often varied as much as 100 per cent.

As long as such rates were sufficiently loose to cover the variations and provide reasonable earnings even under difficult conditions, they were accepted. But when management, under pressure of competition, gradually tried to adjust rates on a more correct basis, the variations became so great that it became necessary to guarantee a minimum wage. This eventually developed into providing a basic minimum hourly rate corresponding to the general characteristics of the job and, in addition, an extra compensation related to performance—the history of wage incentive development.

Individual or Group Incentive: If a workman's output is not influenced by the performance of others, there is no justification for basing his compensation on performance of a group with which he has little or nothing to do. If, on the other hand, the work is of such nature that several workers must co-operate to bring about good final performance, then it is reasonable to base his individual compensation on the group performance.

The past 20 years show a definite increase in number of workers receiving some form of wage incentive not because there are more plants on wage incentive but because more workers in each plant are covered. Organizations using wage incentive plans have found it highly desirable, if not altogether necessary, that all hourly paid employes be included in the plan. This, of course, is because wages on an incentive plan are usually higher, and all employes must be treated alike if wages are to be kept in balance within one organization. Many plants have 90 per cent or more of their hourly employes on a wage incentive plan, including such operations as maintenance and repair work.

Plans Can Be Defective: In those plants where a wage incentive plan has been dropped, it was because either the plan or its application was defective.

A typical example is the automobile industry. If one asked 10 years ago why group bonus prevailed in the automobile industry, the answer would be: First, simplicity; second, workers in a group did not tolerate low producers since any low producer penalized the group.

Thus a plan that should have been designed primarily to provide a basis of pay and therefore should have had fairness as its principal consideration, was preferred because of reduced clerical expense and because it was assumed to do the policing which should have been management's and not the workman's responsibility. While the plan did work as was claimed, it created so much dissatisfaction that it did not survive once labor was in a position to demand its elimination.

Abuses Can Occur: Objections to most wage incentive plans have occurred because of the many cases where it permitted open or hidden abuses. One such was the attempt to maintain low basic hourly rates even though the total compensation compared favorably with going hourly rates in the industry. Requests for wage increases were cut short by the claim that labor could have the increase automatically upon better performance. Labor naturally felt that wage incentives were an obstacle to wage increases.

Furthermore, wage incentive plans no doubt have permitted wage reductions by arbitrary increases in production requirements or by cutting bonus or piece rates without real justification.

Base Rate and Bonus: Some wage incentive systems have been based on the belief that any improvement over past performance predicates the right to additional compensation. On such a basis, any man or group of men whose past performance was poor or mediocre had an easy time, those men whose past performance was good had a difficult time, and the good worker was penalized. Obviously, there must be a correct measure of true performance irrespective of past performance, and also the proper point at which extra compensation begins must be determined. It is much easier to arrive at the correct answer for both if they are considered separately.

Determine Them Separately: A correct measure of performance on one hand and a correct money rating of the job on the other are bound to be satisfactory to both management and labor because they will permit management to pay maximum wages while maintaining low costs.

To get these results, management must be satisfied

that the standard production requirements are reasonable so that additional performance really deserves extra compensation. Labor also must be satisfied that these production standards are reasonable and that it is possible for the average willing workman to earn enough extra money to make it worth while to use his time and skill to best advantage. Furthermore, the workman must feel he is protected so that sudden and arbitrary adjustments in production requirements are not possible.

Management Responsible, Too: If the plan does recognize and differentiate between management and labor responsibilities and provides compensation for lost time whenever management is at fault, as it should, there will be real added incentive not only for labor to do its part but one for management to correct any defective, unsatisfactory condition.

Dependable and correct standards of performance afford a basis for standard costing whereby the combination of standard production requirements and basic hourly wage shows minimum attainable labor costs and also actual current percentages of excess costs.

Correct and dependable standards permit costs to be pre-estimated accurately. Standard minimum costs will be known and current control records will show running percentages of excess costs over and above these minimums for the various classes of work. If the plan is well built and effective, that percentage will be small and finally will become nearly constant.

Planning and scheduling likewise can be handled effectively because there is an accurate measure of performance, and productive possibilities are definitely known, whether they be man power or equipment capacity.

These control features are the things which have made wage incentive plans, built on the proper basis, so effective in promoting good results—something that the money incentive alone could never do. These plans put management on the spot just as much as labor. Labor, of course, is quick to appreciate that fact and to react accordingly.

Job Analysis: One of the most important elements of a wage incentive plan naturally is the correct analysis and classification of specific jobs, for the determination of the basic hourly wage. In most industries there is an accepted minimum wage at or above the minimum legal wage. Classifications requiring greater skill or where working conditions are abnormally difficult or unpleasant must provide for a proportionate differential. Usual practice is to select a number of the most important job factors—learning time, skill, responsibility, hazards, working conditions and the like—and to allocate a certain maximum weight to each.

Point Rating: In the subsequent job analysis, each factor can be used at a maximum weight, at a fraction of the maximum, or not at all. The total gives a rated value for each job and a certain range of values corresponding to one classification. This is the well-known point-rating method. It is not an absolute science but it is an improvement over former rule-of-thumb methods where the only consideration too often was one of supply and demand.

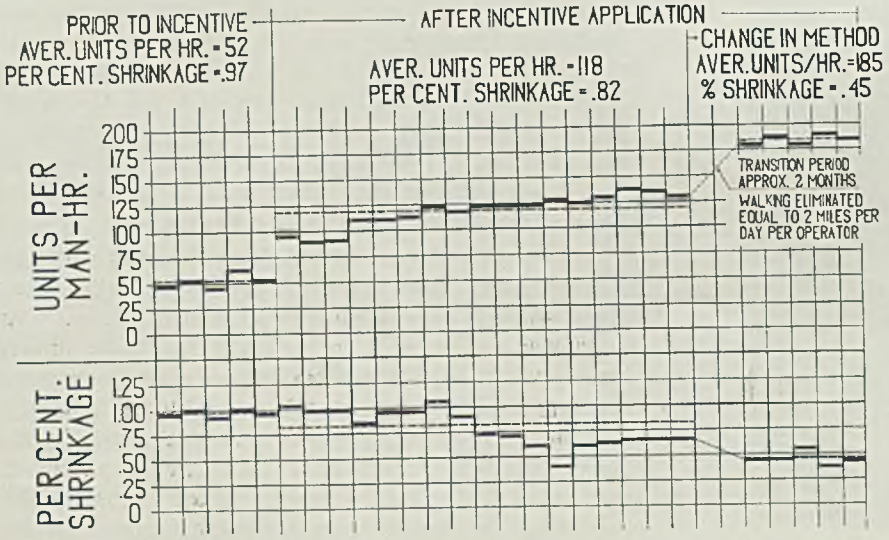


Fig. 2—While a good incentive plan not only increased output from around 53 to an average of 118 and cut shrinkage from 95 to 82, these benefits were further increased by a change in method of doing the work which obtained a production of 185 and reduced shrinkage to 45 per cent. Thus maximum results still are up to management

Standard requirements often are related only to production. There the basic requisite is correctness of production standards. In many instances, however, there are other factors. Take the case of a man operating a heating furnace in a steel mill. His job essentially is twofold—first, to keep the mill going by keeping up output of the furnace; and second, to use a minimum amount of fuel. If he can materially influence both the tonnage and economy factors, then it is common sense to consider both factors in determining his wage.

Work Unit: In complex operations of modern industry, a time unit or perhaps a "work" unit is often most convenient as a basis of measurement of production in determining the basic hourly rate. The work unit is a modification of the time unit and essentially is the standard amount of productive work expected in one minute of time, regardless of the type of work or operations involved.

An advantage of such a unit is that any average group of men, properly trained and qualified, will be able to produce an equivalent number of work units regardless of operations involved. This permits direct comparisons and a positive measure of productivity in all cases.

The level of standards based on such a work unit is set so an average group of experienced workmen can maintain a rate of production 30 to 35 per cent above it if conditions are normal and no limitations are imposed. The latter two qualifying factors are important, since the standard provides only for the best possible use of existing facilities. If these facilities, whether machines, tools or materials, are not in normal condition, attainment of the 30 to 35 per cent higher level will be impossible.

Include Nonproductive Workers, Too: Production processes today depend not only on the workers but upon proper co-operation and supervision. Those who insure the flow and distribution of materials, the maintenance of tools and equipment, those who assign and distribute the work—all may have an important bearing on the performance of productive workers. So it is highly desirable that their work be measured also and means of compensation provided so they, too, will have an incentive to give maximum service and facilitate good performance of the productive workers.

Important: Any wage incentive plan must be accepted by labor. Probably the best way to insure that requirement is to have labor repre-

(*Please turn to Page* 100)

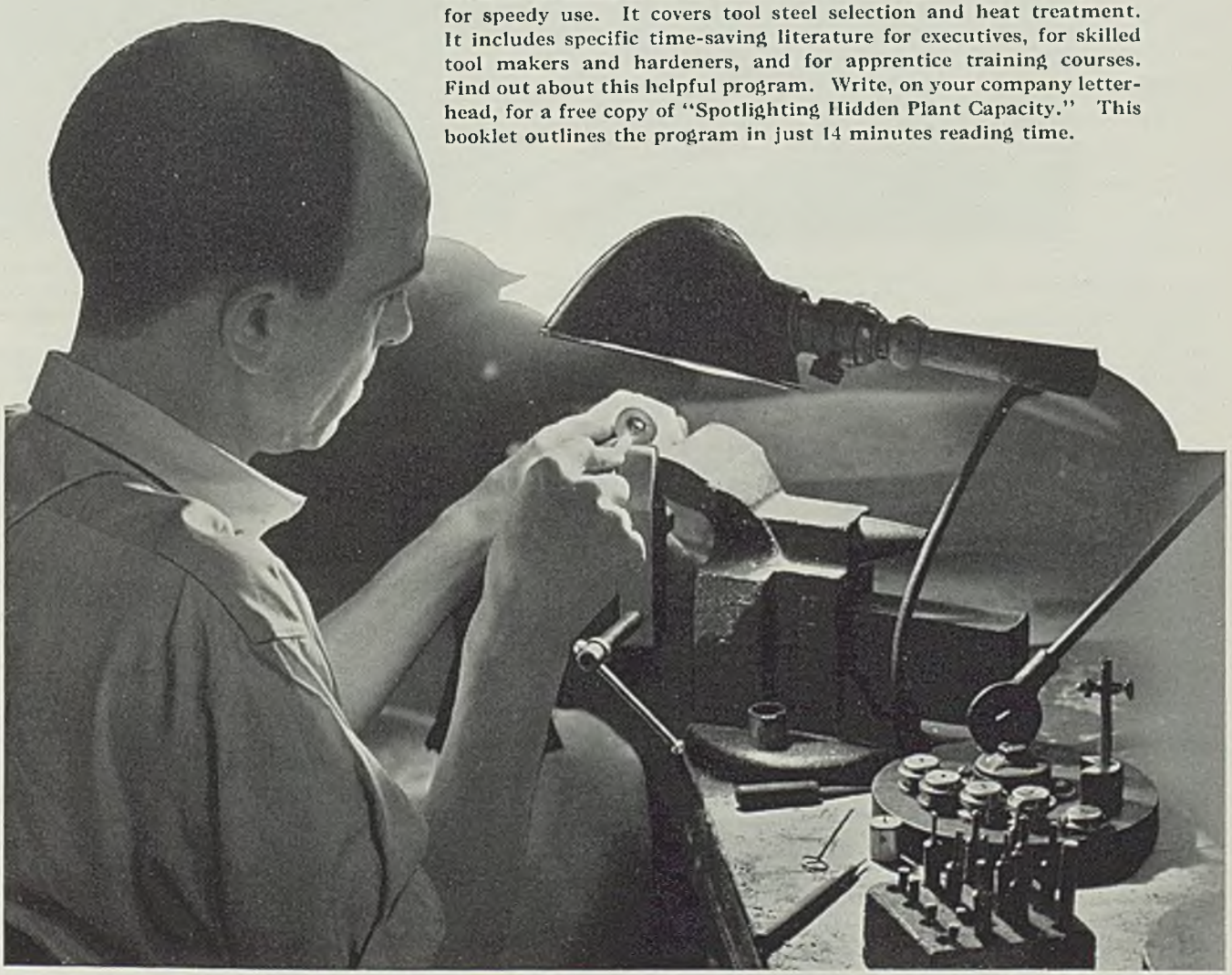
LET YOUR SKILLED TOOL MAKERS DO MORE!

How much time are your skilled tool makers spending on the *maintenance* of tools? How many tools must they remake because of premature failures in service—or because something went wrong in heat treatment?

Each man-hour spent in the tool room on these jobs is a man-hour which can't be spent on getting new tools into service. Furthermore, each tool that comes back to the tool room represents a delay or interruption in plant production, a reduction in the output capacity of your plant.

By providing your tool makers with more factual information on the behavior of tool steels in the tool room, in hardening, and in service, you can help them give you *better* tools that need less attention.

There is a Carpenter Program that is helping industry do this. It is based on facts, down in black and white, organized and simplified for speedy use. It covers tool steel selection and heat treatment. It includes specific time-saving literature for executives, for skilled tool makers and hardeners, and for apprentice training courses. Find out about this helpful program. Write, on your company letterhead, for a free copy of "Spotlighting Hidden Plant Capacity." This booklet outlines the program in just 14 minutes reading time.



THE CARPENTER STEEL COMPANY . . . . . READING, PA

FREE
TO TOOL STEEL USERS IN U. S. A.

Carpenter MATCHED TOOL STEELS

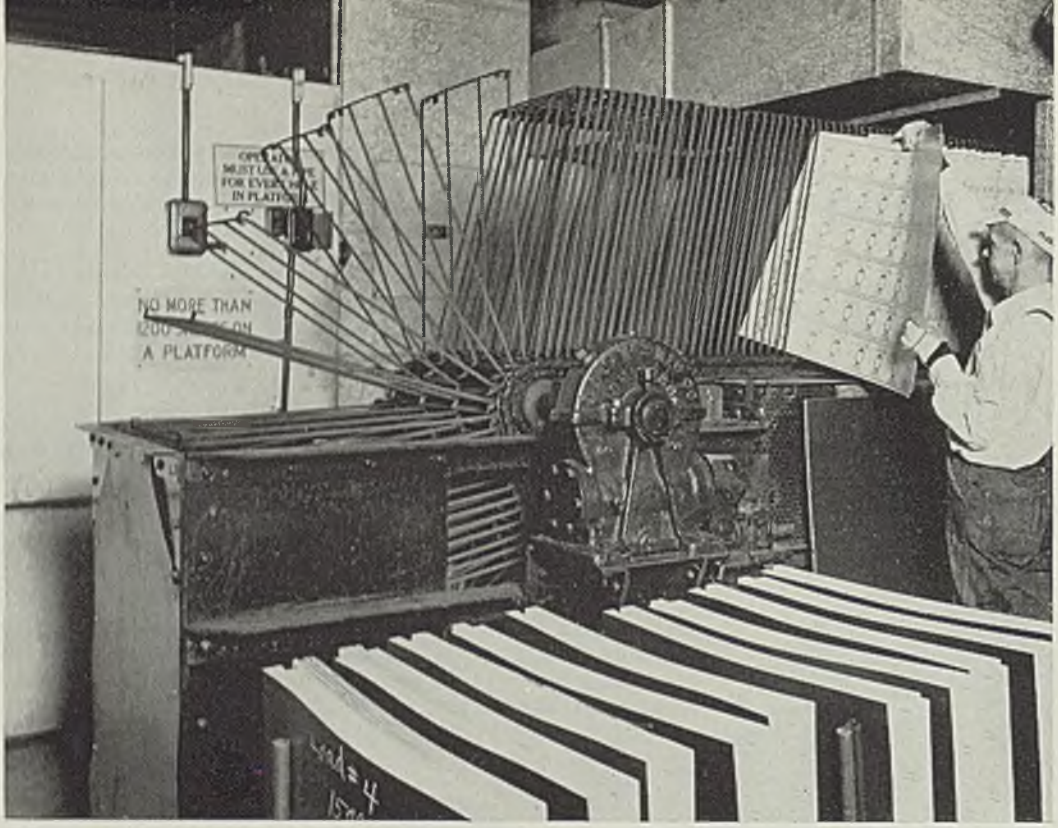


Fig. 4—Discharge end of the lithographing oven showing tinplates as they are being removed from the conveyor belt after leaving the cooling section

Now Tin Plate Lithographing Ovens Are "Air Conditioned"

Without using any refrigeration, a system of controlled heat removal maintains good working conditions, prevents sheets from becoming tacky in hot humid weather, thus permitting a more uniform product and production rate. Reduces room temperatures 25 to 30 degrees Fahr. System is simple, equipment not expensive

By E. H. DAFTER
Engineer
Carrier Corp.
Philadelphia

■ RECENT installation of controlled heat removal and evaporative cooling have produced superior working conditions and greater cooling of tin plate sheets as they emerge from the oven—accomplished without any refrigeration.

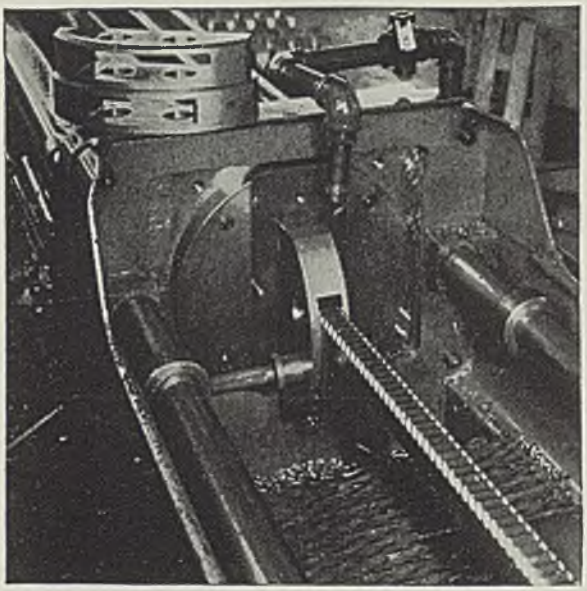
For removing heat from tin plate, the conventional system utilizes room air for the cooling of the sheets and then invariably liberates this heat directly into the room. In a few isolated cases, exhaust hoods have been placed over the exit end of the ovens and attempts made to remove the excess heat by gravity circulation. Such a system is far from efficient. As a result, working conditions in the lithographing department often become excessively warm.

This is not surprising if an analysis is made of the heat supplied to the coating and litho ovens. The heat, as determined from calculations and tests, is split up into the following percentages, within fairly close limits: To heat up tin plate sheets, 34 per cent; to heat up conveyor belt, 34 per cent; radiation losses, 10 per cent; products of combustion (exhaust), 22 per cent; total, 100 per cent.

With the conventional system, all the heat that goes into the tin plate sheets and conveyor belt is given back to the room after the sheets emerge from the oven. Thus 68 per cent of all the heat supplied is added to the radiation losses, 10 per cent, making a total of 78 per cent of the heat supplied being liberated right in the room, winter and summer. As a result, working conditions often become unbearably hot, especially in summer, with a consequent let-down in the efficiency of all labor in the litho department. Furthermore, the room air used for cooling the sheets becomes warmer and warmer, thereby losing in cooling capacity. This results in tacky sheets and frequently slows up production severely.

"Air conditioning," or more truly, evaporative cooling, has now been applied profitably for cooling the sheets. The advantages which this improvement offers are expressed in increased rates of production, uniformity of output, high quality,

BROACHING PAYS for JOB LOTS IN AIRCRAFT



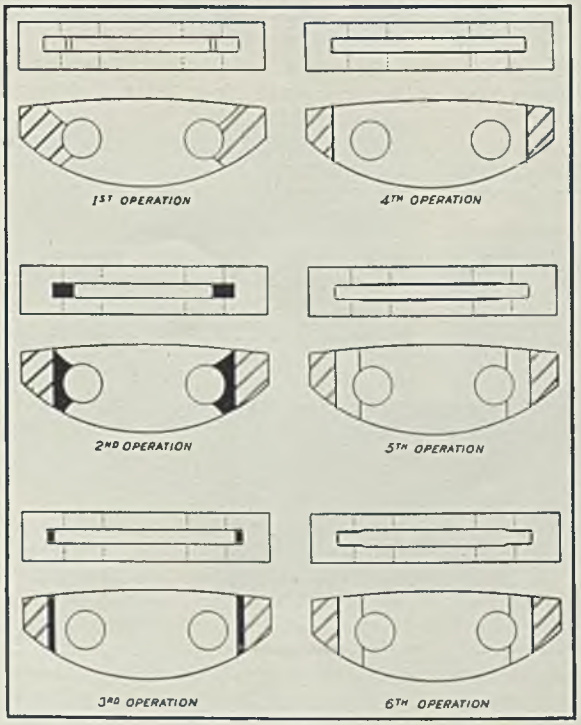
Colonial Universal Horizontal Broaching Machine of 25 tons capacity and 72 inch maximum stroke used for the five slotting operations shown here set up for the second and third operations. (See drawing below). Notice large difference in slot width and length between the unfinished and finished counterweights lying on top of the broaching machine.

The broaching machine again proves its flexibility and application to difficult operations in the shops of a well-known aircraft engine manufacturer. Here five operations in slotting the counterbalance weights of a radial type engine are performed on a single horizontal type broaching machine, using but two fixtures and four broaches.

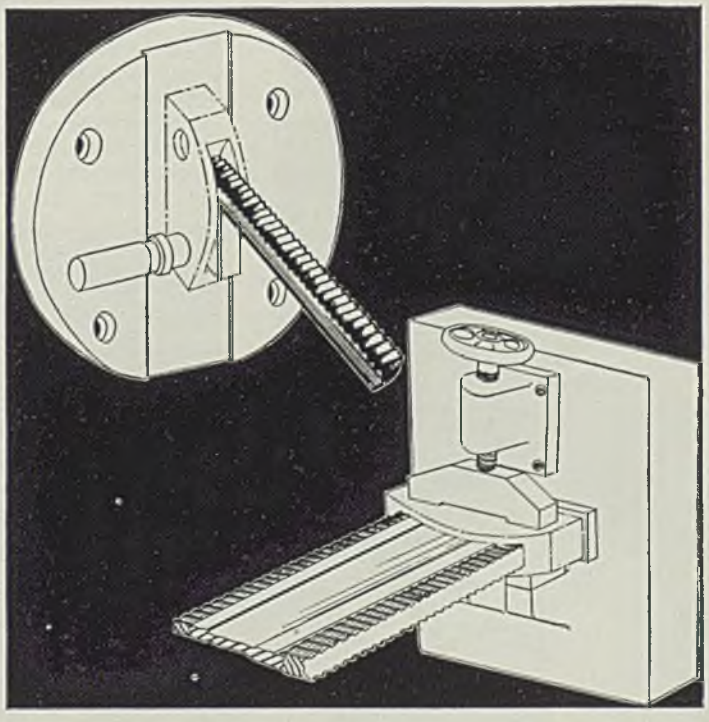
The sequence of operations includes removing excess stock remaining after a preliminary rough milling operation; machining the two ends and sides of the slot in one pass; relieving the center section of the slot, and finally—finishing the total length and width of the slots to accurate dimensions. "Job-lot" quantities are run through each operation before changing broaches, only one change of fixtures being necessary for the entire series of operations.

By using this method of slotting the counterweights, the engine maker has been able to maintain production schedules despite the increased demand for these parts. Proof again that broaching can increase production at low cost.

• • •



In each operation metal is removed at specified locations to provide the desired final slot form. Heavy lines indicate where metal is removed in each operation.



Only two fixtures are needed for all five broaching operations. The four broaches vary in length from approximately 55 to 15 inches and remove from 0.5 inch to a few thousandths per pass. The fourth, fifth and sixth operations are performed in the same fixture.

COLONIAL BROACH COMPANY

ONE FORTY SEVEN JOSEPH CAMPAU • DETROIT, MICHIGAN

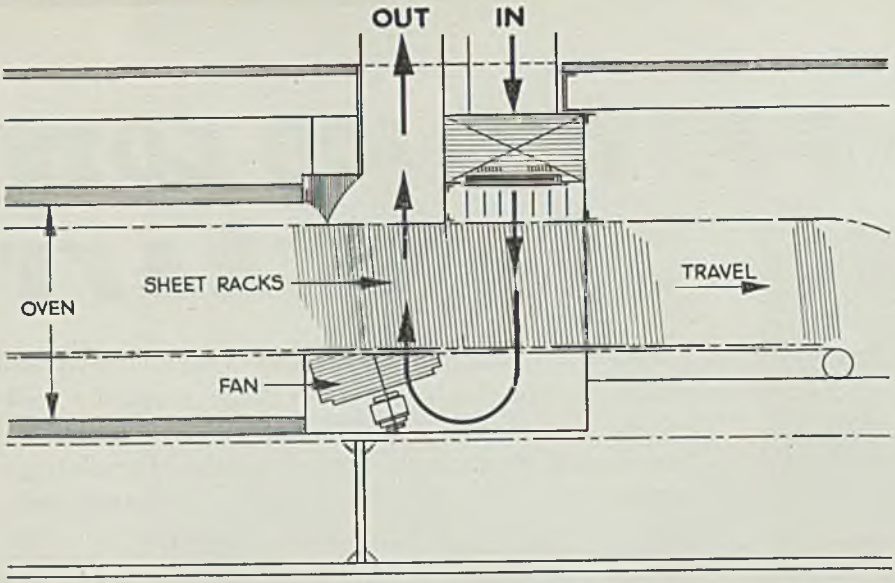


Fig. 1—Cross section showing general arrangement of equipment and ducts at discharge end of the lithographing oven

consistent operating schedules, and the achievement of superior working conditions. This means a more contented and efficient personnel.

In a recent installation of air conditioning equipment for lithographing on tin sheets, room temperatures were actually 25 to 30 degrees Fahr. cooler than those previously experienced.

Design of Air Conditioning System: A major factor in functioning of the air conditioning system is that heat from the delivery end of the litho ovens is collected and exhausted to outdoors without being allowed to enter the room. To accomplish this, the discharge end, or cooling section of each oven was redesigned and fully enclosed with sheet metal for a distance of from 6 to 8 feet. This additional section is divided into two air passageways, forming a new exit section, with a system of supply and exhaust air ducts arranged as shown in Fig. 1. Note that the air makes two passes counterflow through the sheets. This results in an economical air quantity for the work performed.

The supply air system is designed to use 100 per cent outside air during summer months, and a mixture of outside and return air during other seasons to maintain an optimum delivery temperature. The air is first passed through a unit air conditioner using water sprays to produce evaporative cooling. In this manner the supply air has its delivery temperature reduced from 15 to 25 degrees Fahr. below outside dry-bulb temperature, depending on the wet-bulb depression. From the air conditioner, air is delivered into the first air passageway where it is discharged vertically downward through the tin plate sheets. At the bottom is a plenum where the air is collected. A propeller fan blows the air from this plenum through the second passageway and discharges the air vertically upwards into an exhaust plenum, from which a centrifugal fan discharges it outdoors through exhaust duct work. In summer the air may leave the system at a temperature of from 135 to 150 degrees Fahr. in spite of the fact that the sheets are cooled to temperatures from 85 to 100 degrees Fahr.

Note that the balance between the air supplied and that exhausted is fairly critical for the reason that a certain definite quantity of outside air must be supplied to the discharge end of the oven to permit proper combustion within the oven. If this proper balance is not obtained, faulty burner operation will result which may materially increase the cost of gas or produce improper drying temperatures.

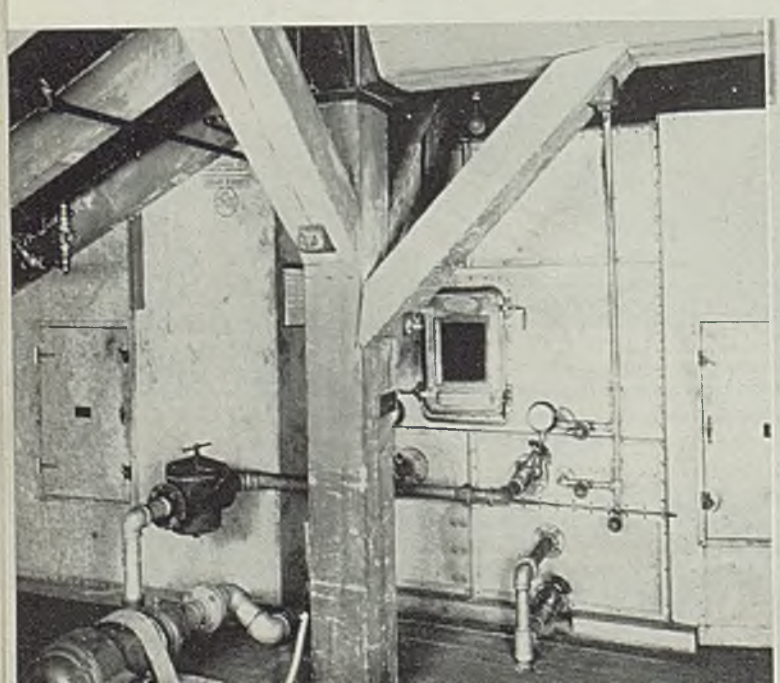
In fall and winter, the room air can become too cool for the comfort of the people working, and therefore some means should be provided for tempering it. This is usually done by recirculating a portion of either exhaust or room air through the conditioning unit.

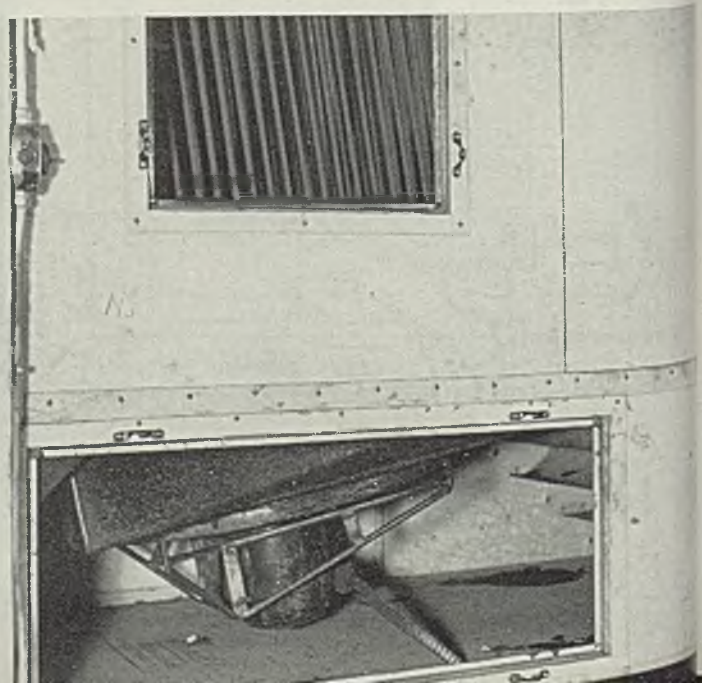
A by-product effect of washing the supply air to the lithographing department is the improvement in general cleanliness and an important reduction in soot and carbon on the oven burners. Whereas formerly it was necessary to clean these burners at the rate of 10 or 12 per week, the average now is about one burner every five or six weeks.

The first installation of five ovens on the sixth floor of a Baltimore lithographing plant was so successful that it was followed a year later by a second installation applied to the entire lithographing department.

Fig. 2 at left shows the main supply apparatus located in attic space on the seventh floor with humidifier or spray section and recirculating pump and piping.

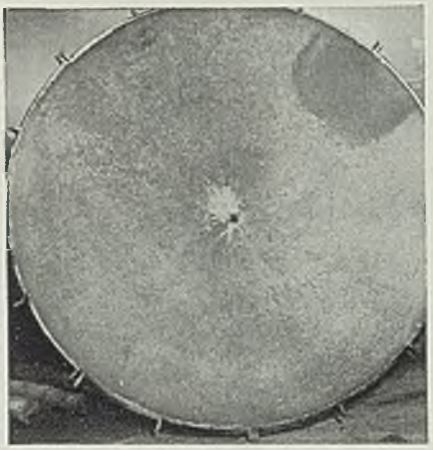
Fig. 3, right, is a closeup of the new cooling section, showing the booster fan for turning the air from the first stage into the second stage cooling. Notice the turning veins visible at extreme upper right through the open lower access door



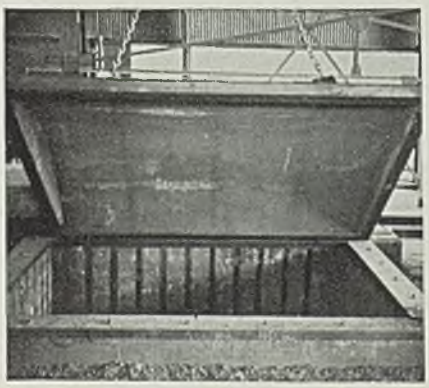


Proof of the Adaptability of Refractory Concrete

...made with Lumnite!



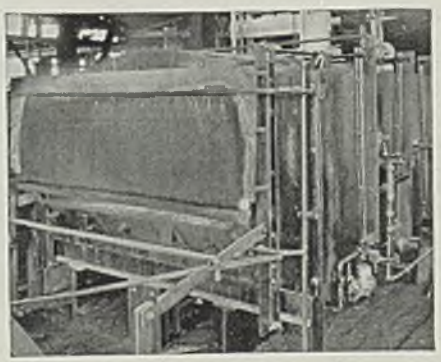
NO JOINTS HERE to leak heat! Because this circular annealing furnace cover (inside view) was lined with Refractory Concrete made with Lumnite... in order to give a smooth, monolithic surface.



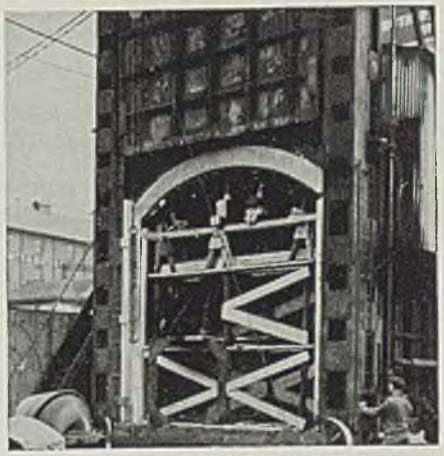
LOW-COST INSULATION was obtained in this modern billet cooling pit by making the cover lining of one-piece, cast-in-place Refractory *Insulating* Concrete. Smooth walls and bottom—without masonry joints—are provided by Refractory Concrete. All are made with Lumnite. Monolithic construction makes it easy to build in the vertical guard rails seen in the picture.

THESE PICTURES show a few of the many ways in which Refractory Concrete can save you time and money. Refractory Concrete is a special type concrete, combining high cold strength with strength after long exposure to high furnace temperatures. It is made by mixing Lumnite—a heat-resistant binder—with refractory or insulating aggregates... to obtain just the thermal qualities you desire.

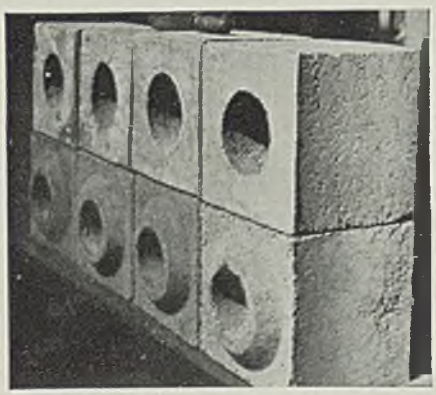
Are you interested in reducing your insulation costs? Do you have trouble with operating delays during refractory replacements? Is your furnace efficiency lowered by excessive heat loss through joints? If your answer to any of these questions is "yes," then you will want to know more about Refractory Concrete. You can get detailed information by sending for your copy of the booklet, "Refractory Concrete." Address Atlas Lumnite Cement Co. (United States Steel Corp. Subsidiary), Dept. S-13, Chrysler Bldg., New York City.



CAST-IN-PLACE, the bottom, walls and roof of this rivet-rod heating furnace are of Refractory Concrete made with Lumnite. Back-up, subfloor and roof cover of Insulating Concrete. Heat-resistant Concrete formed a level, monolithic bottom slab.



PRE-CAST REFRACTORY CONCRETE roof arch section was installed in this stress-relieving furnace three years before the picture was taken. Then side walls beneath the arch were rebuilt with Refractory Concrete.



FACTORY-PREPARED MIXTURES of Lumnite and selected aggregates offer you a means of making Refractory Concrete simply with the addition of water. Lumnite castables are obtainable from refractory manufacturers and their distributors. These castables have the characteristic advantages of Refractory Concrete: quick-hardening, high cold strength, sustained strength in service.

