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STEEL

ESTABLISHED 1882

Contents

Volume 106—No. 6 February 5, 1940

Outsize STEVEDOR

AMERICAN TOWER CRANE GIANT LIFTS 20 TONS ON BANTAM QUILL BEARINGS

An even more severe application—American's 8-sheave blocks that lift loads ranging up to 150 tons in erecting oil refinery cracking stills. These blocks, too, are equipped with Bantam's Quill Bearings.

Lifting 20 tons with its 105-foot boom fully extended is a simple j this mammoth crane, built by American Hoist & Derrick Compa a large Eastern shipyard. And the block that does the lifting—the where power-killing friction must be held to a minimum—is equ with Bantam Quill Bearings.

(*Below*) **BANTAM'S QUILL BEARINGS** are designed for heavy duty. Outer race is a single channel-shaped piece—surfaces are carefully hardened—curvilinear trunnions are sturdy. There are no fragile parts in Bantam's Quill Bearing.

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(*Above*) **THIS GIANT BEARING**—specially designed and built by Bantam for strip mill service—measures 30" O. D., 18" I. D., 20¾" high—a typical instance of Bantam's ability to meet the *unusual* requirement.

This application is typical o many ways industry uses Bantam's Bearing—the bearing that's simpl ruggedly built to give you low c ease of assembly—greater capaci smaller space. These unusual fea of the Quill Bearing may provide answer to one of your bearing probl For further information write for letin H-104. For Needle Bearings t used in lighter service, write our affil The Torrington Company, Torring Conn., and ask for Circular 21-H.

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As the Editor Views The News

■ STEEL production last week moved off 5 points (p. 26) to 76½ per cent of ingot capacity. Further declines are in prospect. New steel buying is at a rate equivalent (p. 77) to about 50 per cent of producing capacity. Favorable factor is that this does not represent the actual rate of consumption since much steel is coming out of inventories, supplemented by releases against previous orders. Finished steel prices generally are being maintained—not so rigidly as during the sellers' market of last fall but without evidence of serious weakness. Scrap prices are easier. Confusion persists (p. 27) as to possible future consequences of a recent iron ore sale.

. . .

Best Quarter In Decade

First eight steel producers to issue 1939 financial statements (p. 21) report total net income of $108,107,042 in that year; of this $61,470,484 was earned in the fourth quarter. . . . Highway construction, a large outlet for steel, received much attention (p. 25) at last week's road builders' convention. . . . Refrigerator production in 1939 (p. 35) accounted for 137,251 tons of steel. . . . As a result of expiration of the trade treaty (p. 38), Japan has revised its scrap buying policy in the United States. . . . "Scrap weeks" are planned (p. 38) for the United Kingdom. . . . Steel Co. of Canada Ltd. plans (p. 39) to erect a tin plate mill at Hamilton, Ont., where it now is building open hearth furnaces.

. . .

ICC Opposes Canal

Insufficient engine capacity is held a principal bottleneck (p. 33) to further expansion of airplane capacity. . . . Prospects for Wagner act revision are seen as improved (p. 30) but their nature and extent cannot be forecast. . . . The navy (p. 32) wants authority to negotiate contracts for war vessels rather than be committed to competitive bidding. . . . The projected Lake Erie-Ohio river canal (p. 29) is opposed by the interstate commerce commission. . . . Aluminum Co. of America (p. 29) is first major company to base a large industrial investment on power from Bonneville dam. . . . Last week's renewed attack (p. 23) apparently added nothing important to the case against the steel price basing system.

. . .

P. & W. in New Plant

Pratt & Whitney has abandoned its historic old plant (p. 39) and moved into a fine new one. . . . Adequate lighting has a good deal to do (p. 49) with efficiency of machine tool and press operations. . . . New industrial building in Cleveland (p. 54) has a porcelain enameled steel roof. . . . Coiled strip can be placed in and removed from stacked piles (p. 56) by a new multiple lifting magnet which is not attracted by adjoining stacks. . . . New bearing closure has high sealing efficiency (p. 59) without any mechanical contact between parts of the seal, eliminating wear. . . . A new welding process (p. 66) permits dies with chipped or worn surfaces to be rebuilt.

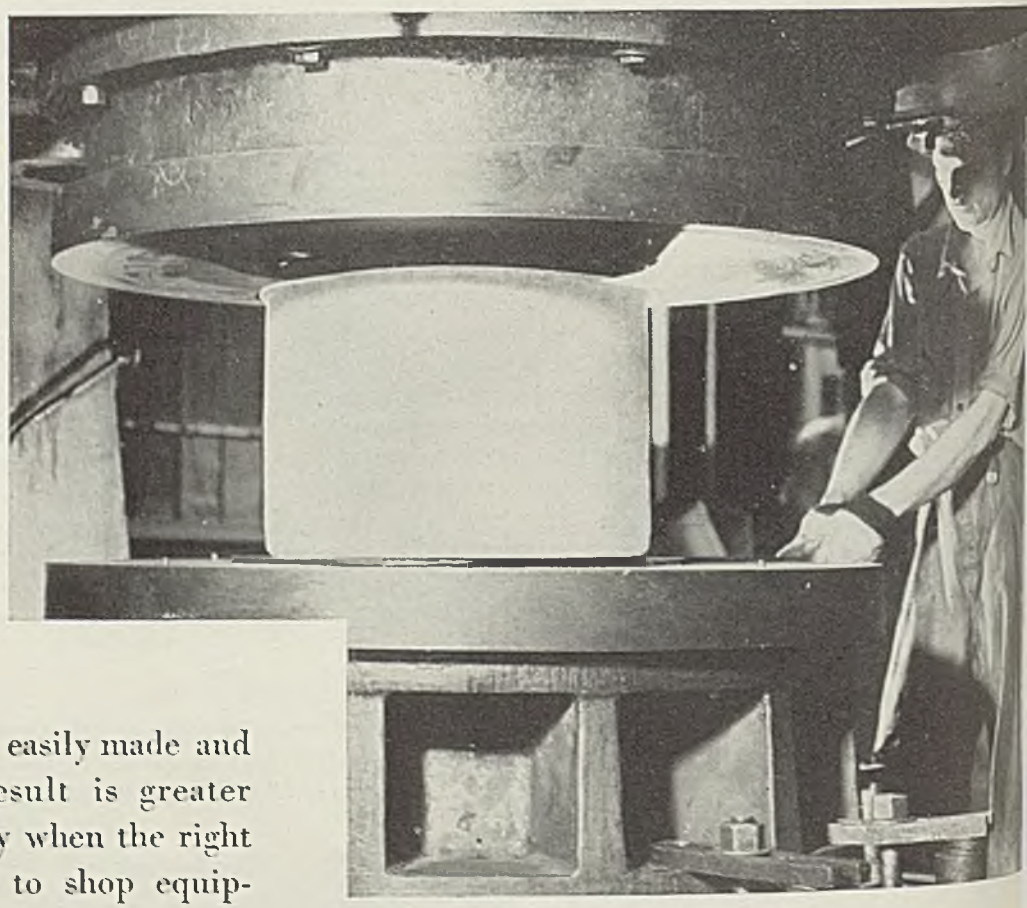
. . .

Measures Topography

Nickel-molybdenum-chromium-iron alloy now may be had (p. 59) in the form of rolled sheets and plates for corrosion resistant construction. . . . A new instrument (p. 58) measures "topography," recording irregularities as small as one-millionth of an inch in ground, lapped, honed or superfinished surfaces. . . . Great savings in weight of highly stressed parts may be effected (p. 61) by making available in production practice the strength possibilities of the steel as computed by the engineer and checked by metallurgical laboratory tests on prepared specimens. . . . Magnetic determination of carbon content of steel (p. 62) is sufficiently accurate to meet the needs of the steel industry.

E C Kreutzberg

WHEN THE DRAW IS TOUGH!



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Active Fourth Quarter Reflected In Steel Producers' Earnings

Seventy per cent of industry reports $108,107,042 net profit in 1939. Final period, at 89.3 per cent operations, best since 1929, contributes over half of year's total

■ FIRST eight steel producers to issue earnings statements for 1939 report $108,107,042 aggregate net income, a manifold increase over total net earnings of $2,377,640 reported for the same companies in recession year 1938. With combined ingot capacity of 50,527,000 gross tons, the eight producers represent 70.9 per cent of the industry.

Net fourth 1939 quarter profit for these companies was $61,470,484, an increase of 133.9 per cent over $26,280,500 in the third period and much greater than the fourth 1938 quarter net profit of $14,190,513. Fourth quarter net earnings for these companies was highest for any quarter since 1929. Total 1939 net income, however, was only 62.7 per cent of the $172,387,796 net profit earned by them in 1937.

Ingot operations for the entire industry in 1939 averaged 64.29 per cent of capacity, compared to 39.65 per cent in 1938. Fourth 1939 quarter operations were 89.3 per cent of capacity, against 55.5 per cent in corresponding 1938 period and 62.2 per cent in quarter ended Sept. 30.

U. S. STEEL EARNINGS EQUAL TO $1.83 PER SHARE

United States Steel Corp.'s fourth 1939 quarter net earnings, reflecting finished steel shipments of 84.3 per cent of capacity, totaled $28,835,282, equal to $2.59 per common share. Net income in corresponding 1938 period was $4,432,914 or $1.22 a share on 7 per cent preferred stock. For quarter ended Sept. 30 net profit was $10,420,445, equal to 47 cents a share on common.

Total 1939 earnings applicable to capital stocks were $41,226,039, equal after payment of preferred dividends, to $1.83 per common share. In previous year the corporation reported a $7,717,453 deficit on operations, and a loss of $32,937,131 after payment of preferred dividends. Net income in 1937 totaled $94,944,358 or $8.01 a share on common.

Earnings Comparisons

Quarters	1939	1938	1937
First	$ 660,551	$1,292,151*	$28,561,533
Second	1,309,761	5,010,426*	36,173,682
Third	10,420,445	5,847,791*	30,617,638
Fourth	28,835,282	4,432,914	4,591,505
Year	$41,226,039	$7,717,453*	$94,944,358
Earned on Com.	$1.83	$3.78*	$8.01

* Loss.

Net 1939 income earned on net tangible investment, before deducting interest charges on bonds and obligations, according to Edward R. Stettinius Jr., chairman of the board, was equal to 3.15 per cent per annum.

Directors declared a regular quarterly dividend of $1.75 on preferred stock, payable Feb. 20 to record of Feb. 2. No action on common was taken.

Fourth quarter shipments of finished steel products, totaling 3,793,723 tons, were 54 per cent greater than in third period. For the year deliveries were 10,652,150 tons, 59.5 per cent of capacity, compared to 6,655,749 tons or 36.7 per cent in 1938 and 12,748,354 tons, 71.1 per cent, in 1937.

Mr. Stettinius reported the corporation increased its net current assets last year by $37,693,529 to $458,372,633 as of Dec. 31. Expenditures, for additions and improvements, amounted to approximately $21,400,000, plus about $7,500,000 used to pay maturing capital obligations, or those retired by sinking funds. Unexpended balance on approved appropriations was nearly $54,000,000.

REPUBLIC STEEL NETS 4.6 PER CENT ON TOTAL INVESTMENT

Republic Steel Corp., Cleveland, reports net 1939 income of $10,671,343, equal to $1.42 a share on common, compared with a $7,997,825 deficit incurred in 1938. Net profit for the year was equal to 4.6 per cent on the corporation's total investment.

Fourth 1939 quarter net income was $6,772,693, compared to $308,613 net profit in corresponding 1938 period, and third quarter net earnings of $2,815,339.

T. M. Girdler chairman, in presenting the report said:

"Republic's 1939 showing came largely as a result of stimulated

Steel Producers' Financial Statements Summarized

	Fourth Quarter, 1939	Third Quarter, 1939	Fourth Quarter, 1938	Year, 1939	Year, 1938	Ingot Capacity, gross tons
United States Steel Corp.	$28,835,282	$10,420,445	$4,394,454	$41,226,039	$7,717,453*	25,790,000
Bethlehem Steel Corp.	13,028,928	5,377,470	3,658,160	24,638,384	5,250,239	10,042,000
Republic Steel Corp.	6,772,693	2,815,339	308,613	10,671,343	7,997,825*	6,500,000
National Steel Corp.	5,292,331	2,903,881	2,753,157	12,581,636	6,661,652	3,400,000
Inland Steel Co.	4,574,441	2,587,750	1,759,785	10,947,251	4,916,203	2,760,000
Wheeling Steel Corp.	2,152,452	1,639,647	1,042,153	5,560,755	493,138	1,750,000
Keystone Steel & Wire Co.‡	418,489	273,923	115,728	1,390,758†	690,576	250,000
Rustless Iron & Steel Corp.	395,868	262,045	158,463	1,090,876	81,110	35,000§
Total	$61,470,484	$26,280,500	$14,190,513	$108,107,042	$2,377,640	50,527,000

*Deficit. ‡Fiscal year ends June 30. †Based on quarterly statements. §Stainless steel.

domestic business. There has been some increase in export business, but very little of it is attributable to the war in Europe.

"Steel production during the last quarter was at an abnormally high rate, resulting in the purchase of steel in excess of current requirements. The drop in the first quarter of 1940 has been due in part to inventory adjustments. . . ."

NATIONAL STEEL CORP.

National Steel Corp., Pittsburgh, in a preliminary statement, reports fourth 1939 quarter net income of $5,292,331, equal to $2.40 per share, compared to net profit of $2,753,157 or $1.25 a share for corresponding 1938 period. Net profit for quarter ended Sept. 30 was $2,903,881, equal to $1.32 per share.

Net earnings last year totaled $12,581,636, equal to $5.71 a share, against $6,661,652 or $3.03 per share in 1938.

WHEELING STEEL CORP.

Preliminary earnings statement of Wheeling Steel Corp., Wheeling, W. Va., reports fourth 1939 quarter net profit of $2,152,452, equal to $2.94 a share on common, compared to net income of $1,042,153 or 99 cents a share for same 1938 period. In third quarter last year net profit was $1,639,647, equal to $2.05 a share.

Total net income for 1939 was $5,560,755 or $6.40 a share on common after allowing for regular dividend requirements on two classes of preferred stock outstanding. Net earnings in 1938 were $493,138, equal to $1.41 a share on 5 per cent cumulative convertible prior preferred. Last year's net income was considerably better than the 1937 net profit of $4,238,488 or $4.11 a share on common.

Corporation reports there are no arrears on the 5 per cent cumulative convertible prior preferred stock. Accumulations on 16,284 shares of old 6 per cent preferred total $512,946 or $31.50 a share.

RUSTLESS IRON & STEEL CORP.

Preliminary earnings statement of Rustless Iron & Steel Corp., Baltimore, reports $1,090,876 net profit for 1939 after special adjustments, including $105,697 write-off for account of British Stainless Steel Ltd. Above net is equal, after dividend requirements on $2.50 preferred stock, to $1.13 a share on common. Net income in 1938 was $81,110 or $2.22 a share on the $2.50 preferred.

Corporation's fourth 1939 quarter net profit was $395,868, compared to $158,463 in corresponding 1938 period and $262,045 in quarter ended Sept. 30.

C. E. Tuttle, president, stated sales and net profits last year set new record highs.

Registration statement covering a proposed offering of 40,000 shares of $1 par common stock has been filed with securities and exchange commission. Proceeds are to be used for plant expansion and improvement.

INLAND STEEL CO.

Inland Steel Co., Chicago, reports net income of $10,947,251, equal to $6.74 per share, for year ended Dec. 31, compared to $4,916,203 or $3.12 a share for previous year. Fourth 1939 quarter net profit was $4,574,441, against $1,759,785 in corresponding 1938 period. September quarter profit was $2,587,750.

Directors declared a cash dividend of $1 per share on capital stock, payable March 1 to record Feb. 13.

Company's fourth quarter operations, according to Edward L. Ryerson Jr., vice chairman of the board, established new records in respect to both production and shipments. Ingot production was at 102 per cent of theoretical capacity; average for the year was 77 per cent.

ACME STEEL CO.

Acme Steel Co., Chicago, reports fourth 1939 quarter net profit of $872,506, equal to $2.66 a share on capital stock, compared with net earnings of $202,726 or 62 cents a share for corresponding 1938 quarter. For period ended Sept. 30 net income was $443,184, equal to $1.35 a share.

Preliminary report for year ended Dec. 31, 1939, shows net profit of $1,915,331, equal to $5.84 a share compared to $368,168 or $1.12 a share for previous year.

Dividends Declared by Steel Consumers

	Stock	Period	Amount	Payable	Record
American Can Co., New York	pfd.	Q	$1.75	Apr. 1	Mar. 15
American Chain & Cable Co., Bridgeport, Conn.	com.	.	0.40	Mar. 15	Mar. 5
American Steel Foundries, Chicago	com.	..	0.25	Mar. 30	Mar. 15
American Meter Co., New York	com.	..	0.75	Mar. 15	Feb. 28
Bower Roller Bearing Co., Detroit	cap.	..	0.75	Mar. 20	Mar. 8
Baldwin Locomotive Works, Philadelphia	pfd.	S-A	1.05	Mar. 1	Feb. 17
Bendix Aviation Corp., South Bend, Ind.	com.	..	0.50	Mar. 1	Feb. 6
Central Ohio Steel Products Co., Galion, O.	com.	..	0.30	Mar. 1	Feb. 15
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.	com.	Q	0.50	Mar. 31	Mar. 15
Crane Co., Chicago	pfd.	Q	1.25	Mar. 15	Mar. 1
Deere & Co., Moline, Ill.	pfd.	Q	0.35	Mar. 1	Feb. 15
Detroit Gasket & Mfg. Co., Detroit	pfd.	Q	0.30	Mar. 1	Feb. 13
Eaton Mfg. Co., Cleveland	cap.	.	0.75	Feb. 23	Feb. 5
Fairbanks Morse & Co., Chicago	com.	Ex.	0.25	Mar. 1	Feb. 10
Fairbanks Morse & Co., Chicago	com.	Q	0.25	Mar. 1	Feb. 10
Interlake Steamship Co., Cleveland	.....	..	0.25	Apr. 1	Mar. 15
International Business Machines Corp., New York	com.	Q	1.50	Apr. 10	Apr. 1
Ingersoll Rand Co., New York	com.	.	1.00	Mar. 1	Feb. 5
J. I. Case Co., Racine, Wis.	pfd.	Q	1.75	Apr. 1	Mar. 12
Lunkenheimer Co., Cincinnati	.....	..	0.25	Feb. 15	Feb. 5
Lunkenheimer Co., Cincinnati	pfd.	Q	1.62½	Apr. 1	Mar. 22
Minneapolis-Honeywell Regulator Co., Minneapolis	com.	.	0.50	Feb. 20	Feb. 5
Motor Wheel Corp., Lansing, Mich.	.....	Q	0.40	Mar. 15	Feb. 29
Midland Steel Products Co., Cleveland	com.	.	0.50	Apr. 1	Mar. 1
Midland Steel Products Co., Cleveland†	pfd.	Q	2.00	Apr. 1	Mar. 1
Midland Steel Products Co., Cleveland*	pfd.	..	0.50	Apr. 1	Mar. 1
Otis Elevator Co., New York	com.	.	0.15	Mar. 20	Feb. 23
Otis Elevator Co., New York	pfd.	Q	1.50	Mar. 20	Feb. 23
Pittsburgh Coke & Iron Co., Pittsburgh	pfd.	Q	1.25	Mar. 1	Feb. 19
Pressed Metals of America Inc., Marysville, Mich.	com.	..	0.25	Mar. 1	Feb. 15
Savage Arms Corp., New York	com.	..	0.25	Feb. 16	Feb. 9
Servel Inc., Evansville, Ind.	com.	.	0.25	Mar. 1	Feb. 15
Signode Steel Strapping Co., Chicago	pfd.	Q	0.62½	Feb. 9	Feb. 5
Signode Steel Strapping Co., Chicago	com.	.	0.25	Feb. 9	Feb. 5
U. S. Pipe & Foundry Co., East Burlington, N. J.	com.	Q	0.50	Mar. 20	Feb. 29
Vogt Mfg. Corp., Rochester, N. Y.	com.	.	0.20	Mar. 1	Feb. 15
Warren Foundry & Pipe Corp., Phillipsburg, N. J.	com.	Q	0.50	Mar. 1	Feb. 15

Q, quarterly; Ex., extra; Sp., special; S-A, semi-annual; † 8 per cent cumulative first preferred; *non-cumulative preferred.

Industrial Machinery Exports Best Since 1920

■ United States exports of industrial machinery in December totaled $29,348,769, one of the highest monthly figures ever recorded and 21 per cent above the corresponding December exports in 1938, which were valued at $24,210,186, according to the machinery division, department of commerce. Practically all types of equipment participated in the increase, ranging from 6 per cent in construction and conveying equipment to 54 per cent in textile machinery.

Total industrial machinery exports in 1939 were $289,863,412, a 7 per cent gain over $269,856,041 in 1938 and 4 per cent above 1939 shipments valued at $277,764,507. The 1939 figure tops all previous years except 1919 and 1920.

Exports of power-driven metalworking machinery reached the record monthly figure of $12,821,234 in December, 30 per cent above the total for December, 1938. Total for 1939 reached the highest annual figure ever recorded, totaling $112,571,552, an increase of 16 per cent over the previous peak figure of $97,270,616 for 1938.