LUMNITE FOR REFRACTORY CONCRETE

How to Estimate the

Cost of a Welded Fabrication

Estimating methods, like cost accounting methods, are subject to extremely wide variations. However, the standards used and the methods employed by one highly successful fabricator are detailed here and may be found helpful as a guide in checking your own practices

THE TAYLOR-WINFIELD CORPORATION
FABRICATING DIVISION
ESTIMATE SHEET

No. 1771
Date 3-2-38

Customer General Electric — 1133 E. 152nd St. Cleveland Ohio — Their Dr. No. 700
Description Base (1 required) — Drawing No. — Ours: 702
Material to be Purchased

	Weight	Cost	TOTALS
2 Pc. 41" (xx) Pipe x 6 1/8		.87	
Wire	28	2.80	
Bar 4.50	16	.72	
Steel 2.53	2296	58.10	
Steel (See Reverse Side)			
Sub Total			
Layout Templates	Hours	62.69	63.41
Shear	1	2.40	
Saw	1	.35	
Flame Cut	1	.35	
Cutter	8	4.80	
Drill or Punch	1	.80	
Break and Roll			
Break and Roll Helper	2	1.70	
Assembler	2	1.40	
Assembler Helper	4	4.00	
Weld	4	2.80	
Grind	7	7.00	
Check	1	.70	
Straighten	1/2	.40	
Layout Shop			
Sub Total		28.75	28.75
Painting and Sandblasting			
Sub Total			16.00
Overhead 150 % Labor			107.44
Profit			41.12
Total			150.56
Cost	15¢		22.58
Total			173.14
Freight	5¢		8.65
Total	wt. 1300#		181.79
Machining $ 154.00 extra	Del. 2-3 weeks		3.00
			184.79

Fig. 1—Estimate sheet showing how totals are broken down into separate items

■ AS IN any other manufacturing operation, especially job shops doing business on a basis of work awarded from competitive price quotations, the matter of estimating costs and holding them closely to actual costs can easily mean the difference between a highly profitable operation and one which loses money.

For this reason, the fundamental principles and practices employed by the fabricating division of Taylor-Winfield Corp. at Detroit, may afford some worthwhile suggestions since their operations have proved extremely successful.

First comes the matter of obtaining and training estimators properly. It is considered advisable that estimators have training in shop practices including layout work on templets, redesigning and designing of parts for fabrication as well as the actual shop operations involved in steel plate fabrication.

In hiring and training engineers, it is recommended that only trained mechanical engineers be engaged, men without experience in cast iron practice but familiar with mechanics, physics and strength of materials. In the same way, it will be found valuable if future estimators are men who have had no experience in cast-iron practice but are familiar with estimating work in some related field. Work in a boiler shop has been found a particularly valuable asset.

The following methods of estimating costs for quotations have been developed within the last few years and have proved to be quite satisfactory.

Fig. 1 shows an estimate sheet for a special machine base with overall dimensions approximately 22 inches high, 44 inches wide and 56 inches long. Most of it is fabricated from ½-inch plate. The engineering department numbers each detail card for assembly on the assembly drawing and also lists with the same symbols the required details on the reverse side of the estimate sheet, shown here in Fig. 2.

All necessary fabricating operations such as flame cutting, shearing, bending and so on, are indicated on the estimate sheet, Fig. 1.

Unlike estimating the cost of castings, which ordinarily is done on a price per pound basis computed from standard price lists, fabricated steel products are estimated according to an entirely different system which may be broken down into sections and which will be found quite applicable to estimating costs of most fabricated steel work.

Material Prices: First the weight of the stock required for fabricating the part is determined. Past records have shown that it is necessary to add from 10 to 15 per cent to this weight to allow for waste. This allowance, you will note, is included in the totals shown at the lower center of Fig. 2. Next for production purposes the shipping weight is calculated and the freight charges determined to point of delivery. Material then is priced and listed as shown at the upper portion of Fig. 1. At this point on the estimate sheet are also listed those parts to be ordered from outside. A separate record of these parts, however, is maintained for the cost record.

Labor Prices: That portion of the finished product which is attributed to labor is determined according to the time required for each individual fabricating operation—these operations being broken down as follows:

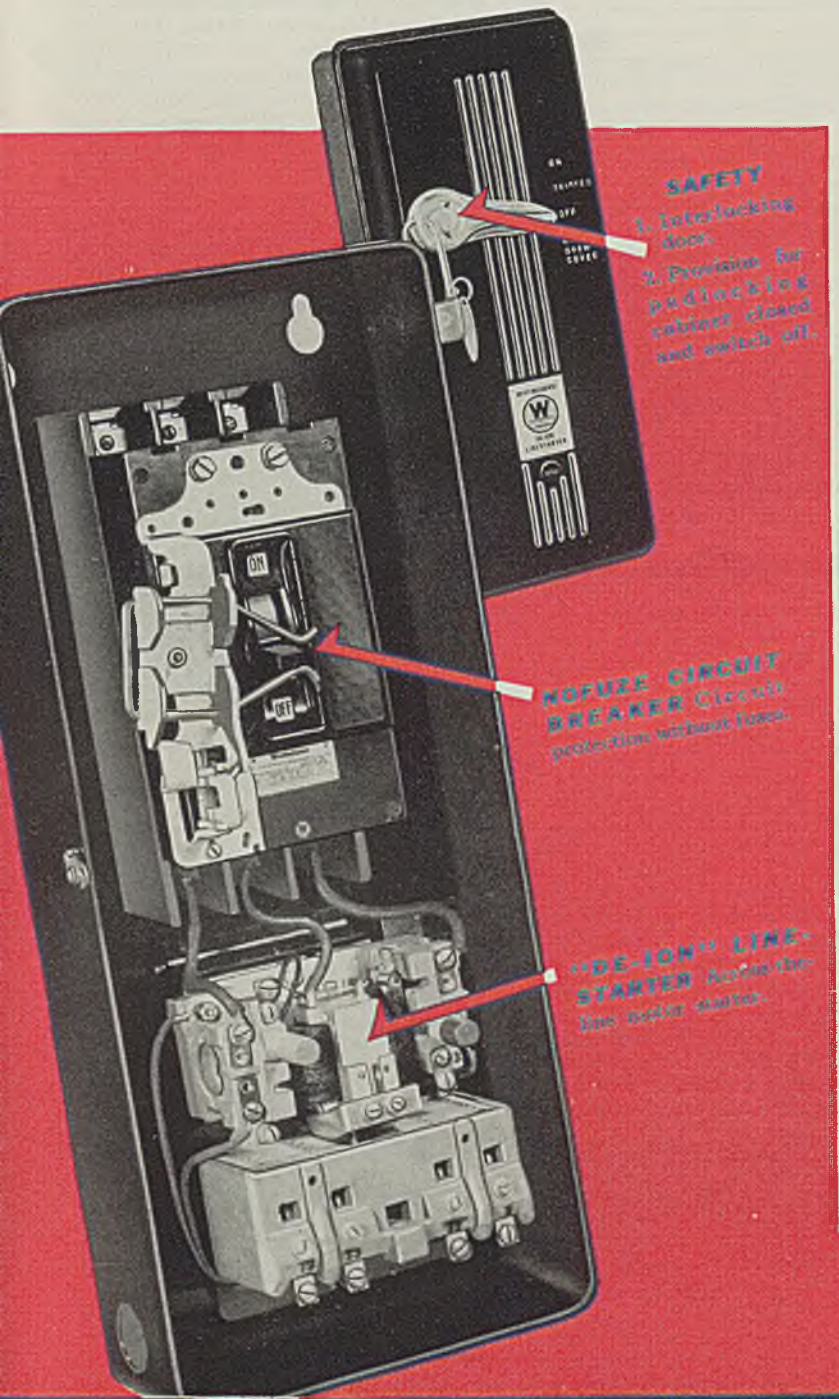
Layout-Templets: The time required for making paper or metal templets is set by the engineering department and is computed on the number and size of the templets required. Note that the estimate sheet, Fig. 1, includes a line for cost of layout-templets with a column being provided for hours and for costs. This, as well as the other operations involved, is first figured as to the amount of time required, which then determines the cost figure in the next column.

Shear and Saw: Standard prices

save

INSTALLATION TIME
INSTALLATION SPACE

WESTINGHOUSE COMBINATION LINESTARTER



GIVES YOU ALL FOUR IN ONE UNIT

- MAGNETIC MOTOR STARTER
- MANUAL MOTOR-CIRCUIT SWITCH
- MOTOR OVERLOAD PROTECTION
- NOFUZE CIRCUIT PROTECTION

Here's everything you need for the motor circuit in one compact, easily installed unit. You save wiring, installation time, space.

Available in dust-tight, watertight or explosion-resisting enclosure. Push button built-in or mounted separately.

NOFUZE CIRCUIT BREAKER

Eliminates conventional fuse equipment. Acts as manual disconnect switch in "Off" position. Bi-metal gives positive protection against short circuits and severe overloads.

"De-ion" principle quenches arcs instantly and saves contacts. Impossible to hold closed on short circuit. Positive indication of circuit condition. Nothing to renew or replace when restoring service.

"DE-ION" LINESTARTER

Starts, stops and protects the motor. Provides across-the-line magnetic starting. Gives full protection against overload and under-voltage.

Operation by push button, float or pressure switch. "De-ion" quenchers protect contacts. Bi-metal gives accurate, unvarying overload protection. Vertical magnet operation speeds contact opening and prevents accidental operation.

WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

J-21144

Westinghouse
MOTORS AND CONTROL

STEEL LIST

Symbol on Bl.Print/ # reqd.			Gross Wt.	Scrap	Price Per Lb	Cost
1	2 Pl. ¾ x 20 7/8 x 91 3/8	Fl.C.	540	151		
2	1 Pl. ¾ x 43 x 58 3/4	"	360	127		
3	1 Pl. 1 7/8 x 28½ x 28½	"	433	313		
4	2 Pl. ½ x 12 x 21½	shear	72	-		
5	1 Bar ¾ x 5¾ x 15½	"	12	-		
6	2 Pl. ½ x 8 x 10	Flame cut	23	15		
7	2 Pl. 1½ x 5 x 5	"	18	9		
8	2 Pl. ½ x 10 x 12	"	34	19		
9	2 Pl. 1½ x 9 3/4 x 40	"	332	82		
10	1 Pl. 1 7/8 x 12½ x 16 5/8	"	111	34		
11	1 Pl. 1½ x 7½ x 7½	"	22	6		
12	1 Pc. 4½ (xx) heavy Pipe x 3/8		16	-	Purchase	
13	1 Pl. 1 3/8 x 4½ x 10½	Fl. C.	18	3		
14	4 Bars 1 Dia x ½ lg.	Saw	1	-		
15	1 Pl. ½ x 15 x 15½	Fl. C.	33	25		
	Pl.Steel to be cut: 1996 #	Bar Steel: 13#				
	15 % added for waste 300 #	15 % 3#				
	Total Pl.Steel reqd. 2296 #	16#				
TOTAL			2025	784		
SCRAP			784			
NET WEIGHT			1241			

Shipping weight 1300#

Fig. 2—Parts list, above, prepared on the back of the form shown here as Fig. 1

Fig. 8—Cost summary sheet for the case shown in Fig. 4

for shearing and sawing, also based on standard time requirements for various types of work, have been established by steel warehouses. These same prices are used here after they are converted into time required and then the total cost for each particular job computed from that base figure.

Flame Cutting and Chamfering: The labor attributed to this item is based on figures published by National Cylinder Gas Co. of Chicago in their table "Machine Flame Cutting." Allowance is made for setting up and handling of the plate by doubling the actual cutting time given in this table. The hourly rates are not wages but a combination of wages and cost of oxygen and acetylene consumed. Therefore we have established a sliding rate according to the thickness of material based on the above-mentioned table.

Drill and Punch: Cost estimates on this item are based on time studies which we have made during a number of years. Each fabricator also can make his own time studies without much difficulty to afford a base for estimates of this item.

Break and Roll: This is one of the most difficult estimates to make as time for bending and rolling operations varies widely. Usually we base the time for these operations on the number of bends required, the types of bends, the gage and weight of plate to be handled and the number of machine setups which must be employed. Due to the large number of steps into which

COST DETAILS

MAN	DATE	HOURS	AMOUNT	MAN	DATE	HOURS	AMOUNT
Urbanek	2/9	1 50	BR 1 19	Pedliseck	2/12	1 75	GR 1 20
Crane	"	3	FC 2 37	Snohr	"	3	WE 2 68
"	"	5 50	CH 4 35	Taylor	"	2	WE 1 79
Perry	"	9 50	FC 6 98	Peters	"	1 50	WE 1 26
LaFleur	"	4	ME 1 68	Yourske	"	1 25	GR 63
Morrison	"	4	SH 2 10				
Jensen	"	1 50	BR 20	Pedliseck	2/13	2 25	GR 1 54
				Yourske	"	2 50	GR 1 25
Crane	2/10	2	FC 1 56				
Lindner	"	7	AS H 4 41	Dahlen	2/16	50	WE 47
"		50	FC 31	Pedliseck	"	2 75	GR 1 88
Perry	"	2	FC 1 47	Ault	"	75	AS 71
Pedliseck	"	1 25	GR 86	Frank Walls	"	1	FC 63
Case	"	7	AS 4 41	Yourske	"	3 50	GR CL 1 75
"	"	50	FC 31				
Ault	"	7 75	AS 7 32				
"	"	25	CH 24				
Snohr	"	50	WE 45				
FrankWalls	"	7 25	AS H 4 88				
"	"	25	CH 16				
J. Walls	"	2 50	AS H 1 25				
Fred Walls	"	1 50	CH 87				
Reiman	"	2 50	AS 2 00				
Clement	2/11	8	WE 7 16				
Snohr	"	8	WE 7 16				
Taylor	"	8	WE 7 16				
Peters	"	8	WE 6 72				

THE TAYLOR-WINFIELD CORP
FABRICATING DIVISION

Shop Order 3042

Our Drawing No.

Foote Bros. Gear & Machine Corp.,	DATE 2/6/37
CUSTOMER'S NAME	CUSTOMER'S ORDER NUMBER
5301 S. Western Boulevard,	F-49772-A-2
ADDRESS	WANTED
Chicago, Illinois	2/13/37 Sure

INSTRUCTIONS

One only Housing (2 Halves) fabricated as per B/P #S-30183-1 Spec. annealed and sandblasted
Cuoted Price $500.00

SH. BR. F C AS. WE LAB.

Ship. Wgt. 4230# 2/16/37

STOCK MATERIALS 94 08

KIND	WEIGHT	PRICE	AMOUNT
Wire	126#		10 87
Bar	425#	3.44	14 62
Steel	5800#	2.32	134 56
			149 18

DIRECT PURCHASES

DATE	SUPPLIER	MATERIAL	AMOUNT
2/9/37	IPO F-144		
	2 Blanks drilled		
	& Tapped		70
	Det. Tl. Cstg. Co.		
	Annealing and		
	Sandblasting		16 00
	Keeshin Motor Frt.		
	Frt. 4230# @ .32		13 54
			50 24

COST SUMMARY

DETAIL	COST
MATERIAL STOCK	149 18
DIRECT PURCHASES	52 24
Wire	10 87
LABOR	94 08
PRIME COST	304 37
BURDEN 150 % LABOR	141 12
TOTAL COST	445 49
SELLING PRICE QUOTATION	500 00
PROFIT	54 51
ESTIMATED COST	

Advertisement

APRIL, 1941

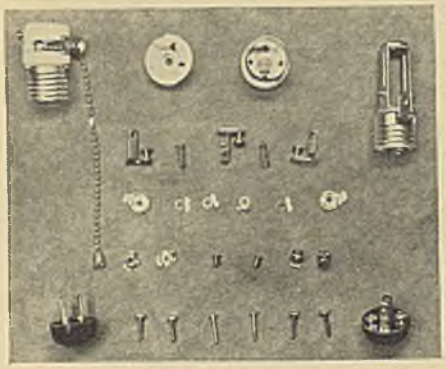
COPPER ALLOY BULLETIN

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*

Lighting Equipment Uses Multitude of Small Brass Parts

Manufacture of electrical sockets, plugs, and other lighting equipment calls for a large number of brass and bronze parts which must be fabricated with extreme precision in small sizes. Extremely careful mill processing of brass wire, sheet, and rod is necessary in order to assure maximum economy in production, combined with high quality of the finished parts. Produced under carefully controlled conditions, Bridgeport brass is ideal for applications such as this.



These brass and bronze parts used in an electric light socket and plug are typical of the many applications of copper alloys in the electrical industry.

Memos on Brass—No. 20

Careful processing of brass at the mill aids the fabricator in attaining maximum economy. Composition and temper can be controlled to meet the requirements of specific jobs.

Lower Heating Costs With Generator-Torch

Substantial savings in the time and cost of many types of heating operations are reported to be possible with the FIREFLOW Dry Gas Generator-Torch, manufactured by Pan-American Laboratories, Inc., Miami. Among the many uses for which the Generator-Torch is said to be suitable are spot and silver soldering, melting lead, heating metals, burning off paint, and operating gasoline or alcohol stoves.

Complete equipment includes motor, pump, and fuel tank mounted as a unit and connected by hose to torch or other accessory equipment. The generator is made of seamless drawn brass, furnished to the manufacturer's specification by Bridgeport Brass Company. Torch head is also of Bridgeport Seamless drawn brass.

Freedom from Oxidation Essential In Successful Soldering of Brass

Clean Surfaces, Correct Selection and Use of Fluxes Are Important Factors in Production of Sound, Strong Joints

In the fabricating of brass, especially of intricate assemblies, it is frequently desirable to join several pieces by soldering, particularly by a soft soldering process involving the use of an alloy of tin and lead.

If the soldering operation is to be successful, it is essential that the brass parts be clean and free from oxide or scale. Depending on the condition and nature of the pieces to be soldered, it may be necessary to resort to alkali cleaning, pickling, acid dipping, filing, sandpapering, scraping, or scratch brushing in order to assure a clean surface.

In addition to removing oxides before soldering, it is necessary to prevent oxidation during the soldering process. This is accomplished by the use of flux which helps to maintain a clean surface and removes any oxides which may form during heating. The flux is applied just before or at the same time the heat is applied.

Types of Fluxes Used

Clean surfaces can often be protected by vaseline, tallow, palm oil, or resin. These materials, however, are not very active, and in many instances it is necessary to use a more active material, such as zinc chloride. Zinc chloride can be made by adding to hydrochloric acid all the zinc it will dissolve. Zinc chloride fluxes usually also contain ammonium chloride, glycerine, and water, depending on the particular requirements. Zinc chloride melts at a higher temperature than some of the tin-lead soldering alloys. Ammonium chloride is therefore often added to reduce the melting point of the flux, so that it will be in a molten condition to protect and cleanse the brass surface when the solder starts to melt. Successful soldering depends on thorough wetting of the surfaces to be joined with molten solder, and this is possible only when clean, oxide-free surfaces are maintained or produced on the brass by proper fluxing.

Glycerine is often added to produce a more viscous material, particularly when the work is of such shape or design that water solutions of the salts mentioned will not remain in place. Soldering paste consists of vaseline to which the more active zinc and ammonium chloride salts are added.

Selection of Solder

The choice of soldering alloy depends on the minimum temperature that must be used on the pieces to be assembled, the melting point of the solder, its strength and cost. For general use, the 50-50 lead-tin alloy is usually satisfactory. As the tin content is increased, the solder becomes more expensive. At 63% tin the alloy of lowest melting point is obtained. Higher tin contents give somewhat higher melting points, while the alloys containing less than 50% tin have considerably higher melting points.

The lower melting alloys are desirable to reduce the tendency to oxidation during soldering. A second advantage is that they have a narrow solidification range, permitting solidification to take place quickly. It is desirable that the solder should have high fluidity at a temperature only slightly above its melting range.

The pieces to be soldered must be heated, at the section to be joined, above the melting point of the solder used. This can be

(*Continued on page 2 col. 2*)

Soldering offers a simple, effective way of producing many brass shapes. When proper care is taken in cleaning, selection and application of flux and solder, strong, efficient joints are readily obtained.

ALLOYS OF COPPER

This is the twenty-second 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 IRON TO COPPER-ZINC ALLOYS

Years ago the processing of brass was such that a small amount of iron was frequently found in commercial alloys. The effect of the iron was to increase the strength and hardness of the alloy. In some cases certain alloys have been made up to take advantage of this increase in strength, although these alloys have been almost entirely of the Muntz Metal type or sand casting alloys.

There are differing opinions as to the quantity of iron which may be dissolved in brass of varying zinc contents. Muntz Metal alloys containing more than about ¾ of 1% of iron form an iron-rich constituent that has a characteristic structure under the microscope. Copper itself has only a slight solubility of iron, and iron in excess of about ¼ of 1% is microscopically visible as an iron-rich constituent.

Effect on Grain Size

The solubility of iron in High Brass is at least as great as in copper, and is probably higher. Its effect on alpha brasses is most marked in retarding grain growth during annealing. This action is cumulative, and is much more noticeable in material which has received a series of cold working and annealing operations than in material which has been cold worked and annealed but once. Practically, therefore, the effect of iron is greater than has been indicated in some of the published reports.

The curves shown in the column at the right clearly indicate the cumulative effect of iron in reducing the grain size of High Brass sheet as the sheet is successively rolled and annealed at lower annealing temperatures. The uncertain effects produced at higher annealing temperatures are indicated by the data for the 665°C. temperature (top curve in graph).

Standard specifications for brass sheet or strip for cupping and forming operations limit the permissible iron content to a sufficiently low value so that the presence of iron is not now a source of difficulty in the fabricating process. Because of this situation, iron is not considered a desirable addition to copper-zinc alloys in which the maximum degree of ductility is desired.

Soldering of Brass

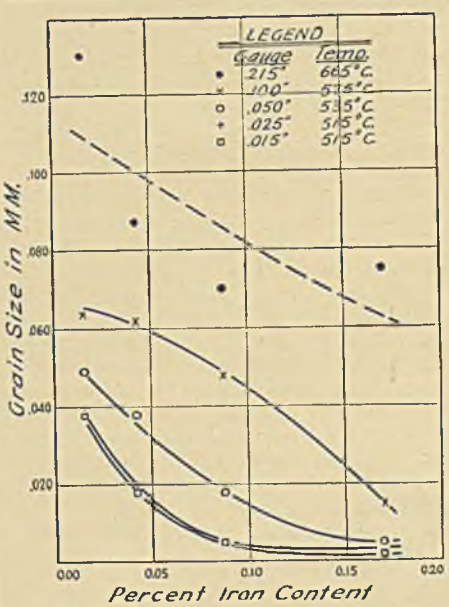
(Continued from page 1 col. 3)

accomplished by torch, soldering iron, or electrical resistance. The manner of applying the heat will influence to some extent the selection of solder and flux. In production, assembly parts can conveniently be rotated in front of a torch until the required temperature is reached and then the solder applied.

Spacing Between Parts

One of the most important points in producing sound, strong soldered joints is the spacing between the parts to be joined. With close spacing, the capillary action insures proper coating of both surfaces if they are clean, and a strong, efficient joint is produced. With wider spacing it is hard to get the solder into the joint, and strength is decreased because of the relatively large mass of soft material.

After completing a soldering operation, it is desirable to wash or cleanse the assembled soldered parts thoroughly, so that the fluxes used do not attack the pieces on standing. Thorough washing in clean water or neutralizing in a mild alkali solution and then rinsing in water is usually sufficient.



Curves illustrate effect of iron content on the grain size developed in Commercial High Brass by subsequent mill annealing operations. (See article at left).

NEW DEVELOPMENTS

A cutting compound is said to combine cooling and lubricating properties, and to permit higher speeds, lower costs, and increased tool life. Maker says that it is composed of oil and neutral chemicals, with no acids, sulphur, or fats, and that it is adaptable to many types of machining operations on brass and copper. **(No. 180)**

A portable grinder, originally intended for toolroom and bench work, is reported to be finding many other applications where grinding operations must be performed n hard-to-reach places. Tool is said to weigh only 1¼ pounds and to operate at 20,000 RPM. **(No. 181)**

Precision grinding is combined with tool grinding in a new machine that is said to have been designed to provide strength, rigidity, ease of handling, and the precision necessary to produce extremely accurate tools. Spindle is built for wet or dry grinding. **(No. 182)**

An electrical connector includes a cable clamp that can be swiveled to either side in relation to the terminal lug. It is said to simplify the making of angular connection to a cable. Range of sizes is said to be suitable for cables from No. 8 stranded to 1,000,000 circular mils. Body and clamp are of copper alloys. **(No. 183)**

A wire stripper employs heat to burn through the insulation. Depressing a foot pedal brings together a pair of heated blades which burn parallel grooves in the insulation. A slight twist and removal of the wire is said to result in clean stripping. Slot in housing assists in guiding wire into position. **(No. 184)**

A new soldering flux is described as acid-free. It is said to be available in stick form for direct application on a heated surface. Maker says that it can also be melted and applied in liquid form with a brush. **(No. 185)**

Welder's clamps are said to provide extra throat depth and definite clearance within the clamp frame. Shield protects clamp screw from spatter or accidental contact with rod and torch. Heavy swivel is said to give broad contact on work, and brass washers reduce wear. **(No. 186)**

A rivet sorter is reported to take accumulations of rivets swept from factory floors and separate them according to diameter, head shape, and length. Originally designed by a leading aircraft manufacturer for his own use, it is soon to be placed on the market. **(No. 187)**

A unit heater of the downblast type is said to be especially suitable for installation in buildings with high ceilings. It is reported that the largest size gives effective heating even at heights of 40 feet above floor level. Heating element utilizes copper tubes brazed into copper headers to form a homogeneous unit. **(No. 188)**

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.

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FLEUR-O-LIERS are tested and *Certified* by Electrical Testing Laboratories to 50 rigid specifications set up by the MAZDA Lamp Manufacturers for good light and safe, reliable service. And all control equipment (ballasts and starters) is also certified to assure you of balanced, economical performance.

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Why it pays to look for this label. Electrical Testing Laboratories certify *that FLEUR-O-LIERS have met with 5 specifications for Lighting Effectiveness—6 for Electrical Safety—18 for Mechanical Soundness —14 for Electrical Excellence—7 for Auxiliary Performance . . . as set up by MAZDA Lamp Manufacturers. All Certified★ FLEUR-O-LIERS must be equipped with auxiliaries (ballasts and starters) certified by E. T. L. When you buy, check with your lighting company on how to install FLEUR-O-LIERS to properly meet your needs.*

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Manufacturers

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TEAR OUT AND MAIL

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Please send me helpful information about Certified★ FLEUR-O-LIERS, packages of indoor daylight for factories.

Name _____

Address _____

City _____ State _____

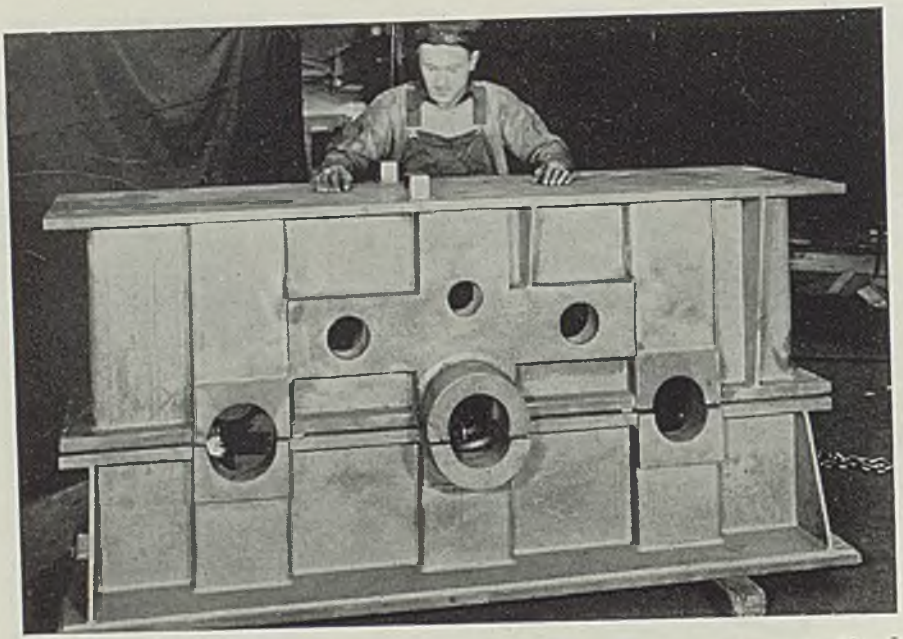

Fig. 4—Gear case fabricated by welding. Cost summary sheet shown in Fig. 3

these operations can be broken down, this estimate requires considerable experience.

Assembly: Time estimates for assembly depend largely upon the number of pieces involved, the weight and thickness of the pieces, their location, the number of bent pieces which must be fitted and the number and type of sub-assemblies. Assembly operations have been broken down according to these factors and time studies made of each one to afford a basis for estimating cost of assembly work. A valuable help also are records of similar jobs. However, estimating assembly time is largely a matter of experience and engineering skill, and so must be developed.

Welding Time: For our estimates we use welding speeds compiled by Lincoln Electric Co. of Cleveland in "Procedure Handbook of Arc-Welding." Various tables are included in part 3, "Design and Practice." Welding speeds are broken down as to size, type and length of weld required. In addition a certain percentage of the actual welding time must be allowed for handling and positioning the work. Of course the size and nature of the job largely determine the handling time, which may easily run up to 40 per cent of actual welding time.

Amount of welding wire to be consumed is estimated also from this same book.

Grinding: Cost records of the last few years reveal that approximately 10 per cent of the estimated assembly and welding time is used for cleaning and grinding. Estimates based on that figure will be found fairly close.

Checking: If 10 per cent of the estimated assembly time is allowed for checking, it will be found adequate to cover this item in most cases.

Normalizing and Sand Blasting: For this item a flat rate based on shipping weight of the part is recommended. These figures are used and may afford a valuable guide. For parts up to 300 pounds, the rate is 1¾ cents per pound; from 300 to 1000 pounds, 1½ cents; from 1000 to 3000 pounds, 1¼ cents; from 3000 to 5000 pounds, 1 cent; from 5000 to 20,000 pounds, ¾ cent; from 20,000 to 100,000 pounds, ½ cent.

To explain the above breakdown of the various fabricating operations, our method of preparing orders and shop procedure should be detailed briefly. For any job, no matter whether it is a redesign or a new design, detailed drawings have to be made and a bill of material made up to list each part. For all parts to be flame cut, paper or metal templets are laid out in full size and with proper allowance for flame-cutting kerf added to the actual size. If more than 10 pieces of the same detail are to be cut, or if close tolerances are required, it is advisable to provide metal templets.

The detailed drawing includes a specification of all necessary fabricating operations as well as size of stock required. All parts are checked before assembly. Complicated designs quite often have assembly specifications included. Jigs and fixtures are designed and used in assembly of work when quantity production is required. The cost of these is determined and spread over the total production on which they will be used—this item being included, of course, in estimating production costs.

Checking assemblies before welding is standard practice. All parts to be welded are marked with chalk, indicating to the welding operator the size, type and length of weld required as specified on the assembly drawing.

Grinding and cleaning operations are standard for all parts fabricated from steel plates or standard roll sheets. Normalizing and sand blasting are standard practice for all parts to be annealed. Parts to be annealed are braced on any surface which might tend to warp or sag under heat. A thorough inspection after sand blasting affords an excellent check on the welds.

Cost Records: A most essential portion of any system for estimating is an accurate and complete set of cost records of each operation. This is necessary not only for accounting purposes but to afford an accurate check on estimated costs. Also this affords a means of spotlighting operations which cause the finished costs to be excessive.

Standard time slips to be filled out daily for each operation performed are recommended. The time spent for any operation is recorded daily on the job summary sheet provided for each shop order. This summary sheet, showing both estimated time allowed for the particular operation and the actual time consumed, affords a means for checking.

A complete cost record listing all expenses for the finished job is shown in Fig. 3. Each man's time and the dates on which he worked are listed as well as stock materials employed and items purchased. A supplementary record is kept for the direct outside purchases, which are summarized on the cost record, Fig. 3. The gear case, Fig. 4, is the complete part for which the detailed cost figures are given in Fig. 3.

Of course the estimating methods and cost records described here can be varied widely and still serve the purpose excellently.

Data and illustrations used here are taken from a study submitted to the James F. Lincoln Arc Welding Foundation, Cleveland, by W. Hoenes, chief engineer, and W. J. Reinhard, formerly draftsman, Taylor-Winfield Corp., Detroit.

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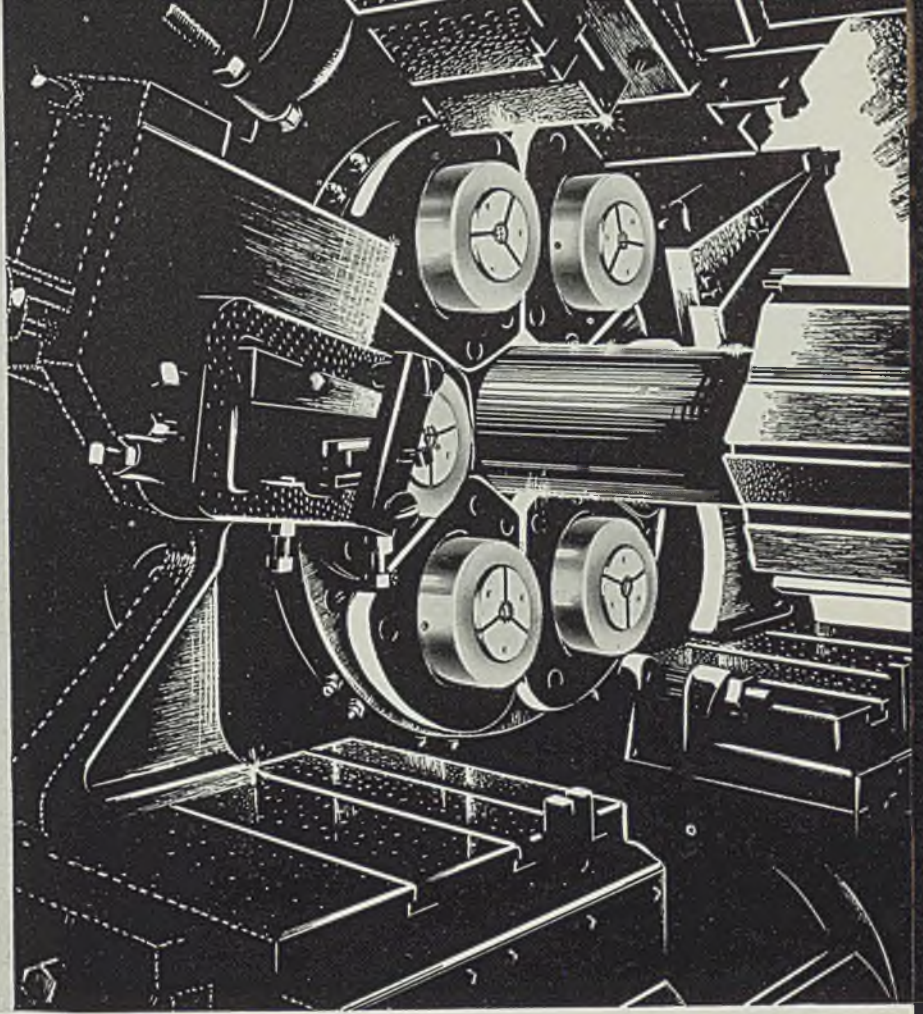

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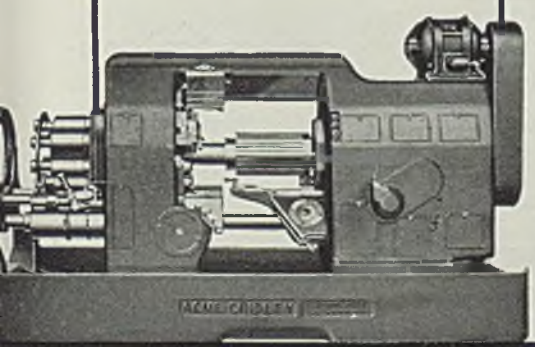

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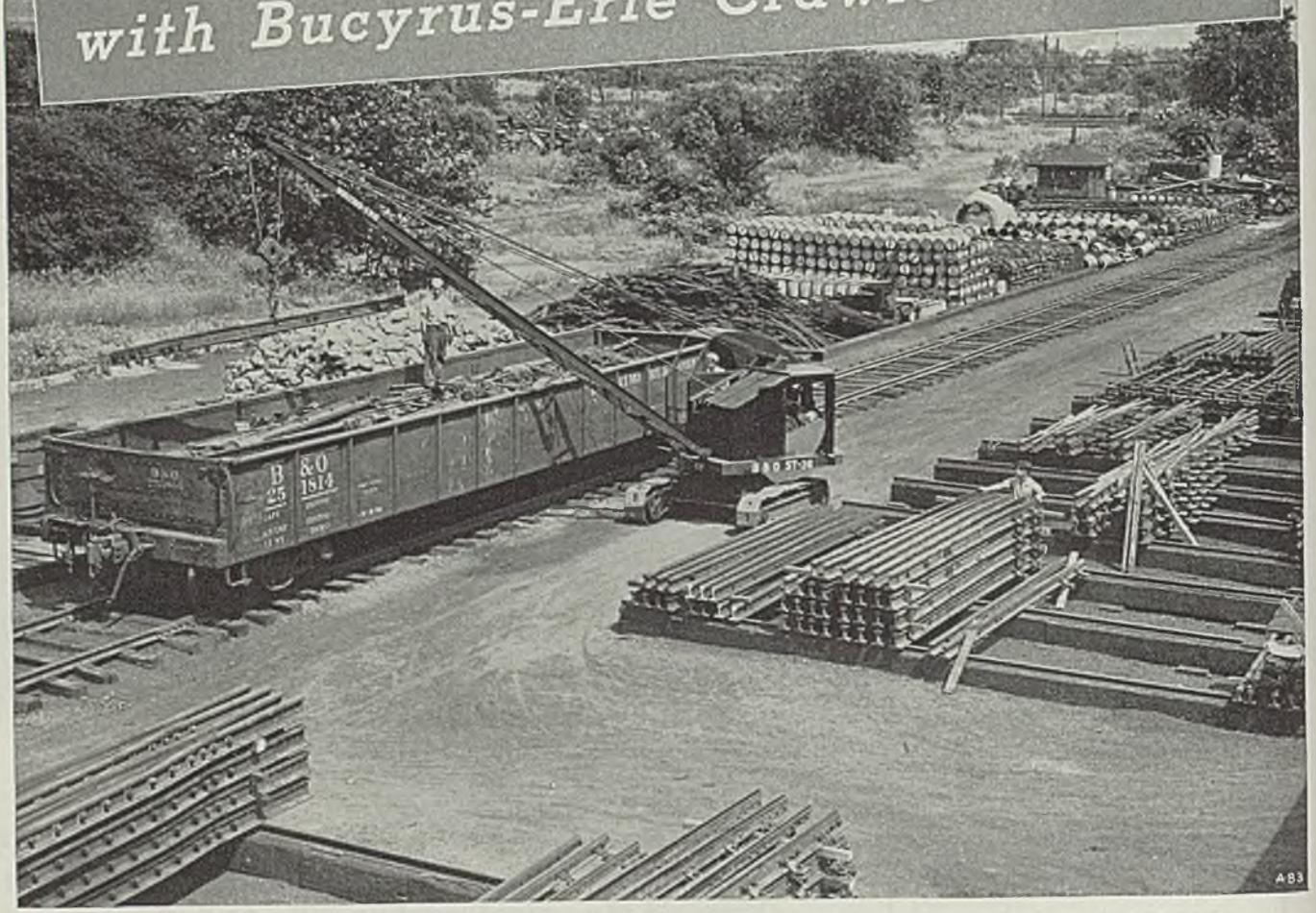

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How Handling Work Is Organized For Field Erection of Steel Tanks

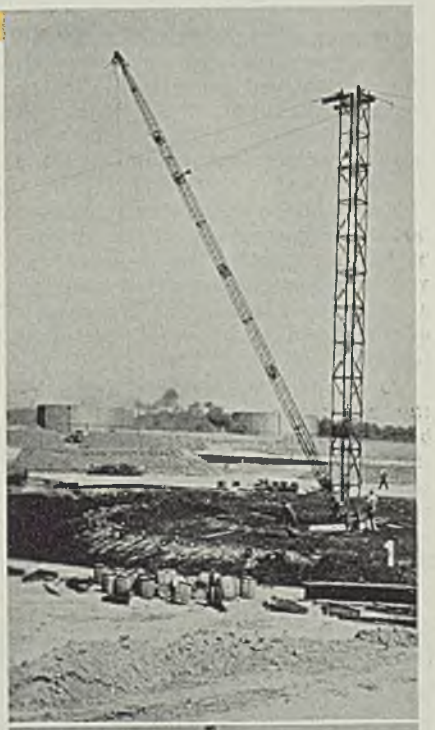
Possibly one of the most unusual shapes of tanks to be field erected is the Hortonspheroid. Thus it serves well to bring out some of the unusual handling methods employed in field erection of steel tanks. Here is presented a complete sequence of operations involved, with a series of 11 illustrations to show pictorially the methods involved

By F. L. SPANGLER
Mechanical Engineer

(Concluded from Last Week)

ALL THE bottom plates of a tank of the Hortonspheroid type rest on a layer of sand. First, the center floor plate, of circular shape, is laid in position. For low-pressure spheroids, this plate, as well as the other plates forming the shell of the tank, is 5/16 or ⅜-inch thick. Its diameter depends on the capacity of the tank. In the center of this plate is then welded a framework forming the base of a tower. This tower is about 40 feet high, not including a temporary extension built onto its top, and consists of angle uprights at the four corners tied together with horizontal and diagonal members bolted or welded to suitable gusset plates.

This tower, with extension, is erected piece by piece, with the workmen climbing the structure as erection proceeds. The individual parts of the tower are hauled up, hand over hand, by the erectors and bolted in place, rope being used for this purpose without the application of sheaves or pulleys. The completed tower remains permanently in



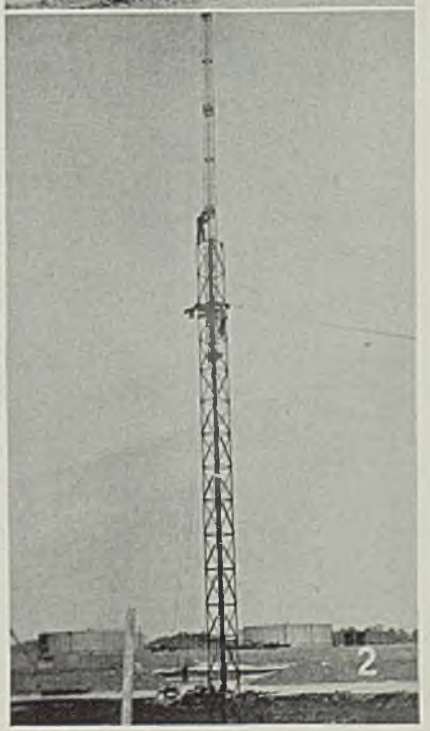
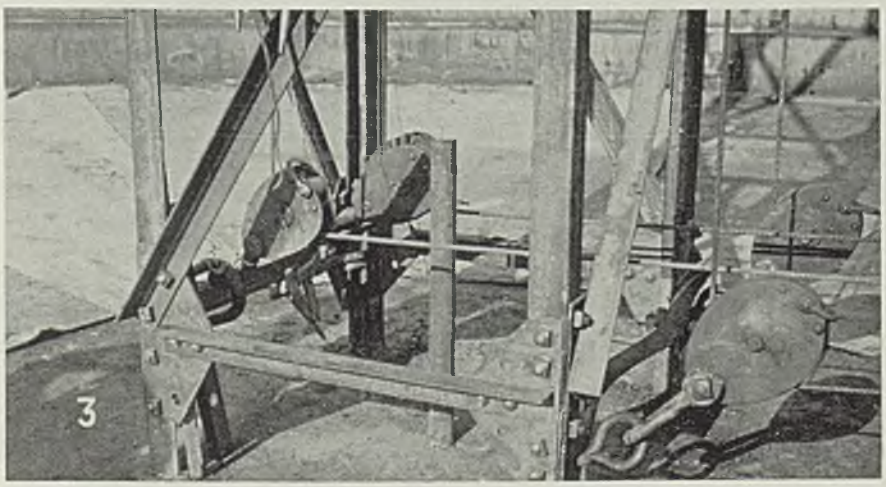
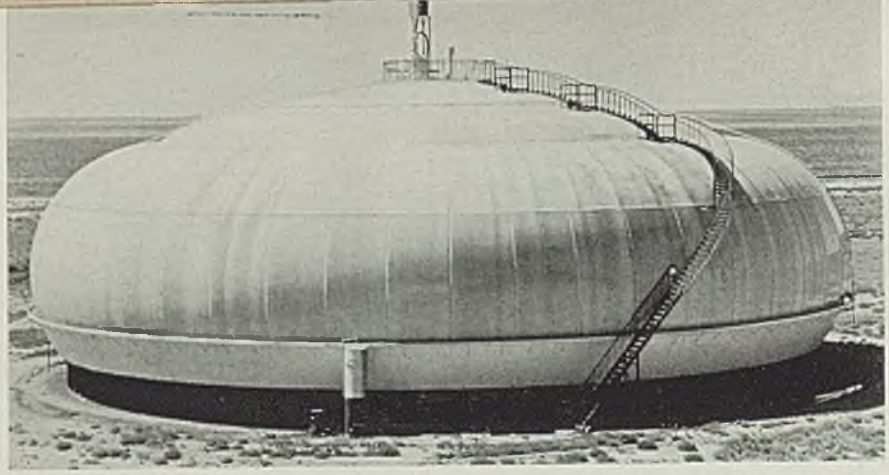


Fig. 1—Center tower has been erected and derrick mast is being raised into its regular position

Fig. 2—Here the derrick mast is in normal position atop tower

Fig. 3—View of fair lead sheave blocks at base of center tower





This is a Hortonspheroid, a type of tank involving some particularly difficult handling work. The steps in its erection are shown pictorially

position and coincides with the axis of the tank, forming a support for the center of the tank roof. See accompanying illustrations showing the sequence of operations. In the instance pictured, the tower was erected directly on the ground with bottom plates subsequently fitted around it.

Meanwhile, the derrick mast and boom are assembled on the ground by bolting together the ends of their various sections, each measuring about 20 feet in length. The length of the mast is about 90 feet and the boom about 75 feet.

To upraise the derrick mast, all the horizontal and diagonal members are removed from one side of the center tower, and the mast is pulled upright by a rope attached to its top and passing over sheaves at the top of the tower, and the horizontal and diagonal members that had been removed from the tower to allow the upending of the mast are again bolted into place.

Now the mast is raised by means of ropes anchored to the bottom of the tower and passing through sheaves at the top of the tower extension, while the top of the mast is steadied by means of guy ropes. When the bottom of the mast has reached the top of the tower proper, it is anchored onto a platform designed specifically for supporting the derrick. This platform is provided with a bull-wheel, also rope-operated, for swinging the derrick. The extension at the top of the tower is now removed. The derrick boom is then lifted into position by means of a rope passing through a sheave near the top of the derrick, and is swung into place and the bottom anchored at the base of the mast.

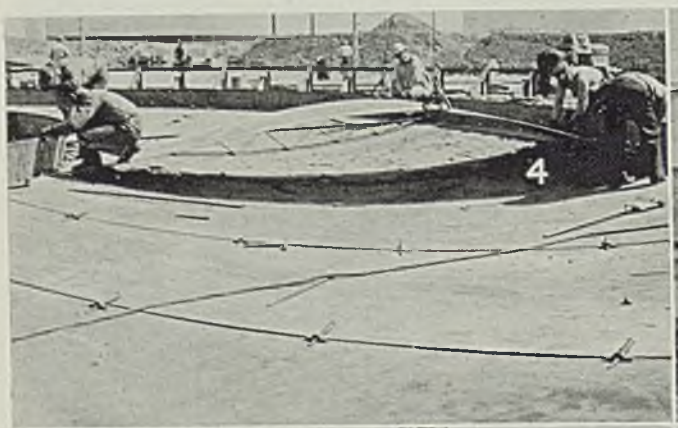
Circular Girder: Then follows the installation of a circular girder onto the sand base of the tank, this forming a ring whose center is the base of the tower. This girder is shipped to the site in weld-up sections, which are bolted end to end after being set in place. These girder sections have a cross-section similar to an inverted Y and consist of three plates welded together at their edges, each plate forming one of the legs of the Y. Since the tank bottom plates, in the form of cusps of a prescribed shape, will later be installed with their edges lapped over or butt-welded to the bottom plates of this girder, it is important that every point on the girder be positioned exactly. To assure proper positioning, permanent wooden stakes are first driven into the ground with their positions and height accurately determined, and then the girders are set onto the

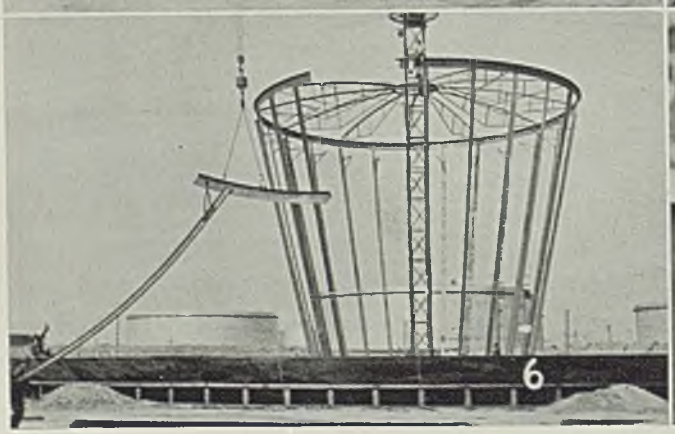
Fig. 4—Laying bottom plates on sand base: Behind plate being lowered is a latticework templet for molding the sand base to proper contour to fit plates

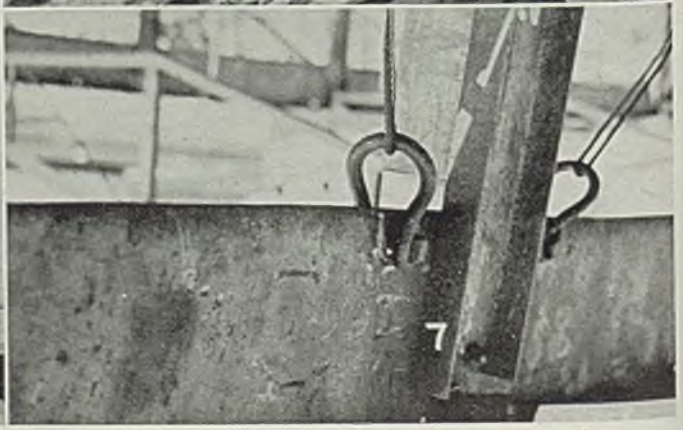
Fig. 5—Laying plates in position on top of the outside circular girder

Fig. 6—Erecting posts and girders around the center tower to constitute the first circle of supports

Fig. 7—Method of dead-ending ropes for plumbing the structure







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stakes, followed by the tamping of sand under the girders.

Tank Bottom: This girder then supports the edges of the cusp-shaped plates forming the bottom of the tank. These plates must rest on the sand bottom at all points. Hence, the sand is molded to the shape of the plates. For the molding operation, a templet is used, one edge of which is shaped to the exact form of the cusp to which the plates have been formed.

The outer end of the templet is set on the inner edge of the circular girder and the other end rests on the edge of the center plate, with the cusp-shaped edge at the bottom. The templet now is moved laterally around the center plate, and the surface of the sand is built up or leveled off even with the bottom edge of the templet.

Standard templets have been developed for each type and capacity of Hortonspheroid. These templets are made of wood or of steel channels, formed into latticework to provide light weight and ease of handling.

With the sand surface molded to proper shape, the plates are laid in place on the sand. These plates are handled by suitable rope slings attached to the derrick hook. On low-pressure tanks, the edges of these plates are lapped and are temporarily held together by special clips.

Second Circular Girder: Outside the first circular girder is now laid a second girder forming a circle of considerably greater diameter than the first. The design of this girder, the use of positioning stakes, molding of the sand, and installation of the bottom plates are the same as with the first girder and first course of plates.

A third or outside girder is next laid, forming a circle having a diameter almost as great as that of the tank itself. This girder serves to support the outside edge of the tank bottom where it meets the curved sides of the tank, thereby maintaining the smooth, unbroken curve between the bottom and side plates. Like the other circular girders, this one also rests on stakes. It consists of welded triangular-shaped upright sections, so positioned that the bottom plates of the tank rest on the longest leg of the triangle, which is shaped to conform to the curve of these plates. These upright triangular sections are bolted to horizontal angle irons bent to form the arc of a circle. The sand bottom between the outer and middle girders is molded with the aid of a templet, and bottom plates are laid in place and clipped together for holding in position.

With all the bottom plates now in place, all seams are welded, and the plates are welded to the girders. In setting up the sequence of welding, effort is made to avoid buckling and shifting of the plates.

Posts: After the bottom of the tank is welded, posts are erected in such a position as to lean slightly away from the tank axis. These posts are built up of channels, and their bottoms are bolted to the top plate of the inner and middle circular girders and are spaced at regular intervals along these girders. Each of the two rings of these posts is tied together at its top by other girders. Steel trusses, delivered to the site already fabricated, span the space between these top girders, and other trusses span the space between the inner top girder and the top of the center tower. The upper edges of these trusses have the same curvature as the top plates of the tank. Before the top plates are installed, however, the framework is plumbed by means of ropes temporarily fastened to the bottom girders by shackles. Prefabricated trusses also are erected between the outside bottom girder and the tops of the outside posts, these trusses serving to support the side plates, or equator course.

Plates: With all posts, girders and trusses bolted, the next step is to install the plates forming the equator course. These plates are hoisted into position by means of the derrick. The bottom of each plate is fastened to the tank framework by means of special clamps, after which the top and sides of the plate are clamped into position. For low-pressure lap-welded spheroids, the plates forming the equator course are not dished or rolled, as are the top and bottom plates, but one edge is crimped, this being the edge that laps under the edge of the adjoining plate.

Following installation of the equa-

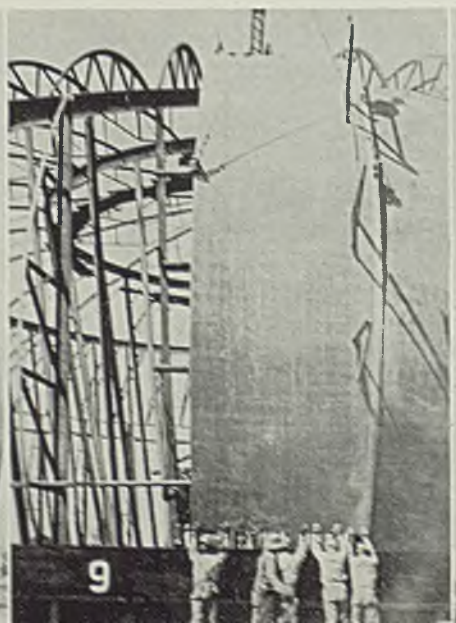
(*Please turn to Page* 99)

Fig. 8—Erecting outer row of girders for supporting top and side plates: Note latticework girders curved to fit plate

Fig. 9—Putting a side plate in place: The welded brackets are used here to support the scaffolding around the tank

Fig. 10—Removing derrick boom from top of center tower: Note scaffolding in place around "bulge" of tank

Fig. 11—Derrick mast is removed in sections



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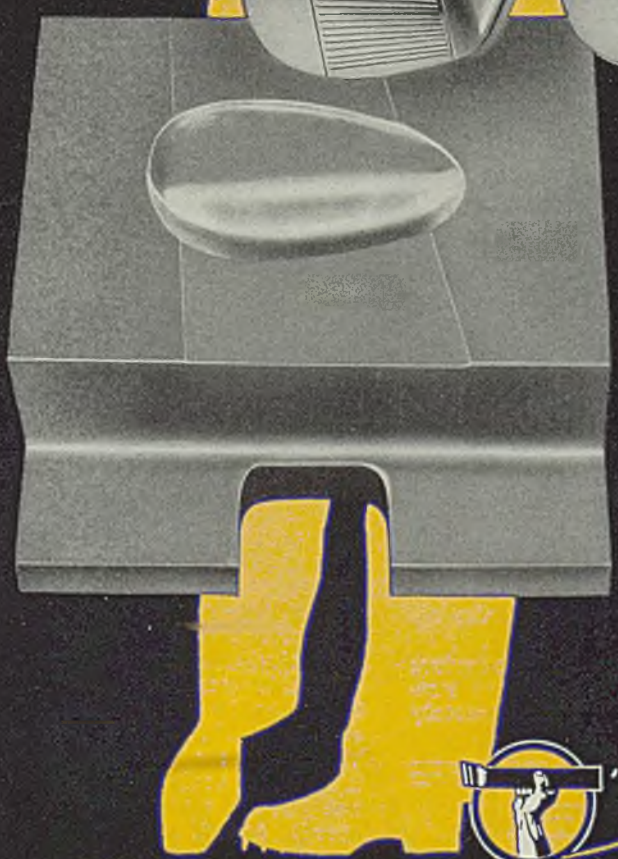

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A Cure for Variable-Voltage Ills in Strip Rolling

Cold reducing mills for sheet and tin plate production now are built with maximum delivery speeds of 2700 feet per minute. Mills are being designed for still higher speeds which has been possible by the development of what is known as IR drop compensation for motors driving the individual stands. This arrangement permits motors to maintain the same synchronized speed relationship between each other throughout the entire range from full running speed, down to threading speed and thus hold normal gage and prevent the strip from breaking. The author in the accompanying article describes the IR compensation system and explains its various applications

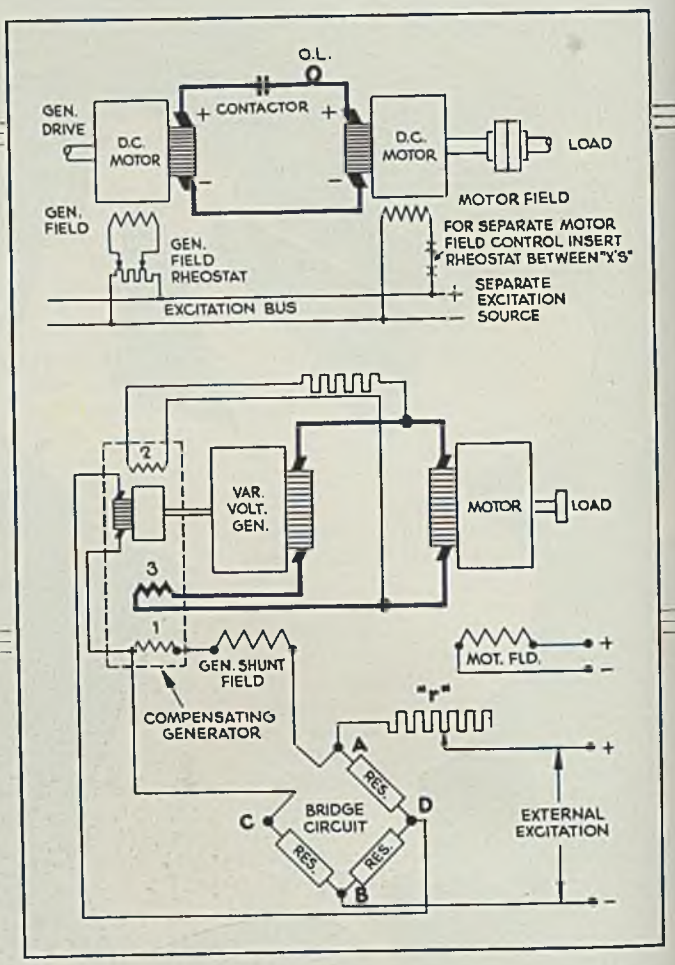

Fig. 1—Simple variable-voltage drive system using a single generator and a single motor. System is adaptable to wide range of speed control where extreme accuracy of speed setting is not required. (See upper diagram)

Fig. 2—Single motor, single generator variable-voltage drive system for use where extreme exactness of speed control is necessary. System is commonly used on planers, single-stand rolling mills and other single motor driven machines

■ AS DELIVERY speeds of cold-reduction tandem mills go higher and higher, the relationship between mill running and mill threading speeds grows steadily larger; and to successfully drive the newer mills, the speed range of the electrical drives has been increased. With this increase of range, mill drive motors under their variable-voltage control system are called upon to drive the mill at threading speeds with only about 10 per cent of their rated voltage applied. Since motor characteristics at such voltages radically differ from their characteristics at normal full voltage, speed and tension relationships between the mill stands become increasingly difficult to maintain during the accelerating, decelerating, and threading periods. A new system of compensation, called IR drop compensation, developed expressly for correcting this undesirable condition, has eliminated these speed and tension variations by automatically compensating for the motor's normal characteristic change. New mills employing this scheme have been found much easier to control and the amount of off-gage strip produced during accelerating and decelerating periods has been considerably reduced.

Compensation is not new to variable-voltage control schemes; many methods of obtaining it have been used with its simpler forms. Before discussing the operation of this latest compensation scheme, it is well to examine a few of the more common compensation methods in wide use at the present time.

In its simple form a variable-voltage drive consists of a direct-current motor electrically connected to a remote direct-current generator, both machines being excited from a separate constant-voltage source. The generator field excitation can be varied from zero to that required for full voltage, and usually can be reversed. The motor field excitation may be fixed, or adjustable, depending on the operating requirements.

Where the duty cycle requires acceleration, deceleration and running under load over a moderately wide speed range the most simple form of control can be used. However, if during a part of the duty cycle the speed must be so low that the generator operates at only a small fraction of its full voltage and if the load is variable during this part of the cycle, some compensation must be provided for the resistance drop in the armature circuit. For example, in a variable-voltage system consisting of a 250-volt shunt generator and motor, the resistance drop in each armature may be 10 volts at full load, or a total of 20 volts in the circuit. When the system is operating at 250 volts, variations in load will not have a material effect on the speed. But if the potential is reduced to 15 or 20 volts, the motor speed will vary widely with changes in load, and the motor may stall completely even though the load

By R. W. WRIGHT
Steel Mill Engineer
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

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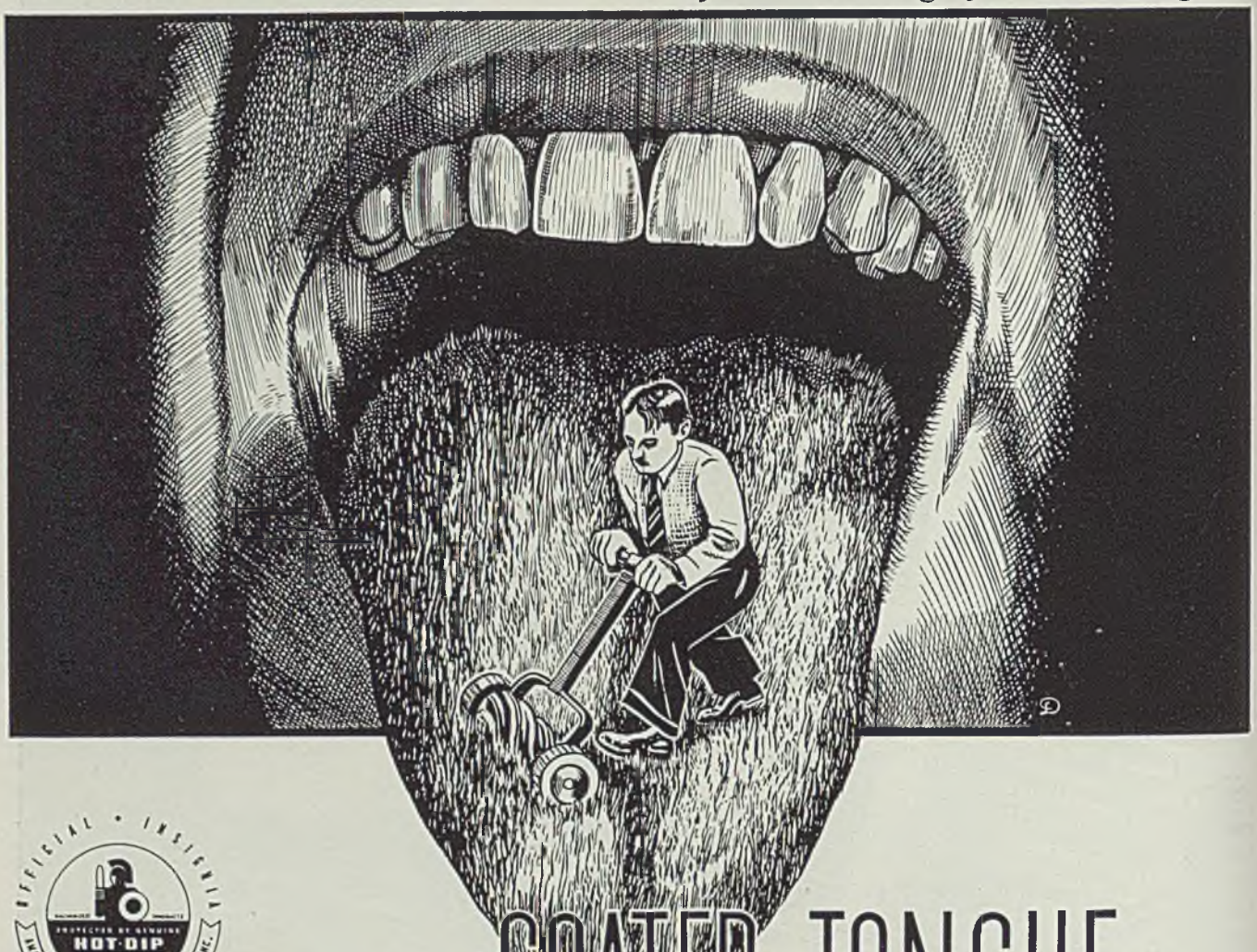

The COATED TONGUE

This coat is not popular in the accepted sense, although it is quite common. The boys who stay out late singing "Sweet Adeline" often grow coats on their tongues which they swear couldn't be trimmed with anything short of a lawn mower, but this might be a slight exaggeration. Doctors use a lot of long words to describe the coat on a tongue, but they learned most of them during the time an Experiment, Noble in Purpose, was written into our Constitution. At that time many tongues grew protective coatings against the corrosive beverages that law-breakers sold for high prices; addicts during that era were said to have been able to lick mild acids without any trouble. Ferrous metals, however, grow no protective coatings. The best way to protect them is to galvanize them. When HANLON-GREGORY, by its HOT DIP GALVANIZING PROCESS, coats ferrous metals, they STAY COATED. As a result of this process, the zinc coating becomes an inseparable part of the base metal. Protection is then assured for more than two generations. When it comes to protective coatings, simply remember that HANLON-GREGORY HOT DIP GALVANIZING is the BEST means of prolonging the life of ferrous metals—it fights corrosion to a standstill.

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torque is less than the full load torque capacity of the drive. It is for this latter condition that resistance drop compensation is required.

For a simple system consisting of a single generator and a single motor, a number of compensating methods for voltage drop are available. Where there is only one low speed and the load torque is known to be constant, a simple voltage regulator, calibrated to maintain a low voltage, can be introduced into the control circuits, at low speed only, to maintain a definite minimum voltage at the motor terminals.

For more exacting applications where the load torque may vary over a wide range, and may be either positive or negative, and where both armature resistance and generator residual voltage may affect operation at low speed, more accurate compensation is required.

Fig. 2 shows schematically a compensation system frequently used for exacting applications. This system utilizes a small regulating generator and a bridge circuit as shown. Exciting current from the external source is introduced into the bridge circuit at points A and B through the adjustable resistance r. The exciting current is proportional to the desired main generator voltage. The compensating generator is connected to the bridge circuit at C and D so that its output current will either be added to or subtracted from the current drawn from the external source, depending on the compensation required. The function of the compensating generator is to maintain the speed at the value corresponding to the current flowing in resistance r.

Same Current Is Carried

Field 1 of the compensating generator is in series with the shunt field winding of the main generator, and carries the same current. It produces a voltage in the compensating generator which assists the main generator field. Field 2 opposes Field 1, and is adjusted so that it exactly neutralizes Field 1 at no load and at about half voltage on the main generator. Therefore at no load and half voltage the voltage of the compensating generator is zero and the main generator voltage is proportional to the current in its field. Field 3 assists Field 1 and its strength is adjusted so that, at any motoring load, it causes the compensating generator to boost the voltage of the main generator by an amount equal to the resistance drop in the main armature circuit. This arrangement makes it possible for the motor to operate with heavy loads at low speeds.

If, on the other hand, the external excitation has been reduced to a low value to secure a low light load motoring speed, and the residual to voltage of the main generator tends to give a higher speed than is desired, Field 2 will be stronger than Fields 1 and 3 and the voltage of the compensating generator will reverse, reducing the main generator voltage to the correct value. If the load current increases due to uneven load, Field 3 will tend to raise the voltage and maintain the speed. If the load is overhauling, the motor becomes a generator; its terminal voltage rises and the current reversed. Fields 2 and 3 then oppose Field 1 and weaken the generator field. This increases the regenerative current and limits the speed.

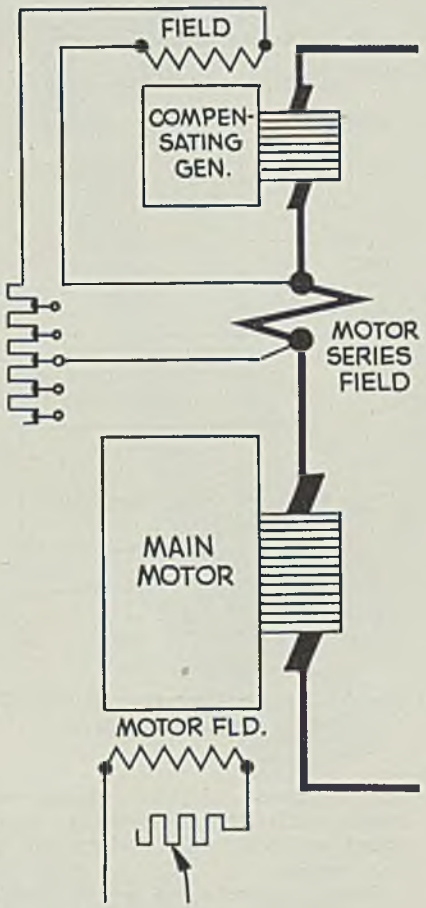


Fig. 3—When various motors must be driven off a single generator, the variable-voltage system is ideal. Unless resistance drop in motor armature circuits is compensated, variations in motor speed will result. Newest compensation method is one where a compensation generator is placed in armature circuit of each motor

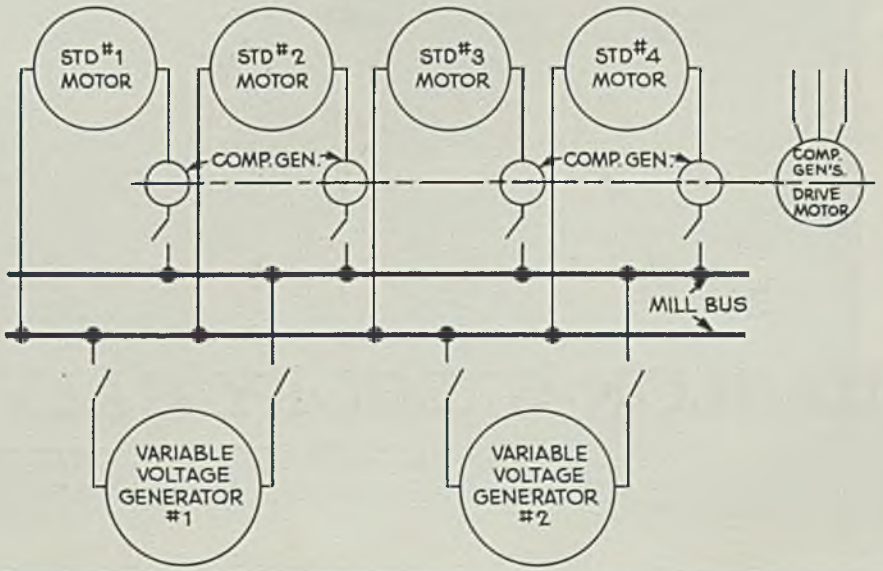
The discussion applies to simple variable voltage systems having one generator and one motor. Resistance-drop compensation is also desirable for more elaborate systems where a single generator supplies several motors, each driving an independent load. For example, a tandem cold strip mill has four or five roll stands, each independently driven and a reel for coiling the finished strip under tension. The tension reel and roll stands are driven by adjustable speed direct-current motors, all supplied from a variable voltage direct-current generator.

Low Speed for Threading

Refinements in mill design and operating practice have made delivery speeds of 2000 to 3000 feet per minute possible. However, with most existing mill equipment it is necessary, when starting on a new coil, to thread the front end of the strip through the mill at a speed corresponding to about 250 feet per minute at the reel. Speed settings of the individual motors are not changed during the threading period; the reduced speed being obtained by lowering the generator voltage. With such a wide difference between running speed and threading speed, it is necessary to make the threading voltage only about 10 per cent of the normal voltage.

When the mill is operating at normal delivery speed, the motor

Fig. 4—Typical IR drop compensation scheme applied to variable-voltage drive of a 4-stand tandem continuous mill



speeds are adjusted so that the strip is under tension between mill stands, as well as between the last stand and the reel. These basic adjustments should not be disturbed while the mill is slowing down to threading speed; while operating at threading speed; or while the mill is accelerating to full speed. At the same time, strip tension must be maintained to keep down the amount of off-gage material produced. To avoid the necessity for adjustments at intermediate and threading speeds, the resistance drop in the motor armatures must be compensated. This is because the motors are not duplicates and the loads are not equal, and no matter how flat the speed regulation may be at full voltage, any motor will have a badly drooping speed characteristic when operated on 10 per cent voltage. A large 600-volt mill motor designed to have less than 2 per cent speed variation from no-load to full-load at rated voltages may have a speed drop of 35 per cent when operated at 10 per cent voltage.