U. S. Steel Defends Basing Point System: FTC Urges Abolition

WASHINGTON

■ PROPOSAL for outlawing the steel price basing point system on the ground it frustrates price competition climaxed steel hearings before the temporary national economic committee last week.

"No more vitally needed legislation within the scope of the committee's functions can be suggested than that of directly prohibiting the basing point system by congressional mandate," said a summation by Walter B. Wooden, assistant chief counsel, and Hugh E. White, examiner for the federal trade commission. Attack on the basing point system concluded TNEC steel hearings started last March.

Conceded more able than the federal trade commission's attack on the basing point system, was the system's defense by Benjamin F. Fairless, president, and other United States Steel Corp. officials.

Mr. Fairless termed the multiple basing points price system "the best merchandising medium for our steel products that has been called to our attention.

System Result of Evolution

"The United States Steel Corp. doesn't take the position there are no justified criticisms of the system. If a better system is called to our attention, we would be the first to adopt it."

Mr. Fairless and Avery C. Adams, U. S. Steel vice president, vigorously denied the system is a price-fixing medium, contended it does not result in high prices. Rather than stifling price competition, they said, it gives the benefit of such competition to all consumers. They pointed out the present system is the result of evolution ever since the American steel industry was established.

A lucid and thorough explanation of what the basing point system is and how it operates was contained in a U. S. Steel presentation prepared by Dr. Theodore O. Yntema, Chicago university economist. Illustrated by simple charts and diagrams, the presentation explained the meaning of "phantom freight," freight "absorption," and freight "advantages," and "disadvantages," and so-called "discrimination."

Attacks by New Dealers on U. S. Steel's presentation brought several rear-clashes, a few humorous incidents, many highly technical discussions among the various "experts."

Amusing was the comment by Abe H. Feller, justice department attorney, following New Dealers attack on Dr. Yntema's analysis. Two department of agriculture economists and one from the WPA engaged in what was dubbed "The battle of the Ph.Ds" involved such terms as econometrics, regression lines, curvilinear and other high-sounding phrases.

Facts Versus "Econometrics"

"The late Justice Holmes once said that a page of history is worth a volume of logic," remarked Mr. Feller smilingly. "To paraphrase him, I think it might be said that a page of business facts is worth a volume of econometrics."

For three days U. S. Steel executives were cross-examined by Mr. Wooden, during which the latter several times tried to ascribe to Mr. Fairless statements which the Corporation president denied he had ever made during previous examinations. When Mr. Fairless asked that the statements be produced, the prosecutor was unable to produce.

Even committee members became impatient during the cross-examination, inasmuch it was in large measure repetition of what they had heard last November.

Mr. Fairless and Mr. Wooden clashed several times on the manner of answering questions on the basing point systems. Mr. Wooden opined there should be some degree of control over the witnesses' answers. His suggestion was quickly overruled by the committee which held it had been policy to give witnesses wide latitude in answering questions.

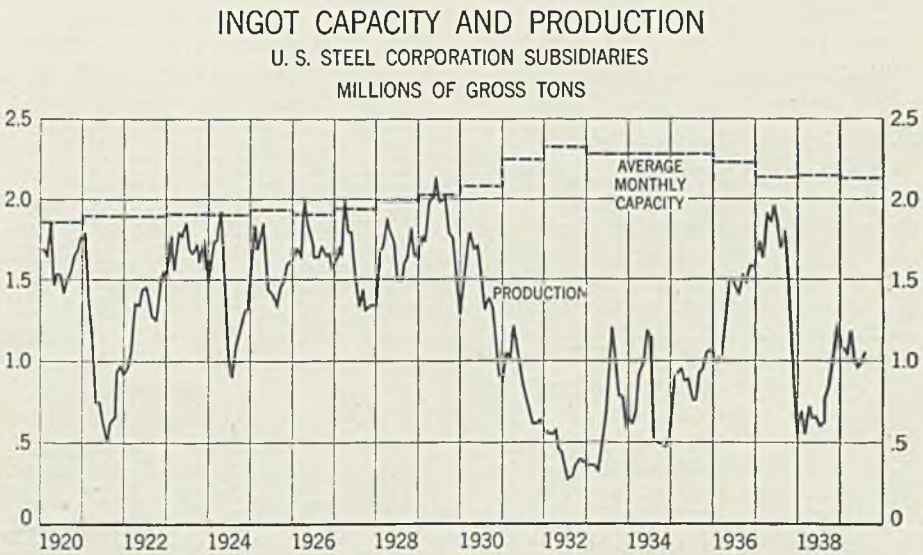
Mr. Fairless declared, regarding Mr. Wooden's complaint on the length of his answers, that he did not intend to answer in the exact manner and way the FTC counsel wanted questions answered.

Mr. Fairless insisted that under the basing point system competition existed and the fact that each company has announced prices prevents them from charging any higher price. A ceiling is established and competition begins with great variations between published prices and actual delivered prices of steel products, he said.

Answering a question by Mr. Wooden, Mr. Fairless said U. S. Steel reaches decisions on quarterly prices after careful survey of production costs. He denied the corporation consults with competitors in arriving at prices, and said the corporation does not inform competitors of new prices.

Mr. Fairless said customers are given a 65 per cent credit on freight rates when they take truck deliveries. At times, he stated, it is necessary to make adjustments from this overall policy depending upon circumstances.

Keen competition, Mr. Fairless pointed out, exists in the steel industry. He said the industry and U. S. Steel have many times shown deficits. In the past ten years only three have shown profits with the other seven years showing deficits. In the past decade, he stated, his



Four times during the 1920s, demands on ingot production facilities exceeded U. S. Steel's capacity. About 1929 the corporation inaugurated a plant modernization program, increased capacity, despite the severe depression in the 1930s. Some obsolete capacity since has been retired. At present, corporation's ingot capacity is no more than sufficient to meet peak demand requirements

company has shown profit of only 2 per cent.

Mr. Wooden often referred to the old steel code under the national recovery act and at one point Senator King asked what that had to do with the present issue. To most the point remained unclarified.

Question of switching charges and truck deliveries were taken up at length, many of the questions and answers being identical with those of the November hearing. In connection with truck deliveries, Mr. Fairless told the committee that trucking charges are not unjust and the steel industry is not trying to make a profit out of this kind of delivery. Where truck deliveries are unjust, he said, adjustments are made.

Denying that uniform prices were either the purpose or the effect of the basing point system, Mr. Fairless said that only after careful consideration should an attempt be made to displace it with "untried methods" because of economic "dislocation" that might result in some steel producing and consuming areas.

Mr. Wooden tried to show that the system resulted in "uneconomic location" of some mills, but Mr. Fairless asserted that other factors were predominant in deciding steel plant location.

Mr. Wooden read into the record long extracts from testimony taken by the federal trade commission in the old Pittsburgh plus case. During the course of this reading the trade commission counsel frequently asked Mr. Fairless if his attention had ever been called to the testimony. Generally the answer was "no." No one, not even TNEC members, could see the relevancy of reading the record into the present inquiry.

Read into the record was the analysis prepared by Dr. Theodore Yntema and his staff on the basing point system.

System Now Simple

The basing point practice is a simple method of quoting delivered prices, which results in the competition of many geographically separated steel producers at the markets for each of the diversified products of modern steel mills, the report said.

"This basing point practice," it continued, "has evolved over a period of more than half a century to meet fundamental economic conditions in the steel industry. Delivered prices result from the buyer's need to know the cost to him of steel delivered at his plant, since transportation charges from mill to consumer are often a substantial part of the value at the place of consumption.

"The producers of steel must take into consideration all of the elements of cost involved, from the transportation of raw materials, through the processes of converting such raw materials into steel products, to the final delivery of such products to the consumer.

"It requires more than four tons of raw materials to produce one ton of finished steel. The location of facilities for producing pig iron and steel ingots must be determined largely by the factor of raw material assembly cost. This limits the location of blast furnaces and open hearth furnaces to a few areas where the raw materials are readily available.

"In turn, the economics of integration cause the location of rolling mills near the steel producing units. Large well-integrated mills, designed to supply the scattered markets of the entire country, have been constructed in such areas. These mills produce many diversified products in order to utilize ingot capacity to the fullest extent and achieve low production cost per unit.

"A modern integrated mill must serve more than its immediate area; it must reach many of the important markets for its diversified products in order to obtain an even flow of orders. Thus, concentration of production facilities in a few areas and wide distribution of products is a rule in the steel industry enforced by economic considerations. The result is competition at all consuming points between several geographically separated producers."

Demand Fluctuates Widely

Demand for steel is subject to enormous fluctuations in the business cycle, the report further stated. The capacity of the industry, including reserve capacity, is not more than sufficient to supply the needs of the country during periods of high demand, such as 1929, 1937 and the present. Less capacity would result in scarcity and high prices during such periods. Problem of adjustment to cyclic fluctuations is solved in the most economical way. While the industry is constantly constructing new facilities to incorporate technological advances, the older mills which, although outmoded, have not served their full useful life, are retained in reserve to meet the demand at high levels of consumption.

Most criticisms of the basing point method disregard entirely these fundamental economic facts, said the analysis. The steel industry is often judged by criteria derived from abstract theory, based upon imaginary conditions which cannot exist. Natural deviations from these criteria are arbitrarily assumed to be evils and are, without demonstration, ascribed to the basing point method.

Critics sometimes rest their case solely upon bland assertions and rhetorical exaggeration, it continued. In many instances, mere name-calling is resorted to. Thus, in the language of some critics, the practice of meeting competitive prices at a distance becomes "freight absorption"; the resulting difference in mill net returns becomes "price discrimination"; the resulting shipments from other than the mill nearest the destination becomes "cross-hauling"; and the realization of a competitive advantage due to superior geographical location becomes "phantom freight."

Price Analysis

The analysis said "competitive forces determine the prices quoted at all destinations. To obtain business in a market at a distance from his mill, a producer must meet competitive prices quoted by other producers nearer to such markets; he must pay the freight necessary to transport the steel product to the consumer; and he will therefore realize a lower mill net return than on sales to consumers nearer his mill. This enables him to operate his mill at a lower unit cost and thus to sell to the nearby consumer for less than he otherwise could.

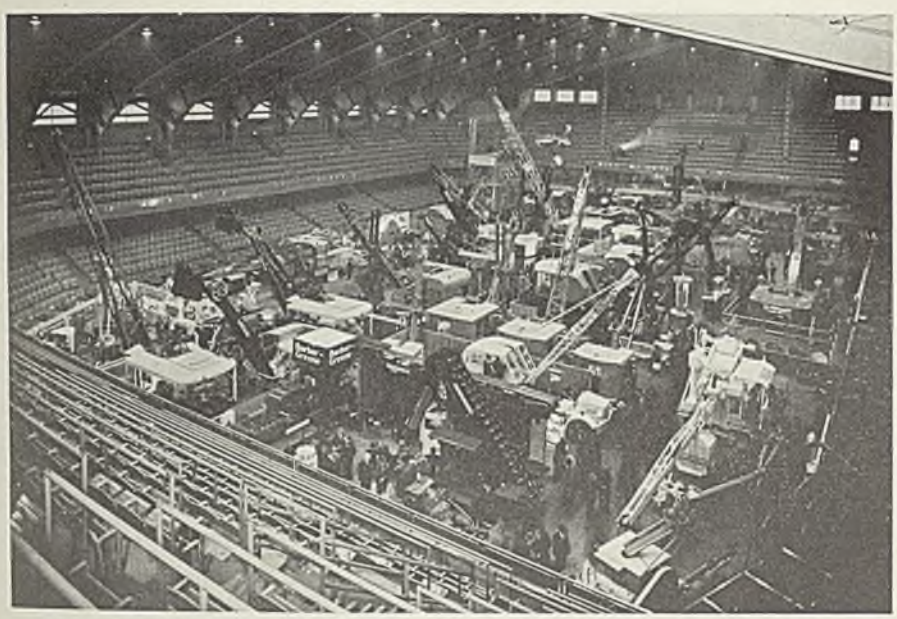
"There will always be some shipments of similar products past each other in opposite directions unless competition between geographically separated producers is arbitrarily limited to the marginal territory between their mills. Even under the uniform f.o.b. mill price system proposed by the federal trade commission, shipments would not always be made from the nearest mill. The alleged economic waste resulting from cross-shipments must be balanced against the countervailing advantages to the public of a competitive system, and also against the economic losses which would follow from artificial limitation of marketing territories.

"Transportation of steel products by water vehicles and trucks has received attention unwarranted by its true importance, and significant factors in the situation have been overlooked. . . .

"Shipment by truck seldom involves an appreciable freight saving, and often involves additional freight cost. The added expense and inconvenience to the producer in truck shipments justify any additional charges made."

Proposed alternative to the basing point method is a uniform f.o.b. mill price system. The effects of this system would be extremely complex, and are therefore large-

(*Please turn to Page 97*)



■ International Amphitheatre, Chicago, scene of the thirty-seventh annual meeting of the American Roadbuilders association, held an estimated 45,000 visitors from Jan. 29 to Feb. 2

"Millions, Perhaps Billions, To Build Adequate, Modern Roads"

CHICAGO

■ INTERNATIONAL Amphitheatre last week was the scene of one of the largest of all industrial gatherings, with close to 45,000 attending the thirty-seventh annual road show and convention, American Road Builders' association, Jan. 28-Feb. 2.

Twenty per cent larger than any previous show, displays of 300 manufacturers took up 8½ acres of floor space. Equipment displayed was valued at $5,000,000, and ranged in size from one-ounce precision instruments to power shovels and scrapers of 70 and 80 tons each. Delegates were present from every state and 36 foreign countries to discuss modern highway construction and roadbuilding equipment.

More Highways Needed

Murray D. Van Wagoner, association president, emphasized the need for more and greater highways, stating: "It will take millions, perhaps billions, to build adequate, modern, limited-access highways into the hearts of such great cities as New York, Chicago, and Detroit.

"Long-term financing plans, added authority to obtain right-of-ways without objectionable court delays, and the support of federal aid are mandatory if we are to solve this problem."

Mr. Van Wagoner pointed out that legislation is before congress which would aid states in financing needed highway constructions, and which would give them the support of federal authorities and make long-term loans available for immediate construction.

"Since my election as president of our organization, I have argued there is no more efficient way to put our people to work than on the building of roads to improve the economy of our country," he stated, also indicating the expectance of forthcoming federal aid for building military roads as a part of the national defense program.

V. G. Iden, secretary, American Institute of Steel Construction, New York, and chairman of the association's committee on elevated highways, stressed the need for increased construction of elevated roads. He quoted excerpts from a report by Dr. Miller McClintock, Yale university, stating: "The only reason the bridge was built across San Francisco bay, at a cost of $72,000,000, was not to make it safer, was not to make it much more convenient so far as the actual convenience of the individual was concerned. It was because they could save 26 minutes in average crossing of automobile across San Francisco bay.

"So the bridge type of structure, in other words the elevated highway, offers a very reasonable and very efficient and very inexpensive manner of accomplishing all the functions of limited-way design."

San Francisco, it was brought out, spends $2,000,000 annually on street improvements; Chicago and Cook county, Ill., spend close to $12,000,000 a year; Detroit spent $18,000,000 for the widening of Woodward avenue alone. The report cited the safety and traffic benefits that might have resulted had all this money been spent on elevated highway construction instead.

Elevated Highway Uses Steel

Quoting reports of committee members from leading American cities, Mr. Iden indicated the sums which will be spent on elevated highway construction, a field of direct interest to the steel industry because of the heavy tonnages of steel required in their construction—more so than in the commoner types of roads.

Proposed initial program for superhighway construction in Chicago involves an estimated cost of $110,000,000, with an additional $95,-

■ Typical of displays at the annual roadbuilders show last week in Chicago, this bay of Link-Belt Speeder Corp., 301 West Pershing road, Chicago, featured a model 570 shovel with a 2½-yard dipper

000,000 estimated for the future.

Many of the disadvantages attributed to elevated highways are a matter of personal opinion, it was suggested in one of the reports, which undertook to list a number of disadvantages of the depressed type of highway, a form which would require less steel.

Elevated highways are one of the most serious problems today before municipalities, the report concluded, suggesting committee's work be continued.

Convention approved plans for immediate flotation of bonds by an international bank, as the first step in making a reality of the Pan-American highway linking 23 American countries.

"We have made numerous minor improvements in our highway systems, rather than fully face the problem and plan and construct major projects that are necessary for the proper care and service of the traffic," it was stated by H. C. Whitehurst, director of highways, Washington.

Build with Definite Program

"It is most certainly the responsibility and duty of highway engineers to expand their viewpoint to visualize future traffic needs and plan and build with a definite program, so that safety and free flow of traffic can be provided for all highways, both state and municipal," Mr. Whitehurst said.

Future airport construction also was discussed at the convention. Lieut.-Col. Stedman Shumway Hanks, United States air corps reserve, Washington, summarized the present airport construction program of the civil aeronautics authority, stating one point is to improve existing airports on the federal airways system and then develop a system of airports for all practical national needs, a program of interest to the roadbuilding machinery industry because of the large amounts of equipment that would be utilized in continued airport construction.

Association's annual banquet, attended by 1400 members Jan. 31 at the Stevens hotel, had as featured speakers John M. Carmody, federal works administrator; Arizona's Senator Carl Hayden; Willard Chevalier, publisher, *Business Week;* T. R. Kendall, editor, *Contractors and Engineers Monthly;* H. V. Kaltenborn, radio commentator.

A delegation of outstanding English engineers attended the show and banquet, headed by P. H. Mangin, Aveling-Darford Ltd., British engineering firm. The delegation are contractors to the admiralty, war and India offices and also crown agents for the colonies and principal foreign agents.

District Steel Rates

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Feb. 3	Change	Same week 1939	Same week 1938
Pittsburgh	73	— 5	46	32
Chicago	85.5	— 5.5	48.5	25
Eastern Pa.	78	— 2	34	30
Youngstown	51	—17	42	26
Wheeling	82	+ 2	64	44
Cleveland	75	+ 1	64	33
Buffalo	60.5	— 6.5	39.5	14
Birmingham	90	— 4	80	63
New England	66	— 9	70	20
Cincinnati	64.5	—10	55	44
St. Louis	70	—13	48.5	29
Detroit	93	+ 6	92	47
Average	76.5	— 5	53	31

1939 Steel Payrolls Aggregate $812,775,000

■ Steel payrolls of $812,775,000 in 1939 were nearly one-third more than 1938, within 20 per cent of the 1937 peak and second highest since 1929, according to the American Iron and Steel institute.

December payrolls were $84,537,000, November payrolls, $86,682,000 and December, 1938, payrolls $59,254,000. Wages averaged 85 cents an hour in December, 84.7 cents an hour in November and 83.5 cents in December, 1938. Working hours each week averaged 36.9 in December, 39.5 in November and 32 in December, 1938.

An average of 483,000 worked in 1939, 443,000 in 1938 and 572,000 in 1937. In December, 563,000 men were at work, in November 561,000 and 449,000 in December, 1938.

Court Approves Auburn Reorganization Plans

■ Reorganization plans of Auburn Automobile Co., Connersville, Ind., conforming to section 77-B of the federal bankruptcy act, have been approved in federal court at Ft. Wayne, Ind. James K. MacGowan, chairman of the board, testified Auburn has 1940 orders totaling $1,750,000, a monthly payroll of $30,000 and 450 employed.

Company manufactures automobile bodies, over-engine truck cabs and other sheet metal stampings.

Westinghouse Adjusted Compensation 12 Per Cent

■ January wages and salaries of all Westinghouse Electric & Mfg. Co. employes will be adjusted upward 12 per cent from base rates in accordance with the company's wage and salary plan. Amount of compensation is established each month in proportion to company's earnings in the previous quarter.

PRODUCTION

SHARP DROP PUTS RATE BACK TO SEPTEMBER LEVEL

■ STEELWORKS operations last week receded 5 points to 76½ per cent, lowest rate since mid-September. Nine districts curtailed production and three made slight gains. Last year the rate was 53 per cent; two years ago 31 per cent.

Youngstown, O.—Sharp curtailment has reduced operations 17 points to 51 per cent, with indications it will drop to 45 per cent this week. Carnegie-Illinois Steel Corp. has dropped four open hearths and banked a blast furnace, Republic Steel Corp. has cut off three open hearths, reduced bessemer operations and banked a blast furnace, and Youngstown Sheet & Tube Co. has taken off two open hearths and banked a blast furnace.

Chicago—Loss of 5½ points to 85½ per cent, sharpest drop since July, except for Christmas week. All interests but one curtailed activities. Carnegie-Illinois Steel Corp. banked a blast furnace at Gary, Ind.

Cincinnati—Drop of 10 points to 64½ per cent followed lighter schedules of finishing mills.

Birmingham, Ala.—Down 4 points to 90 per cent as Republic Steel Corp. dropped two open hearths at midweek for repairs, one to resume this week, the other in a few days.

Detroit—Resumption by two furnaces down for repairs raised the rate 6 points to 93 per cent. Indications are that three or four open hearths will go off this week.

St. Louis—Reduction of 13 points to 70 per cent resulted from two open hearths being taken off by one interest and one each by two others. This is the lowest rate since September except for the first week of January.

Pittsburgh—Receded 5 points to 73 per cent as several producers curtailed production.

Wheeling—Advanced 2 points to 82 per cent on slight changes in activity.

Central eastern seaboard—Off 2 points to 78 per cent with some plants at 50 per cent and others at 90 per cent. Central Iron & Steel Co., Harrisburg, Pa., is enlarging open-hearth soaking pit capacity.

New England—Dipped 9 points to 66 per cent. Two open hearths will be taken off this week for repairs, partially offset by increased production by another interest.

Buffalo—Decline of 6½ points to 60½ per cent as three open hearths were shut down by Bethlehem Steel Co., which also banked a blast furnace.

Cleveland—Increased 1 point to 75 per cent. A decline of 5 or 6 points is indicated for this week.

Steel Corporation's Raw Materials Sales Policy Puzzles Industry

■ CONFUSION precipitated week before last by a series of reports connecting the United States Steel Corp. with the sale of various raw materials, including iron ore, coal, coke and limestone, continues unabated. All interests involved have been attempting to interpret the news and draw accurate conclusions. So far, it has been entirely a matter for conjecture, with little established information.

Only known facts in connection with iron ore are that Oliver Iron Mining Co. has been advertising ore for sale for some time and that its initial sale involved a tonnage for Ford Motor Co. Reports which are accepted by the industry as reliable are that the price was $3.75—with no knowledge as to whether this was a delivered or f.o.b. price, the Ford company to arrange for the transportation.

Other iron ore sellers say this price is below their costs and fear effects which would follow should the market price descend to this level.

At the same time the ore industry sees no reason why such a decline should be expected. Reports say the Ford sale involved 120,000 tons—a mere drop in the bucket. Then, the industry feels that the price on the Ford business must be considered to some extent in the light of the fact that Ford is an important buyer of steel and that its business is highly desirable from the Steel corporation's point of view.

Meeting Competition

In this connection it is recalled that the Steel corporation, during the chaotic period immediately following the disestablishment of basing point differentials June 24, 1938, announced a policy of meeting all competition. In a fight for a larger share of total steel business it is easy to construe this policy to include raw material sales as aids to steel sales.

Reported limestone sales have no particular significance so far as known, for the Steel corporation long has been a major factor in the limestone market.

Reports of coke sales by H. C. Frick Co., while interesting, have caused no serious disturbance; this company has been a consistent buyer of beehive coke since the opening of the fourth quarter, and it is difficult to conceive of it as an important seller. Reports in connection with coal sales by National Mining Co., a Frick subsidiary, represent nothing new, since this company regularly has sold coal to other users in the past and considers such sales as normal.

1939 Exports Up 16 Per Cent; December in Gain

■ Steel and iron exports, excluding scrap, totaled 394,035 gross tons, 18.4 per cent greater than 332,899 tons exported in November and 138 per cent larger than 166,404 tons shipped in December, 1938, according to figures by the metals and minerals division, department of commerce.

For the entire year 1939 exports, excluding scrap, totaled 2,499,002 tons, 16.3 per cent greater than 2,149,249 tons exported in 1938.

Pig iron shipped in December, 18,912 tons, dropped sharply from 36,618 tons in November and for all 1939 totaled only 177,024 tons, compared with 432,851 tons in 1938. Steel ingots and semifinished steel rose from 28,464 tons in November to 47,995 tons in December; steel plates from 19,634 tons to 26,237 tons; sheets from 19,585 tons to 26,432 tons; tin plate from 46,587 tons to 57,675 tons.

Tin plate exports in 1939 totaled 305,525 tons, compared with 157,070 tons in 1938; structural shapes 115,465 tons in 1939 against 83,586 tons in 1938; sheets 264,120 tons against 200,625 tons; plates 242,394 tons against 210,091 tons and ingots and semifinished steel 167,171 tons compared with 159,930 tons.

Scrap exports in December totaled 206,402 tons, compared with 272,656 tons in November and 323,561 tons in December, 1938. Total scrap exports in 1939 were 3,577,427 tons, against 2,998,757 tons in 1938.

UNITED STATES EXPORTS OF IRON AND STEEL PRODUCTS
(Gross Tons)

Articles	Dec. 1939	Nov. 1939	Jan. thru Dec. 1939
Pig iron	18,912	36,618	177,024
Ferromanganese and spiegeleisen	1,066	1,065	2,923
Other ferroalloys	848	555	4,042
Ingots, blooms, etc.:			
Not containing alloy	47,995	28,464	167,171
Alloy, incl. stainless	12,004	16,809	48,579
Steel bars, cold fin.	2,153	1,684	11,392
Bars, iron	119	202	835
Bars, concrete	14,299	6,331	47,446
Other steel bars:			
Not containing alloy	22,049	12,414	134,149
Stainless steel	50	5	296
Alloy, not stainless	2,819	2,015	14,619
Wire rods	6,820	4,236	31,450
Boiler plate	1,278	1,298	9,279
Other plates, not fab.:			
Not containing alloy	26,237	19,634	242,391
Stainless steel	1,684	2,898	9,780
Alloy, not stainless	2,227	1,443	10,218
Pipe fittings:			
Mall. iron screwed	633	452	4,608
Cast-iron screwed	264	154	2,365
Pipe and fittings for:			
Cast-iron pressure	5,251	4,123	31,805
Cast-iron soil	2,074	1,596	11,978
Pipe, welded:			
Black steel	3,351	2,725	19,519
Black wrought-iron	729	718	4,440
Galvanized steel	5,581	4,565	29,226
Galv. wrought-iron	1,241	343	4,173
*All other pipe, ftgs.	2,131	971	7,575
Wire:			
Plain iron or steel	4,914	4,673	32,235
Galvanized	4,567	2,301	28,226
Barbed	7,076	6,604	53,337
Woven-wire fencing	337	257	3,370
Woven-wire scn cloth:			
Insect	41	61	468
Other	127	185	1,457
Wire rope and cable	916	548	4,988
Wire strand	140	26	1,071
Electric welding rods	185	162	1,603
Card clothing	2	1	32
Other wire	2,109	1,195	10,264
Wire nails	4,520	4,210	25,798
Horseshoe nails	68	137	932
Tacks	117	33	389
Other nails, staples	558	826	5,140
Bolts, machine screws	1,129	963	8,858
Castings:			
Gray-iron (incl. semi-steel)	408	271	3,492
Malleable-iron	203	115	1,186
Steel, not alloy	190	185	1,310
Alloy, incl. stainless	55	67	1,385
Car wheels, tires, and axles:			
†Wheels and tires	1,730	1,218	11,733
†Axles, no wheels	310	1,269	8,926
†Axles with wheels	147	29	7,222
Horseshoes and calks	28	40	224
Forgings, n.e.s.:			
Not containing alloy	2,029	1,908	14,591
Alloy, incl. stainless	287	173	2,013
Total	394,035	332,899	2,499,002
Scrap, iron and steel	204,298	271,293	3,551,589
Scrap, tin plate	743	476	10,154
Tin plate circles, strips, cobbles, etc.	788	199	6,552
Waste-waste tin plate	573	688	9,132
Total scrap	206,402	272,656	3,577,427
GRAND TOTAL	600,437	605,555	6,076,429
Iron ore	34,756	210,780	1,122,974

*New class. Included flanged malleable cast-iron fittings, expansion joints, and riveted pipe and fittings.
† New class.

January Iron Production Drops 4.5 Per Cent: Stacks Down 12

■ A NET loss of 12 active blast furnaces in January resulted in a significant drop in the pig iron production rate. This, coupled with the fact that a small recession had been experienced in December, indicates that the peak output for the present has been passed. Active furnaces on Jan. 31 totaled 179, against 191 on Dec. 31.

Giving weight to the belief that curtailment will not become too sharp was the blowing in of two stacks and the banking of at least two because repairs were necessary. As a matter of fact, the January total production and daily rate were the highest for any January in history.

Average daily production of coke iron in January was 115,983 gross tons, a loss of 5552 tons, or 4.5 per cent, from the 121,535-ton rate of December. The December rate had dropped about 2 per cent from November. The January figure was the lowest since last September with 95,802 tons per day, and compares with a 70,175-ton rate in the first month of 1939.

Total output in January amounted to 3,595,467 gross tons, which compared with the 3,767,605 tons of December, was a loss of 172,138 tons, or 4.5 per cent. Production was the smallest since last September with 2,874,054 tons. In January, a year ago, output totaled only 2,175,423 tons.

Relating production to capacity, operations in January averaged 87.1 per cent. This compares with 88.5 in December, 90.3 in November, 85.2 in October, and 51.0 per cent in January, 1939.

During January, two blast furnaces resumed, and 14 were blown out or banked. Of the steelworks or nonmerchant classification, one was made active and 12 were taken out; of the merchant class, one resumed and two were made inactive. The total number of active furnaces, 179, was the smallest since last September with 169, and compares with 118 in January, 1939. The previous best January was in 1929 when 202 stacks were operating.

Furnaces blown in during January were: In Pennsylvania: Bethlehem "G," Bethlehem Steel Co. In Tennessee: Rockdale, Tennessee Products Corp.

Stacks blown out or banked were: In Illinois: Federal "A," Interlake Iron Corp.; South Chicago No. 5, Youngstown Sheet & Tube Co. In Indiana: Gary No. 9, Carnegie-Illinois Steel Corp. In Kentucky: Norton, American Rolling Mill Co. In New York: Lackawanna "G," Bethlehem Steel Co. In Ohio: Youngstown Nos. 2 and 4, Republic Steel Corp.; Campbell Nos. 3 and 4, Youngstown Sheet & Tube Co.; Mingo Nos. 3 and 4 and Ohio No. 5, Carnegie-Illinois Steel Corp. In Pennsylvania: Duquesne No. 6 and Farrell No. 3, Carnegie-Illinois Steel Corp.

MONTHLY IRON PRODUCTION

Gross Tons

	1940	1939	1938
Jan.	3,595,467	2,175,423	1,444,862
Feb.	.....	2,060,183	1,306,333
March	.....	2,393,255	1,470,211
April	.....	2,055,326	1,388,008
May	.....	1,717,522	1,260,937
June	.....	2,119,422	1,060,747
July	.....	2,356,036	1,213,076
Aug.	.....	2,660,513	1,495,514
Sept.	.....	2,874,054	1,683,097
Oct.	.....	3,627,384	2,067,499
Nov.	.....	3,720,100	2,286,661
Dec.	.....	3,767,605	2,212,718
Total	.....	31,526,823	18,889,663

AVERAGE DAILY PRODUCTION

Gross Tons

	1940	1939	1938	1937
Jan.	115,983	70,175	46,608	103,863
Feb.	.....	73,578	46,655	107,857
March	.....	77,201	47,426	111,951
April	.....	68,511	46,267	113,354
May	.....	55,404	40,675	114,360
June	.....	70,647	35,358	103,843
July	.....	76,001	39,131	112,947
Aug.	.....	85,823	48,242	116,676
Sept.	.....	95,802	56,103	113,932
Oct.	.....	117,012	66,694	93,259
Nov.	.....	124,003	76,222	66,901
Dec.	.....	121,535	71,378	48,499
Ave.	115,983	86,375	51,752	100,573

JANUARY IRON PRODUCTION

	No. in blast last day of Jan.	No. in blast last day of Dec.	Total tonnage Merchant	Total tonnage Nonmerchant
Alabama	18	18	104,231*	159,277
Illinois	12	14	70,030	238,105
New York	10	11	57,204	156,127
Ohio	36	43	83,463	674,324
Penna.	64	65	112,352*	1,058,375*
Colorado	3	3		
Indiana	16	17	3,187*	638,424
Maryland	6	6		
Virginia	1	1		
Kentucky	1	2		
Mass.	1	1		
Michigan	5	5		
Minnesota	2	2	23,602*	216,766
Missouri	0	0		
Tenn.	1	0		
Utah	1	1		
West Va.	2	2		
Total	179	191	454,069*	3,141,398*

* Includes ferromanganese and spiegeleisen.

Italy Decrees Further Restrictions on Scrap

■ That the Italian government is endeavoring to utilize to the fullest extent materials available within the country in an effort to lessen importations is indicated in two decrees affecting metal scrap, according to a report from Consul Lester L. Schnare, Milan.

First of these requires the reporting by individuals or firms during the first seven days of each month of the possession of scrap iron or steel in excess of 440 pounds, while the second requires the reporting of copper scrap not in use in excess of 4.4 pounds. Severe penalties are prescribed for violation of these decrees. Previous to the issuance of these latest regulations the government had already imposed stringent restrictions on the use of iron and steel and copper by Italian manufacturers.

RATE OF FURNACE OPERATION

(Relation of Production to Capacity)

	1940[1]	1939[1]	1938[2]	1937[3]
Jan.	87.1	51.0	33.6	76.6
Feb.	....	53.5	33.6	79.5
March	....	56.1	34.2	82.5
April	....	49.8	33.4	83.7
May	....	40.2	29.4	84.3
June	....	51.4	25.5	76.6
July	....	55.0	28.2	82.9
Aug.	....	62.4	34.8	85.7
Sept.	....	69.7	40.5	83.7
Oct.	....	85.2	48.0	68.4
Nov.	....	90.3	55.0	49.3
Dec.	....	88.5	51.4	35.6

[1]Based on capacity of 50,198,920 gross tons, Dec. 31, 1938; [2]capacity of 50,606,400 gross tons, Dec. 31, 1937; [3]first half on capacity of 49,512,737 tons, Dec. 31, 1936—second half of capacity of 49,727,737 tons, June 30, 1937. Capacities by American Iron and Steel Institute.

G.E. Pays $63,899 for Employe Suggestions

■ General Electric Co., Schenectady, N. Y., during 1939 paid employes $63,899 for new ideas accepted under the company suggestion system. This was $12,497 more than in 1938. Awards ranged from $2 to $525. Suggestions numbered 26,901 and 10,121 were adopted.

In 20 years more than $1,000,000 has been paid employes for new ideas and better ways; more than 300,000 suggestions were made. Recently the percentage of adopted ideas has increased. Payments are determined on estimated savings and other factors and awards have been as high as $1500.

ICC Reports Lake Erie-Ohio Canal Would Cause R.R.s Heavy Loss

WASHINGTON

■ OPPOSITION to the proposed Lake Erie-Ohio river canal is expressed in a report by the interstate commerce commission to President Roosevelt. The report was in response to President's request a year ago for information on certain phases of the problem after the board of engineers for rivers and harbors had stated that an average reduction of 29 cents per ton on freight carried by railroads would remove justification for the canal.

Conclusions embodied in the report were that permanent rate reductions of the type and magnitude specified would not be economically justified prior to construction of the canal since reductions could not be confined to traffic of those expected immediately to benefit by the canal; at least 56,000,000 tons of freight a year, and probably more, would be affected and gross revenue loss to the railroads would be $35,000,000 a year, or more; railroads can ill afford to lose such an amount as the traffic produces or will produce; ample line and terminal capacity exists to carry any traffic likely to develop for many years; the public has a vital interest in protection of revenue of a transportation agency whose services are available the year round and to large and small shippers on equal terms.

The proposed waterway, which has been advocated by numerous interests in the Valleys, would be constructed over the socalled Pittsburgh-Ashtabula route. This extends from Beaver, Pa., on the Ohio river 25 miles below Pittsburgh, up the Beaver river 21 miles to a point near New Castle, Pa., thence up the Mahoning river about 35 miles, to Warren, O., and 46 miles to Lake Erie.

Government Pays 94 Per Cent

Cost of the waterway has been estimated at $240,000,000, of which local interests would supply $14,156,000, about 6 per cent, and the federal government the remainder.

Railroads affected by construction of the proposed canal would include all those serving the Ohio river valley, the Pennsylvania, New York Central, Baltimore & Ohio, Pittsburgh & West Virginia, Pittsburgh & Lake Erie and Nickel Plate, as well as soft coal roads from West Virginia to Lake Erie ports.

The report to the President devoted considerable attention to the status of iron ore and scrap, which constitute a large part of the traffic likely to be carried by the canal. In this connection the commission states that "where a long-life facility is provided in large part for the transportation of a wasting asset, such as ore, there should be an exceptional usefulness for the facility during the period in which such traffic is to be carried, or there should be other traffic for development when one or more major classes dry up.

"With due allowance for the uncertainties that exist it appears that shipments of high-grade ores will be much reduced in volume within at least 25 to 35 years after completion of the waterway."

After consideration of technological developments in the steel industry, changes in the balance of steel producing areas, increased use of scrap instead of pig iron in steelmaking and other factors the commission concludes that "to the extent that conditions of ore supply or of demand for steel products enter into this conclusion, the railroads will suffer a loss of traffic whether or not the waterway is built, though obviously a lesser loss if it is not; on the other hand, if scrap further replaces pig iron, the railroads will tend to benefit, unless existing handicaps in transportation of scrap by water can be overcome."

What's New at Pittsburgh . . .

By R. L. HARTFORD, Pittsburgh Editor, STEEL

■ WESTINGHOUSE Electric & Mfg. Co. made news in Pittsburgh with a showing last week of its famed "atom-smasher" to a group of physicists and technical writers.

Although the atom smasher is of considerable interest to the world of physics and, its protagonists hope, will eventually be important to industry through studies of energy, there were other developments shown of more immediate interest to the metalworking industries.

First among these was a new electric furnace using a blanket of dissociated ammonia gas, providing a means of close control of annealing processes without danger of decarburization or oxidation. This prevents distortion and scale formation, leaving finished piece with bright surface.

Unit is seven feet long and is designed so a piece of steel passes through heating zones varying from 1300 to 1750 degrees Fahr. It is then passed through an air-cooled cooling tunnel. Pieces of carbon steel, polished to a mirror finish, have been subjected to a 4-hour hardening treatment without damage to finish. Small springs were one product on which the furnace has been tested, and an important application will be in hardening dies, since after the hardening no finishing will be necessary.

Coincident with this development, the Westinghouse metallurgists have produced a new die steel, containing vanadium, molybdenum and chromium. Distortion characteristics of the resultant metal after tempering are said to be as good or better than in high carbon chrome steel and are much better than manganese oil-hardened steels. General results show a change in dimensions of less than 0.001-inch per inch.

♦

Aluminum Co. To Expand

Aluminum Co. of America has started work on a $30,000,000 expansion program; a $26,000,000 program begun three years ago has just been completed. First step in the new program will be construction of a metal producing plant in Vancouver, Wash., which with betterments in the bauxite, alumina and metal producing divisions of the company will cost $18,000,000. Plant will use power from Bonneville dam, the first major industry to avail itself of these facilities.

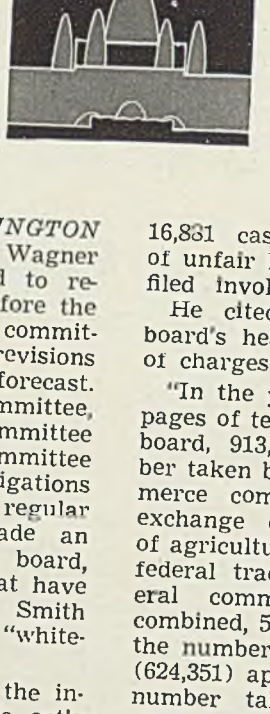
Remaining $12,000,000 will be used to balance capacities of fabricating divisions, including a new metallurgical laboratory at New Kensington, Pa. An extension to the Alcoa rolling mill will increase aircraft sheet capacity more than 1,000,000 pounds per month. At Massena, N. Y., facilities of structural and merchant mills are being increased, while additions will be made to the company's rolling facilities in Edgewater, N. J., die casting operations in Garwood, N. J., forging equipment in Cleveland and Los Angeles, and extrusion capacity at Lafayette, Ind.

♦

Coke Oven Contract Awarded

Koppers Co., Engineering and Construction division, has been awarded contract for 142 Koppers-Becker underjet coke ovens for Gary works, Carnegie-Illinois Steel Corp. These ovens will replace a similar number of ovens to be taken out of service.

Windows of WASHINGTO



By L. M. LAMM
Washington Editor, STEE

WASHINGTON

■ AMENDMENTS to the Wagner act are generally expected to result from the testimony before the special house investigating committee. How drastic these revisions will be is impossible to forecast. In addition to the Smith committee, the regular house labor committee and the senate labor committee have made so-called investigations of the labor board. The regular house labor committee made an effort to "whitewash" the board, but in view of the facts that have been brought out by the Smith committee, there can be no "whitewash."

Those who have watched the investigation believe while the act's basic purpose may not be tampered with, it will be possible to amend the law to make it acceptable to industry.

The labor board has become a part of our governmental policy, said Representative Smith, chairman of the special committee, last week. Originally he was opposed to the enactment and it was due to his insistence that the special investigation is being made. Mr. Smith believes the board should be confined to its proper jurisdiction and administer with equal fairness to both industry and labor.

Board Has Inning

Last week the committee gave the board an opportunity to disprove many of the charges which had been brought out during the course of the hearing. J. Warren Madden, board chairman, was first witness. He charged American manufacturers have been trying to sabotage the Wagner act.

The manufacturers, he asserted, regarded "obedience or acquiescence to the act as unpatriotic." Courts sometimes enjoined the board from even holding hearings in labor disputes, Mr. Madden said.

Mr. Madden said there have been 16,831 cases in which complaints of unfair labor practices have been filed involving 3,087,965 employes.

He cited figures indicating the board's heavy work in explanation of charges of inexcusable delays:

"In the year 1938 the number of pages of testimony taken before the board, 913,845, exceeded the number taken before the interstate commerce commission, securities and exchange commission, department of agriculture, board of tax appeals, federal trade commission and federal communications commission combined, 572,839. In the year 1939 the number taken before the board (624,351) approximately equaled the number taken by the interstate commerce commission and the securities and exchange commission combined (624,961) and exceeded the number taken by securities commission, department of agriculture, board of tax appeals, federal trade commission and federal communications commission, combined (306,491)."