Voltage Drop Corrected

Since all motors usually are not alike, the voltage drop in each motor armature must be individually corrected. This is accomplished by the use of compensating generators, one for each motor. The armature of each compensating generator is in series with the main mill motor armature, and boosts the voltage applied to it. The amount of boost is proportional to the field voltage of the booster or compensating generator, and since its field is excited by the voltage drop across the interpole and compensating winding of the main motor, the voltage boost is proportional to the load on the main motor. The windings of the compensating generator are selected so that its output voltage is equal to the resistance drop in the main motor armature. The speed of the main motor at low voltage is therefore not affected by the load

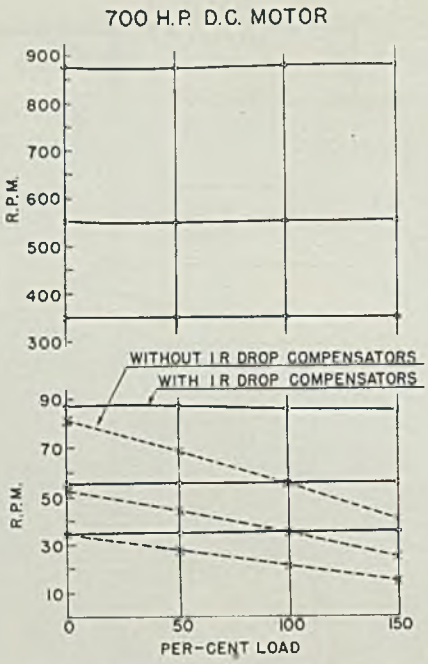


Fig. 6—Graphic illustration of what IR drop compensation does

and the speed relations existing between adjacent motors at high speed are accurately maintained at low speeds.

When a number of motors must be driven off a single generator, the variable-voltage system is ideal. However, unless resistance drop in the motor armature circuits is compensated, variations in actual motor speeds will result. Newest and most successful compensation method is one where a compensation generator is placed in the armature circuit of each motor, as shown in Fig. 3. Field of the generator is excited by the resistance-drop voltage developed across the series field of the motor. The relation of the voltages developed is such that the compensating generator develops a voltage that exactly equals the IR drop developed across the motor armature; thus the system operates as though IR drop never existed.

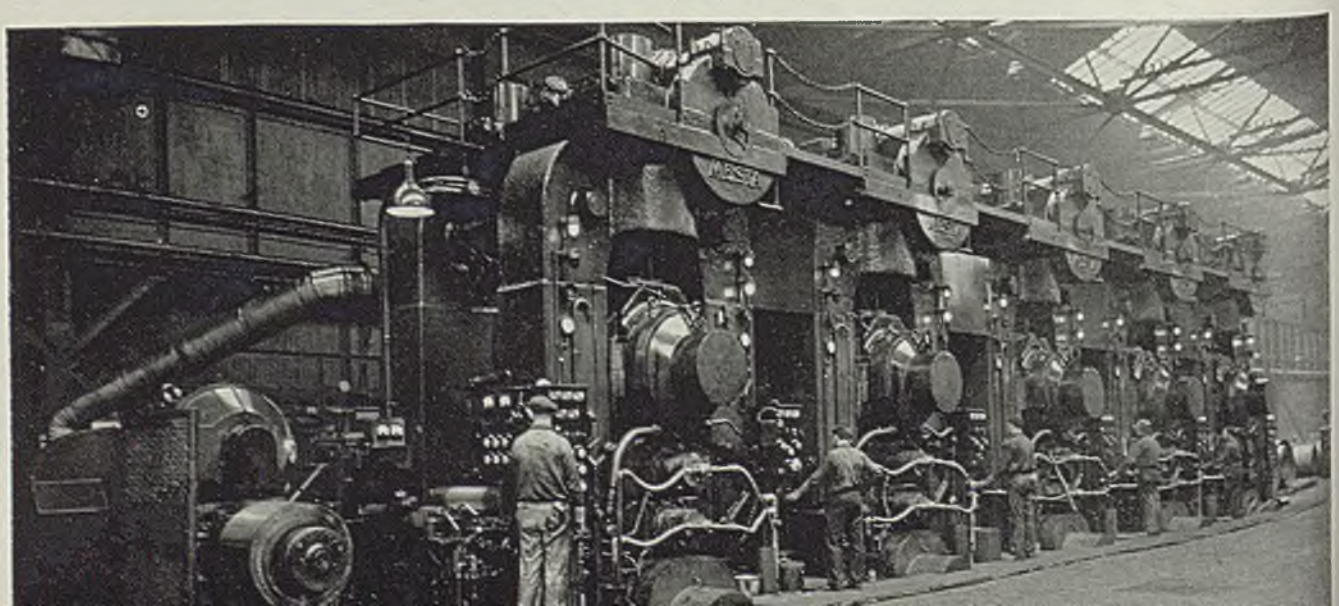
A typical IR drop compensation scheme applied to the variable-voltage drive of a 4-stand tandem continuous rolling mill is shown in Fig. 4. There is a compensating generator on each stand's drive motor. The four compensating generators are driven by a common motor which usually takes its power from an alternating-current mill source. By eliminating IR drop with its accompanying speed variations between the mill stand drive motors, this scheme makes possible a mill that almost controls itself. It assures constant strip tension relationships between mill stands during accelerating and decelerating periods when the mill is advanced from threading to running speeds and vice-versa; manual correction of individual motor speeds is eliminated. Results show up in greater mill production, less off-gage strip especially during these accelerating and decelerating periods, and in improved mill operation. This system has so far been applied to seven mills and results in all have proven the success of the IR drop compensation method. New mills being built at present are including this scheme in their electrical drives.

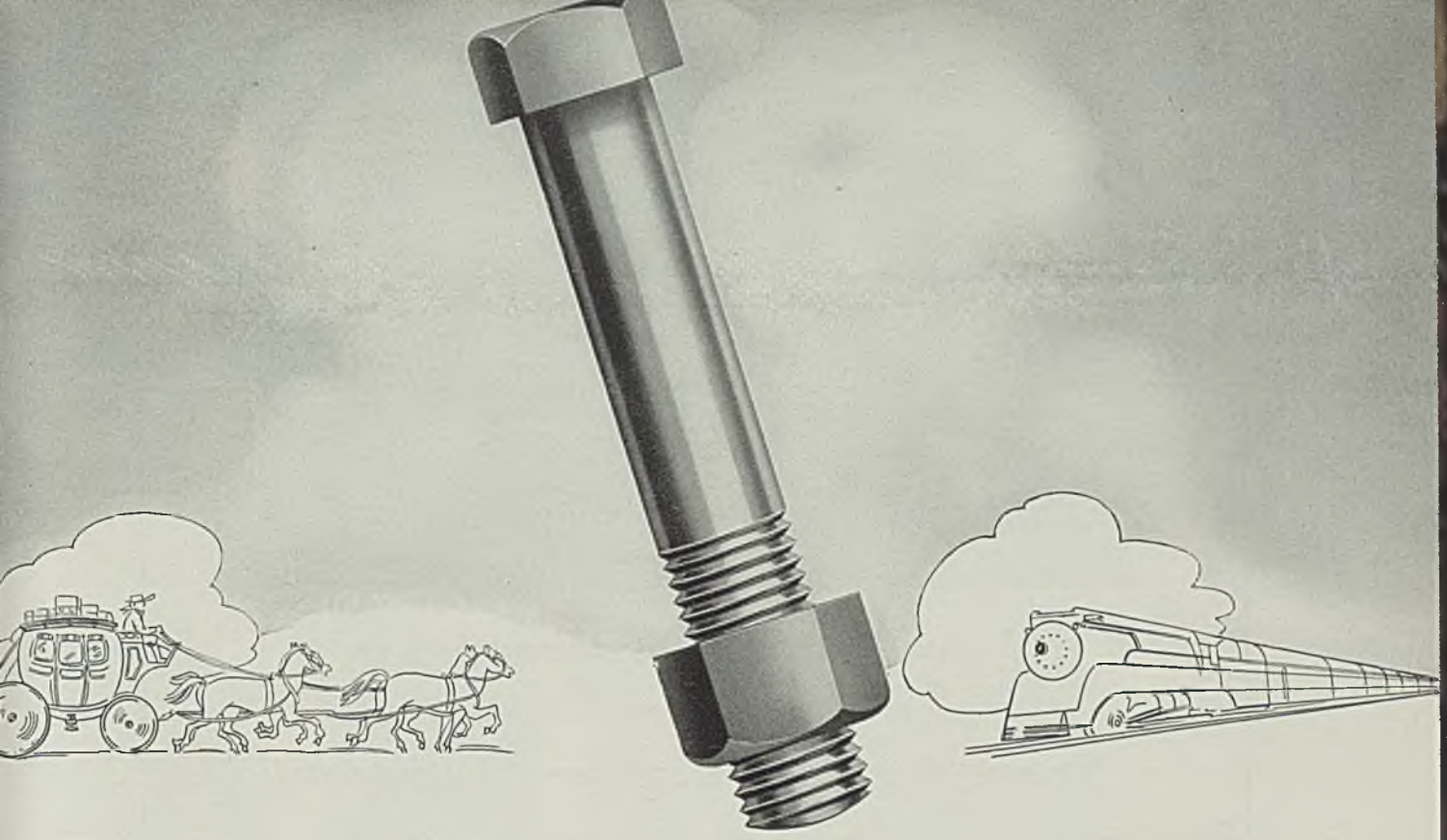
Typical of Latest Mills

The 5-stand-tandem cold-reduction continuous tin mill shown in Fig. 5 is typical of the latest mills of its type. It employs IR drop compensation to automatically maintain correct tension values on the moving strip between mill stands. Compensation has played a major part in making higher mill speeds up to 2000, and on mills being built, up to 3000 feet per minute will be possible. Its use relieves mill op-

(*Please turn to Page* 99)

Fig. 5—Typical 5-stand cold-reduction tin mill which employs IR drop compensation to automatically maintain correct tension values on strip between stands





OLD FASHIONED IN PRINCIPLE

Yet a modern Invention

OLTS: Carriage - Machine - Lag - ow - Stove - Elevator - Step - Tap - Wheel & Rim - Battery - U-Bolts - Tire Automotive - Drilled - Faced - Special Heat Treated, etc. - **NUTS:** Cold Punched - Semi-Finished - Hot Pressed - Case Hardened - Slatted - Castle - Machine Screw - Marsden Lock - Low Sulphur - **RIVETS:** Standard - Tinners' - Coopers' - Culvert - Clevis and Hinge Pins - **SCREWS:** - Cap - Machine - Hanger - Sheet Metal - Phillips Recessed Head - **WASHERS:** Plate - Burrs - **MATERIALS:** Steels - Alloys - Brass - Bronze - Naval Brass - Everdur - Herculoy - and others - **RODS:** Stove - Seat - Ladder - **PLATED PARTS:** Cadmium - Zinc - Chromium - Nickel - Hot Galvanized - Copper - Tin - **SPECIAL UPSET & PUNCHED PRODUCTS.**

In *principle,* this bolt is the same fastening that has been used for centuries. Yet even twenty years ago, no one had yet learned how to make it with the strength, accuracy and finish that it has today.

For its substance is one of the steel industry's latest accomplishments, its outlines are defined by the newest production machines and tools, its surface epitomizes the progress of finishing techniques —and its cost is a salute to mass production at its best.

This is an EMPIRE Bolt, typical of the development of all RB&W threaded fastenings, well known to industry almost a century. For since its inception in 1845, RB&W has always kept pace with progress—in both quality and service.

A program of plant expansion, machinery additions and raw material accumulation, always a part of RB&W foresight, is still being followed to insure unfailing dependability of service and products in the months ahead.

To obtain *modern* industrial fastenings, supplied with the best of *modern* service, specify EMPIRE, the products of a *modern* company.

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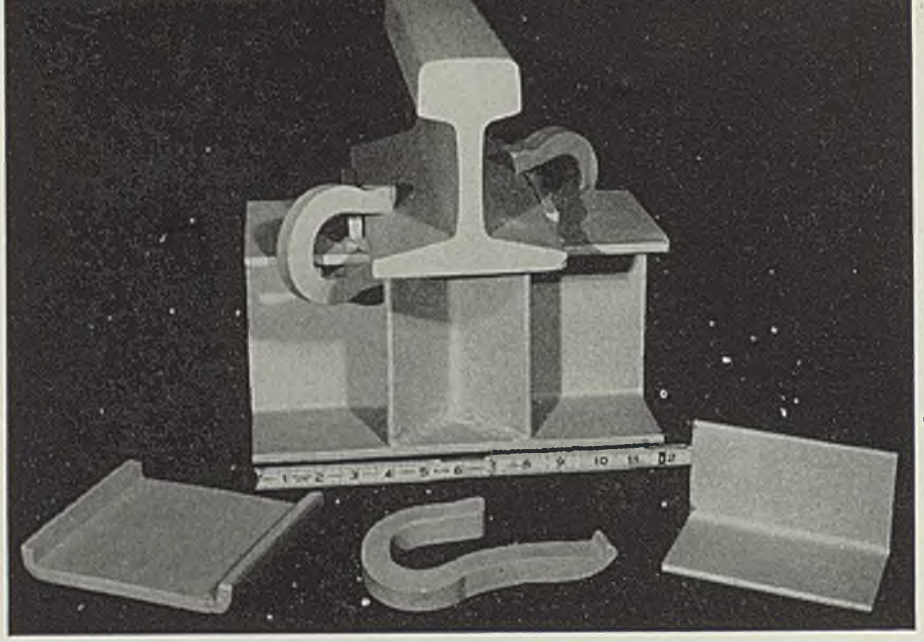


New H-Beam Railroad Tie

Provides

Nearly Perfect Surface Alignment

■ A NEW H-BEAM tie for railroads which is reported to withstand lateral movement so well that the surface alignment is almost perfect after long service is announced by Bethlehem Steel Co., Bethlehem, Pa.

Known as the Anchor tie, (Patent No. 2,224,731) it is especially suitable for use under mine and industrial tracks subject to heavy loads.

According to the company, the tie is easier to install than other types of ties and requires less maintenance. At the place of manufacture, the gage of the track is definitely fixed by two double-shouldered ⅜-inch tie plates measuring 5½ inches wide and are welded to the 6-inch H-beam. The latter is 8 feet long and weighs 15½ pounds per foot. Four 3 x 3 x ¼-inch angles are welded directly beneath the tie plates between the two flanges of the beam act as stiffeners and retainers for the spring clamp. Consequently, the combination of beam, tie plate and angles forms a stiff pedestal construction at the point of maximum load. The use of spring clamps allows enough "give" to create a resiliency to the whole track structure, thereby eliminating any detrimental effects that a rigid pedestal might have.

Due to the reinforcing effect of the welded tie plates and angles, the completed tie provides unusual strength for a lightweight construction. Also the elimination of holes, notches, etc., usually punched in the tie section prevents weak spots.

Rails are fastened to the ties by means of clamps of heat-treated spring steel—four clamps being used for each tie. These are driven into place with a spike maul.

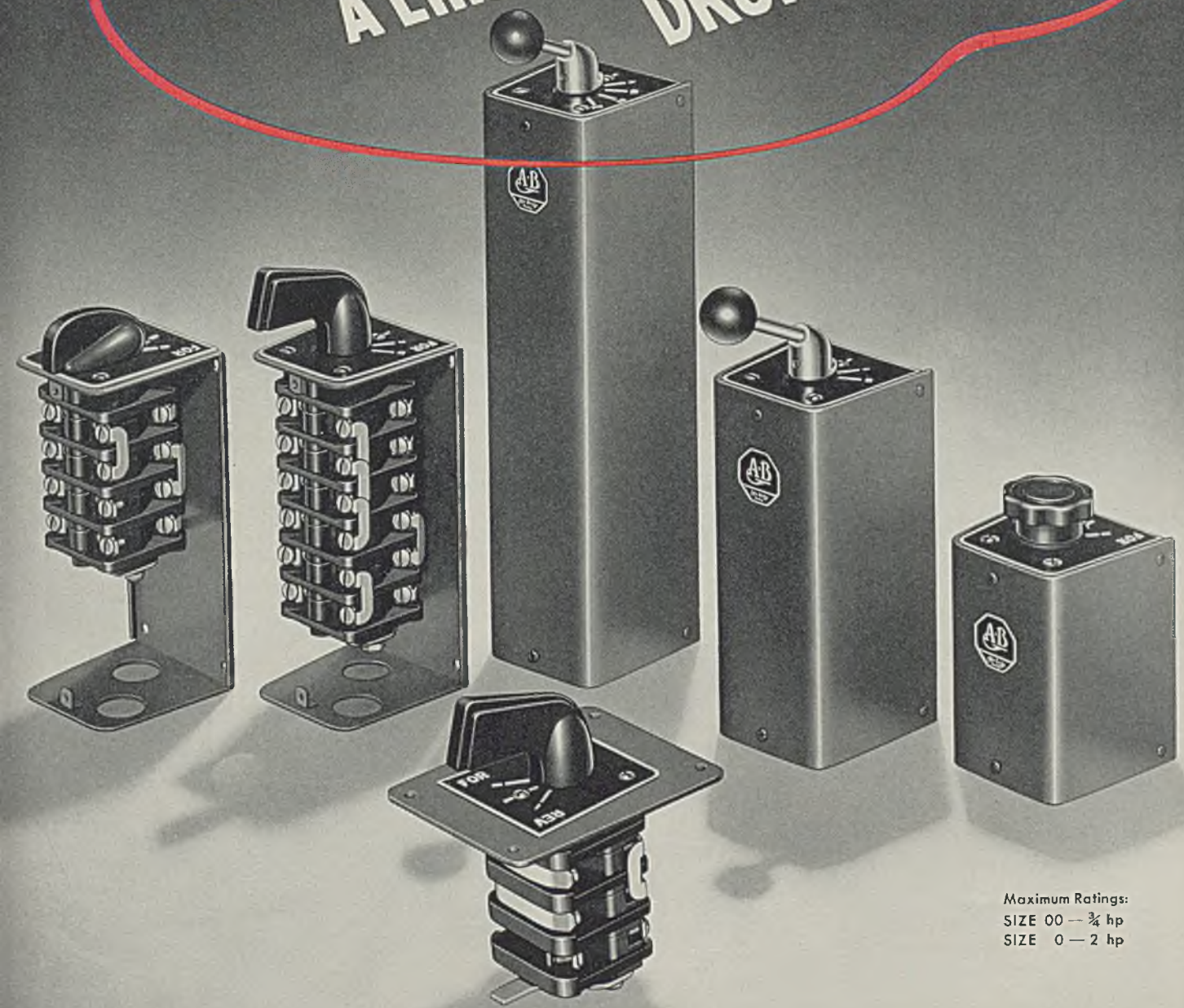
As the hook end of the clamp is driven into place at the base of the rail, its other end snaps over the corner of the angle. A hump located near the end prevents the clamp from slipping back. To lock the clamp further into position the end engages the web of the tie, forcing the hump firmly against the angle. Because the nose of the clamp bears against the base flange of the rail, the loop produces the slight spring action which gives the track resiliency.

In removing the clamp from the tie, only a blow with the spike maul against the hump is required to drive it back over the angle corner.

View above shows the tie assembly clearly. The illustration below shows the ties under the rails. Note here the difference between the new ties in the foreground and the old ones in the background. The section in the foreground after being under test for three years has a surface alignment nearly perfect

NEW

A Line of SMALL DRUM SWITCHES



Maximum Ratings:
SIZE 00 — ¾ hp
SIZE 0 — 2 hp

for Multi-Speed Motor Control and Reversing Service
• also available as Master or Transfer Switches •

ALLEN-BRADLEY

MOTOR CONTROLS FOR EVERY SERVICE

QUALITY

Manual and Automatic Switches

Max. Rating—2 hp-220-440-550-600 volts

STARTING MULTI-SPEED REVERSING MASTER TRANSFER

FOR MANUAL CONTROL

Bulletin 353 Drum Switch showing handy terminals.

Drum switch designed for cavity mounting. Equipped with pistol grip handle.

Bulletin 353 Drum Switch showing enclosing cover and ball handle.

The new Bulletin 353 Drum Switches—Sizes 0 and 00—are the latest addition to the Allen-Bradley line. These drum switches have no rotating contact sectors or sliding finger contacts. The silver alloy contacts are snapped open and closed by cams on the vertical operating shaft.

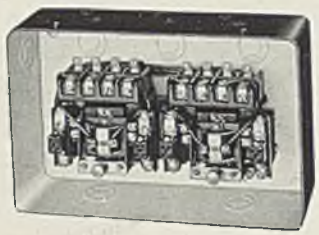
Bulletin 353 Drum Switches are available for surface, cavity, or panel mounting. Four types of control handles—ball, pistol grip, knob, and standard—can be supplied.

Bulletin 609 and 609-RS Starting and Reversing Switches are button-operated. Silver alloy contacts and overload breakers are standard features.

Bulletin 609-RS-Size 0 Reversing Switch showing operating buttons.

Bulletin 609-Size 0 Starting Switch.

FOR REMOTE CONTROL



Bulletin 715 Multi-Speed Motor Starter with overload relays.

Allen-Bradley small magnetic switches (Size 0) handle multi-speed and reversing motors up to 2 hp. There are no bearings, hinges, or jumpers. The double break, silver alloy contacts require no maintenance. Overload protection is provided.

Bulletin 709—Size 0—Across-the-line Starting Switches for small single and polyphase motors.

Bulletin 715—Size 0—Multi-speed Starting Switches are available for separate-winding or consequent-pole motors—reversing and non-reversing.

Bulletin 705—Size 0—Reversing Switches are mechanically and electrically interlocked.

Write for Allen-Bradley starting switch bulletins.

Allen-Bradley Company, 1320 S. Second Street
Milwaukee, Wisconsin

Bulletin 705 Reversing Switch for remote control of small reversing motors.

Bulletin 709-Size 0 Across-the-line Starter.

ALLEN-BRADLEY
MOTOR QUALITY CONTROL

TO KEEP HEAT WORKING at PEAK EFFICIENCY

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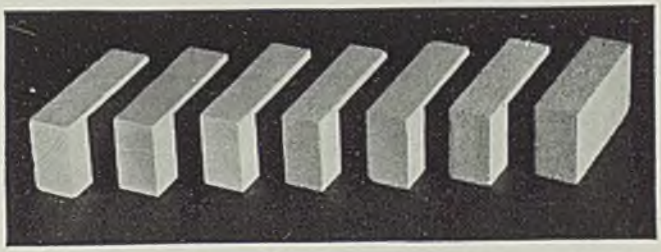
J-M SUPEREX BLOCKS—The most widely used block insulation for temperatures up to 1900°. Economical to install . . . unusually efficient in service. For above-ground sections of open-hearth regenerators, and for hot-blast stoves, mains and bustle pipes, soaking pits, producer gas mains and all types of re-heating and heat-treating furnaces. Furnished 3″ to 12″ wide; 18″ and 36″ long; 1″ to 4″ thick.

Throughout the iron and steel and metal-working industries, J-M Insulations are doing their part in helping to keep plants operating efficiently, economically and with a minimum of maintenance.

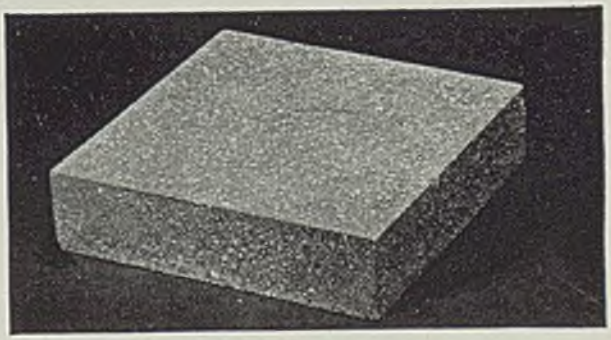
Not only will these materials last indefinitely in the service for which they are designed, but into each is built a margin of safety that operating men have learned to depend upon whenever furnaces must be pushed beyond their normal ratings.

There is a J-M Insulation for every requirement. May we send you complete information? Johns-Manville, 22 E. 40th St., New York, N.Y.



J-M INSULATING BRICK AND INSULATING FIRE BRICK—Seven types, with temperature limits ranging from 1600° F. to 2600° F. to meet every service requirement. Recommended for bases of open-hearth furnaces, for slag pockets and uptakes, hot-blast mains and bustle pipes, the upper rings of hot-blast stoves, and as back-up insulation or insulating fire brick in all types of re-heating and heat-treating furnaces. Furnished in standard fire-brick sizes and shapes.

J-M VERMICULITE GRANULES AND J-M NO. 500 CEMENT—Granules or No. 500 Cement (Vermiculite Base) may be used for open-hearth roofs; the Cement is also widely used for open-hearth furnace end walls above the charging floor. J-M No. 500 Cement combines high covering capacity with good adhesion, excellent working qualities and insulating value. Furnished in 50-lb. containers.



J-M SIL-O-CEL C-3 CONCRETE—An insulating-refractory concrete for temperatures to 1800° F. Recommended for open-hearth flues and below-ground sections of open-hearth regenerators, for bases and lower ring of hot-blast stove, and for furnace bases and doors. C-3 granules furnished in 100-lb. bags; job-mixed with Portland or Lummite cement.

Johns-Manville INDUSTRIAL INSULATIONS

FOR EVERY TEMPERATURE...EVERY SERVICE CONDITION

IF it is made of *malleable sheet metal* there is a YODER MACHINE that will ROLL FORM it *speedily — efficiently — economically*

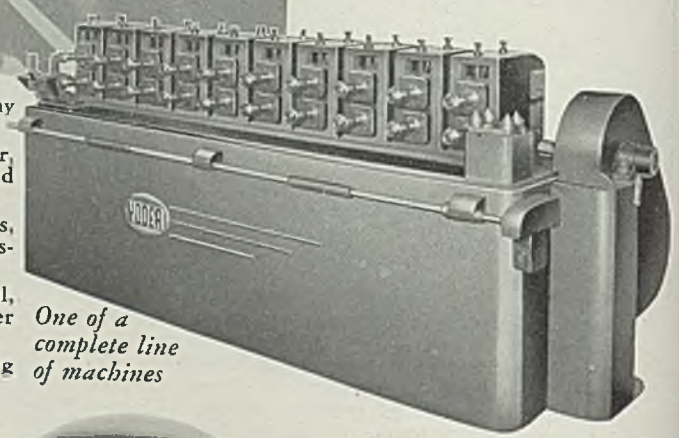
As pioneer designers of Roll Forming Machines, this company has developed the art to a degree near perfection.

Hot and cold rolled steel, stainless steel, bronze, brass, copper, aluminum, high strength alloys, zinc, etc., can be handled successfully.

Various shapes can be produced including: mouldings, angles, channels, tubing, etc., a few cross sections of which are here illustrated. As many as 50 shapes can be formed on one machine.

Products can be made of laminated or single thickness metal, delivered straight and cut-to-length "on the fly" by a Yoder Cut-Off Machine, or coiled and cut off in rings.

Possibly this method can serve you. Investigate by sending parts or blueprints for study by Yoder engineers.



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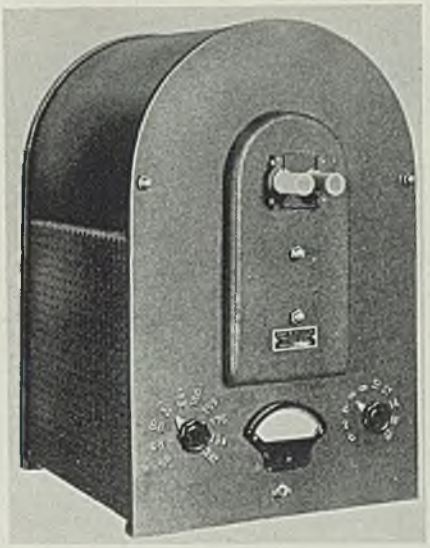
YODER MAKES:

Beading Machines - - Bending Machines - -
Brake Shoe Machines - - Tension Reels - - Coilers - - Uncoilers - - Roll-Forming Machines - -
Flying Cut-off Machines - - Slitting Lines - - Scrap Cutters - - Power Hammers - - Special Machines

Combustion Furnace

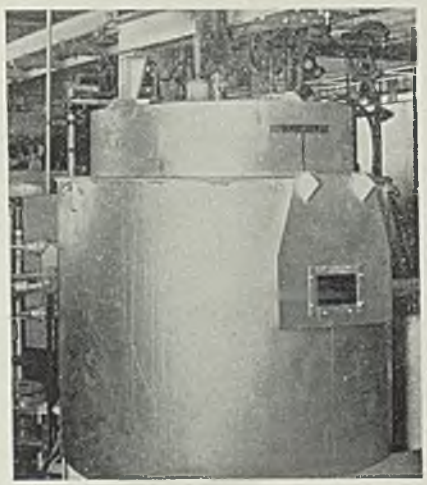
■ Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, has introduced a 2-tube Varitemp combustion furnace. Its front forms a switchboard on which is mounted the pyrometer meter, electric switch and two selective switches for selection of the proper voltage to keep or maintain



a chosen temperature, the maximum available being 2750 degrees Fahr. Four Globar heating elements heat the two combustion tubes of the unit evenly. All electrical parts are enclosed in a compartment in the lower ventilated portion of the furnace and excessive heat loss is prevented by insulation.

Electric Furnace

■ General Electric Co., Schenectady, N. Y., announces a new gas-carburizing electric furnace for case-hardening steel parts. It uses a hydrocarbon gas, circulated rapidly through the charge, instead of a



solid carbon compound as a source of carbon for the carburizing process. Since the gas is distributed uniformly in the furnace, a "case" of uniform thickness forms on every surface, regardless of the load's position. In addition, the furnace can be controlled automatically to reproduce any carburizing treatment on a production-line basis. Savings as high as 75 and 80 per cent are made under some conditions with its use. This is because of the shortened carburizing cycle, the elimination of packing material and the improvement in quality of carburized parts. Propane is substituted for the solid packing compound in the unit. It is passed into the chamber through an inlet at the bottom of the retort at the periphery of the circulating fan. The amount of carbon in the furnace is controlled by measured regulation of the flow of gas—rapid circulation of the gas being assured by a motor-driven fan. Light-weight alloy trays or baskets are used for the cast pots.

Steam Locomotive

■ H. K. Porter Co. Inc., 4975 Harrison street, Pittsburgh, announces a new steam locomotive for switching and general plant use. Designed for use on a 66-inch track, it is 10 feet 3 inches wide, 13 feet 6 inches high and 50 feet long over bumpers. Six 44-inch diameter drive wheels provide a tractive force of 30,040 pounds. Total weight of the

engine is 120,000 pounds, the tender weighing 70,000 pounds in working order. As this particular locomotive was shipped to the Tata Iron & Steel Co. Ltd., Jamshedpur, India, its boiler was constructed in accordance with Indian boiler regulations, for a pressure of 200 pounds per square inch. Frames of the engine are heavy slab steel.

Brush and Can Holder

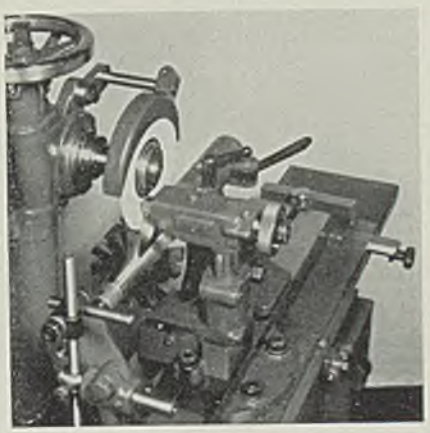
■ Bender Products, Mastic, N. Y., announces a new Handl-Grip and wiping bar for use on paint cans. The Handl-Grips are a combination paint can holder and brush holder in one piece. Made of spring steel, they snap on easily, hold tightly, and are easily removed and used over and over again. As a can holder, it eliminates the hazard of grasping a can on which paint may have spilled or run over the sides.

As a brush holder, it solves the problem of where to rest the wet brush when painting operations are momentarily stopped. The wet brush is easily inserted in the holder clamps which keep the brush suspended in the can but over the paint. The wiping bar prevents excess wasted paint from drooling over the sides of can and distributes paint evenly in brush.

Industrial Equipment

Sharpening Attachments

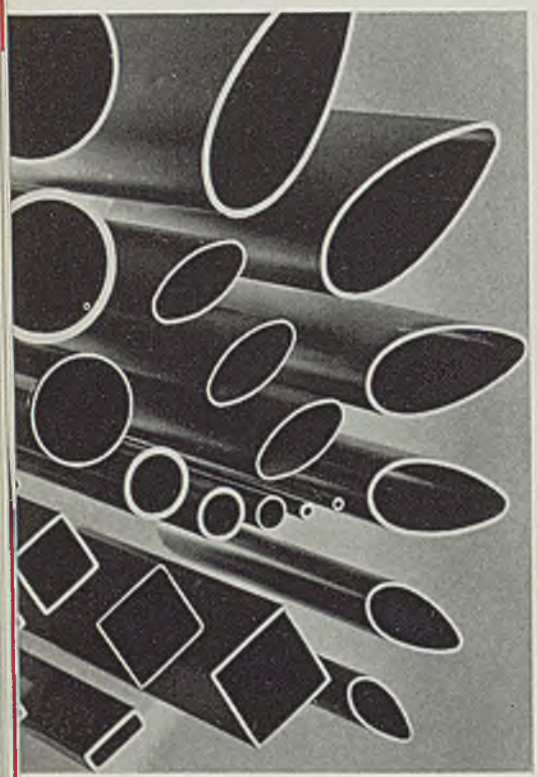
■ Brown & Sharpe Mfg. Co., Providence, R. I., has placed on the market two new formed cutter sharpening attachments—an "in-feed" type and a "through-feed" type—for use in conjunction with its No. 10 cutter and tool grinding machine. The through-feed type, as illustrated, gives a straight cut across the entire tooth face, and sharpens formed cutters up to 6 inches in diameter with straight teeth. A dish wheel is used, with the wheel spindle at right angles to the table. The cutter is supported on a horizontal arbor between the centers of the machine, as shown, and is passed across the face of the wheel by traversing the table. The attachment consists of an adjustable tooth rest assembly mounted at the top of a vertically adjustable column. The supporting bracket which carries the column is adjustable transversely



along dovetail ways in a solid base. In operation, the tooth rest is located so as to touch the top of the cutter tooth close to the face being ground. The transverse adjustment of the attachment on its base allows the tooth rest to be positioned for grinding the tooth radial or with hook or drag, at the same time keep-

CONTRIBUTING SAFETY AN

Marvels of



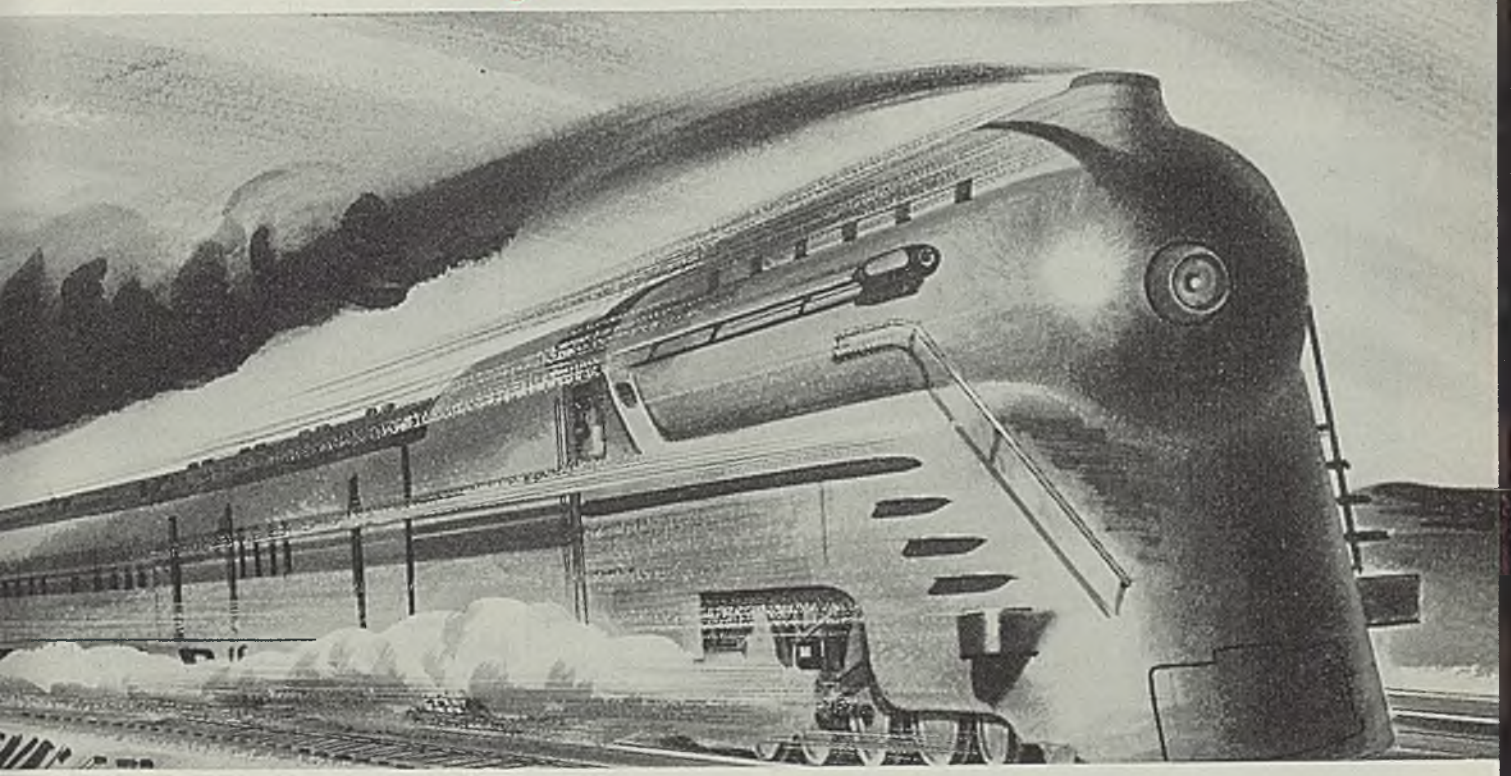
NATIONAL SEAMLESS derives its unsurpassed physical properties first, from the steel of which it is made; and second, from the process by which it is produced. Billets of only the finest, selected, open-hearth steel go into its manufacture. These are pierced at high temperature, then precision-rolled to the correct size and wall thickness. At every stage of production, thorough tests and inspections keep quality at its peak. The result is NATIONAL Seamless as you receive it—uniform in wall strength, accurate in dimensions, and uniform in all physical properties—the finest pipe and tubes metallurgy can produce.

By Air Aircraft designers have been quick to take advantage of the structural efficiency of the seamless steel tube. That's why you'll find SHELBY Seamless Tubing used extensively in modern airplane construction for fuselage struts, spar chords, motor mounts, landing gears, axles, bearings and other highly stressed members.

By Rail Behind the smooth operation for which today's streamliners are famous are NATIONAL Seamless Pipe and Tubes, "Walls Without Welds," today's most modern tubular material. NATIONAL Seamless contributes to safety and dependable performance in air brake lines, water lines, steam lines and boiler tubes.

By Highway In the modern automobile, drag links, tie rods, torque tubes, steering columns, shock absorbers, axles, brake shafts, bearings, and other vital parts are made from SHELBY Seamless Tubing. Automotive engineers have found that this tubing, because of its constant uniformity, is best adapted to the requirements of mass production.

COMFORT TO AMERICA'S *Transportation*



Seamless Tubes serve extensively in modern transportation

WHETHER you travel by rail, by air, or by highway, you ride today in real "armchair" comfort. You arrive refreshed and alert, whereas the same trip a few years ago would have left you "dog-tired." And records prove that you are safer as you travel than in your own home.

America owes thanks for these marvels of modern transportation to the men whose vision and courage converted "fantastic" ideas into actual operating realities.

National Tube Company is proud to have co-operated in the development of these thrillingly modern forms of transportation, by supplying seamless tubes of the finest quality, of exactly the right physical properties for every requirement. You might well be surprised at the extent to which Seamless Tubes are used; bearings, so necessary for high speeds and smooth performance, structural members, air brake piping, boiler tubes—these are only a few of the many purposes for which the seamless tube is employed in modern transportation. And every application is engineered with the same precision that characterizes the whole.

For whatever purpose you need consistently dependable materials, you will find, as have the builders of these marvels of transportation, that your pipe and tubing specifications are safest when they read "NATIONAL SEAMLESS."

NATIONAL TUBE COMPANY

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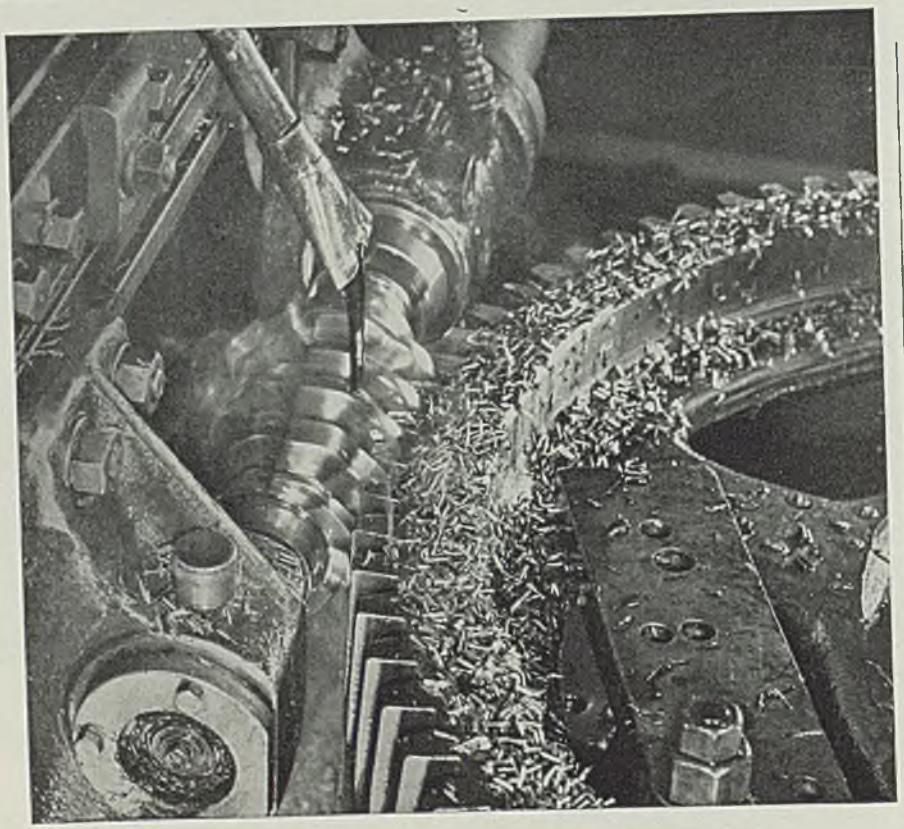
UNITED STATES STEEL

IS THE SAFEST TUBE

ing the tooth rest fairly close to its supporting body. A knurled nut at the upper front of the attachment advances the tooth rest slightly in order to rotate the cutter toward the grinding wheel to remove more stock. Another nut serves as a positive stop to determine the end of this movement. A wheel spindle extension for the lefthand end of the grinding machine spindle is regularly included as standard with each attachment.

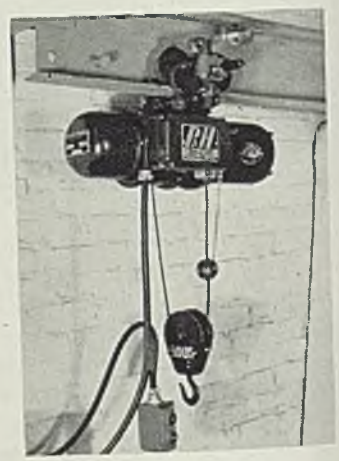
The in-feed type sharpens formed cutters with straight teeth 2 to 6½ inches in diameter. A dish wheel is used with the wheel spindle set at right angles to the table; and the cutter is supported on its side in a horizontal plane and advanced into the edge of the wheel by feeding the table. Since the inner edge of the tooth face area thus ground has a curvature caused by the circumference of the 6-inch diameter wheel, this attachment is generally recommended for sharpening cutter teeth of not more than 1½ inches in width. Essentially, the attachment consists of an adjustable tooth rest assembly and a body for supporting the cutter, mounted on a base plate. The upper part or body turns on a pivot extending through the base plate; and the cutter is placed on a vertical stud or arbor which is inserted in a hole concentric with the pivot. The tooth rest assembly is carried by a bracket at the left end of the attachment body, the tooth rest itself being adjustable vertically as well as for cutter diameter. In operation the tooth rest is located so as to touch the top of the cutter tooth close to the face being ground, and is clamped rigidly in position. The bracket which carries the tooth rest assembly is adjustable transversely on the attachment body, allowing the tooth rest to be positioned for grinding the tooth radial or with hook or drag, while at the same time maintaining rigid support for the tooth rest.

The operator indexes the cutter with one hand and feeds the table with the other. A knurled thumbscrew at the front turns the attachment body on its pivot in order to rotate the cutter toward the grinding wheel to remove more stock. A similar thumbscrew at the rear serves as a positive stop.

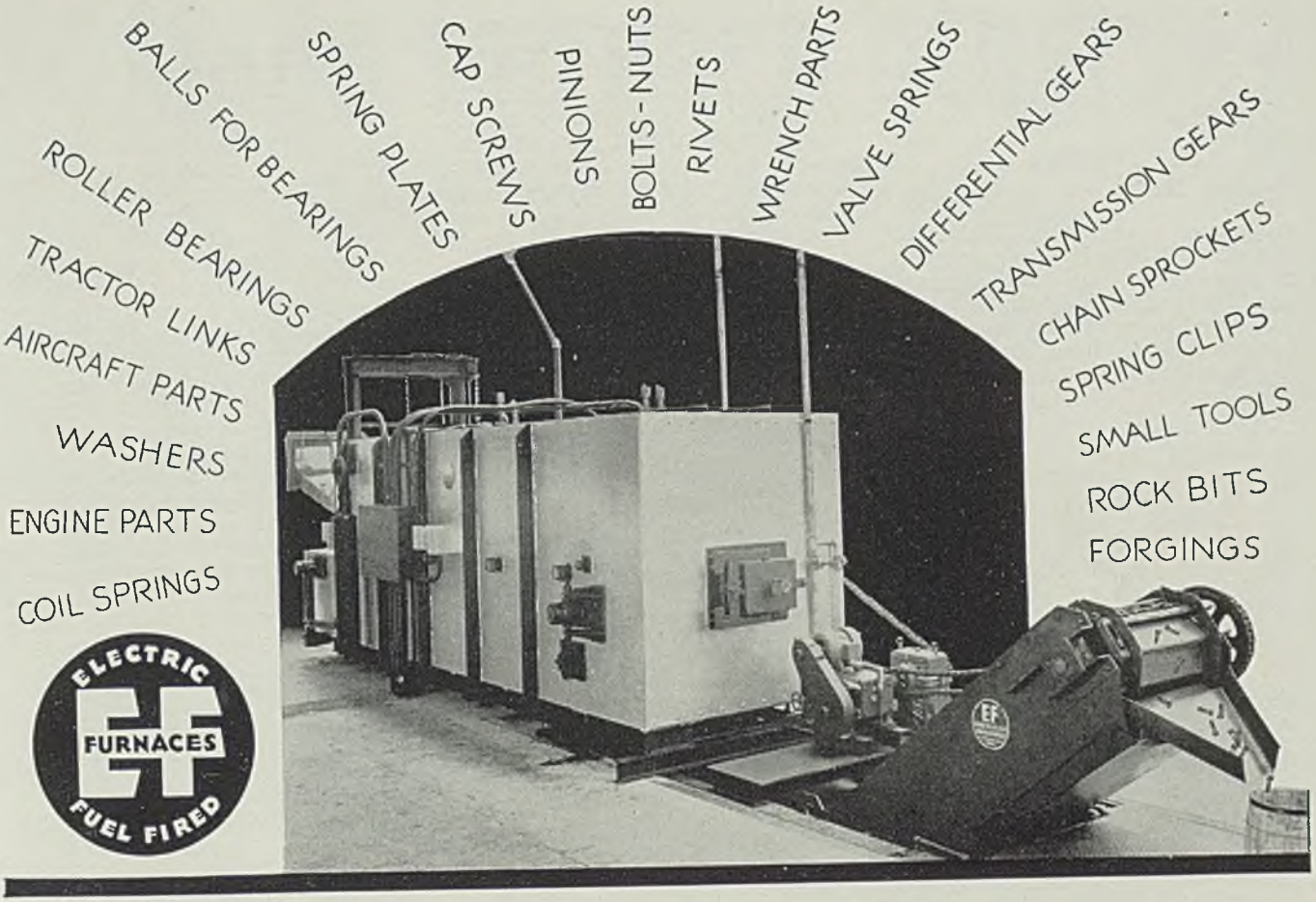


Electric Hoist

■ Harnischfeger Corp., 4411 West National avenue, Milwaukee, has placed on the market a new Zip-Lift full electric wire-rope hoist for flexible handling service in all lines of industry. Light enough for a man to carry, it can be mounted rigid, or on hook or trolley with mountings interchangeable when desired. It operates with push-buttons and is powered from an



ordinary light circuit. Its features include double brakes for safety of loads, automatic limit switch to prevent loads from rising too high and fully enclosed construction. Because it is a wire-rope hoist, it permits a wide latitude of side pull, an advantage in reaching beyond aisles, etc., for loads. Furthermore, the pushbutton cable is anchored to the hoist frame itself, so that the operator can pull the hoist along a trolley. Ideal for handling baskets of parts for pick-



For Scale-Free Hardening Various Products

---300 to 1700 lbs. per Hour

--Investigate EF Chain Belt Conveyor Furnaces

Hundreds of these dependable E. F. Continuous Chain Belt Conveyor Heat Treating units are in operation—handling all kinds of products, ranging in size from small springs and bearing parts up to large crawler links for tractors.

The material is loaded directly onto a rugged heat resisting cast link belt conveyor. Without further attention, it is carried through the furnace, uniformly heated to the proper temperature and automatically discharged through a sealed chute to the quenching medium or directly from the furnace as desired. The chain belt conveyor returns within the furnace without cooling — no pans or trays are used in the furnace — 100% net material.

These furnaces are built for oil, gas or electric heat in five standard sizes with capacities ranging from 300 to 1700 lbs. per hour. Larger or smaller sizes can also be furnished. They are also designed for using special protective atmospheres for scale-free heat treating and hardening without decarburization.

The hundreds of installations in operation handling all kinds of material, have proven them the most satisfactory and dependable general purpose heat treating machines built for the uniform, economical, production heat treatment of miscellaneous small and medium sized parts and products.

We will be glad to give you complete information, including installation and operating costs and submit heat treated samples, if interested.

The Chain Belt Conveyor Furnace is only one of the numerous types we build for various heat treating purposes. We build Gas Fired, Oil Fired and Electric Furnaces—Furnaces in any type, for any process, product or production. We solicit your inquiries.

The Electric Furnace Co., Salem, Ohio

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

ling or heat treating, it also can be used to operate oven doors, raise lids, etc., as well as for carrying materials. It is offered in capacities of 250, 500, 1000 and 2000 pounds.

Speed Drive

■ Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces a new simplified alternating-current variable speed drive, suitable for a 10:1 speed range. It requires no exciter or control wiring, consisting of a standard squirrel-cage induction motor driving a direct-current series wound generator. The generator furnishes power to a direct-current motor which drives the external load, the speed being controlled by a shunting rheostat which varies the generator series field. The drive can be used for conveyors, machine tools, or similar equipment requiring wide speed range where alternating current only is available.

Crawler Crane

■ Bucyrus-Erie Co., South Milwaukee, Wis., announces a new 15-B convertible crawler crane featuring an exceptionally fast operating cycle plus accurate control. It is fully convertible in the field from crane to dragline, clamshell, piledriver, shovel, or dragshovel. Standard power is a 54-horsepower gasoline engine with especially-designed carburetor and manifold to provide peak efficiency under rapid load fluctuations; both diesel and electric power are available also. Direct-action clutches convey to the operator the "feel" of the load. The boom hoist control on this model is located in the main lever bank in front of the operator. It can be set in the down position and the operator's hand removed for use in swinging, hoisting or propelling. The boom lowers at a regular rate until the lever is returned to neutral. "Open throat" boom design permits rigging for 2, 3, or 4 parts of line without removing sheave guards. Even with the boom at a high angle, lines can pass behind the sheave without fouling the boom. The revolving frame

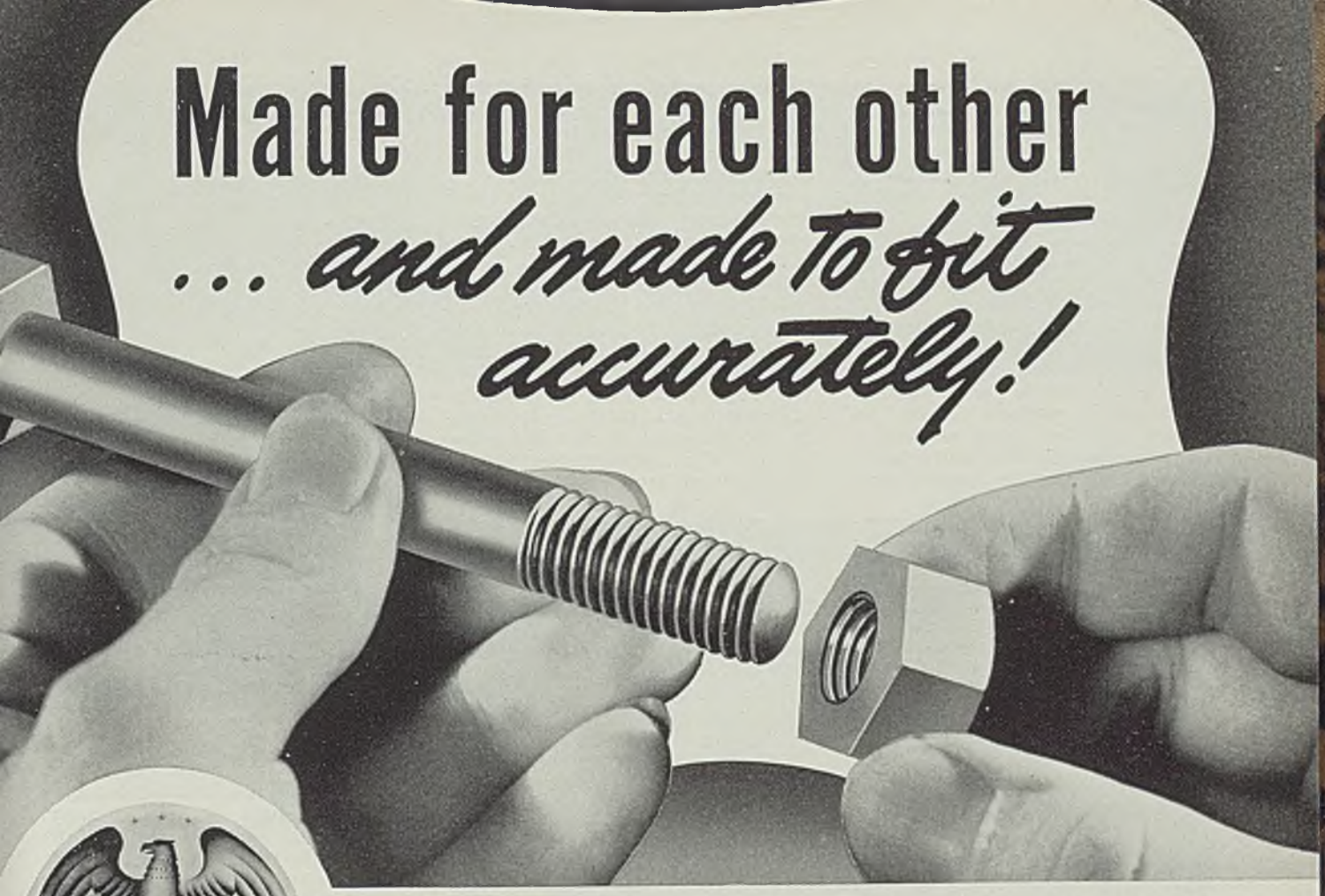
is all-welded with the side frames and gear case welded integral with the main frame. All gears except the swing-rack and pinion, are completely enclosed and run in oil. Controls feature large cool-running clutches with interchangeable parts, self-adjusting for temperature variations and with an easily-set single point wear adjustment. A positive lock controlled by a lever from the operator's position permits free motion in either direction desired by the operator.

Sight Glass Fittings

■ Cochrane Corp., Seventeenth street and Allegheny avenue, Philadelphia, has placed on the market 5 smaller size sight glass fittings than those announced last year. These range from ¾ to 2 inches for the new screwed connection fittings incorporated and from 2½ to 8 inches for the flanged design. Bodies

Made for each other

... and made to fit accurately!



Assembly lines move smoothly, speedily when Republic Upson Quality Bolts and Nuts are used—because they ALWAYS FIT ACCURATELY. ● Threads are just right—never too tight—never too loose—clean and sharp. Shanks are accurate in size, tough and strong. Sharp-cornered heads and nuts fit wrenches snugly—prevent slippage. ● Specify "Republic Upson Quality" on your requisitions for headed and threaded products. They're made for each other—made for high-speed assembly.

REPUBLIC STEEL CORPORATION

Bolt and Nut Division: Cleveland, Ohio

BERGER MANUFACTURING DIVISION • CULVERT DIVISION • NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES DIVISION • UNION DRAWN STEEL DIVISION • TRUSCON STEEL COMPANY

REPUBLIC STEEL — DEFENSE FOR AMERICA

To the Metal Working Industries it is not news that the present demand for steel is enormous. Industry will do its share of carrying forward the National Defense program. At the same time it must provide for the needs of a nation with the world's highest standards of living. All this requires large quantities of steel.

During its ten years of existence, Republic Steel has been constantly improving equipment, enlarging capacity, training men. Now this organization is setting new records for the production of steel . . . records of which our men of steel are proud.

In both mills and offices, the men of Republic are doing their level best to serve the nation with *steel—first line of national defense.*

R. J. Wysor
PRESIDENT

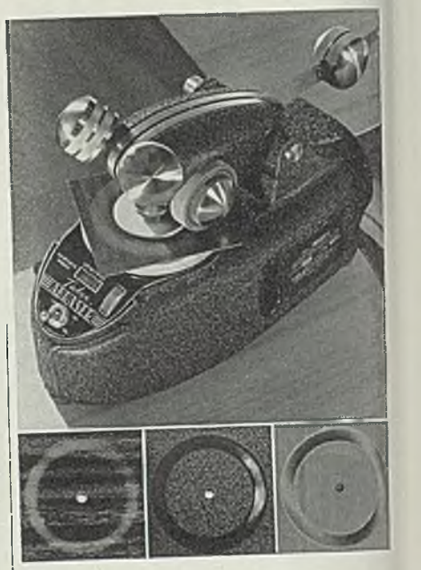
REPUBLIC *Upson Quality*

HEADED AND THREADED PRODUCTS

of the fittings are of cast iron for pressures to 125 pounds per square inch, and the Pyrex windows are held in place by gasketed steel frames.

Testing Machine

■ Taber Instrument Co., North Tonawanda, N. Y., has placed on the market a Research model abraser—an instrument for laboratories where evalutions of resistance to surface abrasion is to be measured. It is suitable for evaluating resistance of surface finishes to rubbing abrasion, such as paints, lacquers, electroplated and plastic surfaces and textile fabrics ranging from sheer fabrics to upholstery. The primary elements of the unit are the motor-driven turntable on which the specimen is mounted, a counter to indicate the number of abrasion cycles, and two abradmg wheels that alternately rub back and forth, and at the same time, crisscross in their rolling path. These wheels are made in five types of closely controlled resilient material charged with special grades of fine abrasive grain. The model also is provided with standardized load adjustment for varying the pressure of the wheels against the specimen to suit the type of material being tested. For instance, the pivoted arms without auxiliary weights apply a pressure against the specimen of 500 grams per wheel. The addition of the auxiliary weights increases the pressures to 1000 grams which is the standard for longer wearing materials and finishes generally classified as paint, lacquer, plastics and metallic plating. In general, the wheel pressure selected should accelerate the test to the point where the duration of the result ranges from 500 to 5000 abrasion cycles. Thin sensitive coatings and delicate fabrics require the use of the counterweight with which a pressure of 125 grams per wheel is obtained (arms less auxiliary weights). The lighter pressure increases the duration of the test permitting a better comparison than would otherwise be possible. Supplementing the wear resistance test is the shear-hardness test performed by an attachment which measures the toughness quality of a plastic surface or its ability to resist digs, scrapes, and similar physical damage not classed as normal wear.



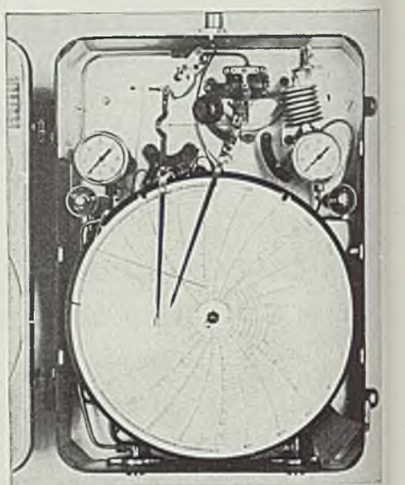
Electric Switch

■ Micro Switch Corp., Freeport, Ill., announces a metal-clad switch with a roller arm that is adjustable vertically through an arc of 225

degrees around its pivot pin and which also has a horizontal adjustment in eight positions 45 degrees apart. It is suitable for slide or cam actuation. The roller, measuring ¾-inch in diameter, is carried on an oilless bronze bearing. Its arm bracket is used in connection with a unit with a zinc, die-cast housing that incorporates the small, precision Bakelite switch as the switching element. Rated at 1200 watts up to 600 volts alternating current, the switch is available as a single pole only, with normally closed, normally open or double throw contact arrangements. It operates on only 2-4 degrees movement with provision for 20-30 degrees overtravel of the arm. It incorporates a standard ½-inch conduit hub with wire way for two No. 10 or three No. 14 weatherproof wires.

Temperature Controller

■ Bristol Co., Waterbury, Conn., announces a new throttling-type air-operated temperature controller for use on processes where the thermal characteristics are such that there is a tendency for the temperature to exceed the control setting of the instrument on the initial rise. Known as the Pre-Set Free-Vane temperature controller, it is particularly useful in conjunction with batch processes that are started-up and shut-down at frequent intervals, having heating characteristics which cause over-shooting of the control point on the starting-up cycle. The controller introduces a presetting effect that is proportional to the width of throttling range and also rate of change of the condition being measured and controlled. The controller action occurs prior to or during the approach of the pen to the control point. It tends to decrease the rate of change of position of the pen and permits the



controlled temperature to gradually approach the control point. The magnitude and duration of the presetting effect may be adjusted over a wide range by an adjustment of a pointer on an arbitrarily calibrated dial.

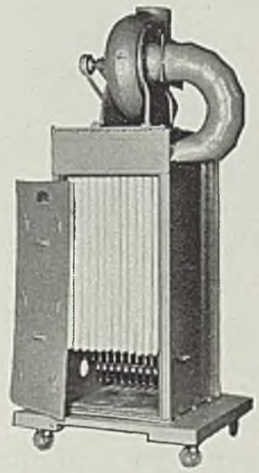
Power Shovel

■ Clark Tructractor division, Clark Equipment Co., Battle Creek, Mich., has introduced a new power shovel for use in handling loose materials, especially in foundries. Built on a 3-wheeled chassis, rear-wheel steer,

it is powered with a 4-cylinder Continental motor and is capable of 24-hour continuous operation. The heavy steel scoop picks its load of loose or semihard material from the pile without ramming it. The machine carries a load of 1500 pounds bulking as much as 18 cubic feet at from 3½ to 11 miles per hour, elevates it in less than 10 seconds, dumps it into carts, trucks or bins. One model has a 45-inch underclearance when dumped, another has a 65-inch underclearance. The driver controls all operations without dismounting. Every part of the machine has ample dust protection. Standard equipment includes self-starter, generator and battery. Special equipment includes lights and a hopper lid that opens and closes automatically as driver picks up load.

Portable Dust Filter

■ W. W. Sly Mfg. Co., 4700 Train avenue, Cleveland, announces an improved model of their Economy dust filter, a simple unit used as an auxiliary to larger filters, or with individual machines requiring exhausting, such as grinders. Mounted on a platform with rubber-tired casters, the filter is portable and is easily moved from grinder to grinder. The exhaust fan is mounted on the filter. The unit also is supplied unmounted, and can be placed on



the floor, against a well, or suspended overhead. Handling 1000 cubic feet of air per minute, the filter is shipped completely assembled, including a 3-horsepower motor which operates at 1800 revolutions per minute. The filter itself contains special cloth bags which clean the air. These are shaken by means of a shaker handle on the right side of exterior.

Piston Ring Compressor

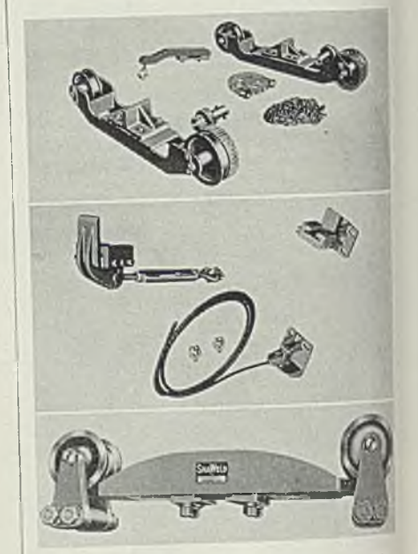
■ Plomb Tool Co., 2209 Santa Fe avenue, Los Angeles, has introduced an entirely new No. 2317 Plomb piston ring compressor. Its design makes it possible to exert direct pressure on the rings by means of a steel band and a con-

venient crank arrangement. This is said to reduce possibility of breakage to a minimum.

Three different sizes of bands are available, small, for all passenger cars, medium for busses, trucks, etc., and large for diesels and other large industrial units. The compressor is extremely simple in both construction and operation.

Crane Assemblies

■ Shaw-Box Crane & Hoist division, Manning, Maxwell & Moore Inc., Muskegon, Mich., has placed on the market several completely new lines of equipment which consist of packaged crane assemblies to be known as Budgit Crane Assemblies. From them, traveling bridge cranes and jib cranes can be built by applying these assemblies to a standard section I-beam. These new lines constitute a new idea in the design, manufacture and distribution of cranes. An outstanding feature of the assemblies is that the only tool required to complete a crane is a wrench. There is not a single hole to be drilled, nor is there any machine work to be done. Any of the types of cranes that can be made from the assemblies can be completed in an hour's time. This idea enables users of modern jib and small bridge cranes to obtain them from a dealer's stock and place them in service the same day they are ordered. Referring to the top illustration the assembly here consists of all parts to build a top running, geared type traveling crane bridge except the I-beam and shaft. The parts required to build a swinging bracket jib crane, with the exception of the I-beam is shown in center illustration. All parts are attached to the I-beam without doing any drilling or machine work. From this assembly 36 standard sizes of jib cranes can be built. An advantage here is that it is unnecessary to locate carefully the top and bottom bearings because a flexible and adjustable tension member is employed. The underhung bridge



crane assembly, as shown at the bottom, consists of two completely assembled end trucks which when attached to an I-beam results in the bridge crane.

Glider for Overhead Trolley Wire Systems

■ Ohio Brass Co., Mansfield, O., announces a new O-B type L shoe or glider for collecting current from standard trolley wire overhead systems. Recommended for use on locomotives which require more current collecting capacity than is provided by trolley wheels or light shoes, it is cast in one piece.

Its most outstanding feature is its design or method of mounting the shoe in the harp. The pivotal center of the shoe is located in the center line of the wearing surface. With this location as a pivot point there is no tendency for the shoe to tilt because of the friction between the wire and the shoe. Consequently, the shoe is always held with the full length of contact against the wire.

Erecting Steel Tanks

(*Concluded from Page 74*)

tor course, the top plates are hoisted by the derrick and laid in position on the top of the framework. These top plates are shaped in the form of nodes, and the supporting trusses are designed to fit the curvature of the plates. Clamps are used to hold these plates in position preparatory to welding.

With all plates in place, the next operation is the welding. Brackets are welded onto the equator course, these serving to hold scaffolding from which the welders work. Here again the welding sequence is selected with care to prevent buckling and shifting of the plates caused by the welding heat.

The top plates and the equator course also are welded to the supporting trusses, so the plates are held rigid and will not breathe under the influence of fluctuating pressure inside the tank.

In the construction of high-pressure Hortonspheroids, all plates, including the equator course, are carefully dished and rolled to size and shape and are butt welded instead of lap welded.

Dismantling Boom: With the completion of the welding, the boom is taken down whole by disconnecting it at the bottom after it has been moved to an upright position alongside the mast. Then the boom-holding rope which passes through a sheave block at the top of the mast is played out, lowering the boom to the ground.

The mast is dismantled one section at a time, starting with the bottom section. These sections are lowered to the ground as they are removed. This procedure is made possible by adding the extension to the top of the center tower which was used originally to raise the mast into position. This extension allows the mast to be supported by ropes while the bottom section is being removed.

It is in field erection that greatest opportunities lie for increased economies in tank construction. Cost of materials and of labor, as well as other factors, are continually changing, and with such changes must go revision of field erection procedures. Also, every effort is being made by tank manufacturers to find short-cuts in erection methods. Hence, what is accepted today as the most advanced practice in field erection may be out-moded tomorrow.

Variable Voltage Ills

(*Concluded from Page 80*)

erators of critical manual adjustments of individual motor speeds during rolling, especially during accelerating and decelerating periods from threading to running speeds, and vice versa.

A graphic illustration of what IR drop compensation does is shown in Fig. 6. The curve at the top shows the speed-load characteristics of a modern direct-current mill motor when operating at its rated voltage. This corresponds to its operation when the mill is running at full speed. Curves at the bottom illustrate what happens to this same motor when operated at 10 per cent rated voltage. This corresponds to the operating condition of the motor when the mill it drives is running at threading speed. Note the sharp droop of the speed curve as load is increased. Most of this droop is due to the effect of resistance drop in the motor armature.

The effect of the IR drop compensation is illustrated by the solid lines. With the compensating generator in the circuit the drooping characteristic disappears; the curves remain almost identical to those where the motor operates at rated voltage. To correct individual motor quirks, it is possible to adjust the amount of compensation to give a slightly drooping, perfectly flat, or slightly rising speed-load characteristic to the motor when it operates below rated voltage.

Wage Incentives

(*Concluded from Page* 56)

sentatives participate in the development and application of the plan. As said before, the two separate considerations of production or bonus rate and basic hourly wage should be distinct, and labor should be convinced of the fairness and reasonableness of both. It should be possible for such representatives to arrive at the correct answer themselves. Since the whole procedure should be on a basis of scientific analysis, it should be possible to explain enough of it to intelligent workmen so they can confirm the conclusions for themselves. It has been demonstrated time and time again that a workman familiar with certain classes of work can analyze corresponding jobs accurately after reasonable training.

Such a practice is being followed successfully in many current cases where wage incentive plans are being applied with result comparing favorably with any obtained in the past and with the full co-operation of labor, whether organized or not. One engineering organization which has specialized in labor management, control of production and wage incentives for 25 years, carried such a program into some 60 different plants during 1940, ranging in size from 100 to 15,000 employes. While many of them had labor contracts, no labor difficulty was encountered and results are comparing favorably with those obtained in similar cases over the past 25 years.

A few briefly summarized case histories will serve to illustrate some of the points made previously.

Case A: Maintenance shops of steel mill in middle west; 200 skilled machinists covered by incentive plan. Since institution of plan, productivity per man-hour has increased up to 125 per cent. Machine output has increased up to 80 per cent. Costs reduced up to 40 per cent. Earnings increased up to 30 per cent. So broad has the improvement become that this shop now handles, in addition to all repair and maintenance work for the mill, a fair volume of outside or jobbing work. Plant operates under CIO-SWOC contract.

Case B: A Wisconsin plant producing mill work, with 450 employes. Wage incentive plan in a year has lowered costs by $5000 per month; wages have increased 15 per cent; plant productive capacity has increased 18 per cent. Plant operates under AFL closed shop agreement.

Case C: Small precision parts plant in midwest with 600 employes. Incentive plan increased labor productivity from 32.8 to 66.9 or 104 per cent. Cost reduction from $1.75 to $1.095 per standard dollar or 37.4 per cent. Increase in wages, 25 per cent. No union.

Case D: An Ohio tube mill, with 1000 employes. Production now on two shifts is equal to that formerly made on three shifts. Wages are 25 per cent higher; costs are appreciably lower. Plant operates under CIO-SWOC contract.

In conclusion it should be emphasized that any form of wage incentive, if considered by management solely in the light of an incentive, may prove unworkable. Wage incentive, above all, must be held a legitimate reward for those willing and able to do their best.

Report on Sulphides in Slags Now Available

■ As part of a comprehensive investigation of the mechanism of desulphurization of iron and steel by slags, the blast furnace studies section, metallurgical division, Bureau of Mines, in co-operation with the Institute of Technology, University of Minnesota, has made a study of ferrous, manganous and calcium sulphides in blast furnace slags. This report, designated R. I. 3552, may be obtained from the Bureau of Mines, Washington.

Steel Supply No Problem Alongside Other Factors

Strikes and nonferrous shortages more imminent worries. Lack of detailed prices for new quarter is unprecedented. British hold up carbon steels.

MARKET IN TABLOID ★

Demand
Brisk, with deliveries slipping, usually 4 to 10 months.

Prices
Quoted "price in effect at time of shipment."

Production
Down 1½ points at 98.