Strikes Reduced

Regarding effectiveness of the act: "In 1938, first full year of the act's operation, there was a decrease from 1937 of 42 per cent in the number of strikes, 63 per cent in the number of workers involved and 68 per cent in the total man-days of idleness due to strikes. The number of men on strike was the lowest in any year since 1932. It was far below the average for the years 1916 to 1938, which was over one million. Less working time was lost in 1938 than in any year since 1931.

"In administering the act the board has had a notable success in disposing of cases through amicable arrangements between the parties.

"Of all charges filed which had been disposed of up to June 30, 1939, just under 50 per cent were settled without even the issuance of a complaint. Almost the same proportion of questions conce representation were settled i informal stage. A few more of both kinds were settled bet commencement of formal a and decision by the board.

"If we compare the figures strikes for the first ten month each year, then we note that number of strikes in that pe in 1938 declined to only 55 per of the number in the same pe in 1937. It declined still furthe 1939, when the number was 46 per cent of the total for the responding period in 1937. Thou there were 614 strikes in Ma 1937, there have not been over in any one month since Septemb 1937. In the first ten months 1939 there were not over 240 any one month."

HOUSE COMMITTEE CONTINU TRADE AGREEMENTS HEARIN

Opposition to extension of t trade agreements act in its prese form because world turmoil make it impossible to foresee condition three years ahead was expresse before the house ways and mean committee last week by Howard Young, St. Louis, chairman of th tariff committee, National Associa tion of Manufacturers.

Mr. Young, president American Zinc, Lead and Smelting Co., St. Louis, declared the association for "over forty years" has favored reciprocal trade agreements, but that "any sound" program would provide that:

"1. They be made on a bilateral basis.

"2. They be based on findings of a non-partisan, scientific fact-finding committee.

"3. They be approved by the senate."

To meet the problem of unemployment, he testified, United States virtually excludes foreign labor, "but importation of goods is im-

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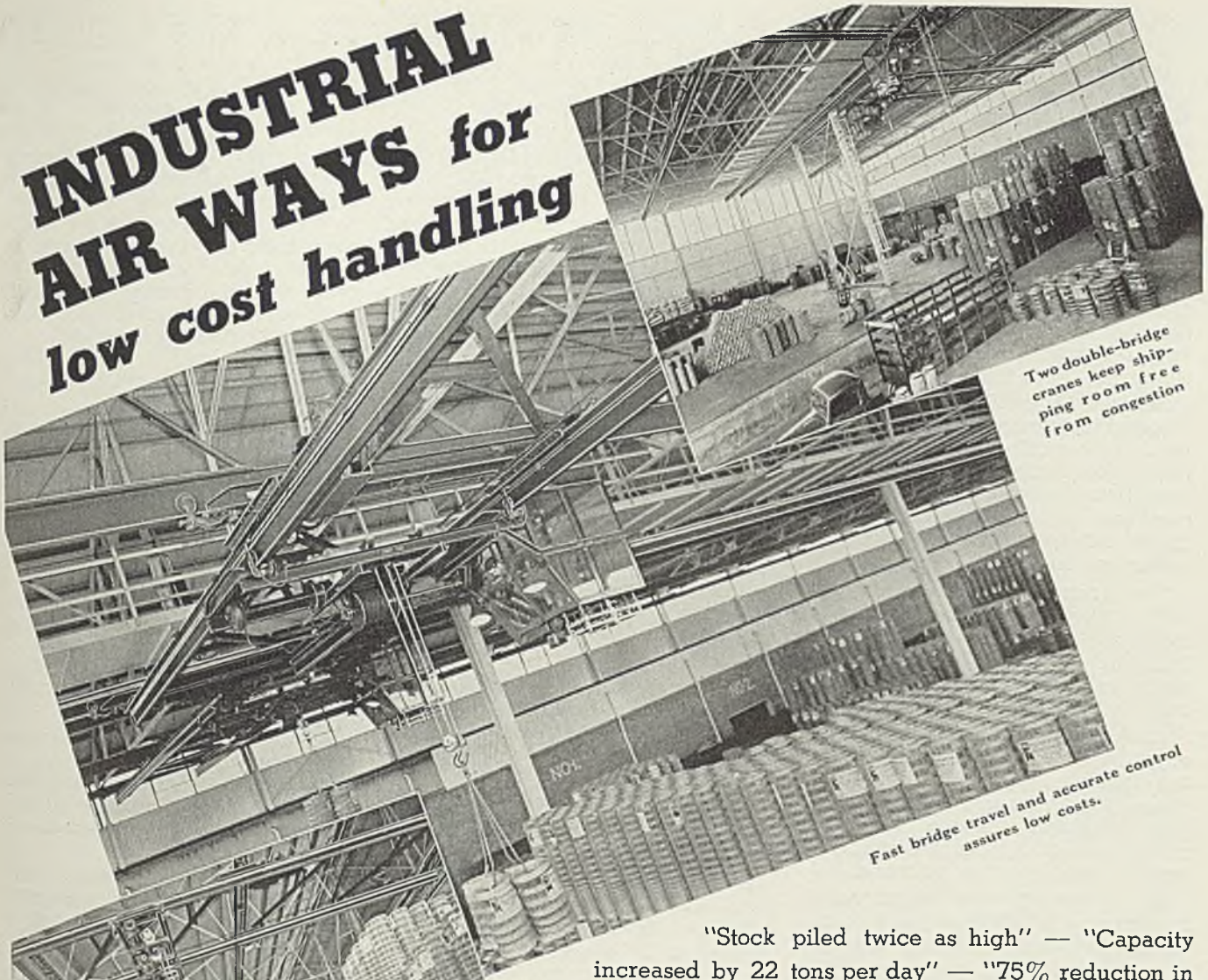

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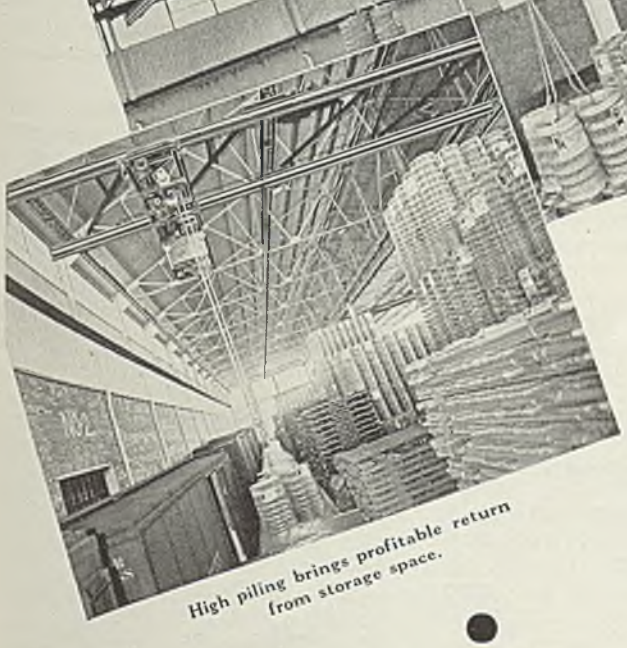

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portation of the men who make them."

Mr. Young also told the committee that import duties as revenue producers are slumping badly, having brought in only $3.56 per capita in 1937 compared with $22.84 per capita in Great Britain. The present trade agreements act, he said, "abrogates" the important principle of flexible tariffs.

Meanwhile Isadore Lubin, commissioner of labor statistics, department of labor, also appeared before the committee in connection with extension of the act.

Between 1934 and 1937, Mr. Lubin asserted, labor employed in manufacturing agricultural machinery for export to trade agreement countries increased 189 per cent. Labor employed in producing agricultural implements for export to other countries increased 152 per cent.

The economist clashed sharply with Representative Woodruff, Michigan, over the reason for establishment of American branch factories in Canada and other countries before the trade program.

Referring to a commerce department report issued in 1932—before the Roosevelt administration took office—Mr. Lubin said it showed factory migration was due to tariffs, restrictions on exchange and interference with free flow of trade.

Mr. Woodruff read a paragraph from the same report which, he contended, showed Canadian patent laws were responsible for the shift of American factories to that country. Mr. Lubin retorted that "when tariffs were reduced, the factories came back to the United States."

When Mr. Woodruff remarked that costs of production in this country were higher than in many foreign countries because wages were higher here, Mr. Lubin declared that despite high wages, efficiency of American workmen enabled manufacturers here to undersell foreign competitors in most lines.

1939 TIN SCRAP EXPORTS AGGREGATE 10,699 TONS

During December, 385 long tons of tin plate scrap, valued at $6890, were exported from the United States under license all going to Japan. During 1939, 10,699 tons, valued at $200,497.52, all going to Japan, were exported. The state department in announcing this says that during December, nine tin plate scrap licenses were issued with a total of 172 during the calendar year.

OBTAINS NEW INFORMATION ON TIN'S ATOMIC STRUCTURE

Information on the atomic structure of tin has been made available by a scientist of the national bureau of standards, who has successfully photographed 341 lines of its spectrum, Lyman J. Briggs, bureau director, announces.

Dr. William F. Meggers, of the bureau's spectroscopy section, has remeasured with increased precision all the tin lines that can be seen with the utilization of special photographic equipment. Only a few lines of the spectrum are visible to the naked eye.

Known since prehistoric times, tin is a common metal, but unknown until relatively recent years was the fact that it possessed a characteristic spectrum, or colored image in which the parts of a beam of light or other radiant energy are separated and spread out according to their wave length.

In his study, Dr. Meggers remeasured lines of all wave lengths, ranging from extreme ultra-violet to infra-red. In addition he corrected 37 lines of even greater wave length which were observed radiometrically.

The total number of lines contained in the spectrum is 378, and the longest observed wave length is nearly fifteen times the length of the shortest.

EDISON URGES NEGOTIATED CONTRACTS FOR WARSHIPS

Secretary of Navy Edison is trying to persuade congress to allow his department to order warships through negotiation contracts rather than through competitive bidding. The secretary contends the bidding system is costly and inefficient.

Negotiated contracts, he said, "is the hard way to do the job, but we will get better results and we will save money."

He cited the British navy as an example of the successful operation of negotiated contracts and termed ridiculous the requirements for detailed competitive bids and purchases which he said have been established only because at rare intervals "somebody might go haywire."

Mr. Edison's idea is to permit the navy to order a proven type of ship on the basis of single bid covering the cost of a specified design with specified equipment.

A clause permitting negotiated contracts was written into the naval expansion bill now before the house naval affairs committee, but under normal procedure on the basis of experience, the clause would be among the first eliminated in rewriting of the bill.

He argues competitive bidding, as applied to a warship, is wasteful in every detail. Construction plans for a battleship, he said, cost about $4,000,000 to create. In them are incorporated thousands of ideas and individual items. Then, when the overall design is approved, bids must be asked on requirements and with a narrow margin of allowance, the lowest bids accepted.

The result often is that compromises and changes must be made throughout the ship to accommodate the products which happen to meet bids, he said, adding that invariably designers will have in mind a special product as the best to do a job, although this not necessarily procurable under the present system.

His plan, he said, would make possible a standardization of production which would result in all ships of specific types and classes being identical, facilitate repair and replacement work and cut red tape.

FIRST INVENTORY SURVEY WILL NOT BE PUBLISHED

Compilation has been made by the bureau of foreign and domestic commerce of the first answers to its questionnaires on inventories. This compilation will not be made public because officials think some of the tabulations might be misconstrued.

The report has been sent to all of the concerns, including several steel mills, that were asked to cooperate in the study.

Government officials feel it will take some time to develop the survey into the informative report which is considered necessary. However, on the basis of the initial response, it is believed that this can be done within a reasonably short time. Questionnaires were sent to approximately 1700 industrial plants, and reports were received from about 600.

GOVERNMENT IRON, STEEL AWARDS TOTAL $934,503

During the week ended Jan. 20, the government purchased $934,502.64 worth of iron and steel products under the Walsh-Healey act, as follows: Massachusetts Gas & Electric Light Supply Co., Boston, $40,355.08; Camden Forge Co., Camden, N. J., $384,900; Wayne Tool Co., Waynesboro, Pa., $12,754.80; Noland Co. Inc., Washington, $17,817.82; Duffin Iron Co., Chicago, $22,100; Bethlehem Steel Co., San Francisco, $11,486.20; Columbia Steel Co., San Francisco, $29,125; C. J. Rainear & Co. Inc., Philadelphia, $11,100; American Bridge Co., Cincinnati, $248,430; Crescent Tool Co., Jamestown, N. Y., $12,072.12; Peco Mfg. Corp., Philadelphia, $75,000; Carnegie-Illinois Steel Corp., Chicago, $12,054.52; The Atwater Mfg. Co., Plantsville, Conn., $26,371.80; Majestic Mfg. Co., St. Louis, $20,455.40 (indefinite); and Noland Co. Inc., Washington, $10,479.90.

AVIATION

SEES 100 PER CENT RISE IN 1940 AIRCRAFT OUTPUT

■ AIRPLANE and aircraft engine production under present schedules is expected to exceed $500,000,000 in 1940, doubling 1939 output, according to John M. Jouett, president, Aeronautical Chamber of Commerce of America. England and France are reported actively considering a billion - dollar aircraft procurement program in this country to include between 6000 to 8000 bombers and a large number of pursuit planes, with full equipment, spare parts and armaments.

With current backlog, estimated at $625,000,000 by Mr. Jouett, and reluctance of planemakers to overexpand, this increased foreign business may present a serious production problem. Already Secretary Morgenthau, head of the aircraft procurement committee and liaison officer to the White House, talks of a "bottleneck" in airplane engines. Last week he flatly informed the industry existing facilities are insufficient for prospective needs and that planemakers could contract for considerably more business if they could be assured enough engines. How the secretary proposes to relieve the situation has not been disclosed.

Industries equipped for precision tooling probably will be drawn into the program through subcontracts. Indications are that design and production of wings, rudders, ailerons, and similar parts may be "farmed out." Goodyear Aircraft Corp., subsidiary of Goodyear Tire & Rubber Co., Akron, O., reports negotiations with a large planemaker for metal and metal-and-fabric tail surfaces.

Serious shortage of skilled labor is not anticipated in the 1940 rush. Shop labor, Mr. Jouett points out, has increased to 60,000, or 100 per cent over a year ago. Straightline production of quantity orders has helped reduce ratio between skilled and unskilled labor. Today larger percentages of unskilled and semi-skilled labor can be used.

Exports Not All War Orders

Exports reached $117,000,000 in 1939 compared to $68,000,000 of 1938. But not all of this business is war business. Exports now go to 91 countries out of a potential market of less than 100. Mr. Jouett points to a substantial increase from Latin America where superiority of American equipment is recognized. With growing pressure in Europe it is logical that the Americas will look increasingly to the United States for technical advances.

Pan American Airways reports placing an order with Lockheed Aircraft Corp., Burbank, Calif., for development of a new four-engine transport land plane with long range operating speeds up to 300 miles per hour. Pan American Airways also is contemplating buying six Boeing clippers for $2,600,000, ten Douglas DC-3 planes for $1,200,000, three Lockheed Excaliburs for $710,000 and three Douglas DC-4 planes, cost undisclosed.

Opinion is growing in England that in order to leave British labor available for the all important export trade, England should import finished goods such as aircraft and armaments rather than component raw materials. A large order from a British purchasing commission in New York, totaling $19,000,000 for improved Hudson-type reconnaissance bombers, minus engines and propellers, is on the way for Lockheed. This will boost Lockheed's backlog to $61,000,000. Lockheed reports completing first order of Hudson-type bombers for British Air ministry and has started on a repeat booking of 200 more planes.

To facilitate delivery of planes to Canada, Lockheed has purchased land on outskirts of Pembino, N. Dak., adjoining international boundary, for site of an airport and hangar facilities.

New records in earnings and sales were established in 1939 by Lockheed according to Robert E. Gross, president. Net profits totaled $3,140,000 for 12 months ending Dec. 31, compared to $442,111 for 1938. Sales for 1939 aggregated $35,303,444 compared to $10,274,503 of 1938. Unfilled orders include a substantial amount for United States government, several sizable foreign orders and a number of fleet contracts for commercial planes. Nearly 20 per cent of present business is commercial orders.

More Money for Research

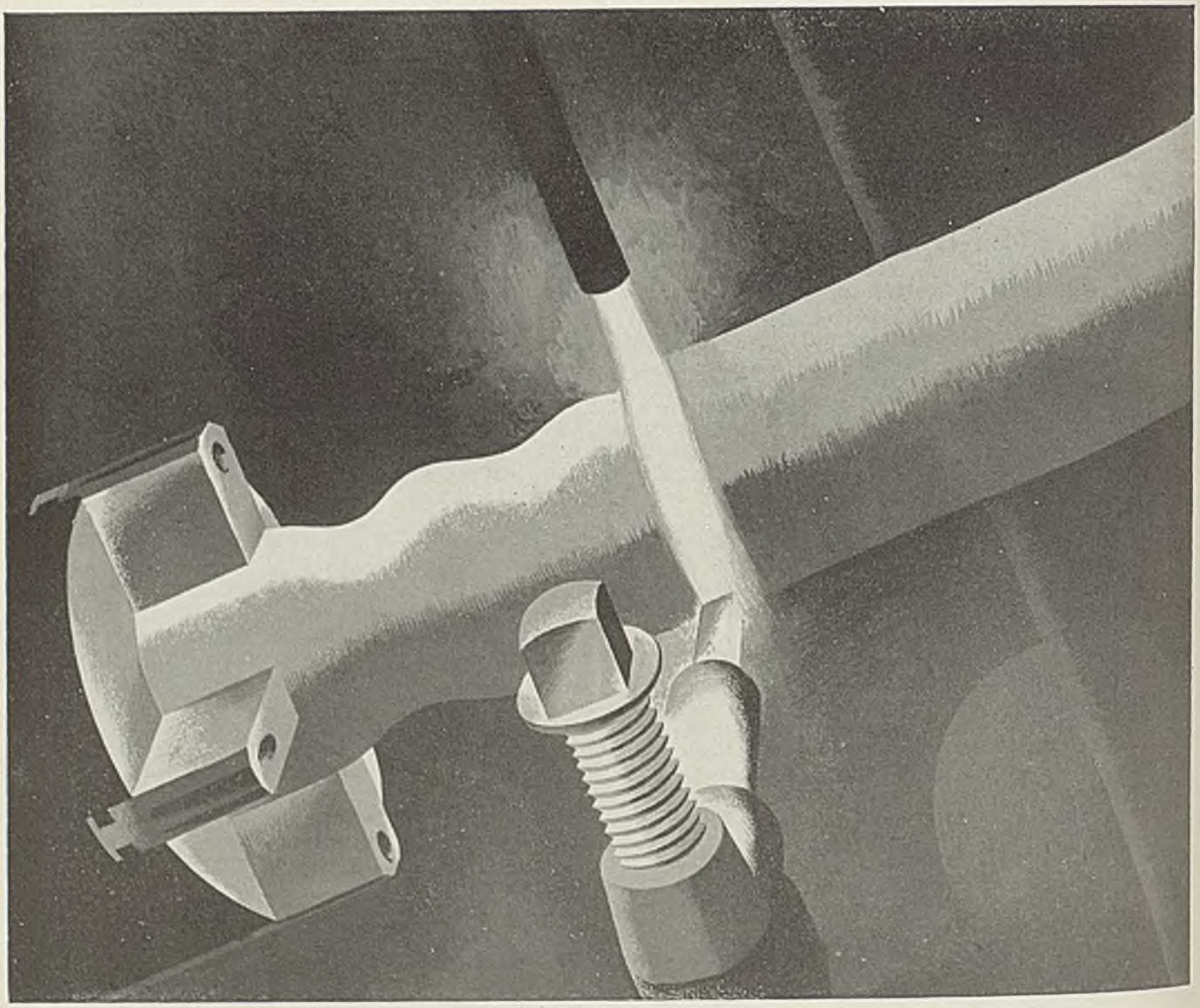
According to Mr. Jouett, planemakers have spent about 10 per cent of their gross sales of the last six years on development work. With increased business, more development can be expected. Advances of last week included perfection of Magnaflux inspection method by TWA laboratories for bronze, dural and other airplane metals not successfully tested by the original method. Other TWA developments were ratchet control on Cuno model oil strainers to permit cleaning in flight, and an automatic lubrication process for wheel bearings which is eight times faster than hand methods. Sperry Gyroscope Co. Inc., Brooklyn, N. Y., perfected its "Flightray" and will make several for test flying in commercial and military planes. Briggs Mfg. Co., 11631 Mack avenue, Detroit, was awarded a contract by U. S. navy for an experimental aviation motor.

War department awarded $1,040,172 contract to Hamilton Standard Propeller division of United Aircraft Corp., East Hartford, Conn., for propeller and control assemblies.

A bill was introduced in the Philippine parliament at Manila for establishment of a $1,000,000 national military and commercial aircraft factory. Technicians will be sent here to study production.

Seamless Steel Tubing for Cabin Planes

■ Shop view in plant of Fairchild Aircraft division, Fairchild Engine & Airplane Corp., Hagerstown, Md., showing extensive use of seamless steel tubing in framework of its model 24 cabin aircraft. Planes fully covered may be seen in the background. Photo courtesy Fairchild



DOUBLED SERVICE–HALVED COST

Designers today, employing modern materials, are frequently able to satisfy requirements formerly considered mutually exclusive. A case in point: fishing spear bodies, used in oil well drilling, must be strong and have a high degree of hardness to resist abrasion. The latter quality made them costly to machine—until the manufacturer adopted Nickel-Chrome-Molybdenum (SAE 4340) steel.