■ PROBLEMS of steel supply are being dwarfed by other more vital issues such as the epidemic of strikes, shortages of nonferrous metals and other materials used in the steel industry and shortages of skilled labor. Despite lengthening deliveries, sold out conditions over 1941 on some items and many general dislocations steelmakers are more convinced than ever that eventually there will be a sufficiency of steel. Working week in and week out at near full capacity of over 80,000,000 tons yearly mills produce a fairly stupendous amount of steel.

Strikes at the Ford Motor Co., which accounts for about a third of the steel production at Detroit, largely caused a drop of 1½ points to 98 per cent in the national rate last week.

Many predict that by early summer present worried conditions will have given place to calm. By then most consumers should have places on order books for the rest of 1941. Moreover consumers will have become educated in anticipating needs several months ahead as previously they did for only a few weeks hence. Again each week sees new or remodeled steelmaking equipment in operation.

Relieving the tension is the request of the British that Americans suspend shipments for two months on all carbon steels, concentrating on alloy steels, drop forgings, pig iron and scrap. Moreover new British purchasing here has been much below expectations at the start of the year, the desire to conserve cargo space being responsible.

Washington will soon inquire for 300 vessels in addition to 200 previously awarded, the new lot to require about 825,000 tons of steel, largely plates. About 335,000 tons of plates will be needed by the Sun Shipbuilding Co., Chester, Pa., for 72 tankers and 12 cargo ships, a part of the program of the Maritime Commission. The Navy has recently purchased 70,000 tons of plates as part of its regular six months' miscellaneous requirements.

For five ore carriers for service on the Great Lakes 30,000 tons of plates will be required, some of these ships to be of record size. Already limited boat service between Cleveland and Detroit has been established through the ice with full ore transporting planned for April 10, indicating the earliest and most complete start on record. Never were mines and docks better prepared for an anticipated record ore season, predictions ranging around 75,000,000 tons.

Structural fabricators predict that in 60 days the bulk of defense housing contracts will have been delivered or contracted for when the way will be clear for civilian business, much of which is already appearing. At Cleveland alone are three live projects reaching definite tonnage stage, estimated as aggregating 60,000 tons, including 10,000 for a brass mill.

Steelmakers comment that never have banks been more liberal in extending credit to steel purchasers, resulting in prompt and complete payment to the mills. Banks, too, have performed a service in checking consumers from placing steel orders in duplicate or triplicate among several mills.

Seldom, if ever before, has the industry entered a new quarter without prices having been announced previously for that quarter. Invoicings continue at first quarter quotations on current deliveries, but sales carry clauses, "price in effect at time of shipment," with former quarterly prices virtually abandoned. Interest in prices is only mild.

Pig iron production in March was an all-time high, both in aggregate and on a daily basis, 4,702,905 net tons for the month and 151,707 tons daily as against 150,244 tons daily in February and 150,524 tons in January, 1941, the previous top. There was a net increase of three furnaces for the month to 205.

Scheduled automobile production for the week ended April 5 is 120,055, a loss of 4350 for the week, comparing with 101,655 for the like 1940 week.

As to steel ingot production last week only one district gained, New England, up 7 points to 92. Declines were: Pittsburgh 1 point to 102 per cent; Cleveland 3½ points to 96, Buffalo, 4½ points to 88½, Cincinnati 4 points to 93½, St. Louis 1 point to 98 and Detroit 21 points to 74 per cent. Unchanged were: Chicago at 101½, eastern Pennsylvania at 96, Youngstown at 97, Wheeling at 88 and Birmingham at 90.

Based on new maximum prices for iron and steel scrap, as set up at Washington, two of STEEL's composite price groups declined last week, steelworks scrap by $1.29 to $18.83 and iron and steel by 14 cents to $38.15. Finished steel was unchanged at $56.60.

COMPOSITE MARKET AVERAGES

	Apr. 5	Mar. 29	Mar. 22	One Month Ago March, 1941	Three Months Ago Jan., 1941	One Year Ago Apr., 1940	Five Years Ago Apr., 1936
Iron and Steel	$38.15	$38.29	$38.29	$38.27	$38.38	$36.69	$31.10
Finished Steel	56.60	56.60	56.60	56.60	56.60	55.90	52.20
Steelworks Scrap..	18.83	20.12	20.12	20.04	20.88	16.00	14.39

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

	Apr. 5, 1941	Mar. 1941	Jan. 1941	Apr. 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
Iron bars, Chicago	2.25	2.25	2.25	2.25
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	2.225	2.17	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.00
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	2.95
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	1.95
Sheets, cold-rolled, Gary	3.05	3.05	3.05	2.90
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	2.25	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

	Apr. 5, 1941	Mar. 1941	Jan. 1941	Apr. 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	19.38	19.38
Southern No. 2, del. Cincinnati	24.06	24.06	23.06	22.89
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	30.34	30.34	30.34	30.34
Gray forge, del. Pittsburgh	24.19	24.18	24.17	23.17
Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	105.33

Scrap

Heavy melt. steel, Pitts.	$20.75	$20.75	$22.15	$16.45
Heavy melt. steel, No. 2, E. Pa.	18.75	18.65	19.31	15.50
Heavy melting steel, Chicago	20.00	19.45	20.15	15.20
Rails for rolling, Chicago	24.25	24.00	24.40	11.25
Railroad steel specialties, Chicago	23.75	23.55	23.95	18.05

Coke

Connellsville, furnace, ovens	$5.50	$5.50	$5.50	$4.75
Connellsville, foundry, ovens	6.00	6.00	6.00	5.75
Chicago, by-product fdry., del.	11.75	11.75	11.75	11.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.10c
Chicago, Gary	2.10c
Cleveland	2.10c
Detroit, del.	2.20c
Buffalo	2.10c
Sparrows Point, Md.	2.10c
New York, del.	2.34c
Philadelphia, del.	2.27c
Granite City, Ill.	2.20c
Middletown, O.	2.10c
Youngstown, O.	2.10c
Birmingham	2.10c
Pacific Coast ports	2.65c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast ports	3.70c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast ports	4.05c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorfed

Pittsburgh, Gary	3.80c
Pacific Coast	4.55c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.40c	4.00c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 303	No 304
Bars	24.00	26.00	25.00
Plates	27.00	29.00	29.00
Sheets	34.00	36.00	36.00
Hot strip	21.50	27.00	23.50
Cold strip	28.00	33.00	30.00

20% Ni.-Cr. Clad

Plates	18.00*
Sheets	19.00

**Annealed and pickled*

Straight Chromes

	No. 410	No. 416	No. 430	No. 442
Bars	18.50	19.00	19.00	22.50
Plates	21.50	22.00	22.00	25.50
Sheets	26.50	27.00	29.00	32.50
Hot strip	17.00	18.25	17.50	24.00
Cold stp.	22.00	23.50	22.50	32.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c-2.44c
Philadelphia, del.	2.15c-2.30c
Boston, delivered	2.43c-2.57c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c--2.25c
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

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Roofing Ternes

Pittsburgh base, 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

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast ports	2.80c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Detroit, delivered	2.25c
Cleveland	2.15c
Buffalo	2.15c
Birmingham	2.15c
Steel Floor Plates	2.50c
Iron	2.80c
Chicago	2.25c
Reinforcing	2.37c
Pittsburgh, refined	3.50-8.00c
Terre Haute, Ind.	2.15c

Buffalo 2.15c
Birmingham 2.15c
Gulf ports 2.50c
Pacific Coast ports 2.80c

Iron

Chicago 2.25c
Philadelphia, del. 2.37c
Pittsburgh, refined ...3.50-8.00c
Terre Haute, Ind. 2.15c

Reinforcing

New Billet Bars, Base

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.. 2.15c
Gulf ports 2.50c
Pacific Coast ports 2.60c

Rail Steel Bars, Base

Pittsburgh, Gary, Chicago, Buffalo, Cleveland, Birm. 2.15c
Gulf ports 2.50c
Pacific Coast ports 2.60c

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

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

*Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.70c
Detroit, delivered 2.80c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.70	3300	3.80
2500	2.55	3400	3.20
4100	0.15 to 0.25 Mo.		0.55
4600	0.20 to 0.30 Mo. 1.50-2.00 Ni.		1.20
5100	0.80-1.10 Cr.		0.45
5100	Cr. spring flats		0.15
6100	bars		1.20
6100	spring flats		0.85
Cr. N., Van.			1.50
Carbon Van.			0.85
9200	spring flats		0.15
9200	spring rounds, squares		0.40

Electric furnace up 50 cents.

Alloy Plates (Hot)

Pittsburgh, Chicago, Coatesville, Pa. 3.50c

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham 2.10c
Detroit, del. 2.20c
Philadelphia, del. 2.42c
New York, del. 2.46c
Pacific Coast ports ... 2.75c
Cooperage hoop, Young., Pitts.; Chicago, Birm.. 2.20c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown 2.80c
Chicago 2.90c
Detroit, del. 2.90c
Worcester, Mass. 3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown 2.95c
Chicago 3.05c
Detroit, del. 3.05c
Worcester, Mass. 3.35c
Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill $40.00
Relay rails, Pittsburgh 20—100 lbs. 32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham. $40.00
Do., rerolling quality.. 39.00

Cents per pound

Angle bars, billet, mills. 2.70c
Do., axle steel 2.35c
Spikes, R. R. base 3.00c
Track bolts, base 4.15c
Car axles forged, Pitts., Chicago, Birmingham. 3.15c
Tie plates, base 2.15c
Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine

½ x 6 and smaller .....68 off
Do., ⅞ and ⅝ x 6-in. and shorter .....66 off
Do., ¾ to 1 x 6-in. and shorter .....64 off
1⅛ and larger, all lengths 62 off
All diameters, over 6-in. long .....62 off
Tire bolts .....52.5 off

Stove Bolts

In packages with nuts separate 73-10 off; with nuts attached 73 off; bulk 81 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.
Step bolts .....60 off
Plow bolts .....68.5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
½-inch and less.	66	70
⅝-1-inch	63	65*
1⅛-1½-inch	61	62
1⅝ and larger ..	60	..

Hexagon Cap Screws

Upset 1-in., smaller .....68 off

Square Head Set Screws

Upset, 1-in., smaller ...74.0 off
Headless set screws ....64.0 off

Piling

Pitts., Chgo., Buffalo .. 2.40c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural 3.40c
⅞-inch and under ....65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off

Welded Iron, Steel, Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cutlengths 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
2½ "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
2½ "O.D.	12	16.01	18.45
2½ "O.D.	12	17.54	20.21
2¾ "O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½ "O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½ "O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm..$45.00-46.00
4-in., Birmingham.. 48.00-49.00
4-in., Chicago 56.80-57.80
6-in. & over, Chicago 53.80-54.80
6-in. & over, east fdy. 49.00
Do., 4-in. 52.00
Class A Pipe $3 over Class B
Stnd. fitgs., Birm., base $100.00.

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, 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 47/64-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... $5.00- 5.75
Connellsville, fdry... 5.25- 6.00
Connell. prem. fdry. 6.00- 6.60
New River fdry. ... 6.50- 7.00
Wise county fdry. .. 5.50- 6.50
Wise county fur. .. 5.00- 5.25

By-Product Foundry

Newark, N. J., del.. 11.85-12.30
Chicago, outside del. 11.00
Chicago, delivered. 11.75
Terre Haute, del. .. 11.25
Milwaukee, ovens.. 11.75
New England, del... 13.00
St. Louis, del. 11.75
Birmingham, ovens. 7.50
Indianapolis, del. .. 11.25
Cincinnati, del. 11.00
Cleveland, del. 11.55
Buffalo, del. 11.75
Detroit, del. 11.50
Philadelphia, del. .. 11.63

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.) 13.75c
Do. (1000 lbs. or over) 12.75c

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

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$25.00	$25.50	$24.50	$26.00
Birmingham, Ala.§	20.38	.....	19.38	24.00
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	24.50
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	.....	23.62	.....
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	†24.12	.....	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

Valley furnace $23.50
Pitts. dist. fur. 23.50

Charcoal

Lake Superior fur. $27.00
do., del. Chicago 30.34
Lyles, Tenn. 26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $29.50; 6.51-7—$30.00; 7-7.50—$30.50; 7.51-8—$31.00; 8-8.50—$31.50; 8.51-9—$32.00; 9-9.50—$32.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo, is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $60.80

First Quality

Pa., Ill., Md., Mo., Ky. 47.50
Alabama, Georgia 47.50
New Jersey 52.50

Second Quality

Pa., Ill., Ky., Md., Mo. 42.75
Georgia, Alabama 34.20
New Jersey 49.00

Ohio

First quality 39.90
Intermediate 36.10
Second quality 31.35

Malleable Bung Brick

All bases $56.05

Silica Brick

Pennsylvania $47.50
Joliet, E. Chicago 55.10
Birmingham, Ala. 47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press $28.00
Wire cut 26.00

Magnesite

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 $50.00
Chem. bonded chrome 50.00
Magnesite brick 72.00
Chem. bonded magnesite 61.00

Fluorspar

Washed gravel, duty pd., tide, net ton. $25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail. 20.00-21.00
Do. barge 20.00
No. 2 lump 20.00-21.00

Ferroalloy Prices

Ferromanganese, 78-82%, carlots, duty pd. $120.00
Ton lots 130.00
Less ton lots 133.50
Less 200 lb. lots 138.00
Do., carlots del. Pitts. 125.33

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

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, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do., spot 1.15

Chromium Metal, 98% cr., 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	4.65	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	3.22	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	3.90	4.00	4.00	3.95	3.95	5.55	3.65	....	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	4.35	5.00	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	4.12	4.87	3.61	4.02	8.77	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	....	5.01	....	3.97	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.68	3.75	....	4.50	....	4.39	....	....
Tulsa, Okla.	4.44	4.34	4.34	4.49	4.49	6.09	4.19	....	5.54	....	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	3.85	3.85	5.50	4.20	....	5.25	....	6.60	10.55	9.80
Seattle	4.00	4.00	5.20	4.00	4.00	5.75	4.00	6.50	5.25	....	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	4.65	6.45	4.15	4.15	6.40	4.30	6.50	5.25	....	6.60	10.55	9.80
San Francisco	3.75	4.25	6.00	3.90	3.90	5.60	3.75	6.40	5.65	....	6.80	10.65	9.80

	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	5.85	..	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	9.05
San Francisco	5.25	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland; 300-9999 Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in B'ham., Memphis.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 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; 150-1049 in Los Angeles; 300-4999 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; 25 to 49 bundles 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; 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.

CURRENT IRON AND STEEL PRICES OF EUROPE

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	$ 6.29 — 1 11 4

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	7.15	1	15 6
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	3.50c	18	7 0

(a) del. Middlesbrough 5s rebate to approved customers. ††Rebate 15s on certain conditions.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers except where otherwise stated; †indicates brokers prices

These prices represent the market prior to announcement of maximum prices by the Stabilization Division, National Defense Advisory Commission, effective April 3. They apply on contracts to be shipped before April 10. Stabilized prices, applying on current business will be found on page 25 of this issue.

HEAVY MELTING STEEL

Birmingham, No. 1.	18.00
Bos. dock No. 1 exp.	17.00
New Eng. del. No. 1	18.25-18.75
Buffalo, No. 1.....	21.00-21.50
Buffalo, No. 2.....	19.00-19.50
Chicago, No. 1	20.00
Chicago, auto, no alloy	19.00
Cincinnati, dealers.	18.25-18.75
Cleveland, No. 1....	20.00-20.50
Cleveland, No. 2....	19.00-19.50
Detroit, No. 1.....	†17.00-17.50
Detroit, No. 2.....	†16.00-16.50
Eastern Pa., No. 1..	20.00
Eastern Pa., No. 2..	18.50-19.00
Federal, Ill., No. 2..	16.75-17.25
Granite City, R. R. No. 1	17.50-18.00
Granite City, No. 2..	16.50-17.00
Los Ang., No. 1 net	14.50-15.00
Los Ang., No. 2 net	13.50-14.00
N. Y. dock No. 1 exp.	†16.50
Pitts., No. 1 (R. R.)	21.00-21.50
Pittsburgh, No. 1...	20.50-21.00
Pittsburgh, No. 2...	19.50-20.00
St. Louis, No. 1	17.25-18.25
St. Louis, No. 2....	16.50-17.00
San Fran., No. 1 net	15.00-15.50
San Fran., No. 2 net	14.00-14.50
Seattle, No. 1.....	15.00
Toronto, dlrs., No. 1	12.25-12.50
Valleys, No. 1	21.00-21.50

COMPRESSED SHEETS

Buffalo	19.00-19.50
Chicago, factory ...	19.00-19.50
Chicago, dealers ...	18.50-19.00
Cincinnati, dealers.	17.00-17.50
Cleveland	20.00-20.50
Detroit	†17.50-18.00
E. Pa., new mat....	20.00
E. Pa., old mat....	17.50-18.00
Los Angeles, net...	12.50-13.00
Pittsburgh	20.50-21.00
St. Louis	15.00-15.50
San Francisco, net..	13.00-13.50
Valleys	20.50-21.00

BUNDLED SHEETS

Buffalo, No. 1.....	19.00-19.50
Buffalo, No. 2.....	17.50-18.00
Cleveland	15.00-15.50
Pittsburgh	19.50-20.00
St. Louis	13.00-13.50
Toronto, dealers ...	10.00-10.50

SHEET CLIPPINGS, LOOSE

Chicago	15.50-16.00
Cincinnati, dealers..	12.50-13.00
Detroit	†13.50-14.00
St. Louis	12.00-12.50
Toronto, dealers....	9.00

BUSHELING

Birmingham, No. 1.	16.00
Buffalo, No. 1.....	19.00-19.50
Chicago, No. 1.....	18.50-19.00
Cincin., No. 1 deal..	14.25-14.75
Cincin., No. 2 deal..	7.75- 8.25
Cleveland, No. 2....	14.00-14.50
Detroit, No. 1 new.	†16.50-17.00
Valleys, new, No. 1.	20.50-21.00
Toronto, dealers....	7.00- 7.50

MACHINE TURNINGS (Long)

Birmingham	9.50
Buffalo	14.00-14.50
Chicago	14.50-15.00
Cincinnati, dealers..	10.00-10.50
Cleveland, no alloy.	13.50-14.00
Detroit	†11.00-11.50
Eastern Pa.	15.50-16.00
Los Angeles	4.00- 5.00
New York	†10.50-11.00
Pittsburgh	16.00-16.50
St. Louis	12.00-12.50
San Francisco	5.00
Toronto, dealers....	†8.75- 9.00
Valleys	15.50-16.00

SHOVELING TURNINGS

Buffalo	16.00-16.50
Cleveland	14.50-15.00
Chicago, specl, anal.	16.25-16.75
Detroit	†12.50-13.00
Pitts., alloy-free....	17.00-17.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	†8.50- 9.50
Buffalo	14.50-15.00
Cincinnati, dealers..	9.25- 9.75
Cleveland	16.00-16.50
Eastern Pa.	14.50
Detroit	†12.50-13.00
New York	†11.00-11.50
Pittsburgh	17.00-17.50
Toronto, dealers....	†8.75- 9.00

CAST IRON BORINGS

Birmingham	8.50
Boston dist. chem...	†11.25-11.50
Buffalo	14.50-15.00
Chicago	15.50-16.00
Cincinnati, dealers..	9.25- 9.75
Cleveland	16.00-16.50
Detroit	†12.50-13.00
E. Pa., chemical....	17.50-18.00
New York	†11.50-12.00
St. Louis	10.75-11.25
Toronto, dealers....	†8.75- 9.00

RAILROAD SPECIALTIES

Chicago	23.50-24.00

ANGLE BARS—STEEL

Chicago	23.50-24.00
St. Louis	21.50-22.00

SPRINGS

Buffalo	25.00-25.50
Chicago, coil	24.75-25.25
Chicago, leaf	23.50-24.00
Eastern Pa.	26.00-26.50
Pittsburgh	26.75-27.25
St. Louis	23.25-23.75

STEEL, RAILS, SHORT

Birmingham	20.00
Buffalo	27.00-27.50
Chicago (3 ft.).....	24.00-24.50
Chicago (2 ft.).....	24.50-25.00
Cincinnati, dealers..	25.25-25.75
Detroit	†22.50-23.00
Pitts., 2 ft. and less	26.75-27.25
St. L. 2 ft. & less..	24.00-24.50

STEEL RAILS, SCRAP

Birmingham	18.00
Boston district.....	†15.75-16.00
Buffalo	22.00-22.50
Chicago	20.00
Cleveland	24.00
Pittsburgh	22.00 (nom.)
St. Louis	20.00-20.50
Seattle	18.00-18.50

PIPE AND FLUES

Chicago, net	14.50-15.00
Cincinnati, dealers..	13.25-13.75

RAILROAD WROUGHT

Birmingham	16.00
Boston district.....	†11.75-12.25
Eastern Pa., No. 1..	20.50-21.00
St. Louis, No. 1 ...	14.25-14.75
St. Louis, No. 2 ...	16.50-17.00

FORGE FLASHINGS

Boston district	†13.50-14.00
Buffalo	19.00-19.50
Cleveland	18.50-19.00
Detroit	†16.50-17.00
Pittsburgh	20.00-20.50

FORGE SCRAP

Boston district	†12.75-13.00
Chicago, heavy	24.00-24.50

LOW PHOSPHORUS

Buffalo, plates	26.00-26.50
Cleveland, crops ...	26.00-26.50
Detroit, thin gage..	†19.00-19.50
Eastern Pa., crops .	25.50-26.00
Pitts., billet, bloom, slab crops	27.00-27.50
Toronto, dealers ...	13.50-14.00

LOW PHOS. PUNCHINGS

Buffalo	25.00-25.50
Chicago	24.00-24.50
Cleveland	22.00-22.50
Eastern Pa.	25.50-26.00
Pittsburgh	26.50-27.00
Seattle	15.00

RAILS FOR ROLLING

5 feet and over

Birmingham	20.00
Boston	†18.50-19.00
Chicago	24.00-24.50
New York	†19.00-19.50
Eastern Pa.	26.00-26.50
St. Louis	22.50-23.00

STEEL CAR AXLES

Birmingham	18.00
Boston district	†20.00-20.50
Chicago, net	26.00-26.50
Eastern Pa.	27.50-28.00
St. Louis	25.50-26.00

LOCOMOTIVE TIRES

Chicago (cut)	23.50-24.00
St. Louis, No. 1 ...	20.00-20.50

SHAFTING

Boston district	†19.75-20.00
New York	†21.00-21.50
Eastern Pa.	25.00-25.50
St. Louis, 1¼-3¾"...	19.75-20.25

CAR WHEELS

Birmingham iron...	18.00
Boston dist., iron...	†16.50-17.00
Buffalo, steel	24.50-25.00
Buffalo iron	21.50-22.00
Chicago, iron	20.50-21.00
Chicago, rolled steel	23.00-23.50
Cincin., iron deal...	19.50-20.00
Eastern Pa., iron...	23.50-24.00
Eastern Pa., steel..	26.50-27.00
Pittsburgh, iron ...	22.00-22.50
Pittsburgh, steel...	26.75-27.25
St. Louis iron	21.75-22.25
St. Louis, steel	22.50-23.00

NO. 1 CAST SCRAP

Birmingham	19.50
Boston, No. 1 mach.	†19.00-19.50
N. Eng., del. No. 2..	19.25-19.50
N. Eng. del. textile	22.00-23.00
Buffalo, cupola	20.50-21.00
Buffalo, mach.	22.50-23.00
Chicago, agri. net..	19.75-20.25
Chicago, auto net..	19.50-20.00
Chicago, railr'd net	20.00-20.50
Chicago, mach. net.	21.50-22.00
Cincin., mach. deal..	21.50-22.00
Cleveland, mach....	24.00-24.50
Detroit, cupola, net.	†19.00-19.50
Eastern Pa., cupola	26.00-26.50
E. Pa., No. 2	23.00-23.50
E. Pa., yard fdry...	23.00-23.50
Los Angeles	16.50-17.00
Pittsburgh, cupola..	22.50-23.00
San Francisco	14.50-15.00
Seattle	14.00-15.00
St. L., agri. mach...	20.00-20.50
St. L., No. 1 mach. .	22.00-22.50
Toronto No. 1 mach., net dealers	†21.50-22.00

HEAVY CAST

Boston dist. break.	†18.00-18.25
New England, del...	20.00-20.50
Buffalo, break.	18.00-18.50
Cleveland, break, net	18.50-19.00
Detroit, auto net...	†19.50-20.00
Detroit, break.	†17.50-18.00
Eastern Pa.	24.00
Los Ang., auto, net.	13.00-14.00
New York break...	†17.00

STOVE PLATE

Birmingham	13.50
Boston district	†15.50
Buffalo	18.00-18.50
Chicago, net	14.50-15.00
Cincinnati, dealers.	13.00-13.50
Detroit, net	†13.00-13.50
Eastern Pa.	20.50-21.00
New York fdry. ...	†17.50
St. Louis	17.00-17.50
Toronto dealers, net	†17.50-18.00

MALLEABLE

New England, del...	22.00-23.00
Buffalo	24.00-24.50
Chicago, R. R.	24.50-25.00
Cincin. agrl., deal...	18.00-18.50
Cleveland, rail	25.00-25.50
Eastern Pa., R. R....	23.00-23.50
Los Angeles	12.50
Pittsburgh, rail	26.00-26.50
St. Louis, R. R.....	21.50-22.00

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..	$23.50-24.00
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, clf.	$43.00-46.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%..	.....
So. African, 48%...	65.00-67.00
Brazilian, 46%	60.00-62.00
Chilean, 47%	65.00
Cuban, 50-51%, duty free	67.50

Molybdenum

Sulphide conc., lb., Mo. cont., mines..	$0.75

Scrap

Scrap Prices, Page 108

Although the scrap iron and steel industry had expected announcement of maximum prices and differentials by the price stabilization division of the National Defense Advisory Commission it was thrown into confusion by promulgation, Thursday, of schedules and rules. The order and ceiling prices are presented on pages 23-25, this issue.

Uncertainty preceding the government action had prevented trading to a great extent and prices were largely nominal on most grades. On publication of the new prices trading practically stopped until the trade could digest the new figures and adjust itself to the situation.

The new prices are to apply on all purchases after April 3 but dealers are allowed until April 10 for completion of deliveries on contracts made at old prices previous to April 3. First reaction of the industry to this provision was that the time allowance was far too short to allow shipments to be made on standing contracts and considerable losses would result from full application of this clause.

This opinion crystallized on action at several points, of which the Chicago group is typical. A resolution to Leon Henderson, of the price stabilization division, was forwarded Thursday afternoon, asking extension of this time limit and a delegation of scrap dealers went to Washington that night to present their case.

Another feature tending to unsettle the situation is the incomplete coverage of the price announcement, numerous important grades not being included. It will take some time and negotiation to establish prices on these materials, in line with other grades. Unification of price relationships may require several weeks, in the opinion of many dealers.

While price announcement is being taken in a spirit of co-operation by the industry in general, several districts fear the new differentials will work to their disadvantage in obtaining sufficient tonnage for consumer needs. Brokers at Pittsburgh believe that district is pocketed and that differentials are too small to permit equal competition with other districts. Supporting this view, brokers in the New York area believe little steelmaking scrap will move to Pittsburgh and under the new schedule brokers will be able to pay more relatively for shipment to Bethlehem, Pa., and Buffalo, notably to the latter by water.

New England interests view with some alarm the sharp drop in de-

livered price and believe prices in that territory will experience the most severe adjustment downward of any part of the country. Concern is manifested that New England delivered prices will be so low as to divert tonnage to mills outside the district to a greater degree than in the past.

Another factor causing complaint against the April 10 deadline for completing contracts lies in the fact that considerable scrap has been bought at upper Great Lakes ports for shipment by water to lower lake consuming points. Obviously this cannot be moved by that date and hope is held that some provision may be made to extend the time to cover this factor.

No estimate can be made of total unshipped scrap under contract but in the Pittsburgh district it is believed more than 300,000 tons is under contract, most of which can not be covered before the deadline.

Sheets, Strip

Sheet & Strip Prices, Pages 104, 105

Delivery dates on steel sheets continue to recede and many producers have little remaining capacity until late in the year. Stripmakers are booked even more fully and some are filled to the end of the year.

Expected lessening of demand from the automotive industry has not developed and car buiders continue to place substantial orders and are pressing for delivery. Pressure for shipment is developing in some directions in which it had not been expected.

The fact that no announcement of second quarter prices has been made has not affected the situation, delivery being of more importance. Current sales are being made at prices prevailing at time of delivery. Quarterly price announcements appear to have been abandoned for the present.

Zinc shortage continues to affect galvanized production and with few exceptions these sheets are difficult to obtain. The navy recently placed galvanized and hot-rolled sheets with Alan Wood Steel Co., Conshohocken, Pa., to the value of $400,000.

Stainless steel deliveries for defense work vary considerably. One stamping interest figuring a contract for mess trays taking A-1 rating was quoted 14, 18 and 32 weeks, by three producers, one bid including a clause to the effect delivery would depend on nickel supply.

Non-defense orders for sheets and strip are difficult to place for fourth quarter and practically impossible for third quarter. A consumer seeking to place 500 tons was able to place only two carloads for fourth quarter with its regular supplier but a substantial portion is still unplaced.

Sheet seconds have become practically impossible to obtain and prices have gone higher. One consumer who formerly paid $2 per hundred for strip, pickled and oiled, now is quoted $3.95 for similar material, not pickled and oiled.

Warehouses find difficulty in obtaining supplies and are placing sheet orders for closing weeks of the year. Demand for sheets from store is heavy as mill supplies have dried up. Galvanized sheets are most difficult to obtain.

Narrow cold strip is seldom obtainable short of November and capacity for the final two months is being absorbed rapidly. Consumer inventories are not large in view of current rate of consumption. Cold-rolled strip is being substituted for aluminum and other nonferrous materials in non-defense production. Stainless strip is fully under priority and as high as 30 weeks is quoted currently even on the highest rating.

Ferroalloys

Ferroalloy Prices, Page 106

Ferrosilicon and high silicon silvery iron are extremely scarce and some users have been unable to obtain sufficient supplies. Producers are prorating available tonnage and allotments in some cases are only sufficient to provide for national defense jobs carrying preferential ratings.

Plates

Plate Prices, Page 104

Allocation of steel plates is being watched closely to give distribution according to needs and avoid accumulation. Much of the tonnage offered is being referred to mills before acceptance. Defense and ship tonnage are placed ahead of much other buying. Some plate fabricators find their inventory reaching a low point and are seeking earlier mill shipments than first promised. Jobbers are especially urgent in their appeals.

Current orders are usually accepted for delivery not much earlier than October and some mills can not equal that. Floor plates are in easier situation and can be obtained in four to five weeks. Small tank makers are taking much material and this contributes to tightness in quarter-inch plates. Demand from miscellaneous users has declined somewhat in some districts, principally because little tonnage is available before fall delivery and mills are discouraging more extended coverage.

Supply of plates for non-defense purposes is dwindling as requirements for armament increase, particularly for naval and Maritime Commission vessels. Recent additions to the latter's program include 72 tankers and 12 cargo ships to be built by the Sun Shipbuilding Co., Chester, Pa., involving about 335,000 tons of steel, of which three-fourths will be plates. These are in addition to 200 standardized cargo ships, orders for which were placed recently among various yards.

Meanwhile, additional orders for tankers and cargo ships are being placed and there are definite indications that the government will be in the market soon for at least 300 additional ships similar to the 200 above noted. These would require 825,000 tons, the greater proportion, of course, being plates.

In some quarters, it is believed that a substantial portion of these additional government cargo ships will be built at Jacksonville, Fla., where the newly organized Jacksonville Shipbuilding Corp. is planning to lay down 25 ways. It is understood that this yard will be given work on 200 ships of a type to be definitely decided upon later, with the construction of the ways and

the initial work on ships to go forward simultaneously.

The navy has divided 70,000 tons of plates between Lukens Steel Co., Coatesville, Pa., and Worth Steel Co., Claymont, Del. This is included in its regular six months miscellaneous steel requirements.

Award of three more large cargo carriers by the Pittsburgh Steamship Co., in addition to two recently placed, brings steel requirements for the five to about 30,000 tons, mainly plates.

Plate mills in Alabama are hard pushed to supply sufficient tonnage for shipbuilding and carbuilding needs in areas directly tributary.

Plate Contracts Placed

757 tons, high-strength low-alloy plates, also 108 tons fabricated steel beams and grillages, Panama, schedule 4923, U. S. Steel Export Co., Washington, $104,876.63, bids March 31, Washington.

200 tons, 500,000-gallon tank and tower, airport at Las Vegas, Clark county, Nev., to Darby Products & Steel Plate Co., Kansas City, Mo.

200 tons, 500,000-gallon tank and tower, military airport near Litchfield Park, Maricopa county, Ariz., to Darby Products & Steel Plate Co., Kansas City, Mo.

160 tons, water tank and tower for Moscow, Idaho, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

Plate Contracts Pending

220 tons, bureau of reclamation, invitation A-33,172-A, for Pit river bridge, Redding, Calif.; floor plates; bids opened.

100 tons or more, 300,000-gallon elevated steel water tank, Fort Benning, Ga.; bids in; inv. 6406-566.

Bars

Bar Prices, Page 104

Steel bar deliveries are receding, demand during the past 30 days having pushed back possibilities several weeks. On most sizes and grades entire third quarter capacity is covered. Consumers seek to place 1942 tonnages but producers are limiting bookings to fourth quarter in most instances. Releases are being examined closely by steelmakers to promote the most equitable distribution in relation to needs. A large proportion of present bookings is for defense purposes.

Various changes are being made in buying habits under stress of present conditions, one being increasing purchases f.o.b. mill instead of on the usual basing point plan. Consumers unable to obtain material from usual sources are willing to pay higher freight to obtain needed bars.

Users of electric furnace alloy bars, confronted by extended deliveries, are specifying various open-hearth alloys, although only occasionally can producers give deliveries before October.

Cold-drawn bar producers find supply of hot-rolled material uncertain, interfering with their schedules. Tool steel inventories by secondary suppliers are low and orders placed in March by a distributor can not be shipped until July. Machine tool builders are buying more heavily from warehouses and some industrial fabricators are following the same plan to supplement lean mill deliveries.

Forging shops in some instances are depleting alloy steel stocks, notably producers of alloy forgings for the aircraft industry. A midwest company is shipping 1000 forged Rolls-Royce crankshafts monthly to England. Cold-finished steel suppliers have heard of a 600,000-ton order for shell steel about to be allocated.

Small quantities of Swedish steels are beginning to filter through the war zone, according to consumers. Shipments of partial orders for high alloy steels for use in high temperature applications were made last week.

Quickening in inquiry for shell steel, both by the British and the American government, is noted and with the probability that this will be reflected soon in the bar market. There is also demand from the army for 105 and 155 millimeter gun carriages, which also may require a sizable amount.

Pipe

Pipe Prices, Page 105

Merchant steel pipe demand for construction is gaining and miscellaneous industrial activity is steady. Strong inquiry for alloy tubing, largely chromium-molybdenum for aircraft assembly, is being received and producers are booked well ahead.

Cast iron pipe demand is seasonal, involving additional blanket contracts covering undetermined requirements for the remainder of the year. Pipe foundries are operating at a high rate and considerable tonnage is pending, mainly in small lots for municipal use.

White Eagle division, Socony-Vacuum Oil Co. Inc., New York, has asked bids on a 250-mile extension of its Augusta-Topeka-Kansas City light oil pipe line, involving six-inch pipe from Topeka to Omaha and Sioux City, Iowa, connecting with river terminals at these points.

Prices of merchant steel pipe from warehouse are steadier and concessions, recently offered, have largely disappeared.

Cast Pipe Placed

2612 tons, 16 and 18-inch, San Diego, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

650 tons, 2 to 10-inch, River Road district, Eugene, Oreg., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

300 tons, 2 to 8-inch, Menlo Park district, Portland, Oreg., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

250 tons, 4 to 12-inch, water system, government airport, Tucson, Ariz., to United States Pipe & Foundry Co., Burlington, N. J.

130 tons, 6-inch, Wrentham, Mass., to Central Foundry Co., Birmingham, Ala.

100 tons, 12-inch universal pipe, Mills Field airport, San Francisco, to Central Foundry Co., Holt, Ala.

Cast Pipe Pending

515 tons, 6, 8 and 12-inch, additional tonnage, Fort Devens, Mass.; Coleman Bros., Boston, contractor.

350 tons, Phinney Bay district, Bremerton, Wash.; bids in.

100 tons, 10-inch, alternate transite, Fort Lewis, Wash., improvement; Marci Bros., Seattle, general contractor.

Unstated, 2 to 12-inch and fittings, for Shelton, Wash.; bids in.

Wire

Wire Prices, Page 105

Widely diversified demand for wire and wire products continues

without sensible abatement. Automotive users are large buyers and spring farm work is bringing in additional demand.