This steel is heat treated to a high degree of combined toughness, fatigue strength and hardness (375-400 BHN). But what, in this case, proved especially important, it can be so readily machined at the specified hardness that the tools used last about twice as long as formerly, thus halving the tool cost.

This instance of Nickel-Chrome-Molybdenum meeting the double requirement of high serviceability and low fabrication cost is typical of the results achieved by the employment of modern materials. Rechecking your own specifications may disclose similar opportunities. Our helpful booklet, "Molybdenum in Steel," will be sent free on request to engineers and production executives.

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MOLY

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ ALTHOUGH not generally recognized as such, this city has come to be a formidable center for the manufacture of electric refrigerators as well as automobiles, and in recent weeks an upheaval of major proportions has been shaping up this industry as a result of local action.

Refrigerators and automobiles have much in common. Both are mass production commodities fed, occasionally under intense pressure, into a mass consuming market. Both are comparatively young industries, some distance away from market saturation points. It has been estimated electric household refrigerators have reached a 40 per cent saturation of their market. Both autos and iceboxes are made largely of steel. Both are supported by vast merchandising programs.

Some appreciation of the volume of refrigerator manufacture, with accompanying steel requirements can be realized from reports issued by "Nema," the industry trade group, and published in *Air Conditioning and Refrigeration News*. Steel requirements are computed by figuring an average of 135 pounds per box, this including inner and outer cabinets and miscellaneous pieces such as legs, frames, supports and the like. Production figures are world sales of household electric units, encompassing well over 90 per cent of the industry. Five years' tabulations, with December 1939 estimated, show:

	Total sales	Steel tons
1935.....	1,722,269	116,253
1936.....	2,222,240	150,003
1937.....	2,559,200	172,746
1938.....	1,430,213	96,539
1939.....	2,033,346	137,251

Trends shown by these figures check closely with other industrial indices and point to a "normal" consumption of refrigerators of about 2,000,000 annually. But a number of increasingly complicated factors have come into the sales picture.

First, the life of the average electric refrigerator, or more exactly the single-owner life, is far beyond that of the automobile, making the problem of reselling an owner most difficult. The average family figures a refrigerator to supply a minimum of ten years of service, whereas the turnover in automobiles is about three years.

Second, the competition from so-called "private" brands, that is, those boxes sold by department stores and mail order houses under their own trade names, is vexing to the big-name producers. Profit margins are slimmer on these units, and sales costs are lower.

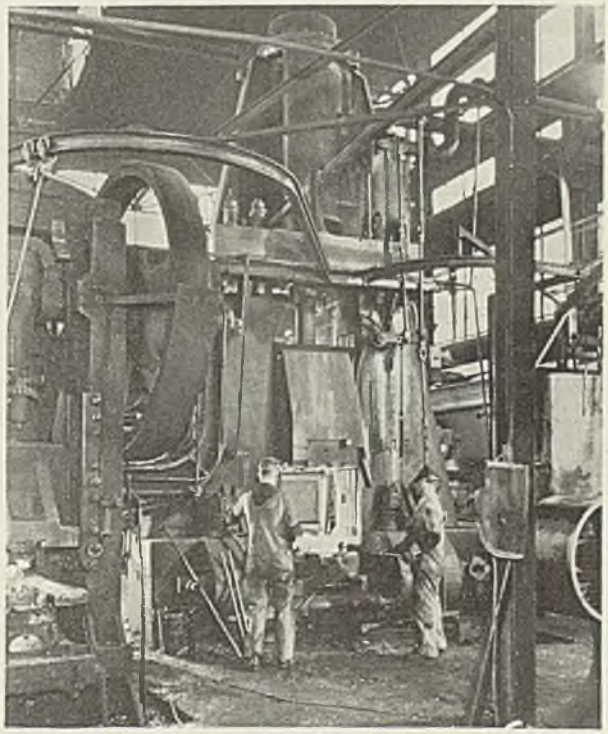
Third, nearly all manufacturers supply such a wide assortment of sizes and types of models that dealers find their sales muddled and profits evanescent because of large investment in stocks.

Fourth, the handling of trade-ins is considerably more difficult than the handling of used cars which at times seriously glut the automobile market. Only recently has a Philadelphia company started in the business of reconditioning trade-ins for resale, either by the dealer receiving them, or by the rebuilder. This company now handles 125 units a week and in its first year of operation has sold some 2000 rebuilt boxes to appliance dealers. Nearly a third of those received must be scrapped. A flood of reconditioned boxes, however, will only serve to complicate the problem of selling new units, lower in price, to lower income groups.

Patterned after the bluebooks of

Forge Chevrolet Crankshafts

■ Old but still versatile, the 86 steam forging hammers in the Chevrolet forge plant, Detroit, are hard pressed these days to keep up with production demands. Here is one of the largest, with ram weighing 12,000 pounds, forging a crankshaft. Overhead monorails support lifting levers which bring blanks from heating furnace



the used car industry, a national market index of trade-in values for used refrigerators has been compiled and is used widely as a measure of allowances on old boxes.

Taking the bull by the horns, Nash-Kelvinator Corp. here has hurled a three-fold challenge into the retailing of refrigerators in the effort to stabilize dealer profits, meet competitive price situations, step up replacement business and reduce dealer investments. First, 96 per cent of scheduled production has been concentrated in five 6-cubic foot and three 8-cubic foot models. Second, in anticipation of greatly increased sales, production schedules have been *doubled*, with resultant savings in manufacturing costs permitting lower prices. Third, selling costs have been reduced by working out a sales plan which utilizes the most efficient and economical forms of selling in various markets.

By the new plan, Kelvinator and Leonard refrigerators can be sold at from $30 to $60 less than in 1939, a vital sales point which is now being broadcast throughout the country in newspapers and magazines and on the radio. Advertised prices are now "delivered in the kitchen", except west of the Rocky mountains, another new technique in refrigerator selling.

Refrigerator Prices Reduced

With most 1940 refrigerator models just placed on the market (January introductions are the policy of the industry), this bombshell has stirred up the trade in no small way. Already two other large manufacturers have announced they will reduce prices to meet the Kelvinator competition.

Refrigerator designers and engineers have had their work cut out for them in trying every conceivable means to obsolete older models and create the urge to buy among present owners. Current price reductions, which after all are just a reiteration of tested American merchandising principles, i.e., reduce prices, extend volume, improve profits, are hoped to prove the means of making electric refrigeration available to a whole new income group not now owning such equipment, but whether the reductions will support a doubled manufacturing schedule is problematical.

In any event, doubled manufacturing schedules should double demand for sheet and strip steel for enameling and lacquering, as well as stainless steel for evaporators and shelving, aluminum, die castings, rubber, bolts and fastening devices, plastic moldings, motors, belts, compressors, copper tubing, wiring, switches, valves, seals, glass, refrigerants, porcelain enamel, lacquers of the dulux and glyptal types and the other materials and parts going into the building of modern refrigerators, not to mention presses, welding machines, rustproofing equipment, spray booths, ovens, conveyors and other fabricating equipment.

There are plenty of potent sales arguments for 1940 refrigerators even against those of but five years ago. Costs are probably 20 per cent lower, defrosting is now automatic, ventilation and humidification have been solved; ice cube capacity has been trebled, freezing time halved; operation is quieter and much more economical, several models featuring completely sealed-in power units. Finishes, both lacquer and porcelain enamel, have been improved in appearance and are applied more economically and in shorter time.

Speaking of refrigerators, General Motors Corp. has started a vast new plant in Buenos Aires, Argentina, for the manufacture of refrigerators, batteries and automobile accessories, completion scheduled for August, with initial employment around 300. Plans call for eventual expenditure of nearly $4,000,000, and may include an auto assembly plant later.

■ UNFORESEEN difficulties occasionally crop up with new design ideas in motor cars which are embarrassing when they result in customers' complaints but which often develop through no fault of the design itself. Take for example a new stabilizer bar developed for one of the 1940 models, a round steel bar supported at the ends in fabric bushings impregnated with synthetic rubber. Field reports told of rough action of this bar, of sticking, chattering, noise and even instability where stability was the chief function. Study quickly showed that on the faulty cars some of the rubber in the bushings either had worked through the fabric or was on the surface of the bushing originally, and had galled to the ends of the steel shaft. A bearing of rubber on rubber thus was established which soon gave rise to jerky performance.

Corrective was simple—merely taking out the shaft, removing the galled rubber on an emery wheel and applying a specialy developed lubricant to the bushings. Further trouble has not developed, since properly made bushings have no rubber to come off onto the shaft, the rubber being a backing material only.

Standard Automobile Manufacturers association new car guarantee on 1940 Willys models has been extended to 100,000 miles or three years, succeeding 4000 miles or 90 days, according to announcement recently made in Chicago by Willys President Joseph W. Frazer. He noted at the same time that sales of 1940 Willys models from their introduction through Jan. 15 were 27 per cent ahead of total domestic production for the entire 1939 model year. It appears doubtful if other manufacturers could afford to extend new car guarantees in the generous fashion Willys has, but should one of the big names do so, the rest probably would follow in short order.

Automatic Casting

Completely automatic method for casting passenger car transmission housings is among the most interesting of new developments in the Ford Motor Co. foundry here. Molten steel runs continucusly from one of two 96-inch cupolas into a 15-ton holding furnace. From the latter, the metal flows into one of a dozen refractory lined bowls located around the rim of a revolving table. Each bowl is filled automatically with a measured amount of iron and revolves around an axis geared to the reel until it meets a mold coming into position on the conveyor line. A cam causes the bowl to tilt at a given spot and so pours the metal into the mold. The bowl continues around to take another charge while the conveyor brings new molds into position. About 125 tons of iron is so poured in an 8-hour shift.

The identical operation is being extended to flywheel casting as soon as equipment can be completed.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1937	1938	1939
Jan.	399,186	226,952	356,950
Feb.	383,900	202,597	317,517
March	519,022	238,447	389,489
April	553,231	237,929	354,263
May	540,377	210,174	313,214
June	521,153	189,402	324,235
July	456,909	150,450	218,478
Aug.	405,072	96,946	103,343
Sept.	175,630	89,623	192,672
Oct.	337,979	215,286	324,673
Nov.	376,629	390,405	368,538
Dec.	347,349	406,960	469,002
Year	5,016,437	2,655,171	3,732,374

Estimated by *Ward's Reports*

Week ended:	1940	1939†
Jan. 6	87,510	76,685
Jan. 13	111,330	86,925
Jan. 20	108,545	90,205
Jan. 27	106,400	89,200
Feb. 3	101,240	79,410

†Comparable week.

	Week Ended Feb. 3	Jan. 27
General Motors	39,480	42,155
Chrysler	26,965	27,535
Ford	26,000	26,250
All others	8,795	10,460

SERVICE PROVED

3 DIE CASTINGS ON THE JOB SINCE 1929

—RESULTED IN THE USE OF 17* IN 1940

—DIE CASTINGS DO THE JOB BEST

In 1929, a leading hardware manufacturer employed ZINC Alloy Die Castings for the first time—in a padlock. Not only is this padlock still being sold in volume, but many more products with die cast construction have been added to the manufacturer's line. In 1940, for example,* we find a combination locker lock which is almost entirely constructed of ZINC Alloy Die Castings—17 in all!

Why have the engineers of this hardware concern steadily increased the number of die castings in their products? If you do not know the answer to this question you may be overlooking the solution to some of *your own* production problems. Any commercial die caster will be glad to acquaint you with the physical and economic advantages offered by ZINC Alloy Die Cast parts—or write to The New Jersey Zinc Company, 160 Front Street, New York City.

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The Research was done, the Alloys were developed, and most Die Castings are made with

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

Japan, Hoping for New Trade Pact, Revises U. S. Scrap Buying Policies

NEW YORK

■ JAPAN has revised scrap buying policies in the United States to ruffle the economic waters as little as possible following expiration of the trade treaty between the two countries Jan. 26.

More than anything else, Japan fears an embargo on scrap under present day-to-day trade arrangements with the United States. Japan in the past was a large buyer of pig iron, ingots, billets, plates and bars but recently purchases of iron and steel products other than scrap have been slight.

Last year Japan bought a considerable tonnage of plates and bars for its railroad program in Manchukuo but these items now are hardly apparent on export manifests. Some stainless steel sheets, hot-rolled strip and tin plate have been bought.

Japanese purchases are being confined more to raw materials than to finished products in the nonferrous classifications, as well as iron and steel. On a dollar basis, recent purchases of ingot copper, copper and brass scrap rank close to those of iron and steel scrap. Japan is our leading customer for these products, along with pig lead, slab zinc, aluminum and nickel scrap. Movement of fabricated nonferrous products is practically nonexistent.

Japan's Facilities Increasing

Trend of purchases indicates production facilities are progressing toward the point where Japan can practically care for its own needs despite the terrific drain occasioned by war in China.

Japan has purchased much rolling mill equipment here and steelmaking capacity in Asia alone is said to have reached an annual total of 2,000,000 tons, covering a wide range of products including rails, plates, sheets and bars. Capacity soon will be at least doubled.

Last week, final details were being arranged for purchase of an 86-inch plate mill, apparently as part of the continued expansion program. Discovery of important new ore bodies has encouraged Japanese expansion in former Chinese territory.

Revision of its scrap buying policies indicates Japan is hopeful of negotiating a new treaty, for it wants cotton, machinery, automotive equipment and petroleum products, as well as iron, steel and metals from the United States; and it wishes to sell its raw silk and low-cost manufactured products. Interruption of trade with Europe has intensified the hope.

Japan closely controls its scrap purchases since these are handled through a central association with a representative in the United States who distributes buying orders among six Japanese trading houses headed by the famous Mitsui and Mitshubishi interests. The same representative, incidentally, also handles purchases of steel mill equipment.

Japan's large scrap purchases in the United States undoubtedly have had some effect on the domestic market, especially during periods of peak steelmaking activity. In fact, December export figures reveal Japanese scrap purchases in 1939 set a new all-time record, even eclipsing the heavy 1937 movement. Monthly figures for past three years:

(Gross tons)

	1939	1938	1937
January	153,331	31,281	33,246
February	169,729	88,103	66,051
March	200,470	141,432	220,452
April	134,884	200,837	278,580
May	197,944	220,240	437,634
June	178,166	85,056	252,960
July	121,012	60,452	207,323
August	130,495	43,376	204,584
September	177,104	58,979	68,872
October	248,176	114,789	61,327
November	180,538	143,795	22,245
December	124,216	177,381	9,336
Year	**2,016,065	1,365,721	*1,872,646

* Annual total includes revisions not appearing in monthly figures. ** Annual total not corrected to include any revisions.

December exports of 124,216 tons brought the total for the year up to 2,016,065 tons, which compared with 1,365,721 tons for 1938 and 1,872,646 tons for 1937. While Japan has drawn upon the United States for steelmaking raw materials for a number of years, the movement assumed no particular importance until the depth of the depression when extremely low prices offered little incentive for accumulating scrap, especially at points far removed from domestic consuming centers.

How Japan's scrap purchases have grown:

(Gross tons)

1939	2,016,035	1933	547,539
1938	1,365,721	1932	164,001
1937	1,872,646	1931	48,036
1936	1,009,767	1930	168,186
1935	1,065,143	1929	208,260
1934	1,168,496	1928	160,427

For a number of years, Japan bought scrap with little regard as to its source as long as contracts were filled at the stipulated figures. In 1937, movement in one month alone came close to reaching the half-million-ton mark. Purchases in 1938 slackened somewhat but last year averaged close to 160,000 tons monthly.

More recently, Japan not only has curbed its purchases of scrap to around half the 1939 average but it times these purchases to disrupt the domestic market as little as possible. Purchases are concentrated in sections where competition is less likely with domestic mills.

Examination of recent scrap movement reveals that nearly half was from areas far removed from consuming areas, especially the South Atlantic and Gulf coasts. However, New York probably is the most important single port of exit and a little material is drawn directly out of the eastern Pennsylvania consuming area through Philadelphia.

Less scrap has been taken from the West coast recently, despite more favorable freight rates, since local consumers protested that prices were rising unduly. Actually, Japan takes scrap from some 16 or 17 customs districts skirting the Atlantic, Gulf and Pacific coast and extending to Hawaii.

Japan Is Rebuilding

In all fairness to the Japanese, American iron and steel scrap is not going into bombs to "kill Chinese babies" as erroneously indicated in the public press. Part of it is finding its way into war materials but by far the bulk is helping Japan develop economically.

Hundreds of thousands of tons of steel are going into building construction, for Japan is replacing the shaky structures which resulted in widespread disaster during the earthquakes. Unfortunately for Japan, a large part of the steel must go into extremely deep substructures since few metropolitan sections are favored by stable foundations.

Britain Launches Scrap Collection Campaign

■ Observance of special "scrap weeks" in thickly populated areas of the United Kingdom is planned by the iron and steel control and the ministry of supply to enlarge stocks for armaments and ammunition. Maj. H. E. Crawford, chairman, National Federation of Iron and Steel Merchants, announced collections from 150,000 firms approached already equal the cargo capacity of a dozen ships.

Farmers' organizations are cooperating in county to county collection of old metals. First effort in gathering scrap directly from the consuming population started in a London suburb. Householders were requested to give their iron and steel scrap to municipal dustmen.

Pratt & Whitney Celebrates 80th Year, Opens Modern New Plant

■ DELIBERATELY abandoning 23 multi-story buildings become obsolete, Pratt & Whitney division, Niles-Bement-Pond Co., Hartford, Conn., late in January formally opened its large new single-story plant in Charter Oak park, West Hartford. Open house was held Jan. 22-26.

More than 12,500 visited the plant during the week. Full operating schedule was maintained, that visitors might observe production of high-precision machine tools and other Pratt & Whitney products.

Pratt & Whitney is believed to be the first large machine tool manufacturer to abandon entirely an obsolete but complete manufacturing unit and move into new quarters specifically designed for its exact needs. New location is considered exceptionally advantageous for manufacturing purposes, possesses complete railroad facilities and is out of the flood area.

New plant was designed, by Albert Kahn Inc., Detroit, architect, to accommodate the requirements of precision machine tool, small tool and gage manufacture. The 1-story factory building is nearly 1000 x 550 feet. It is supplemented by a 2-story office building and a 2-story pattern storage unit with garage and heating plant. Company's 2650 employes are housed in modern manner, with every convenience for producing fine equipment.

Work on the new plant was started last March, and the pattern shop was completed and occupied July 1. Moving of the shop itself was completed in November; engineering department and offices were transferred early in December. Clayton R. Burt, president, was the last to leave the old factory site.

Pratt & Whitney had occupied the old location for 79 years. Some of the multi-story buildings had been used continuously since 1865. While still suitable for light manufacturing, company officials report, they were definitely unfitted for the weight of modern machines.

Ten years ago the heaviest piece of equipment manufactured by the company weighed about 12,000 pounds. Today some Pratt & Whitney products weigh more than 80,000 pounds. Separate buildings and many stories presented numerous obstacles to safe and efficient handling of heavy castings and parts.

Detailed description of the new plant can be found on page 46, this issue.

Canada Places $15,000,000 Shipbuilding Awards

TORONTO, ONT.

■ Minister of Transport C. D. Howe announces orders in excess of $15,000,000 have been placed for antisubmarine boats of the "whale-catcher" type with shipbuilders at Montreal, Sorel and Quebec. Other awards will be announced soon.

From Vancouver comes a report that all shipbuilders on the Pacific coast will receive ship orders and that actual construction will start within the next month or six weeks. Companies receiving contracts are in the market for materials and inquiries for steel are appearing in increasing number.

Canada's production capacity for plates, sheets and other steel essential to shipbuilding is booked several months into the future. To obtain sufficient tonnage for the program, heavy buying in foreign markets will be necessary. United States is regarded the most likely source of supply.

Other war contracts placed during the past week totaled about $2,000,000. Gasoline and fuel purchases amounted to $500.000, aircraft supplies, including four Noorduyn "Norseman" planes, $227,012, and construction contracts on the Atlantic and Pacific coasts, $257,852.

Week's awards included $30,000 for munitions to Sawyer-Massey Ltd., Hamilton, Ont.; aircraft supplies: Mackenzie Air Service Ltd., Edmonton, Alta., $95,472; British air ministry, $68,250; Trans-Canada Air Lines, Montreal, $14,475; Canadian Pratt & Whitney Aircraft Co. Ltd., Longeuil, Que., $11,491; Noorduyn Aviation Ltd., Montreal, $6,829.

F. F. Barber Machinery Co., Toronto, received $5422 order for machinery, tools and supplies. Mechanical transport orders totaling $29,929 went to Ford Motor Co. of Canada Ltd., Windsor, Ont., and to Maryin-Perry Corp., West York, Pa., $117,757.

Steel Co. of Canada Ltd., Hamilton, Ont., has purchased an eight-acre site for erection of a tin plate mill to cost $2,500,000. Construction will start immediately. Company's original program of expansion has been enlarged and a total outlay of $15,000,000 is proposed. Company now is installing new open hearth furnaces.