While shipments on current purchases of some products can be made late in third quarter an increasing volume of bookings now is for delivery in October and later. Finishing schedules are interrupted frequently by appearance of defense tonnage which must be produced ahead of other material. In some instances wire rod producers are reducing wire rod quotas to their own finishing departments in order to supply regular customers whose supplies are nearly exhausted.

Warehouse stocks are depleted in many items and prices have stiffened, scattered weakness prevailing previously on nails having practically disappeared.

Moderate price advances are being made on some fine round wires and specialties by eastern mills while others, figuring costs closely, are adding extras for processing operations, which ordinarily are waived.

Absorbs Nut Department

■ Lamson & Sessions Co., with general offices in Cleveland and plants at Birmingham, Ala., Chicago, Cleveland and Kent, O., has purchased the machinery and stock of nuts and steel of the semifinished nut department, Sherman-Klove Co., Chicago. E. L. McDonough of this company will represent Lamson & Sessions with his customers. This purchase does not affect manufacture and sale of other products of Sherman-Klove Co.

Rails, Cars

Track Material Prices, Page 105

Approximately 90,000 tons of rolled steel will be required for freight cars now on inquiry, according to trade estimates. This represents requirements of about 12 lists, which includes among the newer inquiries 3200 cars for the Missouri Pacific and 1000 hopper cars and 1000 box cars for the Louisville & Nashville.

In addition a substantial tonnage is involved in a contemplated list for the New York Central, which it is believed will cover at least 1000 freight cars and possibly a much larger number. With steelmakers hard pressed to supply increasing needs of defense work, railroads and railroad equipment builders find it difficult to obtain satisfactory deliveries.

On the New York Central's Clayton act opening last week covering miscellaneous quarterly requirements no steel company was in position to quote a firm price and four of them, Inland Steel Co., Jones & Laughlin Steel Corp., Republic Steel Corp. and Weirton Steel Co.—indicated they would not be in position to quote on shipments over the remainder of the year.

Domestic freight car awards in March, according to figures now available, amounted to 8074 units, against 5508 in February and 15,169 in January. This brings the total for the first quarter to 28,751, against 4611 in the corresponding period last year, 3062 in the first three months of 1939 and 914 in the same period in 1938. Further comparisons follow:

	1941	1940	1939	1938
Jan.	15,169	360	3	25
Feb.	5,508	1,147	2,259	109
March	8,074	3,104	800	680
3 mos.	28,751	4,611	3,062	914
April	.....	2,077	3,095	15
May	.....	2,010	2,051	6,014
June	.....	7,475	1,324	1,178
July	.....	5,846	110	0
Aug.	.....	7,525	2,814	182
Sept.	.....	9,735	23,000	1,750
Oct.	.....	12,195	19,634	2,537
Nov.	.....	8,234	2,650	1,232
Dec.	.....	7,181	35	2,581
Total	.....	66,889	57,775	16,303

Car Orders Placed

Baltimore & Ohio, fifty 70-ton cement cars, to Greenville Steel Car Co., Greenville, Pa.

Canadian Pacific, 250 twin hopper cars, to unstated builder.

Chicago, Indianapolis & Louisville, 150 fifty-ton box cars and 60 fifty-ton flat cars, to Pullman-Standard Car Mfg. Co., Chicago, subject to court approval.

Delaware & Hudson, five 100-ton well cars, to own shops.

E. I. du Pont de Nemours & Co., 192 tank cars, to American Car & Foundry Co., New York.

Minneapolis & St. Louis, fifty 50-ton steel box cars, to Pullman-Standard Car Mfg. Co., Chicago.

Nashville, Chattanooga & St. Louis, 200 hopper cars, to Pullman-Standard Car Mfg. Co., Chicago.

Nickel Plate, 500 fifty-ton steel box cars, to American Car & Foundry Co., for its St. Louis shops.

Pennsylvania, fifty 90-ton container cars, to own shops.

Russian government, 100 seventy-ton air dump cars, to unstated builder.

Car Orders Pending

Army Ordnance department, Washington, 200 tank cars, pending.

Bureau of reclamation, Denver, one 80-ton transfer car with accessories complete; bids Apr. 10.

Louisville & Nashville, 1000 box cars and 1000 hopper cars, bids asked.

Missouri Pacific, 3200 miscellaneous freight cars, pending.

New York Central, 1000 freight cars or more, contemplated.

Locomotives Placed

Norfolk & Western, six Mallet type locomotives, to own shops.

Standard Fruit & Steamship Co., one 2-8-0 type narrow gage locomotive for Honduras, to American Locomotive Co., New York.

Terminal Railroad Association of St. Louis, eight 1000-horsepower diesel-electric switch engines; three to American Locomotive Co., New York, three to Electro-Motive Corp., La Grange, Ill., and two to Baldwin Locomotive Works, Eddystone, Pa.

Locomotives Pending

Navy, ordnance, delivery Yorktown, Va., one electrically operated diesel-electric locomotive and spares, Atlas Car & Mfg. Co., Cleveland, low; bids March 21, schedule 5722.

Rail Orders Placed

Illinois Central, 17,000 tons for 1942 delivery to Tennessee Coal, Iron & Railroad Co.

Rail Orders Pending

St. Louis Southwestern, court permission asked for purchase of 112-pound rails for 42 miles of track in Arkansas and Texas.

Tin Plate

Tin Plate Prices, Page 104

Tin plate buying has slackened slightly, as large users have placed liberal estimates of their needs. However, buying is unusually heavy for this season, spurred to some extent by fear of future shortage of tin. Production continues at 80 per cent of capacity, the other 20 per

cent being principally in hot mills remaining idle.

Tin plate capacity is larger than a year ago and some additional facilities will be in production in a short time. There has been no shortage of tin plate and consumers have not been forced to interrupt production for lack of material. Mill stocks are in excellent condition and able to meet demand as it arises until shipments are needed in much greater volume than at present.

Export demand promises to be heavy but has not yet materialized to a degree beyond ability of producers to meet it.

Shapes

Structural Shape Prices, Page 104

With the crest of defense building, engineering and shipyard extension work—now past—fabricators are better prepared to handle regular civilian work. This makes the situation look easier, or at least shows daylight ahead. Many predict that in another 60 days most defense work will be out of the way completely. Recently much regular peacetime work has appeared for state, county and municipal projects, as well as for private enterprises.

In some cases plain material has been delivered to fabricators so rapidly they have asked mills to hold back. Fabricators complain that in the rush of the past few months architects and designers have often become careless and not supplied enough details, which delays fabricators pending more complete data.

Deliveries on fabricated material have slipped behind, with five months average as against four months about a month ago. In rare cases a three and a half months' delivery is promised. Fabricators recall that during the first world war as much as ten months' deliveries prevailed.

Typical of brisk business in sight is Cleveland where three live projects will require 60,000 tons, including 10,000 tons, estimated, for the Chase Brass & Copper Co. Inc.

Among the large tonnages pending is 8500 tons for a bridge over the Mississippi at Dubuque, Iowa.

Shape Contracts Placed

5500 tons, buildings, Western Cartridge Co., St. Louis, to Mississippi Valley Structural Steel Co., Decatur, Ill.

4000 tons, airplane plant, Akron, O., Goodyear Rubber Co., to R. C. Mahon Co., Detroit.

3750 tons, bridges, Mariflores locks, Panama, to Pittsburgh Des Moines Steel Co., Neville Island, Pa., previously reported as going elsewhere.

2800 tons, assembly shop and buildings, Long Beach, Calif., for navy, to American Bridge Co., Pittsburgh.

2033 tons, sheet piling, specification H. D. 108, Long Beach, Calif., to Columbia Steel Co., San Francisco.

1000 tons, 23 bridges, West Virginia, for Baltimore & Ohio railroad, to American Bridge Co., Pittsburgh.

1000 tons, barbette plant, Mesta Machine Co., Homestead, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

820 tons, sewage treatment plant, contract 10, Jamaica, N. Y., to American Bridge Co., Pittsburgh, through Caye Construction Co., New York, contractor.

800 turbine generator foundations, Public Service Electric & Gas Corp., Jersey City and Burlington, N. J., to Bethlehem Steel Co., Bethlehem, Pa.

700 tons, building, Methodist hospital, Brooklyn, N. Y., to Harris Structural Steel Co., New York.

650 tons, storage warehouses, Jeffersonville, Ind., for government, to Gage

Shape Awards Compared

	Tons
Week ended April 5	26,214
Week ended March 29	35,067
Week ended March 22	14,839
This week, 1940	14,226
Weekly average, 1941	33,849
Weekly average, 1940	28,414
Weekly average, March, 1941	20,157
Total to date, 1940	257,128
Total to date, 1941	473,884

Includes awards of 100 tons or more.

Structural Steel Co., Chicago.

600 tons, steel sheet piling, U. S. engineer, New Orleans, to Carnegie-Illinois Steel Corp., Pittsburgh.

500 tons, addition, G. L. F. Mills Inc., Buffalo, to Bethlehem Steel Co., Buffalo.

500 tons, nine shipyard cranes, California plants, to Pacific Car & Foundry Co., Seattle.

500 tons, estimated, structures for switchyard, Grand Coulee power plant, to Bethlehem Steel Co., Bethlehem, Pa.; bids March 18 to Bureau of Reclamation, Denver.

450 tons, apartment, Central Park South, New York, to Fichter Steel Co., New York.

450 tons, trusses and beams, Little Compton and Point Judith, R. I., for war department, to American Bridge Co., Pittsburgh.

360 tons, school, Upper Darby, Pa. to Lehigh Structural Steel Co., Allentown, Pa.

315 tons, building No. 127, Mariner Harbor shipyard, Bethlehem Steel Co., Staten Island, New York, to Schact Steel Construction Co., New York, through Justin C. O. Brien Co., New York.

300 tons, plant addition, Hughes Tool Co., Houston, Tex., to Commercial Iron Works, Houston.

300 tons, rebuilding plant, fire loss, Geneva Foundry Co., Geneva, N. Y., to American Bridge Co., Pittsburgh.

265 tons, mechanical engineering building, Worcester Polytechnic Institute, Worcester, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; Robert Whipple Co., Worcester, contractor.

250 tons, addition, pipe shop, Fore River shipyards, Bethlehem Steel Co., Quincy, Mass., to West End Iron Works, Boston.

225 tons, bridge, Front street, Hartford, Conn., to American Bridge Co., Pittsburgh; M. A. Gammino Construction Co., Providence, contractor, $98,603.42; reinforcing bars to Truscon Steel Co., Youngstown, O., bids March 17, Hartford.

180 tons, 5-story edible oil and lard refining plant, Atlanta, Ga., to Ingalls Iron Works, Birmingham, Ala.; A. Farnell Blair, Decatur, Ga., contractor; work also takes 57 tons reinforcing bars.

176 tons, building, Blockson Chemical Co., Joliet, Ill., Campbell-Lowrie-Lautermilch Corp., Chicago, contractor, to Joseph T. Ryerson & Son Inc., Chicago.

176 tons, overhead crossing, FAGH-282-B (2), Sterling, N. Dak., for state, to Minneapolis-Moline Power Implement Co., Minneapolis.

165 tons, building, Galion Metallic Vault Co., Galion, O., to C. E. Morris Co., Columbus, O.; Schirmer, Snyder Co., Cleveland, contractor.

160 tons, addition for production of aircraft engine parts, New Britain Machine Co., New Britain, Conn., to Berlin Construction Co., Berlin, Conn.; Hasson & Downes, New Britain, contractors; Scherer Steel Co., Hartford, awarded reinforcing bars.

150 tnos, bridge L-264, Lackawanna, N. Y., for New York Central railroad, to American Bridge Co., Pittsburgh.

150 tons, addition to building No. 25 National Aniline & Chemical Co., Buffalo, to Ernst Iron Works, Buffalo.

150 tons, building, Coca Cola Bottling Co., Brighton district, Boston, to A. O. Wilson Structural Co., Cambridge, Mass.

140 tons, shapes, specification H. D. 108, Long Beach, Calif., to Columbia Steel Co., San Francisco.

125 tons, extension, disposal platform, Brooklyn, N. Y. city project, to Weatherly Steel Co., Weatherly, Pa.; McAndrew Construction Co., New York, contractor.

124 tons, state highway bridge, Onawa, Iowa, to Des Moines Steel Co., Des Moines, Iowa.

100 tons, dormitory, University of Delaware, Newark, Del., to Anthracite Bridge Co., Scranton, Pa.

100 tons or more, control equipment, Coulee power plant, to Valley Iron Works, Yakima, Wash.; awarded by Denver.

Shape Contracts Pending

10,000 tons, estimated, building, Chase Brass & Copper Co., Cleveland; Stone & Webster, engineers.

8500 tons, bridge, Mississippi river, Dubuque, Iowa-E. Dubuque, Ill., for Dubuque Bridge commission.

4700 tons, Frank R. Phillips power station, Wireton, Pa., for Duquesne Light Co.

3300 tons, grade crossing elimination, New York Central Railroad, Herkimer county, N. Y., PSC 5937; bids April 23.

3150 tons, superstructure, North State street bridge, city of Chicago; bids April 11.

2500 tons, transit shed, naval air station, San Diego, Calif., National Iron Works, San Diego, Calif., low.

1805 tons, including 768 tons of sheet piling, improvement Los Angeles River between Atlantic and Randolph streets, Los Angeles; bids April 5.

1800 tons, building addition, New England Telephone & Telegraph Co., Providence.

1700 tons, diesel engine frame building, for Lukenweld Inc., Coatesville, Pa.

1600 tons, power plant, Wood River, Ill., Standard Oil Co. of Indiana.

1600 tons, Hudson Motor naval ordnance plant, Macomb county, Michigan, to Bethlehem Steel Co., Bethlehem, Pa.; Bryant & Detwiler, contractors.

1500 tons, shell loading plant, Milan, Tenn., to Laclede Steel Co., St. Louis.

1400 tons, viaduct, East River drive, E. Forty-fifth-E. Fiftieth streets, New York.

1200 tons, power station, Duquesne Light Co., Wireton, Pa., to Jones & Laughlin Steel Corp., Pittsburgh.

950 tons, hangar and buildings, naval base, Trinidad, B.W.I.; James Stewart Co., New York, contractor.

900 tons, aircraft parts assembly plant, Fleetwings Inc., Bristol, Pa.

800 tons, grade crossing elimination, Queens, N. Y.; bids April 10.

800 tons, buildings, Plum Brook Ordnance works, Sandusky, O., for government.

750 tons, building, Goodyear Tire & Rubber Co., Akron, O.

670 tons, steel piling, local protection project, Massillon, O., for United States Engineers, Huntington, W. Va., E. J. Albrecht Co., Chicago, contractor, low; bids March 27. Job also involves 380 tons, bars, reported in Steel, March 16.

600 tons, plant expansion Pittsburgh Metallurgical Co., Niagara Falls, N. Y.

580 tons, Slauson avenue bridge, improvement Los Angeles River between Downey Road and Randolph streets, Los Angeles; bids April 2 U. S. engineer, Los Angeles.

566 tons, bearing piles and sheet steel piling, improvement Los Angeles River between Aroyo Seco and North Broadway, Los Angeles; bids April 7 U. S. engineer, Los Angeles.

550 tons, store house, Fore River shipyards, Bethlehem Steel Co., Quincy, Mass.

520 tons, for New Orleans, Texas and Mexico Railway bridge in Point Coupee Parish, La.; bids due April 31.

500 tons, grade crossing elimination, Chautauqua County, New York; bids April 23.

500 tons, power plant addition, unit 6, Aurora, Ill., Western United Gas & Electric Co.

463 tons, bridge, Pacific Electric Railroad Co., improvement Los Angeles River between Downey Road and Randolph streets, Los Angeles; bids April 2 U. S. engineer, Los Angeles.

430 tons, warehouse, G. C. Murphy Co., McKeesport, Pa., to Bethlehem Steel Co., Bethlehem, Pa.; Dick Construction Co., contractor.

400 tons, underpass, Middle River, Md., for state.

400 tons, new school to replace schools Nos. 25 and 40, Buffalo.

390 tons, soap plant extension, Lever Bros. Co., Baltimore.

375 tons, building, Corning Glass Works, Corning, N. Y.

320 tons, office and factory extension, Hamilton Watch Co., Lancaster, Pa.

320 tons, Buick storage and drive-away building, Flint, Mich., to Jones & Laughlin Steel Corp., through Taylor-Gaskin Co.; Darin & Armstrong, contractors.

310 tons, state bridge FB-2 of 3-8-1, Plainwell, Mich.

300 tons, factory addition, Universal Products Co., Dearborn, Mich.

290 tons, state bridge FB-1 of 80-17-7, South Haven, Mich.

260 tons, grade crossing elimination, Wabash railroad, Decatur, Ill., for Illinois; bids April 11.

250 tons, bridge 29.37, Ballston, N. Y., Delaware & Hudson railroad.

250 tons, building, Cleveland Hobbing Machine Co., Cleveland; bids last week.

250 tons, grade crossing elimination, Chicago & Alton railroad, Carlinville, Ill., for Illinois; bids April 11.

240 tons, steel wales for tunnels, Pacific Gas & Electric Co., San Francisco at Cresta and Polga sections; bids opened.

220 tons, raising Berwick Bay bridge, Berwick-Morgan City, La., Texas & New Orleans railroad.

220 tons, Sisters of Mercy hospital, Hammond, Ind., to Republic Steel Corp., through O. J. Dean Co.

212 tons, grade crossing elimination, Chicago & Eastern Illinois railroad, for Illinois; bids April 11.

200 tons, building 4, shed and shipping building, American Brass Co., Detroit.

200 tons, garage, Van Buren and Sherman streets, Chicago, to Joseph T. Ryerson & Son Inc., Chicago, through Selzer-Ornst Co., Chicago, contractor.

160 tons, lunch and wash room building, Ford Motor Co., Detroit.

160 tons, addition, Riverside hospital, Newport News, Va., to Bethlehem Steel Co., Bethlehem, Pa., through Virginia Steel Co.

150 tons, bottling plant, Coca Cola Co., Brighton district, Boston, to Truscon Steel Co., South Boston, Mass.

150 tons, McInerny apartment, Washington, to Bethlehem Steel Co., Bethlehem, Pa., through Madison Supply & Equipment Co.

125 tons, cell blocks, state prison, Dannemora, N. Y., to Truscon Steel Co., Youngstown, O.; Thomas C. Brown Co., Syracuse, contractor.

100 tons, warehouse, Harshaw Chemical Co., Elyria, O.

100 tons, National Guard bureau, Harris-

burg, Pa.; bids April 21, inv. 6.

100 tons, bridge, highway project, Revere-Saugus, Mass.; bids April 22 to R. W. Coburn, chief engineer, Department of Public Works, Boston.

Unstated, also plates, seven minesweepers, to Commercial Iron Works, Portland, Oreg.

Unstated, also plates, four subchasers, to Albina Engine & Machine Works, Portland, Oreg.

Reinforcing

Reinforcing Bar Prices, Page 105

New concrete bar tonnage is developing in rapidly increasing volume, principally for defense jobs. New inquiries and placements are more active than any previous time this year. One of the largest awards of the week involved 5750 tons of concrete bars and 1,370,000 square feet of wire mesh for the army ammunition depot at Hermiston, Oreg., awarded to Bethlehem Steel Co. One of the largest inquiries in the Middle West involves 1930 tons for the superstructure of Studebaker Corp.'s airplane engine parts plant, South Bend, Ind. Where good bargains as to prices are secured it is usually WPA projects that are involved. Lots of 20 tons are base, with discounts and premiums applying as tonnages vary.

Reinforcing Steel Awards

5750 tons, also 1,370,000 sq. ft. wire mesh, for Hermiston, Oreg. army ammunition depot, to Bethlehem Steel Co., Portland; J. A. Terteling & Son, Boise, Idaho, contractor.

694 tons, Bureau of Reclamation, inv. A-33,162-A, Coram, Calif., to Judson Steel Corp., San Francisco.

180 tons, deformed open hearth billet steel, state procurement office, Treasury Dept., Baltimore, to Dow Weld Co. Inc., Baltimore, 2.38c, inv. 235-3721; bids March 5.

133 tons, dried sludge building, West-Southwest sewage treatment works, division G, Stickney, Ill., sanitary district, Chicago, Marsch Construction Co., Chicago, contractor, to Concrete Steel Co., Chicago.

130 tons, Yesler Hill housing project, Seattle, to Bethlehem Steel Co., Seattle; J. C. Boespflug, Seattle, contractor.

130 tons, three pumping stations, Fairfax-Jersey Creek, Kansas City, Kans., Carruthers and Crouch, contractors, to Sheffield Steel Co.

125 tons, addition Hyde Park exchange, Illinois Bell Telephone Co., Chicago, W. J. Lynch Co., Chicago, contractor, to Olney J. Dean Steel Co., Cicero, Ill.; bids March 17.

120 tons, engine test building, Wright Aeronautical Corp., Paterson, N. J., to Truscon Steel Co., Youngstown, O.; Mahony-Troast Construction Co., Passaic, N. J., contractor.

108 tons, water works and sewage treatment plant, army airport, Ft. Wayne, Ind., for war department, Crouse & Saunders, Detroit, contractors, to Hugh J. Baker Co., Indianapolis.

100 tons, Edison vocational school addition, Seattle, to Northwest Steel Rolling Mills, Seattle; Hans Ness, Seattle, contractor.

Concrete Bars Compared

	Tons
Week ended April 5	13,940
Week ended March 29	12,628
Week ended March 22	11,889
This week, 1940	10,972
Weekly average, 1941	10,918
Weekly average, 1940	9,661
Weekly average, Mar., 1941	12,486
Total to date, 1940	109,236
Total to date, 1941	152,852

Includes awards of 100 tons or more.

Reinforcing Steel Pending

5125 tons, New Orleans, Texas & Mexico railway bridge, Point Coupee Parish, La.; bids April 31.

2800 tons, Navy super drydock, Bayonne, N. J.; George H. Flinn & Great Lakes Drydock Co., contractors.

2265 tons, improvement Los Angeles River between Fourth and Aliso streets, Los Angeles; bids opened.

1930 tons, superstructure airplane engine parts plant, Studebaker Corp., South Bend, Ind.; bids April 2.

1600 tons, rolling mill, Bridgeport Brass Co., Indianapolis; Stone & Webster, contractors.

1500 tons, naval supply depot, Bayonne, N. J.; Mahoney Troast & Wighton Ab-

Behind the Scenes with STEEL

Phillips' Pills

■ You may remember the article Leighton Wilkie, president, Continental Machines Inc., wrote for STEEL back in January—"Little Vitamin Pills Do Big Things," in which he told of the success they have had in reducing sick absenteeism, etc. Some way or other that ace columnist, H. I. Phillips of the *New York Sun*, got to thinking about it all and the poetic muse was irresistible. Here are a couple of verses from his resulting pome:

A happy factory is ours—
We do not mind the daily toil;
We like the boss and he likes us—
It's largely done by liver oil;
We work and do it with a song,
Our faces are a sea of grins;
No task is ever hard for us—
We do it all through vitamins!

So three cheers for our gracious boss!
And three more for the good old shop!
We find that working is such fun—
It pains us when we have to stop;
In vitamins we put our trust
Instead of union concepts new;
How happy would we workers be
If all our leaders took 'em, too!

Stultifying Stuff

■ Strategically perched behind the pseudonym, "A Grick Etymologist," one of our good readers and advertisers (if our guess is right) really pours it to us in six syllable words for being so downright dumb last week about Mr. Rosenthal's definition of *lallygagging*. Just in case your secretary may have a big Webster's in the office we'd better skip some of his neater sesquipedalia, and simply let it go that "our psiltacism has proved there is more apparatus for the final stage of the digestive process than there are equines!" Which ain't exactly the way we heard it!

Army Life

■ We notice that on April 10 the Quartermaster Supply Officer at Fort Mason, Calif., is taking bids on 6000 decks playing cards, poker, and 408 decks playing cards, pinochle. Apparently the boys are having difficulty in finding out what to do with those $21 checks!

Puzzle

■ We were admiring a nice plug STEEL got in March issue of *The Postage Stamp* and came across this puzzler which we flunked cold. It seems a young fellow was consulting his pastor about his wedding which he wanted to take place as soon as possible. "Well," said the preacher, "the banns will have to be published for three successive Sundays, but we can make it immediately after that—on the 28th." "Fine," said the bridegroom, "and how early in the day?" The minister looked up his program. "I have a funeral at ten o'clock in a nearby city that day, and I'll need time to get back. How about two in the afternoon?" "It's a date," agreed the young man—and now tell us what's wrong with this picture.

Prosperity

■ In the interoffice mail the office "clipper" sends us "Today's one minute editorial for the too, too busy executive" from the *Cleveland Plain Dealer* one day this week—a silhouetted picture of a factory with smoke and steam belching out like mad, and in the foreground a park bench —*empty*.

Never Again

■ Some day in the future we'll look back to April 7, 1941 as the day we went on the wagon—after just a quick look at that Hanlon-Gregory ad on page 78.

SHRDLU.

bott Co., contractors.

1500 tons, shell manufacturing plant, Chase Brass & Copper Co., Euclid, O.

797 tons, grade elimination, contract CH-41-1, Astoria, N. Y.; bids April 10.

570 tons, superstructure, Studebaker plane engine gear plant, Chicago; bids April 11.

500 tons, power plant, Buffalo Niagara Electric Corp., Tonawanda, N. Y.

500 tons, housing project, Capitol Homes extension, Atlanta, Ga.; Gilbert Beers, Atlanta, contractor, $611,400, bids April 1.

463 tons, improvement Los Angeles River between Downey Road and Randolph street, Los Angeles; bids April 2, United States engineer, Los Angeles.

400 tons, sewage treatment plant, contract 10, Jamaica, N. Y.; Caye Construction Co., New York, contractor.

350 tons, Blue Mountain dam spillway, Waveland, Ark.

350 tons, General Electric Co., Victor X-ray division plant, Chicago; James Stewart, contractor.

250 tons, viaduct, East River Drive, New York.

250 tons, medical supply storehouse, Navy yard, Brooklyn, N. Y.; W. J. Barney Corp., contractor.

220 tons, superstructure Studebaker plane engine gear plant, Ft. Wayne, Ind.; bids April 1.

200 tons, dynamometer building, Buick Motor Co., Chicago; bids April 3.

167 tons, State Procurement division, Treasury Department, New York; Carroll-McCreary Co. Inc., Brooklyn, N. Y., low.

124 tons, quartermaster, Camp McCoy, Wis.; bids in, inv. 988-64.

110 tons, state highway project, Pomfret-Eastford, Conn., to Truscon Steel Co., South Boston, Mass.; M. A. Gammino Construction Co., Providence, contractor, $359,940.91, bids March 17, Hartford.

105 tons, highway project, Wethersfield-Newington, Conn., to Truscon Steel Co., South Boston; D. V. Frione & Co., New Haven, Conn., contractor, $195,290.68, bids March 17, Hartford.

100 tons, including 71 tons for propeller building and 29 tons for personnel building, airplane engine plant, Buick Motor division, General Motors Corp., Chicago; bids April 11.

100 tons, U. S. engineer, New Orleans, to Jones & Laughlin Steel Corp., New Orleans, 2.56c, inv. 358, bids March 17; also 7,500,000 square feet wire fabric, Inv. 342, to Keystone Steel & Wire Co., Peoria, Ill., $1.63 per 100 square feet, f.o.b. Peoria, bids March 12.

Unstated, control house and untanking tower, Covington, Wash.; bids to Bonneville project, April 15, spec. 1814.

Unstated, 800,000 gal. concrete water reservoir, Manette, Wash.; bids soon to FWA.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 105

With few exceptions bolt and nut manufacturers find difficulty keeping stocks balanced. In fact, some have found it impossible, particularly on larger rounds, 1½ and 2 inches and over, which are difficult to obtain from mills because of heavy demands for shell work.

On materials requiring these heavi-

er rounds, some bolt and nut manufacturers cannot make deliveries much under eight to ten weeks. In certain cases of urgent character they can start making shipments in possibly five weeks, but if the tonnage is at all large, they are not able to complete them until some time later.

Pig Iron

Pig Iron Prices, Page 106

Following recent precedent pig iron producers are making no price announcement for second quarter and melters are given to understand this means virtual suspension of quarterly price announcements, at least for the present. Price announcements are to be spot, applying to shipments after the effective date. For some time sales have been at price applying at time of shipment.

While the situation is tight, production is at a high rate and shipments are being rationed as closely as possible, with the result there has been no great hardship on the part of melters. Makers are using every effort to keep supplies even with actual needs and prevent accumulations at one point to the detriment of others. A steelworks furnace in Ohio has been switched to part-time merchant production to aid the situation.

Some second quarter tonnage has been sold but many producers have not yet accepted such business, confining sales to spot lots. In many instances melters enter second quarter with comfortable tonnages on furnace books as carryover from first quarter. A few furnaces were able to clear up all first quarter obligations at the end of the period. Efforts to place third quarter tonnage have not been successful. A development of the situation is partial abandonment of the basing point system, some quotations being f.o.b. furnace instead of nearest basing point.

To meet pressing needs of melters, furnaces are increasing the number of small shipments of special grades, as need arises. Scarcity of some scrap grades has placed additional pressure on pig iron. In many cases foundries are making considerable change in proportions of pig iron and scrap to meet conditions. Silvery iron has been in light supply and foundries serving the automotive industry have been forced to use lower silicons in some cases. Change from aluminum to cast iron for automobile pistons is putting an extra burden on pig iron.

Current negotiations on wages in the coal industry may have an effect on future pig iron prices although an increase probably would not be reflected in iron for some time, probably on little second quarter iron.

Unfilled orders of gray iron foundries in the Philadelphia Federal Reserve district increased 66.1 per cent in February to 267.5 per cent ahead of a year ago, according to the monthly compilation of the industrial research department, University of Pennsylvania. Production was off 7.9 per cent from January but 43 per cent larger than last year, with shipments 34.4 per cent ahead of the 1940 month. Pig iron stocks showed a 40.3 per cent increase over a year ago, with scrap stocks up 13.1 per cent.

Tight position in pig iron is reflected in the failure of a single seller to bid on 446 tons of foundry iron for Norfolk, Va., navy yard under schedule 5783, delivered or f.o.b. furnace.

Pacific Coast

Seattle — While shipyards continue to absorb most plates coming from eastern centers, local fabricators report a large volume of small tank and boiler jobs. In view of difficulty in promptly obtaining new stocks, shops are conserving material and prefer jobs involving small tonnages to larger contracts which cannot be filled by definite dates.

Cast pipe is active and prospects indicate increased volume in second quarter, important tonnages pending.

Warehouse buying is heavy. Deliveries of some items are uncertain and dealers are handling stocks to accommodate the trade to best advantage. Local houses have eliminated the upper brackets so that the best price works out at 10,000

pounds. This is to compensate for higher freight charges by rail, against water, by which most steel products ordinarily move. Otherwise prices are unchanged.

Dealers are upset over suggestion that steel scrap be pegged on a $20, Pittsburgh, base with differentials that would make dealers' price here about $12.60, compared with $14 and $15, gross, now being paid by mills for No. 2 and No. 1 heavy melting steel, respectively. The proposed level, dealers claim, would not attract shipments from the interior.

Canada

Toronto, Ont. — Canadian primary steel producers are maintaining production almost at maximum capacity, but are falling further behind in delivery. On some materials mills in the Montreal area and in the Maritimes are said to have some surplus production and recently have been making deliveries to consumers in Ontario despite the handicap of high freight charges. Ontario mills, on the other hand, are booked beyond their present production rate. Approximately 90 per cent of orders can be traced directly to war industries. Prices generally are unchanged. In addition to ordinary war demand for steel, the Canadian Pacific railway plans expenditure of upwards of $9,700,000 on new rolling stock, for which contracts will be placed soon. Sheet sales are increasing, with delivery now the latter part of third or early fourth quarter. It is stated no sheets are available for second quarter on new order.

Orders for plates are at record levels and both the Canadian and British governments are placing orders for ships for which even greater tonnages of plates will be required.

While orders for merchant bars are heavy, mills have been able to handle demand, although deliveries are running into third quarter.

Order of the steel controller prohibiting use of steel in private construction, except under special permission, has resulted in some slowing down in structural steel awards and prospective business.

Second quarter pig iron booking was strongly featured during the week. Local blast furnace representatives state that melters show keen interest and inquiries are numerous, many indicating that melters are prepared to close for larger tonnages than in more than a year.

No settlement has been reached between foundrymen and dealers with regard to machinery cast scrap prices. Foundry interests continue to bid $21.50 but are unable to get

tonnage. Those in urgent need of supplies, however, are paying up to $25.50, net ton, delivered.

Equipment

Seattle—Demand for machinery and equipment continues strong and dealers report the best volume in years. Automotive, road maintenance and electric items lead. Bonneville project, Portland, will open bids April 8 for four circuit breakers, Spec. 1810. United States engineer, Portland, has received figures for gas water heaters for the Boise, Idaho, cantonment. Denver has called bids April 9 for lighting and power transformers for Coulee dam, Spec. 1494-D and April 21 for four circuit breakers and seven disconnecting switches for Coulee, Spec. 957. Bids are in to United States engineer, Portland, for mechanisms, chlorinator, pumps, etc., for the Pendleton, Oreg., air corps cantonment. Seattle has called bids for April 8 for five trucks, Asotin county, Wash., April 7 for rock crusher and April 8 for tractor and angle dozer; Spokane, April 10 for diesel power road maintainer and scarifier. Seattle will open bids April 18 for three disconnecting switches. Crane Co. is low, $111,000, to Tacoma for furnishing 20 tons condensing tubing for the light department.

Steel in Europe

Foreign Steel Prices, Page 107

London (*By Cable*)—Little change has taken place in Great Britain in the steel and iron situation, except further increase in production. Foundry iron deliveries are expanding. Demand principally is for shipbuilding material, tanks, boiler plates, sheets, galvanized sheets and special steels. Tin plate export trade is more active, owing to release of some unsold stocks.

Fluorspar

Fluorspar Prices, Page 106

In another month movement of fluorspar from Kentucky and Illinois mines will be in full swing, and it is expected new records will be made, especially since imports are small and uncertain. A little spar comes from Mexico but the movement is far below normal because of war conditions.

Some quickening in domestic fluorspar shipments is already noted, though shippers are cautious thus early in the season. Large operators in Kentucky and Illinois have been operating at a good rate all winter but wagon mines were sus-

Nonferrous Metal Prices

Mar.	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
29	12.00	12.00	12.25	52.37½	51.62½	5.85	5.70	7.25	17.00	14.00	35.00
31	12.00	12.00	12.25	52.00	51.37½	5.85	5.70	7.25	17.00	14.00	35.00
April											
1	12.00	12.00	12.25	51.62½	50.87½	5.85	5.70	7.25	17.00	14.00	35.00
2	12.00	12.00	12.25	51.62½	50.75	5.85	5.70	7.25	17.00	14.00	35.00
3	12.00	12.00	12.25	51.62½	50.75	5.85	5.70	7.25	17.00	14.00	35.00
4	12.00	12.00	12.25	51.75	51.00	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

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	9.00-9.25
Cleveland	10.00
Chicago	9.12½-9.37½
St. Louis	9.00

Heavy Copper and Wire

New York, No. 1	10.00-10.25
Cleveland, No. 1	11.00
Chicago, No. 1	10.25-10.50
St. Louis	10.25

Composition Brass Turnings

New York	8.75-9.00

Light Copper

New York	8.00-8.25
Cleveland	8.75
Chicago	8.25-8.50
St. Louis	8.25

Light Brass

Cleveland	6.00
Chicago	6.12½-6.37½
St. Louis	5.75

Lead

New York	4.85-5.00
Cleveland	4.50-4.75
Chicago	4.62½-4.87½
St. Louis	4.50

Old Zinc

New York, del., buyer's plant	5.10
Cleveland, del., buyer's plant	5.10
St. Louis, del., buyer's plant	5.10

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.	13.75-14.00
Standard No. 12 aluminum	16.00

pended, as usual, during the winter.

Prices are unchanged at $20 to $21 per net ton for domestic, carloads, all rail shipment, f.o.b. mines, washed gravel. However some look for an advance of $1 per ton in another month or two, or when the season is in full activity.

Molybdenum To Relieve Demand for Tungsten

Priorities on tungsten are expected to result in increased use of molybdenum in alloy steels. It already is being substituted for nickel. Molybdenum-manganese steel may be used for bullet cores, which would result in saving tungsten from about 10,000 tons of ore, about twice normal requirements for all purposes.

Even with this saving tungsten needs will be large, for cutting tools, often using 20 per cent tungsten, and for military equipment, such as ordnance, armor plate and airplane steels. Domestic ore production this year is expected to be increased at least 40 per cent, to about 6000 tons. Last week 1900 tons of wolframite arrived from China, second only to 4600 tons brought in last summer. The current shipment is understood to be for immediate distribution instead of being placed in reserve.

Tungsten ore ordinarily is shipped in lots of about 50 tons. Because of unsettled conditions in the Far East the larger consignment was brought in but in case of critical conditions there the smaller shipments may be resorted to in an effort to reduce possible losses by ship sinkings. Metals Reserve Co. now has more than 32,000 tons of concentrates on order, practically all Chinese wolframite.