Canadian production of steel ingots and castings, pig iron and ferroalloys in December was higher than in November. Production of all three products in 1939 was greater than the preceding year. Comparisons:

		(Gross tons) Steel ingots, castings	Pig iron	Ferro-alloys
Dec.,	1939	150,062	94,620	10,494
Nov.,	1939	147,182	87,822	7,285
Dec.,	1938	77,807	53,709	2,810
Year,	1939	1,384,827	756,182	75,234
Year,	1938	1,155,190	705,427	55,926

■ Fabricated steel plate orders in December totaled 23,627 net tons, compared with 26,020 tons in November, according to the department of commerce. Bookings for 1939 were 357,393 tons, against 285,061 tons in 1938 and 428,884 tons in 1937.

■ Clayton R. Burt, president, Pratt & Whitney, Hartford, Conn., is first to blow the three-toned whistle on the plant's new power house. With him is Hubert D. Tanner, vice president

MEN of INDUSTRY

■ M. L. JACOBS has been elected vice president in charge of raw materials, Bethlehem Steel Co., Bethlehem, Pa. He succeeds C. A. Buck, who will continue as vice president and a director, serving in a consulting and advisory capacity. Mr. Jacobs joined Bethlehem in 1916; four years later was advanced to manager of quarries, Bethlehem Mines Corp., and in 1934 was named general manager of quarries, Bethlehem Steel Co. He continued in that position until September of last year when he became assistant to Mr. Buck.

♦

G. H. Jones, first president of the Chicago Heights Manufacturers' association and one of the founders of Inland Steel Co., Chicago, was guest of honor at the association's thirty-third annual meeting Jan. 25 at the Palmer house, Chicago. He was presented with a distinguished service scroll. The occasion had a double significance for Mr. Jones because the date of the meeting fell on his eighty-fourth birthday. He is still active as president, Midwest Forging & Mfg. Co., Hillside Fluor Spar Mines and Pershing Quicksilver Co.; also continuing as director of Inland and Buffalo Steel Co.

♦

Elton Hoyt II, senior partner of Pickands, Mather & Co., Cleveland, has been elected president, Interlake Steamship Co. He succeeds the late Henry G. Dalton. Frank Armstrong, a partner of Pickands Mather, has been elected to Mr. Dalton's place on Interlake's board.

♦

Benton J. Willner and Maurice E. O'Brien have been named assistant vice presidents, Inland Steel Co., Chicago. Mr. Willner will assume the

G. H. Jones

position of manager of sales, sheet and strip steel division, of which he has been assistant manager of sales since 1936. He joined Inland in 1927. Mr. O'Brien is manager of sales, carbon steel bars and billets, a position he has held since 1936. He became affiliated with Inland in 1934.

♦

George McIntire has been named purchasing agent, All-Metal Products Co., Wyandotte, Mich. He succeeds Ray Nielson, who has joined B. F. Goodrich Co., Akron, O. Mr. McIntire was formerly with Kelvinator Corp.

♦

Herbert G. R. Bennett, since 1933 assistant general superintendent, Duquesne works, Carnegie-Illinois Steel Corp., has been appointed to the staff of the corporation's chief engineer at Pittsburgh. Walter A. Jayme, general superintendent, McKeesport plant, has been named assistant general superintendent, Duquesne works, succeeding Mr. Bennett, and Carl M. Nystrom, heretofore assistant general superintendent, has been made general superintendent, Wood works.

Mr. Bennett was first employed by a subsidiary of United States Steel Corp. in 1901, and joined the former Carnegie Steel Co. at Youngstown, O., in 1907. He is a past president and director, Association of Iron and Steel Engineers. Mr. Jayme began his career as a metallurgist in 1921 and was associated with several alloy producing steel companies before joining the metallurgical division of Carnegie-Illinois in November, 1935. Mr. Nystrom has been employed at Wood works during his entire industrial career, beginning as a metallographist in January, 1926.

♦

F. M. Huffman has been named assistant general traffic manager, Bethlehem Steel Co., Bethlehem, Pa. He joined Bethlehem after graduation from Lehigh university in 1922. The following year he was assigned to the Philadelphia sales office, and later was transferred to Chicago. He became manager of sales at St. Louis in 1936, and in March, 1938, assistant manager of sales at Baltimore.

♦

Walter Mason Hutchison, since 1937 sales promotion manager, lighting division, Westinghouse Electric & Mfg. Co., Cleveland, has been transferred to East Pittsburgh, Pa., as manager of agency market development.

♦

Edward D. Emerson, since 1937 district sales manager, Babcock & Wilcox Tube Co., New York, has

B. J. Willner

M. E. O'Brien

Bachrach

E. D. Emerson

been appointed general manager of sales, John A. Roebling's Sons Co., Trenton, N. J., effective March 1. Previous to joining Babcock & Wilcox he was with Jones & Laughlin Steel Corp. several years as sales engineer.

♦

Francis H. Penn, vice president and general manager, has been elected president and general manager, American Bantam Car Co., Butler, Pa., succeeding Roy S. Evans, resigned. Mr. Evans will continue as chairman of the board.

♦

William K. Breeze, district sales manager at New York, Jones & Laughlin Steel Corp., Pittsburgh, has been appointed Pacific coast manager with supervision over district offices at Los Angeles, San Francisco and Seattle. He will make his headquarters in Los Angeles. John B. DeWolf succeeds Mr. Breeze as district sales manager at New York. Since March,

H. B. Spackman

1938, he has been Philadelphia district sales manager. Herbert B. Spackman, since March, 1938, assistant district sales manager at Philadelphia, has become district sales manager there.

♦

L. A. Estes has been appointed executive vice president and general manager, South Chester Tube Co., and of its subsidiary, South Chester Terminal & Warehousing Co., Chester, Pa. He formerly was manager, commercial division, Carnegie-Illinois Steel Corp., Pittsburgh.

♦

John W. Lohnes has been appointed assistant general manager of sales, Vanadium Corp. of America, New York. He has been assistant to general manager of sales the past year, since being transferred from the corporation's Chicago office. Donald C. Hostettler, eastern sales representative, has been transferred to take charge of the Detroit district sales office as sales representative, succeeding J. Berens Waters, who is assuming the duties of general purchasing agent. John B. Girdler has been named eastern sales representative to succeed Mr. Hostettler.

W. K. Breeze

♦

Frank T. Sisco, editor, *Alloys of Iron Research* of the Engineering Foundation, New York, has been elected chairman, Iron and Steel division, American Institute of Mining and Metallurgical Engineers for 1940. He will take office following the annual meeting of the institute in New York, Feb. 12-15. Edmund M. Wise, staff adviser, research laboratories, International Nickel Co. Inc., Bayonne, N. J., has been elected chairman, Institute of Metals division. He likewise will take office following the annual meeting.

Mr. Sisco began his career in the steel industry in 1913 as chemist for Illinois Steel Co., South Chicago, Ill., serving successively as chief chemist, metallurgist, and engineer of tests for a number of large steel corporations. In 1923 he became metallurgist and chief of metallurgical laboratories, United States army air corps, Dayton, O., continuing in that capacity until he became editor of the *Alloys of Iron Research* in 1930. Associated with International Nickel since 1927, Mr. Wise formerly was affiliated with General Electric Co., Schenectady, N. Y., and Wadsworth Watch Case Co., Dayton, Ky.

L. A. Estes

Died:

■ LESTER F. DAVIS, 53, president and general manager, Scranton Pump Works from 1917 to 1929, at his home in Scranton, Pa., Jan. 26. He joined the company in 1904, and served successively as purchasing agent, treasurer and president. When the firm was reorganized in 1929 and taken over by Heidenreich & Van Nostrand, he remained in an advisory capacity.

♦

James E. Jones, 83, the past nine years roll consultant, Continental Roll & Steel Foundry Co., East Chicago, Ind., Jan. 24 at his home in Chicago. He formerly was chief roll designer for 26 years at the South works of the former Illinois Steel Co.

♦

Milton M. Wagner, 77, president and treasurer, Wagner Mfg. Co., Sidney, O., maker of cast aluminum and cast iron cooking utensils, Jan. 25 in Sidney. His active interest in the Wagner company began in 1891 when he became purchasing agent and treasurer.

♦

Col. Arthur F. Townsend, 74, chairman of the board, Raybestos-Manhattan Inc., and general manager, Manhattan Rubber Mfg. division, Passaic, N. J., Jan. 14 in Ridgewood, N. J. He was an organizer of the Manhattan Rubber Mfg. Co. in 1893, serving successively as secretary, vice president, and president.

♦

William J. Price, 62, a director and since 1924 secretary and treasurer, Hubbard & Co., Pittsburgh, recently in Pittsburgh. At one time he was associated with the former Illinois Steel Co. and American Steel & Wire Co. He also was secretary-treasurer, Beall Bros. Supply Co.

♦

Donald L. Brown, president, United Aircraft Corp., Hartford, Conn., Jan. 29 in New York. He had been head of the aircraft company since its reorganization in 1934 and had been with its predecessors since the original Pratt & Whitney group was formed in 1925 to make radial aircraft engines.

The Surface Has Only Been Scratched

■ MANUFACTURERS have a very clear idea as to what kind of an election result next November would be best for the country. That is, the voting into public offices of men friendly to business and anxious to stimulate it.

Industry once wielded considerable influence in the determination of national policies. Today, organized labor, agriculture, the American Legion, the silver bloc and other pressure groups must be listened to with respect by the man running for office. Class legislation and class consciousness have come between the employer and employe, and the public.

As a practical influence in politics and national planning the manufacturer today stands at an all-time low. This is strikingly illustrated by a recent off-the-record discussion with a distinguished United States senator who has wielded a powerful influence over most of our legislation in recent years.

Pressure Through Lobbyists Wrong Approach to Legislative Help

"Businessmen could always get a sympathetic hearing if they would come to Washington themselves and present their problems to congress. Instead, they pay big fees to lobbyists and lawyers with alleged influence—persons with whom many members of congress are afraid to talk or even to be seen." This was the general tenor of his remarks. "Hopeless when it comes to public relations," was the way the senator described businessmen who are eminently competent in other phases of their companies' affairs. At the same time, the senator feels that the more intelligent of the big businessmen have a much broader viewpoint than generally credited to them. He is convinced there is a definite place for them in our national planning, provided they would occupy it in a proper and effective way.

This matter is worth serious pondering. Unless the concepts which must underlie any genuine approach toward real business recovery are widely accepted, the election results of next November will be less satisfactory than desired. Unless people generally are better informed about how jobs are created and individual security and well-being promoted, we always will be threatened with the danger that elections merely will produce a good many new crackpots to replace old ones.

Better Public Relations Necessary To Stimulate Business Activity

Manufacturers have derived some comfort from a trend toward the right during the past year and a half. This is more than counterbalanced by their concern over the minute trickle of new capital into industry, and the continued gravity of the unemployment problem. They can foresee no real solution to these problems as a result of much of our present legislative and administrative thinking.

For a number of years manufacturers have been increasingly impressed with the necessity for good public relations. They have made notable advances in their public relations and methods. It will be wise for them to feel, however, that all they have done so far is to scratch the surface. Manufacturers still have before them the problem of making theirs a vital voice in the country's economic planning.

The *BUSINESS TREND*

Business Pace Declines As Order Backlogs Recede

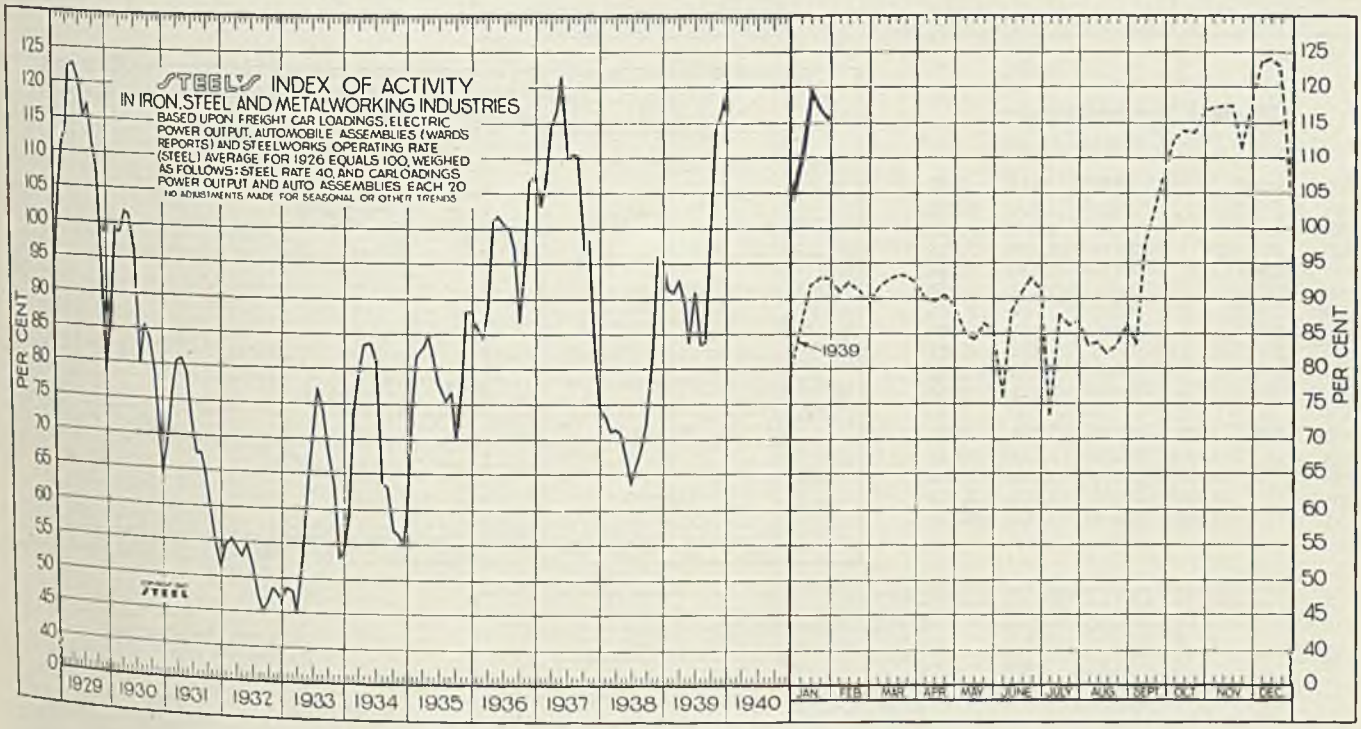
THE statistical record of business activity throughout January confirmed earlier expectations of a downward movement in industrial production after the first of the year. This has been particularly noted among the durable industries.

Despite moderate contraction of operations in the heavy industries, order backlogs are rapidly shrinking.

Forward buying ceased almost entirely last month, as purchasing agents returned to the policy of covering for only immediate needs. The uncertain domestic business outlook, weaker commodity markets and generally well stocked positions were the chief factors retarding new buying.

So far the decline in business activity has been gradual, since relatively high operations still are warranted by the large order backlogs. Current indications point to a further contraction of industrial production throughout February.

STEEL's index of activity again declined during the week ended Jan. 27, to 115.4. This compares with the 117.3 level recorded in the previous week and is 8.8 points below the 1939 peak of 124.2, reached late in the year. However, the index is still well above the 92.9 level recorded at this time last year.



STEEL'S index of activity declined 1.9 *points to* 115.4 *in the week ended Jan.* 27:

Week ending	1939	1938
Nov. 25	111.4	93.9
Dec. 2	117.9	100.1
Dec. 9	123.9	100.7
Dec. 16	124.2	99.8
Dec. 23	123.4	94.8
Dec. 30	104.0	79.9
Week ending	**1940**	**1939**
Jan. 6	110.3	86.5
Jan. 13	119.2	91.9
Jan. 20	117.3	93.0
Jan. 27	115.4	92.9

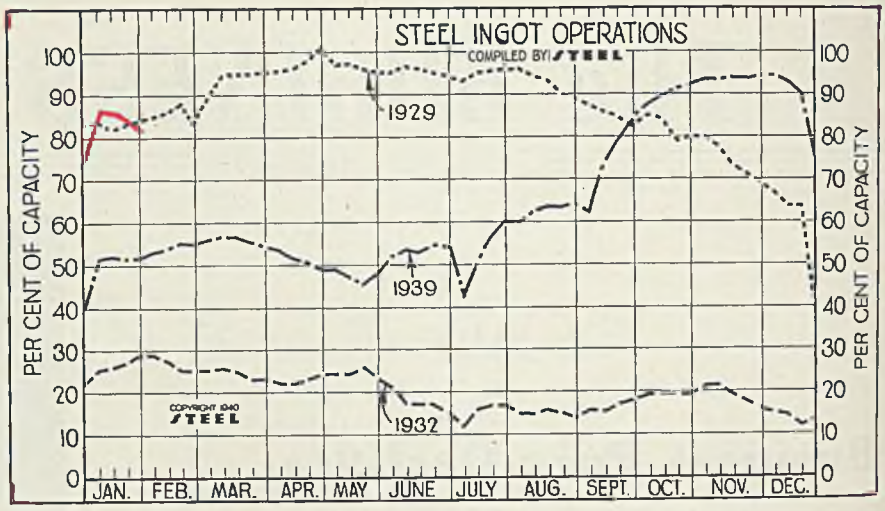
Mo. Data	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	114.0	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

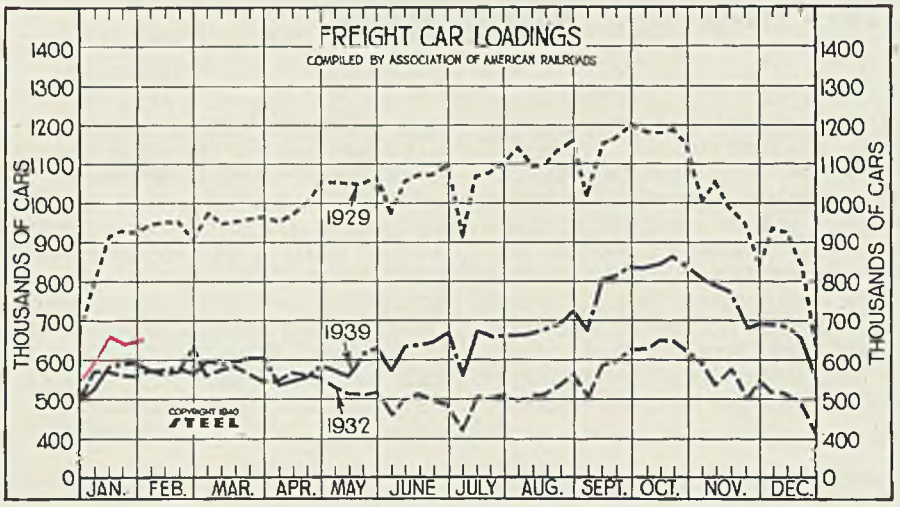
Steel Ingot Operations

(Per Cent)

Week ended	1939	1938	1937
Oct. 28	92.0	54.5	51.0
Nov. 4	93.0	57.5	47.0
Nov. 11	93.0	61.5	39.0
Nov. 18	93.5	63.0	35.0
Nov. 25	93.5	62.0	31.5
Dec. 2	94.0	61.0	30.5
Dec. 9	94.0	61.0	27.0
Dec. 16	92.5	58.0	27.0
Dec. 23	90.5	52.0	23.0
Dec. 30	75.5	40.0	21.0

Week ended	1940	1939	1938	1937
Jan. 6	86.5	51.5	26.0	79.5
Jan. 13	86.0	52.0	29.0	79.0
Jan. 20	84.5	51.5	30.5	80.0
Jan. 27	81.5	51.5	33.0	76.0





Freight Car Loadings

(1000 Cars)

Week ended	1939	1938	1937
Oct. 28	834	709	772
Nov. 4	806	673	732
Nov. 11	786	637	690
Nov. 18	771	657	647
Nov. 25	677	562	559
Dec. 2	689	649	623
Dec. 9	687	619	622
Dec. 16	681	606	603
Dec. 23	655	574	460
Dec. 30	550	500	457

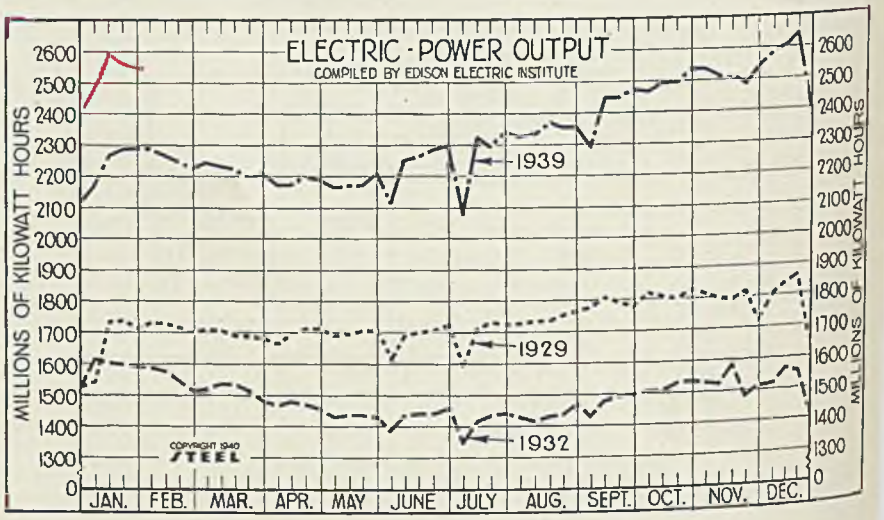
Week ended	1940	1939	1938	1937
Jan. 6	592	531	552	699
Jan. 13	668	587	581	700
Jan. 20	646	590	570	670
Jan. 27	650	594	553	660

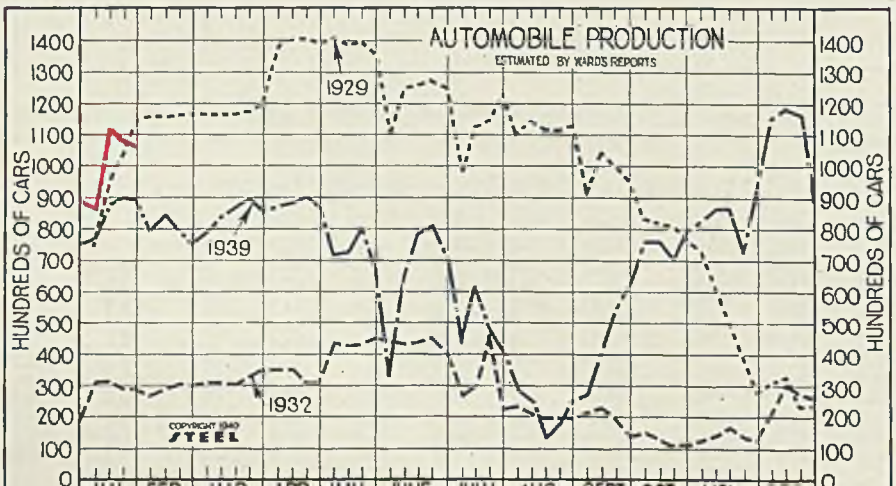
Electric Power Output

(Million KWH)

Week ended	1939	1938	1937
Oct. 28	2,539	2,226	2,255
Nov. 4	2,537	2,207	2,202
Nov. 11	2,514	2,209	2,176
Nov. 18	2,514	2,270	2,224
Nov. 25	2,482	2,184	2,065
Dec. 2	2,539	2,286	2,153
Dec. 9	2,586	2,319	2,196
Dec. 16	2,605	2,333	2,202
Dec. 23	2,641	2,363	2,085
Dec. 30	2,404	2,121	1,998

Week ended	1940	1939	1938	1937
Jan. 6	2,473	2,169	2,140	2,244
Jan. 13	2,593	2,270	2,115	2,264
Jan. 20	2,572	2,290	2,109	2,257
Jan. 13	2,566	2,283	2,099	2,215



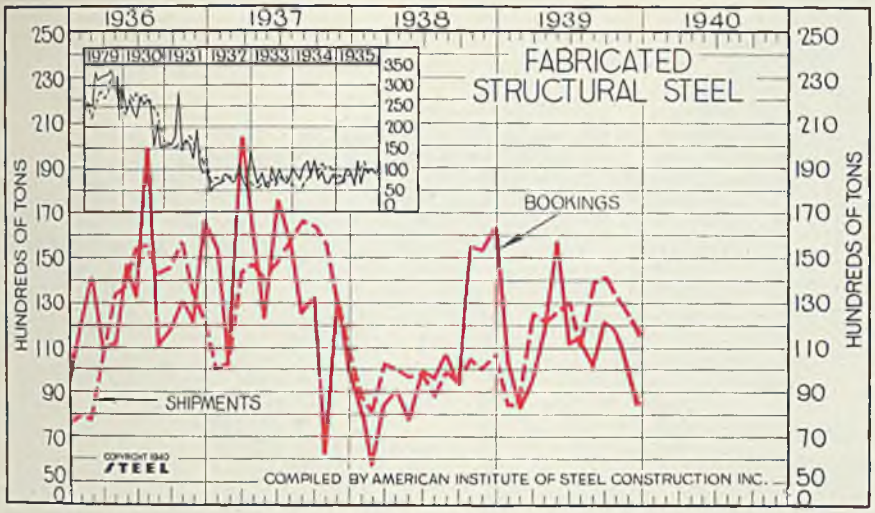


Auto Production

(1000 Units)

Week ended	1939	1938	1937
Oct. 28	78.2	73.3	90.2
Nov. 4	82.7	80.0	89.8
Nov. 11	86.2	86.3	85.3
Nov. 18	86.7	96.7	85.8
Nov. 25	72.5	84.9	59.0
Dec. 2	93.6	97.8	86.2
Dec. 9	115.5	100.7	85.8
Dec. 16	118.4	102.9	82.0
Dec. 23	117.7	92.9	67.2
Dec. 30	89.4	75.2	49.6

Week ended	1940	1939	1938	1937
Jan. 6	87.5	76.7	54.1	96.8
Jan. 13	111.3	86.9	65.7	91.7
Jan. 20	108.5	90.2	65.4	81.4
Jan. 27	106.4	89.2	59.4	74.1



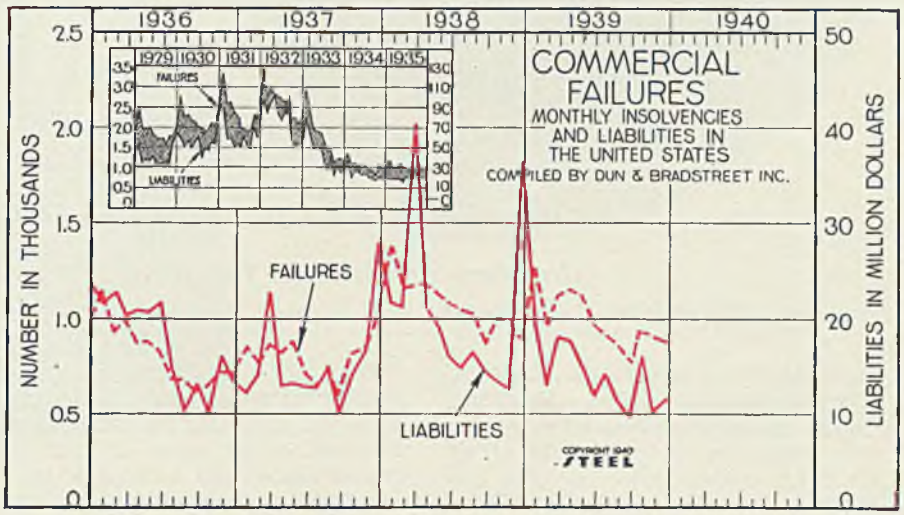
Fabricated Structural Steel

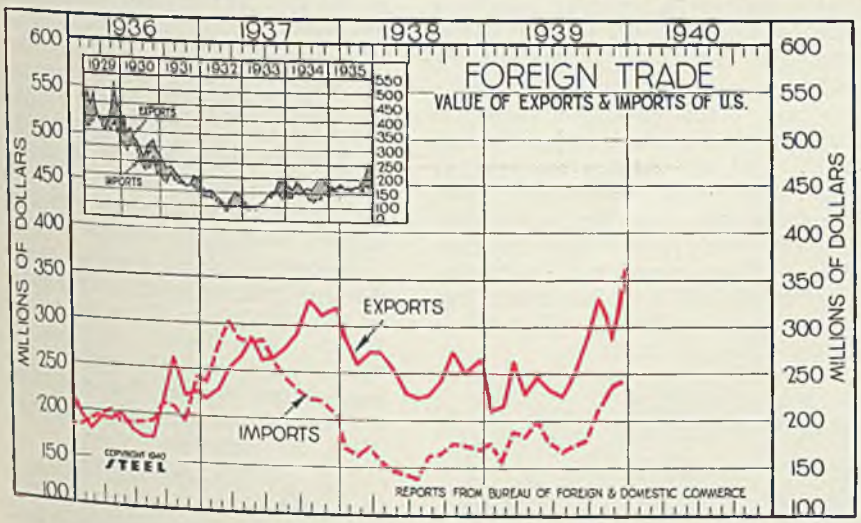
(1000 tons)

	Shipments			Bookings		
	1939	1938	1937	1939	1938	1937
Jan.	84.3	87.8	99.9	101.7	80.3	153.8
Feb.	84.4	81.2	102.2	82.7	57.1	101.7
Mar.	125.3	103.3	143.0	95.1	84.3	206.3
Apr.	120.9	100.0	146.8	118.3	91.2	158.5
May	125.9	96.4	140.5	156.9	77.3	122.9
June	130.1	98.6	147.6	111.6	99.9	175.5
July	110.5	88.0	156.4	114.1	96.0	158.3
Aug.	139.7	98.6	166.1	100.9	106.8	124.9
Sept.	140.8	93.5	163.5	121.4	92.5	132.4
Oct.	133.8	105.0	155.9	118.8	154.8	62.3
Nov.	128.2	99.9	130.2	99.3	153.1	132.8
Dec.	116.2	106.5	108.4	84.4	163.4	99.1
Total	1440.1	1158.8	1660.6	1305.0	1256.6	1628.6

Commercial Failures

	Failures Number		Liabilities (Unit: $1,000,000)	
	1939	1938	1939	1938
Jan.	1,263	1,377	$19.12	$21.42
Feb.	963	1,149	12.79	21.03
Mar.	1,123	1,167	17.92	40.33
April	1,140	1,172	17.49	21.15
May	1,122	1,123	14.76	19.14
June	952	1,073	11.61	15.92
July	917	1,038	14.15	14.76
Aug.	859	1,015	11.26	16.38
Sept.	758	866	9.40	14.34
Oct.	916	997	16.14	13.22
Nov.	886	984	11.88	12.30
Dec.	882	875	12.08	36.53
Total	11,408	12,836	$168.20	$246.52





United States Foreign Trade

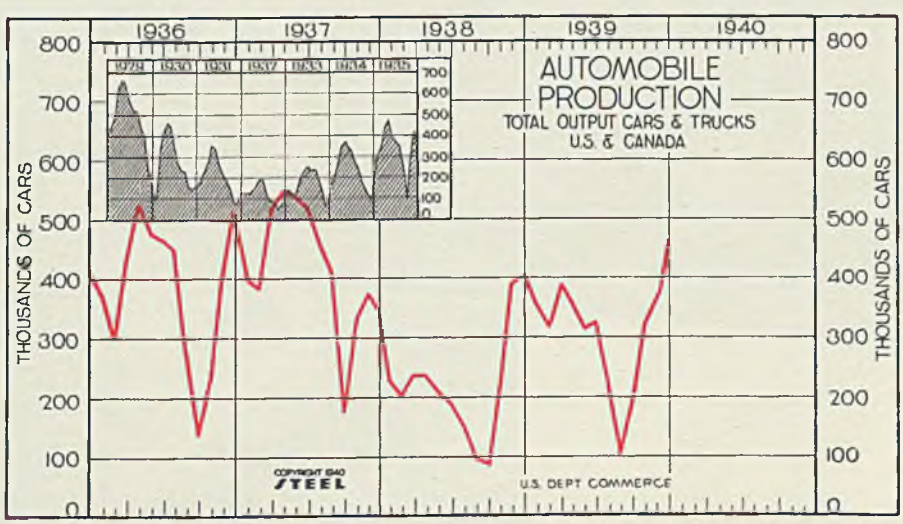
(Unit: $1,000,000)

	Exports		Imports	
	1939	1938	1939	1938
Jan.	$212.9	$289.1	$178.2	$170.7
Feb.	218.6	261.9	158.0	163.0
Mar.	267.8	275.3	190.5	173.4
April	231.0	274.5	186.3	159.8
May	249.5	257.3	202.5	148.2
June	236.1	232.7	178.9	145.9
July	229.6	227.5	168.9	140.8
Aug.	250.8	230.8	175.8	165.5
Sept.	288.6	246.3	181.5	167.6
Oct.	332.1	277.7	215.3	178.0
Nov.	292.7	252.2	235.4	176.2
Dec.	368.0	268.6	247.0	171.5
Total	$3,177.0	$3,093.9	$2,318.3	$1,960.6

Automobile Production

(Unit: 1000 Cars)

	1939	1938	1937	1936
Jan.	357.0	227.1	399.2	377.2
Feb.	317.5	202.6	383.9	300.8
March	389.5	238.6	519.0	438.9
April	354.3	238.1	553.4	527.6
May	313.2	210.2	540.4	480.5
June	324.2	189.4	521.1	469.4
July	218.5	150.4	456.9	451.2
Aug.	103.3	96.9	405.1	275.9
Sept.	192.7	89.6	175.6	139.3
Oct.	323.0	215.3	338.0	230.0
Nov.	370.2	390.4	376.6	405.8
Dec.	469.0	407.0	346.9	519.1
Average	311.0	221.3	418.0	384.7



New Plant Promote

Precision

Structure is designed around most efficient manufacturing layou for producing machine tools, small tools and gages. In-line pro duction minimizes handling. Cranes, hoists serve all floor area

■ PRATT & WHITNEY division, Niles-Bement-Pond Co., Hartford, Conn., recently celebrated not only the completion of a new plant of the most modern type, but also the moving into it of 950 machines from the machinery department and 1350 machines from the small tool department, equipment formerly housed in 23 old buildings some 2½ miles away from the new quarters.

New plant, designed by Albert Rahn Inc., 345 New Center building, Detroit is 550 x 1000 feet and is one-story throughout except for office, pattern storage and heating plant which are two-story. Starting in a small rented room in Hartford in 1860, Pratt & Whitney subsequent to 1865 occupied an area on Capitol avenue which little by little became covered by a maze of buildings. These came into existence one by one over a period of 70 years as the business of manufacturing precision machine tools, small tools and gages grew in size and broadened in scope.

Demands for greater production combined with the increased size and weight of castings involved in modern machine tool building presented serious handling problems now effectively solved by the new plant. Here production facilities have been laid out for minimum movement, many parts traveling only a few feet from one jab to the next.

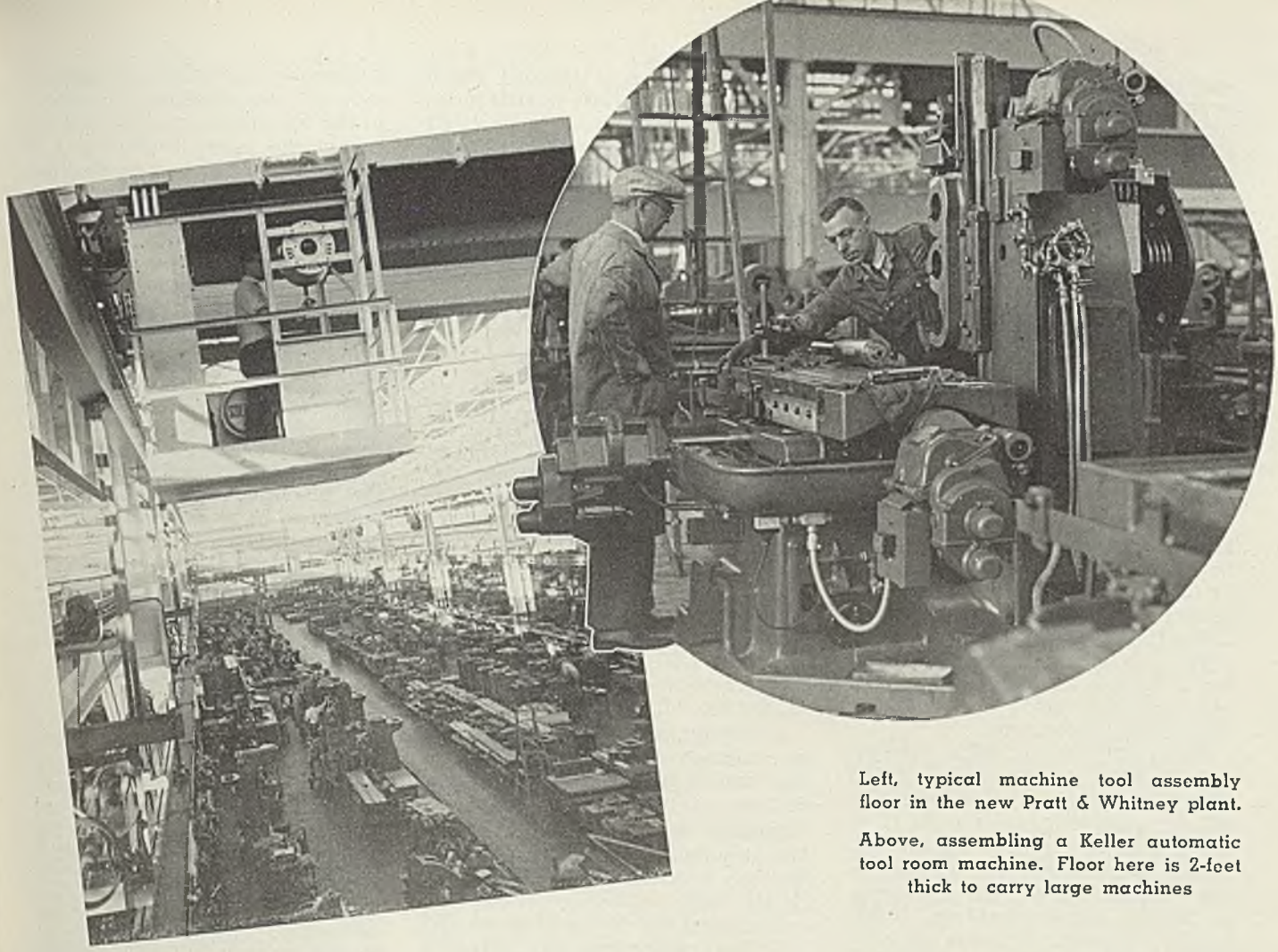
For example, castings come into the new plant either by truck or by railroad to the unloading dock at the rear of the plant where crane and hoists move them to the finishing and cleaning department immediately adjoining. Here they are ground, cleaned, filled and painted. From this section it is only a step to the milling and planing floors where the larger castings receive their initial machining. A few feet further on are the assembly floors.

Similarly, small parts travel through other sections of the plant

Top of page, new plant with bluish-green lights showing through 110,000 windows affords an excellent air-mark for night-flying planes

At the left, cafeteria with acoustical ceiling seats 600, provides good food at cost to both night and day shifts—just one of the many conveniences for workers in this new plant

Below, looking across 550 feet of floor space before equipment was moved in



Left, typical machine tool assembly floor in the new Pratt & Whitney plant.

Above, assembling a Keller automatic tool room machine. Floor here is 2-feet thick to carry large machines

from one job to the next until they arrive finished on the assembly floor. All production operations are carefully planned for proper sequence to minimize handling. When a machine is completed, a big crane moves it a short distance to the shipping floor where it is boxed, moved outdoors and taken away on a truck or railroad car. Overhead cranes serve all areas throughout the plant and handle the heaviest loads easily. The one-story plant eliminates moving heavy loads from one floor to another.

Waste Motion Eliminated

Manufacture of small tools and gages likewise is carefully laid out. There is a separate shipping room for small tools and gages immediately adjoining the stockroom where they are placed upon completion. Also, a separate loading platform permits express and parcel post trucks to pick up these smaller shipments easily.

Plating department, hardening rooms and constant-temperature rooms are located at strategic points to eliminate waste motion from start to finish of manufacturing and assembly operations. These as well as all other operations were most carefully planned in laying out the new plant. Result is a smoothly-working manufacturing setup which already has materially cut down overhead expenses and materials handling costs.

Artificial lighting is from 1400 high-intensity mercury-vapor lamps made by General Electric Co., Schenectady, N. Y. Each unit is rated at 400 watts. Fixtures are mounted 14 feet above the floor and are spaced on 20-foot centers. General illumination thus produced amounts to 22 to 27 foot-candles at working level. No supplementary lighting is used except occasional built-in lamps on certain specified machines.

This new Pratt & Whitney plant at Charter Oak park, West Hartford, Conn., without any equipment installed represents the labor of 2000 men full time for one year, a total of 3,000,000 man-hours. This is direct labor and does not include the "wheels within wheels." Today some 2600 workmen are making machine tools, small tools and gages here.

Preliminary borings and soil tests showed the need to go down from 90 to 100 feet to reach bed rock. This required 1628 wood piles averaging better than 90 feet in length. Each was capped with a concrete and steel pile long enough to drive the wood to bed rock and below surface water level where the wood will never rot.

Foundations containing 600 tons of reinforcing steel and some 18,791 cubic yards of concrete were built on top of the piles.

Structural steel went up extremely fast. All of it was fabricated by Bethlehem Steel Co. and shipped in on special railroad tracks laid into the plant site so steel could be switched right to point of erection. Tractor cranes picked up sections from the cars and swung them into final position with only one handling.

Then the steel workers and riveting crews completed the erection. Some 371,000 rivets were used in erecting the 3530 tons of structural steel. Prefabricating the steel required 264,280 man-hours with 35,720 additional man-hours for its installation. Well over 5000 tons of steel was used in the building as reinforcement, structural work, roofing, etc.

Entire building is fireproof. Roof not only carries all snow loads, but is designed to resist an upward lift of more pounds per square foot than were exerted in the hurricane of September, 1938. Some 675 tons of 18-gage steel are welded in place on the steel girders. This is covered with 1-inch layer of cork and ⅜-inch of roofing felt. Roofing felt

was applied in 3/32-inch layers bound together with roofing pitch. Roofs required 1568 tons of felt, 4000 barrels of pitch. A layer of coarse gravel forms the top surface. Total roofing material weighs over 3100 tons.

Acres of glass in walls and roof structure eliminate dark corners and give excellent natural lighting conditions in all parts of the plant. About 11 carloads of glass, around 300,000 square feet, were used. Some 5 acres of steel sash, 28 carloads, were required, with 125,000 pounds of putty. To operate windows, there are 4 miles of 1¼-inch rods in the plant.