Nonferrous Metals

New York—The government continued to expand its control over major nonferrous metals as consumption maintained a peak level. All scrap metals are likely to come under complete control, as already in aluminum and zinc, unless voluntary reductions restore the normal relationship with virgin metal prices.

Copper—Maximum prices may be established officially within a few days on most copper and allied products, with the exception of scrap. Indications now are that 12.00c will be set for electrolytic copper in the producers' market and 12.00c to 13.00c for 85-5-5-5 brass ingot. The latter market displayed a softening tendency on Friday with base prices declining ¼-cent due to lighter demand and heavy receipts of red metal scrap.

Lead—Sales were heavy with all

leading sellers easily balancing their intakes. Production from foreign concentrates will decline due to high ocean freight rates but imports of foreign refined lead likely will increase. Undertone of the market remained strong at 5.85c, New York.

Zinc—Secondary prime western zinc was fixed at a maximum carlot price of 7.25c, East St. Louis, while maximum prices were also fixed for the various grades of scrap. Lack of slab zinc has reduced galvanized sheet output to only 62 per cent of capacity compared with a recent high of 84 per cent. More manufacturers are cutting out nondefense brass items by switching to higher copper content articles.

Tin—Prices remained well above the Metals Reserve Co.'s standing bid of 50.00c with Straits spot closing at 51.75c.

Capacity Released by British Aids Delivery

The two-month suspension requested by the British government on production of all carbon steels for its account will release approximately 500,000 tons of capacity, according to reliable trade estimates.

Normally, such development would have pronounced effect, but under present conditions this capacity will be absorbed quickly, without slightest bearing on the rate of ingot operations and probably without much disruption of finishing schedules, it is believed. The principal net effect will likely be the stepping up of deliveries in some cases.

That the tonnage involved in the present suspension is not heavier may be attributed in part to the fact that England has bought relatively little tonnage in this country since late last year, or since the question of financing future purchases on other than a cash basis first came up.

In addition to substantial stocks at seaboard and a desire to conserve cargo space for other necessities, the recent action by the British Iron and Steel Federation is attributed also to another reason. It appears that the British, in their heavy buying last year, bought an extra amount for use in the event their own production failed to keep up to schedule. It is claimed now that despite bombing raids, British production has exceeded schedules originally set around the middle of last year.

Of the $7,000,000,000 lend-lease law, $1,500,000,000 has already been allocated, with $1,500,000,000 to $2,000,000,000 "under study," President Roosevelt said at his press conference, Friday.

Windows of Washington

(*Concluded from Page 32.*)

part of his time to finding ways and means of maintaining continuity of employment in plants affected by the establishment of mandatory priorities.

Special representative of the United Mine Workers of America since 1939, Mr. Lewis was formerly commissioner of the Bituminous Coal Commission, and for 16 years prior to that, president of the Iowa State Federation of Labor. In 1937 he went to Geneva, Switzerland, as technical adviser on steel and coal on the staff of John C. Winant, head of the American delegation to the International Labor Office.

James S. Earl, of the Federated Metals Division, American Smelting & Refining Co., has joined the OPM reclamation and conservation unit where he will be in charge of the waste materials program.

Samuel R. Fuller Jr. was named chief of the materials branch, production division, OPM, replacing W. A. Harriman. Mr. Fuller remains chairman of the production planning board. A. I. Henderson will continue as acting deputy of the branch.

Elmer E. Walker, of Colorado Springs, has been appointed national specialist on apprenticeship in metal trades and Joseph E. Foster, of Chicago, to a similar post in aviation, by Secretary of Labor Perkins.

Mr. Walker, former business representative of the International Association of Machinists, has long been interested in apprenticeship training methods. Mr. Foster, as former president of the Airline Mechanics Association International, aided the American Airlines, Pennsylvania Central and Braniff Airways in establishing their apprenticeship systems under the Federal Committee on Apprenticeship standards.

Appointment of Major Arthur N. Ziegler, as general counsel for the Administrator of Export Control, has been announced by Brigadier General Russell L. Maxwell, administrator. Major Ziegler has served with the office since its organization July 2, 1940 and formerly was chief of its administrative division.

Vacations Canceled, but Extra Pay for 13,000

■ Caterpillar Tractor Co., Peoria, Ill., has canceled 1941 vacations for its 13,000 employes to maintain production for national defense. Each employe will receive on Aug. 1 vacation pay in addition to regular compensation for time worked.

"Even though employment is now at the highest point in our company's history, production is not enough to satisfy requirements," the company states in notifying employes of the decision. "Nationwide sentiment calls for uninterrupted effort in supplying the needs of the defense program."

The company termed the sacrifice of vacations this year "an emergency measure only, and it is earnestly hoped that conditions will permit again enjoying next year and in following years the annual two weeks' period of rest and recreation." A vacation with pay plan for employes was adopted in 1939.

■ A jury of award composed of architects and engineers has been appointed by the American Institute of Steel Construction, New York, to select the most beautiful new steel bridges opened to traffic in 1940. Entries will be received until May 1.

Construction and Enterprise

Illinois

CHICAGO—Oscar F. Carlson Co., 2600 West Irving Park road, manufacturer of boiler controls, is taking bids on a plant addition.

CHICAGO—Acme Industrial Co., 200 North Laflin street, manufacturer of machine tools, jig bushings, etc., is building a top-floor addition 150 x 150 feet and has placed orders for about $100,000 worth of equipment.

CHICAGO—Pyott Foundry & Machine Co., 328 North Sangamon street, is building a one-story machine shop addition covering 7700 square feet. Equipment for addition will cost about $10,000.

CHICAGO—Container Corp of America, 111 West Washington street, will let contract soon through J. B. Black, engineer, 520 North Michigan avenue, for a one-story 135 x 168-foot plant addition at 404 East North Water street, to cost about $50,000.

CHICAGO—Mercil & Sons Plating Co., 1911 West Fulton street, has let general contract for a one-story plant at Wolcott and Fulton streets, to Chicago Industrial Construction Co., 165 West Wacker drive, costing over $40,000.

CHICAGO—A. Dalkin Co., 4311 North Ravenswood avenue, is building a one-story 90 x 90-foot factory at 3222 Kilpatrick avenue, which will more than double present space. Company manufactures automatic vending machines and does engineering work. New plant will cost about $18,000.

CHICAGO—Birtman Electric Co., 4140 West Fullerton avenue, manufacturer of electrical appliances, plans plant additions to cost about $250,000.

CHICAGO—Cullen-Friestedt Co., 1300 South Kilbourne avenue, is building a $20,000 addition to its steel erecting shop, 65 x 75 feet, to increase manufacturing space about 25 per cent. Company manufactures locomotive cranes, clamshell buckets, sheet lifters and special machinery.

ROCKFORD, ILL.—Greenlee Bros. Co., manufacturer of tools, will build a two-story addition costing about $10,000.

SPRINGFIELD, ILL.—City, John W. Kapp Jr., is having plans made for two or four additional filters for water supply, to cost about $50,000. Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., is engineer.

Connecticut

EAST BERLIN, CONN. — Stanley Chemical Co. is building a one-story 35 x 104-foot addition costing about $50,000, with equipment.

NEW BRITAIN, CONN.—Goss & DeLeeuw Machine Co., 100 Harding street, Kensington, has let general contract to Aberthaw Co., 80 Federal street, Boston, for a machine shop building costing $100,000.

NEW BRITAIN, CONN.—New Britain Machine Co. is extending its plant at cost of about $400,000, with government aid.

Maine

LISBON FALLS, ME.—Worumbo Mfg. Co. plans to modernize and improve plant and install additional equipment, at cost of $250,000.

SOUTH PORTLAND, ME.—Todd-Bath Iron Shipbuilding Corp. is building nine shipways for its new plant, plate shop 100 x 300 feet, machine shop 100 x 225 feet, general equipment and warehouse building 75 x 300 feet, power plant 75 x 100 feet and office, garage and other structures. Total cost estimated at $5,000,000, with equipment.

New York

DUNKIRK, N. Y.—Marsh Valve Co., 307 Brigham road, will build a one-story foundry addition 60 x 90 feet, general

■ Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 117 and Reinforcing Bars Pending on page 119 in this issue.

contract to W. Washington, 118 West Sixth street, to cost about $50,000, with equipment.

NIAGARA FALLS, N. Y.—Union Carbide Co., 137 Forty-seventh street, will build a furnace building addition costing over $40,000. G. L. Lardie, care owner, is in charge.

Ohio

CLEVELAND — Pittsburgh Steamship Co., Rockefeller building, has let contracts for three lake freighters, in addition to two others recently awarded to Great Lakes Engineering Works, River Rouge, Mich. One of the three will be built by same builder and two by American Shipbuilding Co., at Lorain, O.

CLEVELAND—Kinetic Mfg. Co. Inc., 12000 Athens avenue, Ralph C. Hummer, secretary-treasurer, plans a plant on Euclid boulevard, Lorain, O., 66 x 116 feet, costing about $10,000. Production will be removed to new plant.

CLEVELAND—Industrial Plating Co., 4415 Czar avenue, is building an addition 36 x 213 feet to enlarge shipping facilities.

CUYAHOGA FALLS, O.—Reimer & Bloomgren Machine Co., 1850 South Front street, will enlarge facilities about one-third by new plant at Second and Hudson avenues, 40 x 160 feet, to cost about $12,500.

VAN WERT, O.—National Motor Bearing Co. Inc., Oakland, Calif., has bought seven-acre site and will build a plant costing about $100,000 to house equipment costing $125,000. Company manufactures oil and fluid seals and shims for machinery and automobiles.

VAN WERT, O.—Kennedy Mfg. Co., manufacturer of sheet steel specialties, will build a one-story addition 100 x 200 feet to meet demands for production space.

Pennsylvania

BRADFORD, PA.—Healy Petroleum Corp., Kennedy street, will build a three-story 50 x 50-foot plant addition costing about $50,000. F. Fensel, Main street, is architect.

CONSHOHOCKEN, PA. — Quaker Chemical Products Co., Elm street, will build a three-story 116 x 122-foot plant costing about $75,000. P. M. Sax, Penfield building, Philadelphia, is engineer.

MILTON, PA.—Milton Steel & Supply Co. will build a one-story 40 x 192-foot addition costing about $40,000, with equipment.

PITTSBURGH — Mine Safety Appliances Co., 201 North Braddock avenue, will expand its plant at Callery, Pa., by additions and alterations to six buildings, new boiler plant and manufacturing building. Prack & Prack, 119 Federal street, Pittsburgh, architects, are in charge.

WARREN, PA.—Boro council, C. Barwis, engineer, will take bids in early summer for a sewage disposal plant in Pleasant township and trunk line sewers, at total cost of about $300,000. Chester Engineers, 210 East Park Way, Pittsburgh, are in charge.

Michigan

BATTLE CREEK, MICH.—City plans sewage disposal plant to cost about $100,000. H. P. Jones, engineer, Second National Bank building, Toledo, O., is making preliminary plans.

DETROIT—Contract Specialties Co., 743 Beaubien street, has been incorporated with $10,000 capital to conduct a general manufacturing business, by F. A. Vollbrecht, 1299 West Ann Arbor trail, Plymouth, Mich.

KALAMAZOO, MICH. — Balch-Lundberg Mfg. Co. has been incorporated with $25,000 capital to manufacture automobile parts, by Severans Balch, 405 Stewart avenue, Kalamazoo.

MUSKEGON, MICH. — Midwest Machine & Mfg. Co. has been incorporated with 37,500 shares no par value to manufacture machine parts, by Thomas Mahoney, Wardell apartments, Detroit.

PLAINWELL, MICH.—Valley Metal Products Corp. has been incorporated with $25,000 capital to manufacture metal products, by Richard Stiles, Plainwell.

Indiana

MUNCIE, IND.—Maxon Pre-Mix Burner Co., 2520 Mulberry street, is building a plant addition for which some new equipment has been bought for manufacture of industrial gas and oil burner equipment.

Missouri

KANSAS CITY, MO.—Water department, K. K. King, director, will take bids in April on equipment for water softening plant to cost about $624,000. Burns & McDonnell Engineering Co. and Black & Veatch, both of Kansas City, are associate engineers.

KANSAS CITY, MO.—Columbian Steel Tank Co., 1509 West Twelfth street, is building an 84 x 107-foot addition to

galvanizing department, to house galvanizing pot 5 x 5 x 20 feet. Pickling vats will be enlarged.

ST. LOUIS—Perma-Net Co. has been incorporated with $5000 capital to manufacture laundry and dry cleaning machinery and supplies. Harris, Reinhardt & Bebb, 29 South LaSalle street, Chicago, are representatives.

ST. LOUIS—Shop Master Tool Corp. has been incorporated with $2000 capital to manufacture tools, machinery, etc., by Henry C. Stoll, 722 Chestnut street, attorney, and associates.

ST. LOUIS—Atlas Enameling Co., 2024 North Broadway, has given general contract to William Green & Son, 3131 South Broadway, for a plant addition costing about $10,000; one-story 52 x 72 feet.

Oklahoma

OKLAHOMA CITY, OKLA.—City, H. E. Bailey, manager, has retained V. V. Long, Colcord building, Oklahoma City, as consulting engineer to make survey for improvement to waterworks plant, including reservoir, purification and pumping plant, watermain extensions and repairs. Estimated cost is about $7,000,000.

Wisconsin

BEAVER DAM, WIS.—Kirsch Foundry Co. has given general contract to C. Starkweather & Son for foundry addition 22 x 72 feet.

DORCHESTER, WIS.—Village, S. C. Sorenson, clerk, will take bids in April on sand, gravel and sludge pumps for sewage disposal plant. Entire plant will cost about $60,000. Davy & Davy, 502 Main street, LaCrosse, Wis., are engineers.

MILWAUKEE—Trackson Co., manufacturer of tractor equipment, crawlers and cranes, will build a one-story plant addition 80 x 110 feet. E. W. Burgess, 1838 North Fifty-second street, is engineer.

MILWAUKEE — Cutler-Hammer Inc., manufacturer of electrical devices, has given general contract to H. Schmitt & Son Inc. for one-story addition 78 x 90 feet. Keymar & Slaby are architects.

MILWAUKEE—Globe Seamless Tubes Co. is building a one-story shipping room addition 60 x 400 feet, with overhead crane and other handling equipment.

MILWAUKEE—Sterling Motor Truck Co. has given general contract to Gebhard-Berghammer Inc. for a one-story factory addition.

MILWAUKEE—Milwaukee Mfg. Co. has been incorporated to manufacture welding and general machinery, by A. J. Hertzberg and associates.

PHILLIPS, WIS.—Hallett Construction Co., Crosby, Minn., is low bidder at $229,455 for construction of 377 miles rural transmission lines to serve 964 customers of Price electric co-operative, Frank X. Schumacker, secretary. Wisconsin development authority, 522 Tenney building, Madison, Wis., is engineer.

TWO RIVERS, WIS.—Paragon Electric Co., Manitowoc, Wis., manufacturer of electric devices, has bought plant here and will remodel and add boiler plant.

Minnesota

RED WING, MINN.—City, S. T. Irvine, clerk, plans sewage disposal plant and interceptor sewer to cost about $200,000 and is considering bond issue. M. E. Chamberlain, Montevideo, Minn., is engineer.

ST. LOUIS PARK, MINN.—Village, Joseph Justad, recorder, is taking bids to April 14 on construction of 500,000-gallon elevated steel water storage tank and tower.

Kansas

EMPORIA, KANS.—City, E. T. Mandel, clerk, will hold election soon on $75,000 bond issue to finance sewage disposal plant. Robert W. Cunningham is city engineer.

North Dakota

KINDRED, N. DAK.—Cass county electric co-operative, A. J. Tuskind, manager, has awarded contract to Zonatelli Bros., Ironton, Minn., at $153,880 for construction of 300 miles rural transmission lines to serve 500 customers. M. S. Hyland, Fargo, N. Dak., is engineer.

South Dakota

WINNER, S. DAK.—City, Elna Nicholson, clerk, will vote April 8 on $195,000 bond issue to finance municipal light plant and distribution system.

Nebraska

OMAHA, NEBR.—Metropolitan Utilities, Walter Byrne, general manager, is taking bids to April 10 on gas works boiler equipment, including two 500-horsepower boilers, piping, equipment and installation, at estimated cost of $145,000.

SEWARD, NEBR.—City, Carl McGrew, clerk, plans a special election on $22,000

bond issue to finance construction of a water tower.

Iowa

DELHI, IOWA—Town, Roy H. Smith, clerk, is taking bids to April 22 for a power house, diesel generating units and auxiliaries and a distribution system. A. S. Harrington, 501 Baum building, Omaha, Nebr., is engineer.

FORT DODGE, IOWA — Fort Dodge Gas & Electric Co., T. C. Roderick, general manager, has given contract to General Electric Co., Schenectady, N. Y., for a steam turbine generator in connection with its additions and improvement program for 1941, which will total close to $1,000,000.

GRAETTINGER, IOWA—Bond issue of $100,000 has been approved to finance construction or purchase of an electric light plant. C. E. Norris is clerk. (Noted Feb. 24.)

GRIMES, IOWA — City, Frank M. Briggs, clerk, is taking bids to April 22 on diesel engine generating equipment of 300 horsepower, consisting of two units and auxiliaries. Ralph W. Gearhart, Cedar Rapids, Iowa, is engineer.

LAMONI, IOWA—Board of trustees, Roy L. Mortimer, secretary, takes bids to April 14 for extension and improvement of electric light plant, including additional diesel generator unit of 375 to 475 horsepower, and auxiliary equipment. A. S. Harrington, 501 Baum building, Omaha, Nebr., is engineer. (Noted March 24.)

LORIMOR, IOWA—City plans construction of complete waterworks system and application will be made to WPA for aid.

MUSCATINE, IOWA—Board of water and light, Herman Zeug, secretary, is taking bids to April 23 on fuel-burning equipment for steam generating unit with peak capacity of 100,000 pounds of steam per hour. Stanley Engineering Co., Muscatine, is engineer.

MUSCATINE, IOWA—City, H. H. Hanson, clerk, is preparing report on sewage disposal plant and sewers to cost about $500,000. Bond issue will be voted on before plans are completed. Stanley Engineering Co., Muscatine, is engineer.

WEST BEND, IOWA—City, Alex Pastl, clerk, will take bids about May 15 for sewage disposal plant and sewers, including distributor, filter and 20-gpm pump. Currie Engineering Co., Webster City, Iowa, is engineer.

Wyoming

LUSK, WYO.—City, Earl Peet, mayor will vote April 15 on a $60,000 bond issue to finance construction of a light and power plant.

Idaho

MOSCOW, IDAHO—Board of regents, University of Idaho, is preparing to build an engineering laboratory building costing $121,000, and dairy building, $82,000. Former will include shops, foundry and hydraulic testing building. Equipment is estimated to cost $34,000.

California

BURBANK, CALIF. — General Water Heater Co., 9 East Cypress street, is building a plant addition 50 x 120 feet, costing about $10,000.

CULVER CITY, CALIF. — Steel-Weld Building Corp., 1250 La Cienega boulevard, Los Angeles, is building a new plant at 8949 Washington boulevard, Culver City, 36 x 80 feet, costing about $8000.

LOS ANGELES—Industrial Wire Mfg. Corp. has been organized with $50,000 by Edward D. McCoy, 905 Foreman building, and associates.

LOS ANGELES—Kay Mfg. Co., manufacturer of springs, is building a plant 30 x 160 feet at 6511 McKinley avenue, at cost of $4000.

LOS ANGELES — North American Aviation Co., 5701 Imperial highway, will build a plant addition 40 x 440 feet, costing about $40,000.

LOS ANGELES—Hughes Aircraft Co., 1008 Airways avenue, Glendale, Calif., is building a plant in the Baldwin Hills district, 150 x 240 feet, to cost about $300,000.

Oregon

SALEM, OREG.—California Packing Co. is building $200,000 plant addition for vegetable packing. Vlesko & Hannaman, Portland, Oreg., are general contractors.

Canada

LONDON, ONT.—Fleet Aircraft Ltd., Fort Erie, Ont., will build airplane overhaul and repair plant near Crumlin airport, to cost about $1,000,000. Will be equipped to repair planes used by Royal Canadian air force.

SARNIA, ONT.—Sarnia Elevator Co. has let general contract to Carter-Halls-Aldinger Co. Ltd., 419 Cherry street, Toronto, Ont., for $250,0000 grain elevator on St. Clair river.

TORONTO, ONT.—Link-Belt Ltd., 791 Eastern avenue, has let general contract to Milne & Nicholls, 57 Bloor street West, for $50,000 plant addition. Ewart Armer & Byam, 36 Toronto street, are engineers.

WELLAND, ONT.—United Steel Corp., King street, has given general contract to Gardner Construction Co. Ltd., Riverbank street for $50,000 plant addition.

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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., 1st 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. 34, 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.

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
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Landis Machine Co., Inc., 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 (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.

BOLTS (Track)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9371-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.
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, 2700 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—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Ladle)
Globe Brick Co., The, East Liverpool, O.

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.
Ingalls Iron Works Co., The, Birmingham, Ala.
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.

BRUSHES
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

BRUSHES (Industrial)
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

BRUSHES (Steelgript)
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

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.
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Erosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Hanniffin 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-47, 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., Metalline 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)

CAR DUMPERS
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.

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.
Differential Steel Car Co., Findlay, 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.
Differential Steel Car Co., Findlay, O.
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-47, 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-47, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, 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., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

WHERE-TO-BUY

CASTINGS (Steel)—Con.
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 Co., 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-47, 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.
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-13, 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., Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, 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
Chromium Mining & Smelting Corp., Ltd., 700 Bank of Commerce Bldg., Hamilton, Ont.
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)
Tomkins-Johnson Co., The, 617 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANING SPECIALTIES
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., Dept. E. Pennsalt Cleaner Div., Philadelphia, Pa.

CLIPS (Packaging)
Consumer's Steel Products, 6454 E. McNichols Rd., Detroit, Mich.

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., 663 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 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, Waukesha, Wis.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

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.

COILS (Furnace)
Production Plating Works, Inc., The, 123-129 Main St., Lebanon, O.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
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, 2700 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Curtis Pneumatic Machinery 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-13, 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. New Brighton, 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 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 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. 34, 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., 928 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 9371-B, Scranton, Pa.

COTTER PINS
American Chain & Cable Co., Inc., York, Pa.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 426 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, 2700 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.
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)
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
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)
Bucyrus-Erie Corp., So. Milwaukee, Wis.
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)
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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, 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)
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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Reading Chain & Block Corp., Dept. 34, 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.

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 Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, 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)
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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, 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.

CRANES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Reading Chain & Block Corp., Dept. 34, 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 317 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)
Taylor-Wilson Mfg. Co., 15 Thompson Ave., McKees Rocks, Pa.

CYLINDERS (Air or Hydraulic)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Curtis Pneumatic Machinery 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, 617 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.

WHERE-TO-BUY

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Amoco Metal, Inc., Dept. S-47, 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., Inc., 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.
Forgings & Castings Corp., 1350 Jarvis St., Ferndale, Mich.

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.

DRAGLINES (Crawler)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

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, 2700 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co, Dept. B75, 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Dept ST, Graybar Bldg., New York City.

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., 1st 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.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., 1st National Bank Bldg., 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., Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINES (Diesel)
Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co, Dept. B75, 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co, Dept. B75, 600 So. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Kerosene)
Fairbanks, Morse & Co, Dept. B75, 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

EXCAVATORS
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

FANS (Crane Cab)
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.

FANS (Exhaust Ventilating)
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

FANS (High Temperature)
Garden City Fan Co., 332 S. Michigan Ave., Chicago, Ill.

FANS (Portable)
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Wall)
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
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.

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., 1643 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., 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
Kidde, Walter, & Co., Inc., 332 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)
Carey, Philip. Co., The, Dept. 71, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Open Steel Flooring Institute, Inc., Dept. E-317, American Bank Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.

FORGING BILLETS—See BILLETS
FORGING MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.

FORGING ROLLS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Ampco Metal Inc., Dept. S-47, 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.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

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 Co., 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., 1st 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.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Sales Corp., 1368 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., 1368 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.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Ohio Crankshaft Co., The, 6600 Clement Ave., Cleveland, O.
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.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson, Lee, Sales Corp., 1368 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., 1368 Blount St., Cleveland, O.

FURNACES (Open Hearth)
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 1st 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.
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 Gage Corp., 1528 E. Third St., 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 Gage Corp., 1528 E. Third St., 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.
Commercial Metals Treating, Inc., Toledo, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Equipment Steel Div., of Union Asbestos & Rubber Co., Blue Island, Ill.
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 PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GALVANIZING PRODUCTS
Enterprise Galvanizing Co., 2507 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., 1st 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-47, 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.

GEARS (Steel Laminated)
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
Electric Generator & Motor Co., 4519 Hamilton Ave., Cleveland, O.
Fairbanks, Morse & Co., Dept. B75, 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. B75, 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.

GRAPPLES (Scrap Handling)
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDERS (Foundry Core)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

GRINDERS (Precision Thread)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.

GRINDER CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

GRINDING COMPOUNDS
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (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 (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 (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

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.
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-47, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HAMMER BUSHINGS
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.

HAMMERS (Drop)
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Power)
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Snafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland, O.
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.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HEAT TREATING
Commercial Metals Treating, Inc., Toledo, O.

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)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. 34, 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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, Reading, Pa.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Northern Engineering Works, 2609 Atwater St., 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, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

HYDRAULIC UNITS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

INDICATORS (Temperature)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Superior Mold & Iron Co., Penn, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Dept. 310, Ambler, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa
Eagle-Picher Lead Co., The, Cincinnati, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., 56 W. 45th St., New York City.

INSULATING CONCRETE
Atlas Lumnite Cement Co., Dept. S-13, Chrysler Bldg., New York City.

WHERE-TO-BUY

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)
Carey, Philip, Co., The, Dept. 71. Lockland, Cincinnati, O.
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-C2, 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.
Differential Steel Car Co., Findlay, 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-1, Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.
South Bend Lathe Works, 860 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, 860 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 (Fluorescent)
Fleur-O-Lier Manufacturing Co., 2135-4 Keith Bldg., Cleveland, O.

LIGHTING (Industrial)
General Electric Co., Dept. 166-S-C2, Nela Park, Cleveland, O.
Graybar Electric Co., Dept. ST. Graybar Bldg, New York City.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, 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.
Differential Steel Car Co., Findlay, 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.
Differential Steel Car Co., Findlay, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Differential Steel Car Co., Findlay, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.

LOCOMOTIVES (Steam)
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Special)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Broslus, Edgar E., Inc., Sharpsburgh 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.
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.
Marr-Galbreath Machinery Co., 53 Water St., 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., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Dings Magnetic Separator Co., 663 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.

MANIFOLDS (Gas)
Production Plating Works, Inc., The, 123-129 Main St., Lebanon, O.

MANIPULATORS
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

MARKING DEVICES
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
American Foundry Equipment Co., The, 509 So. Byrkit St., 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.

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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Corp., Dept. 34, 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. B75, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
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.

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., 1643 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., 2340A 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 (Self Locking)
Elastic Stop Nut Corp., 2340A 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.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
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.

WHERE-TO-BUY

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)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
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.

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 (Industrial)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.

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, 6017 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. 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.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 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., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 680 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.

PIPE (Steel)—Con.
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., Inc., 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 & Machy. 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., 663 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.

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., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 680 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLATING EQUIPMENT
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 426 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, 617 N. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Bending)
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.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Forging)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

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.
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.
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., 663 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. B75, 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 & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Boiler Feed)
Fairbanks, Morse & Co., Dept. B75, 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. B75, 600 So. Michigan Ave., Chicago, Ill.
Peerless Pump Div., Food Machinery Corp., 301 West Ave., 26, Los Angeles, Cal.
Tomkins-Johnson Co., The, 617 N. Mechanic St., Jackson, Mich.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (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.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)
Fairbanks, Morse & Co., Dept. B75, 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. B75, 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. B75, 600 S. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
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.

WHERE-TO-BUY

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.
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.
Marr-Galbreath Machinery Co., 53 Water St., 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.

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.
Globe Brick Co., The, East Liverpool, O.
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 Company, 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-13, Chrysler Bldg., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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.
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, 2700 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
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, 617 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.

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.

RODS (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*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.

RODS (Rounds, Flats, Shapes) (*Also Stainless)—Con.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
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 LEVELERS (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
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.

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, 680 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carey, Philip, Co., The, Dept. 71. Lockland, Cincinnati, O.
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.
Johns-Manville Corp., 22 E. 40th St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
New Jersey Zinc Co., 160 Front St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

RUST PREVENTIVES
Alrose Chemical Co., 80 Clifford St., Providence, R. I.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.

RUST PROOFING COMPOUNDS
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.

RUST PROOFING PROCESS
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Parker Rust Proof Co., 2158 E. Milwaukee Ave., Detroit, Mich.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES
Junkin Safety Appliance Co., 934 W. Hill St., Louisville, Ky.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.

SAND-BLASTING NOZZLES (Boriun)
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)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, 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)
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.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hot and Cold)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.

SAWS (Inserted Tooth, Cold)
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.
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 (Segment)
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. B75. 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial & Recording)
Fairbanks, Morse & Co., Dept. B75, 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)
Fairbanks, Morse & Co., Dept. B75, 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. B75, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Toledo Scale Co., 3216 Monroe St., Toledo, O.

SCHOOLS
International Correspondence Schools, Box 9371-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., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Continental Screw Corp., New Bedford, Mass.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Cap, Set, Safety-Set)
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREWS (Cold Headed)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Machine)
Central Screw Company, 3517 Shields Ave., Chicago, Ill
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

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.

SCREWS (Sheet Metal, Recessed Head)—Con.
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)
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., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 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.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
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.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.
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.
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.
Hallden 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.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
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-47, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, 680 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, 680 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., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 680 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, 680 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.
Weirton Steel Co., Weirton, W. Va.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 680 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.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., 33 Pride St., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
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 (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 680 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 (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, 680 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHELLS (Seamless Drawn)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

SHOVELS (Power)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT
Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.

SILICO-MANGANESE
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa

SILICON METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 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)
Broslus, 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.

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., 1654 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 426 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
*Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Coil & Elliptic)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Compression)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Oil Tempered—Flat)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Torsion)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Valve)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

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., 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.
Hubbard, M. D., Spring Co., 426 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.
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, 2700 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.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 581 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & 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.
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.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
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.
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.
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.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
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.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 680 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.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.

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)
Carboloy Co., Inc., The, 11141 E. 8 Mile Rd., Detroit, Mich.
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.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

VALVES (Brass, Iron and Steel)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Check)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Control—Air and Hydraulic)
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.
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)
Barnett-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.
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 (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)

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 426 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.
Washburn Co., The, Worcester, Mass.

WASHERS (Spring)
Barnes, Wallace, Co. The, Div. Associated Spring Corp., 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., Dept. S41, Troy, O.
Lincoln Electric Co., The, Cleveland, O.

WELDERS (Electric-Resistance)
Federal Machine & Welder Co., Dana St., Warren, O.

WELDING
Bartlett-Hayward Div. Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O.
Western Gas Div., Koppers Co., Fort 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., Dept. S41, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

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.
Weldit Acetylene Co., 642 Bagley Ave., Detroit, Mich.

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., Dept. S41, 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., 1643 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.

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.

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.
*Pittsburgh Steel Co., 1643 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.
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., 1643 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., 1643 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., 1643 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.
Pittsburgh Steel Co., 1643 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.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
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.

WIRE (Round, Flat, Square, Special Shapes)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.

WHERE-TO-BUY

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.
Moore, Lee C., & Co., Neville Island, Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Co., Dept. 34, 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.

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 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.
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., 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., 1643 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., 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., 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., 1643 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

TUBING (Copper, Brass, Aluminum)
American Brass Co., The, Waterbury, Conn.
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

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.
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., 1643 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., The, Steel and Tubes Division, Republic
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBING (Square, Rectangular)
Ohio Seamless Tube Co., Shelby, O.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
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., Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.

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.
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., 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.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
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.
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.
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, 2700 E. 79th St., Cleveland, O.
General Electric Co., Dept. 166-S-C2, Nela Park, Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

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.
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
Carboloy Co. Inc., The, 11141 E. 8 Mile Rd., Detroit, Mich.
Vascoloy-Ramet Corp., No. Chicago, Ill.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., 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., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
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., 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.
Carboloy Co., Inc., The, 11141 E. 8 Mile Rd., Detroit, Mich.
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)
Carboloy Co., Inc., The, 11141 E. 8 Mile Rd., Detroit, Mich.
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.
Weldit Acetylene Co., 642 Bagley Ave., Detroit, Mich.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS
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.

WHERE-TO-BUY

STEEL (Corrosion Resisting)—Con.
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.
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)
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 (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
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.
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., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
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., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
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., 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., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 680 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
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.
*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.

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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)

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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., 1643 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., 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., 1643 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)

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Graybar Electric Co., Dept. ST, Graybar Bldg., New York City.
Roebling's John A., Sons Co., Trenton, N. J.

WIRE CLOTH

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.
B[illegible] Wallace, Co., The, Div. [illegible]ated Spring Corp., 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.

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Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)

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Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
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Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
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NORTH WALES MACHINE CO., INC., North Wales. Grey Iron, Nickel, Chrome, Molybdenum Alloys, Semi-steel. Superior quality machine and hand molded sand blast and tumbled.

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Where-to-Buy Products Index carried in first issue of month.

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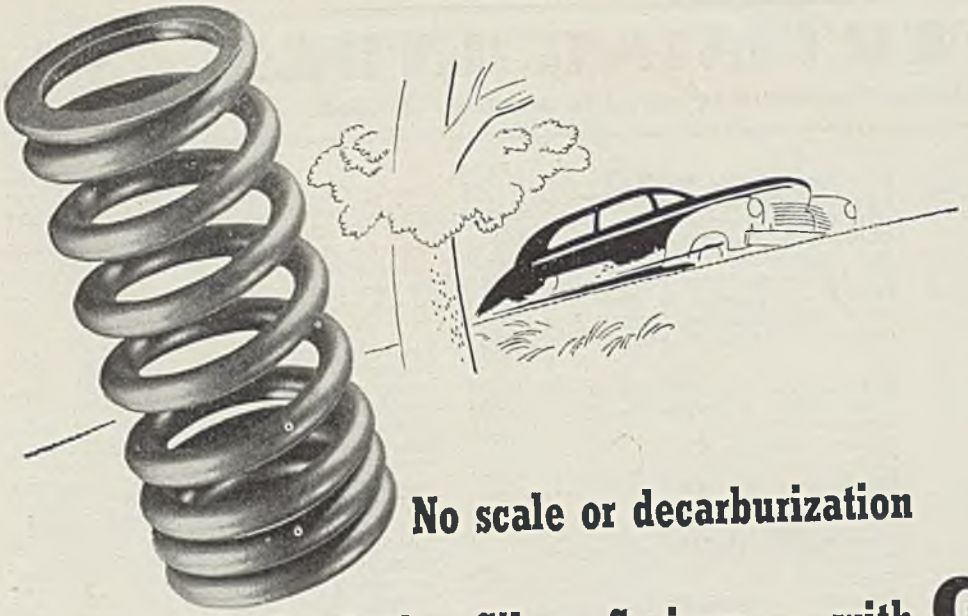

No scale or decarburization in hardening Gibson Springs . . . with GAS

At the William D. Gibson Company, Chicago, springs are hardened at the rate of 700 lbs. per hour without a trace of scale or decarburization in the continuous Gas furnace shown below. After being automatically quenched, the springs are as bright and clean as when they entered the furnace.

Heating is accomplished with Gas-fired radiant tubes. The furnace, lined with insulating firebrick, can be heated to temperature in one-half to one-third the time required in similar furnaces with conventional firebrick and it takes only three hours to bring the furnace from cold to 1500 degrees F. A prepared Gas is used for the protective atmosphere and, after hardening, the springs are drawn to the required hardness in a continuous recirculated air furnace.

* * * * *

Heat treating methods are moving ahead rapidly with Gas and Gas engineering research—as are other Gas-fired applications in the metals field. Whether for hardening, annealing, carburizing, or many other heat treating operations, Gas-fired equipment can help to handle them more efficiently and more economically. Ask your Gas company for information.

AMERICAN GAS ASSOCIATION
INDUSTRIAL and COMMERCIAL GAS SECTION
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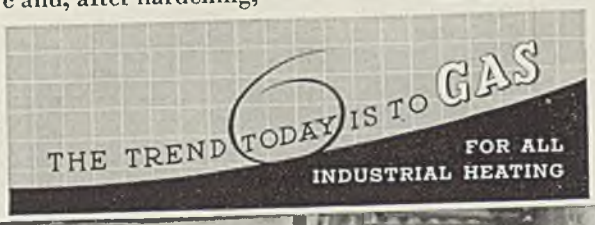

Continuous radiant tube furnace —Surface Combustion—for heat treating automobile and other types of springs in plant of William D. Gibson Co., Chicago.