Floors for the most part are creosoted wood block laid on edge in tar on a concrete base. Three million blocks were used. One section of the floor for heavy machine assembly is solid reinforced concrete, 2 feet thick.

The concrete administration building is floored with composition tile, 34,313 of them being laid on 61,000 square feet of concrete.

About 1275 tons of brick were required with an additional 21,000 radial brick for the stack, which is 175 feet high and tapers from 11 to 7½ feet inside diameter. In addition, 27,000 glazed hollow tile were used. Plant also required almost 2 acres of 20-gage copper flashings, 10,500 gallons of paint, 29 miles of electrical conduits, 79 miles of electric cable and wire, 5 miles of pipe underground with 16 miles overhead.

Plant is heated by 152 steam-operated unit heaters and blowers. Power house contains three 400-horsepower boilers, oil fired and rated at 200 per cent overload. These develop steam at 200 pounds pressure, for heating only. Fuel oil is stored in three large tanks with total capacity of 60,000 gallons. Tank cars spotted on adjacent siding are unloaded through an electric pump into these tanks. Perfect combustion of the oil assures a smokeless stack.

Two electrically driven 2-stage air compressors handle 1100 cubic feet of free air per minute, which is compressed to 90 pounds per square inch.

Largest Crane Lifts 20 Tons

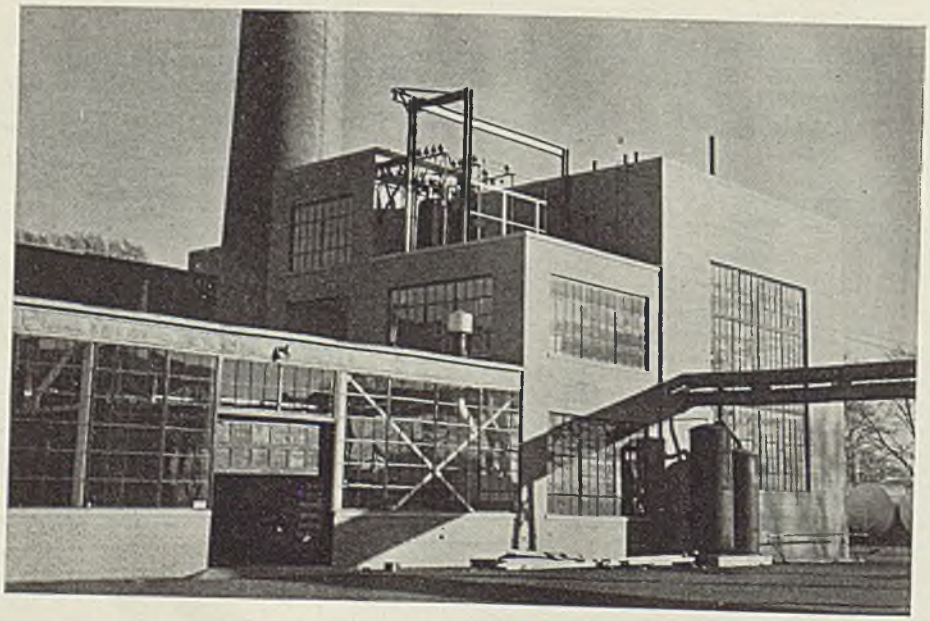
All electric power is purchased at 11,000 volts. Four transformer stations about the plant change the 11,000 volts to 220-volt 2-phase for power. Separate transformers handle the 110-volt single-phase lighting circuits. Equipment is arranged for easy changeover to 440-volt 3-phase current. Total load is estimated at 7500 kilowatts with maximum demand of 2600 kilowatts and an average of 2000 kilowatts.

Crane equipment in the plant has a combined capacity of 160 tons, the largest individual crane lifting 20 tons.

Moving the equipment from the 23 old buildings 2½ miles away into the new quarters was worked out in detail long before actual moving was undertaken. Every machine and piece of equipment was given a number corresponding to a chalked portion of the floor in the new plant. Then the movers picked up machines on temporary skids, dragged them behind tractors to waiting trucks which carried them across the city to the new receiving room where more tractors dragged them across the floor to the designated location. They were immediately spotted in place and hooked up to get them back into production.

The fastest time recorded was on a grinder on which the operat shut off the machine at 9 o'clo in the morning at the old plant a turned the power back on at 4 the afternoon in the new plant a was back in production. While mar machines took longer than this, th average lost time was surprising low. Some 950 machines were move from the machinery department an some 1350 from the small-tool de partment without seriously inte rupting production. This in itsel was no small job, especially sinc these were all precision machine and had to be handled with grea care. Moving of the machine sho was begun October 9 and completed the latter part of November. Last section to be moved was the office Last man to leave the old plant was Clayton R. Burt, president, who was installed in his new offices amid a huge demonstration on Dec. 18, 1939.

Power house has three 400-horsepower oil-fired boilers with automatic control. Discharge from the 175-foot stack is smokeless. All photos courtesy Pratt & Whitney division, Niles-Bement-Pond Co., Hartford, Conn.



Simplified Practice Files and Rasps

■ National bureau of standards, Washington, has approved a proposed revision of simplified practice recommendation R6, Files and Rasps, which would eliminate 128, or 25 per cent, of items included in original recommendation, and add 9 new items. This would bring recommended stock varieties to 377. Revision now is before the industry. Copies of proposed revision may be obtained from division of simplified practice, national bureau of standards, Washington.

Machine Shop Practice Under Modern Methods

■ *Machine Shop Work*, by Frederick W. Turner, Oscar E. Perrigo, Aldrick Bertrand; 412 pages, 5½ x 8¼ inches; published by American Technical Society, Chicago; supplied by STEEL, Cleveland, for $2.75.

This is a comprehensive treatise on approved shop methods, including construction and use of tools and machines, details of efficient operation and discussion of modern production methods.

Production methods have enormously increased shop output and machines making this possible are diversified. The automotive industry has speeded development of precision work and development of high-speed alloys has increased speed of machining.

Yet, the authors state, with all this development of the machine the workman has not lost his skill.

The book considers in detail hand-operated tools, power-driven tools, modern manufacturing, air tools, the slide rule. It also gives instruction in laying out work, gear cutting, automatic screw machines and many other subjects.

By DEAN M. WARREN and A. R. FINLEY

Industrial Illumination

Studies by Illuminating Engineering society in lighting of machine tool and press operations are presented here. Position of light source relative to work affects visibility

This is the third of a series of articles on industrial illumination. The first appeared in STEEL of Jan. 22, 1940, p. 36, the second Jan. 29, p. 51

Part III

UNDER the auspices of the Illuminating Engineering society, studies have been made recently of lighting for intricate production, assembly and inspection processes, lighting of power presses and lighting for the machining of small metal parts.

A study of lighting for machining of small metal parts was conducted in the plant of Cleveland Graphite Bronze Co., 880 East Seventy-second street, Cleveland, which is considered well lighted according to present-day practice. In this plant, machinery, ceilings and walls are regularly painted and excellently maintained.

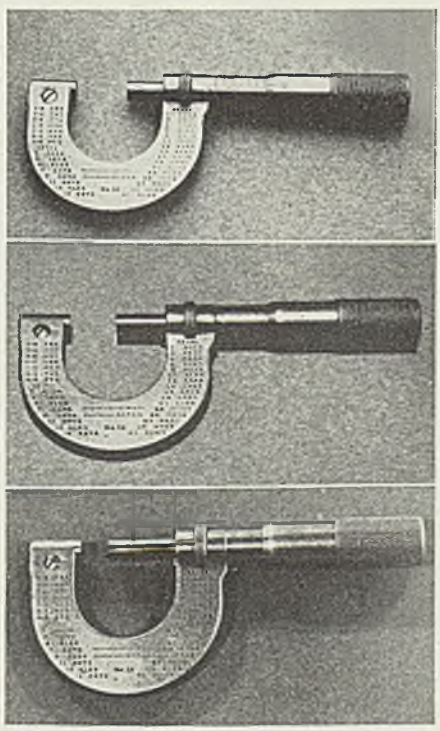
Study was confined to representative major operations including lighting for maximum visibility of flat steel rules, micrometer calipers, bench work, scales on machine tools, precision lathes, grinders, universal and vertical millers, shapers, drill presses, inspection of polished surfaces, blowholes and chatter marks.

A preliminary survey revealed that although the tool room was well lighted, men moved various seeing tasks about to avoid glare from specular reflection, particularly micrometer calipers, often shielding principal light source with their bodies or holding task in shadow. They apparently preferred a low-value diffused illumination to a greater quantity of direct lighting with its associated glare by reflection.

The seeing task in reading a micrometer scale is principally the observation of dark lines against a semipolished metallic background which functions also as a convex mirror and redirects light into eyes.

It was found that relative positions of light source to operator materially affected visibility. Size and brightness of light source also are factors. Best results were obtained, however, when a light source of large-area and low-brightness whose specular reflection on micrometer scale was a band of light of sufficient width to form a uniformly bright background for figures and divisions was employed.

Fig. 16. (Top)—Visibility of a micrometer scale under a large-area low-brightness light source. (Center)—Poor visibility resulted when a concentrated light source was used. (Bottom)—Visibility under the usual industrial reflector represents a compromise between the two sources above



High visibility was obtained because of good contrast between dark figures and bright background as well as absence of reflected glare.

Although the same footcandles of illumination were available from a concentrating source, appearance of micrometer barrel was greatly different, see center Fig. 16. Reflection here was a narrow, brilliant, glaring band obscuring remainder of micrometer because of harsh specular reflection. It was noted that due to the relatively small size of the usual direct-type industrial reflectors in use for general lighting, the most general appearance of a micrometer caliper is as at bottom in Fig. 16. This represents a compromise between the ideal at top, Fig. 16, and the poor lighting at bottom, Fig. 16.

In course of these studies, a curious and significant fact was brought out. More light from a large area source on a convex scale actually can decrease visibility. In this test, illumination was increased by lowering the light source—that is, decreasing distance between source and work. Results indicated that for a source of given brightness whose reflection forms a background of detail to be seen, visibility decreases as illumination is increased. This sounds paradoxical, but an explanation is that dirt and grease, etc., of an appreciable reflection factor have lodged within the cut detail. On increasing the illumination, brightness of the matte material increases in proportion but brightness of background remains constant, being proportional to the source brightness. Contrast, therefore, is lessened and consequently the visibility is decreased. This example serves to show the folly of installing lighting without a full realization of all factors involved in performance of a seeing task.

Another interesting observation was that typical open-type indus-

trial reflector in the vicinity of the work reduced visibility to a considerable extent, even though principal component of illumination was supplied by a source of large area and low brightness. When light from the diffuse large-area source was 10 footcandles and from the glare source 18 footcandles—total 28 footcandles—the visibility meter read 2.1. It was found that adding more light from the large-area source but keeping the glare constant increased visibility very slowly, an increase to 20 footcandles raising visibility to 2.5. In other words, a 100 per cent increase in light from large-area source increased visibility only 19 per cent. Similarly, in going from 20 to 50 footcandles on the large-area source, a 150 per cent increase, visibility was raised only 8 per cent. Another 100 per cent increase, in large-area source, from 50 to 100 footcandles, raised visibility another 11 per cent. Summing this up, increasing footcandles 1000 per cent from 10 to 100, keeping constant the 8 footcandles from the glare source, increased visibility only 43 per cent.

Survey Entire System

Results of this experiment indicate that when installing supplementary lighting, the entire system should be surveyed to insure getting the maximum value from supplementary lighting.

Top Fig. 17 shows appearance of a steel rule under a typical system of industrial reflectors, and bottom, under a light source of large area and low brightness. Here the seeing task is the observation of numbers and divisions cut into a semi-polished metal surface functioning as a mirror. Best visibility was obtained when the background was bright by reason of its mirror-like reflection of the luminous surface of a large-area low-brightness light source. It is important that the source of illumination be of sufficient size and so located that its image will be reflected by the entire section of rule.

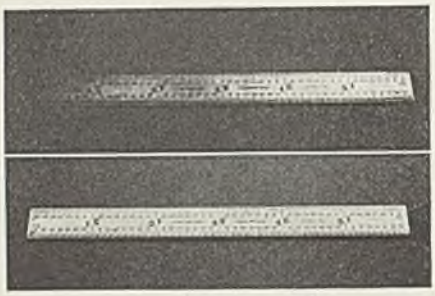


Fig. 17—Top illustration is a rule under a typical system of industrial reflectors. Below, the same rule under a large-area low-brightness source

Benchwork also studied in this survey was extremely varied in character. The tasks, however, may be considered as layout work and hand finishing. Probably the most difficult visual tasks are scribing and reading of rules and micrometer calipers. If lighting is adequate for these, it suffices in most instances for other tasks. In scribing work, metal usually is treated with copper sulphate and commercial dyes, or is scribed untreated. Pieces of steel representing these conditions were scribed and placed under different types of lighting. Appearance of these blocks under the different kinds is shown in Fig. 19. Blocks in left column are untreated; in center column they are treated with copper sulphate; in right column, they are treated with a commercial dye. Top Fig. 19 shows these lighted by a directional light source and oriented for maximum visibility. Obviously this method is not practical since it is not always possible to move the work around to find the exact position for maximum visibility. This approximates conditions under the average directional nondiffusing-type reflector. In center illustration, work is normal to line of vision. This clearly is not always possible. Bottom photo shows results obtained when a low-brightness large-area source is employed. This, of course, is the practical solution as it requires no attention to position of work. Appearance of work under such a light source and typical recommended lighting fixture are shown in Fig. 18.

Fig. 18. (Top)—Large-area low-brightness source of light for a metal-working bench. (Below)—Appearance of scribed lines under such a light source

Studies on lighting of machine tools centered mainly on indicating circular scales, micrometer collars, graduated tailstock spindles, etc.

Lathe Scale Lighted by Reflectors

Fig. 21, left, is crossfeed micrometer collar of a lathe lighted by a general system of industrial reflectors. The directional nature of these reflectors is shown by the sharp shadows and sharply illuminated parts of the convex and spherical surfaces. Fig. 21, right, shows improvement in visibility following lighting by a large-area low-brightness source.

On micrometer collars with 100 divisions indexed by tens, a band of reflected light should cover a sector of at least 36 degrees to cover a minimum of 10 numbered divisions. Circular scales usually indexed every 10 degrees are well illuminated if a band of 10 degrees is fairly visible. Position of light source should be selected so its reflected image will be centered at about stationary index of collar.

In some cases, improved visibility of vertical or inclined graduated machine scales can be obtained by installing a small reflecting surface adjacent to scale and at a 45-degree angle with horizontal. Fig. 20 shows reflecting collar applied to a graduated speed indicating dial. Center picture is lighting of dial

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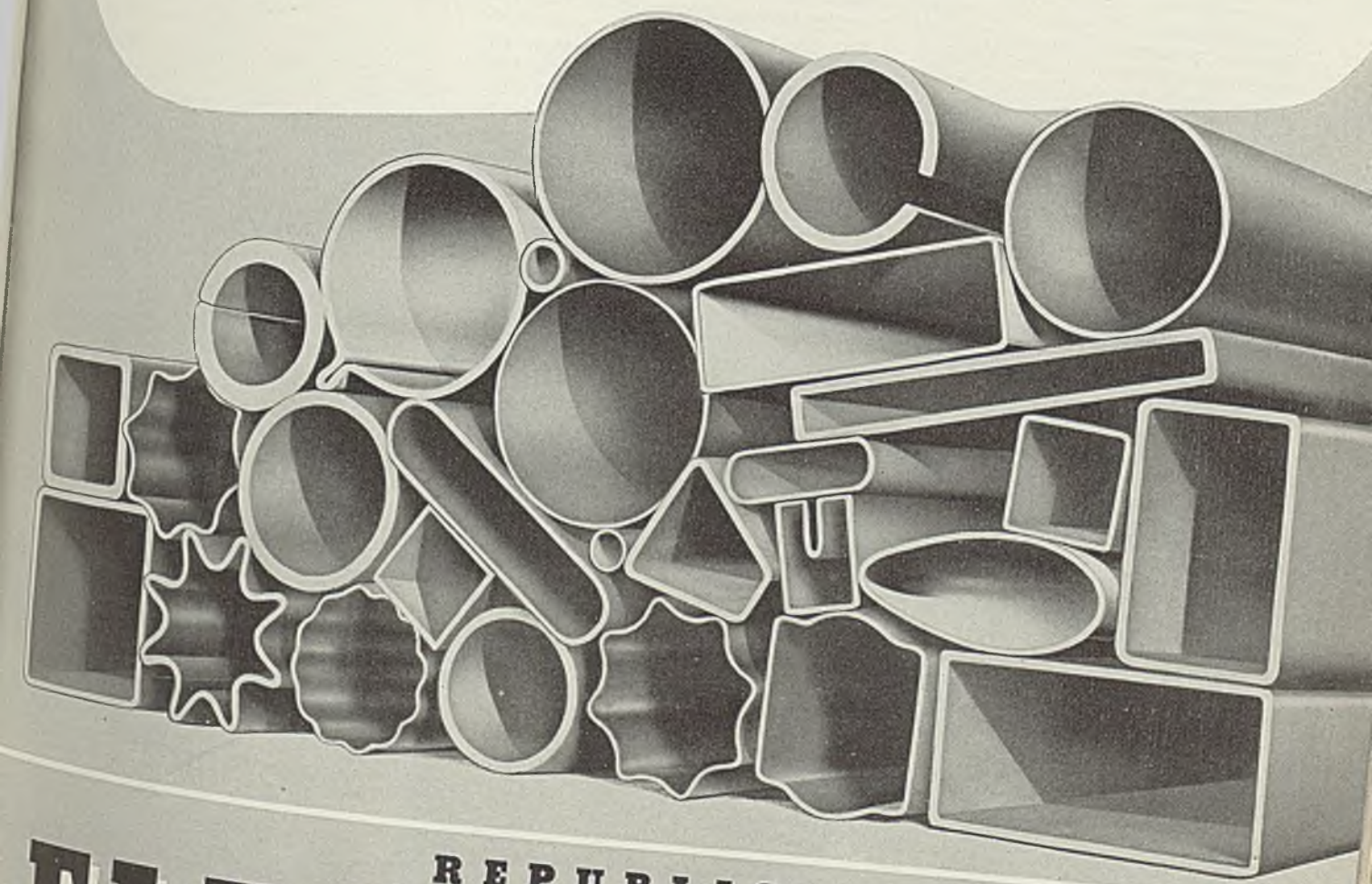

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before and bottom, after installation of reflecting collar. A durable matte surface of high reflectivity is most satisfactory for this reflecting collar. Judicious application of these reflecting collars as secondary light sources helps to make the operation of these machines a less difficult visual task.

A further point brought out in connection with lighting of machinery was color of machine frames adjacent to indicating dials. It was found in case of power press frames that when frames were painted green, reflection factor increased to 25 per cent, as compared with 6 per cent for ordinary stock paint.

Light Background Best

Inspection of mirror-like concave semicylindrical bearing surfaces presents considerable difficulty. Blowholes, scratches, dings and pits, usually are seen best by contrast against a light background. Size and position of light source are most critical. In observance of the 10 to 1 ratio of brightness in field of view, it must be remembered that if a higher brightness of the polished metal surface is needed for the recognition of these defects, it may be necessary also to lighten surroundings such as top of work bench, etc.

Chatter marks cause a series of ripples on a polished surface. These can best be identified by use of a low-brightness large-area luminous panel upon which several parallel black lines are superimposed. Reflected images of these straight lines from polished surfaces will be wavy if chatter marks are present. Good visibility also is obtained with a matte white surface panel upon which parallel black lines are drawn, providing panel is uniformly lighted from a source shielded from eyes of inspector.

Visual task incident to grinding is not particularly severe, but visibility in one instance was improved by placing an insert of high reflectivity inside hood which is drawn over work during grinding and painting interior. Hinged at rear, hood is raised during setting-up operation and advantage is taken of this painted interior as a reflecting surface. Grinder also was painted a light buff to help illuminate scales on headstock.

This study revealed that the modern machine shop with its finishing machines, highly polished scales, spherical handles and rails on which various parts of machinery move, requires special lighting to insure efficient operation.

Lighting of Power Presses.—With the slow press speeds and large stampings of larger presses, there usually is little die damage caused by doubling or misplacing of work in the dies. Operators, however, like to be able to see stampings in dies open. This often gives an indication of approaching die trouble and eventually saves time if the fault can be remedied before reaching proportions dangerous for work.

When repairmen are working on a die, they stamp a piece to get an indication of the trouble, repair die, then stamp another piece to check their work. This is continued until good stampings are obtained. If just one stamping is saved by better lighting, it is a worthwhile investment since one steel fender blank, for instance, costs about $2 before any labor charges are added. A fender press equipped with two local units of 100 watts each and supplied with power costing 1½ cents per kilowatt-hour was lighted satisfactorily for about 83 working days of 8 hours each for the cost of one fender blank.

To facilitate investigation, presses were divided arbitrarily into two classes, small and large. Large presses are those generally found in automobile plants for production of body panels, fenders, tops and other large stampings and generally require two or more operators. These require adequate illumination. On small power presses, operators seemingly work by sense of touch when placing material in the dies; actually, seeing is important in their operation. They see the stock before it enters die and finished piece as it leaves. They also must see that no foreign material remains in or on the die surfaces. In many cases, small presses operate at exceedingly high speeds and consequently the seeing task

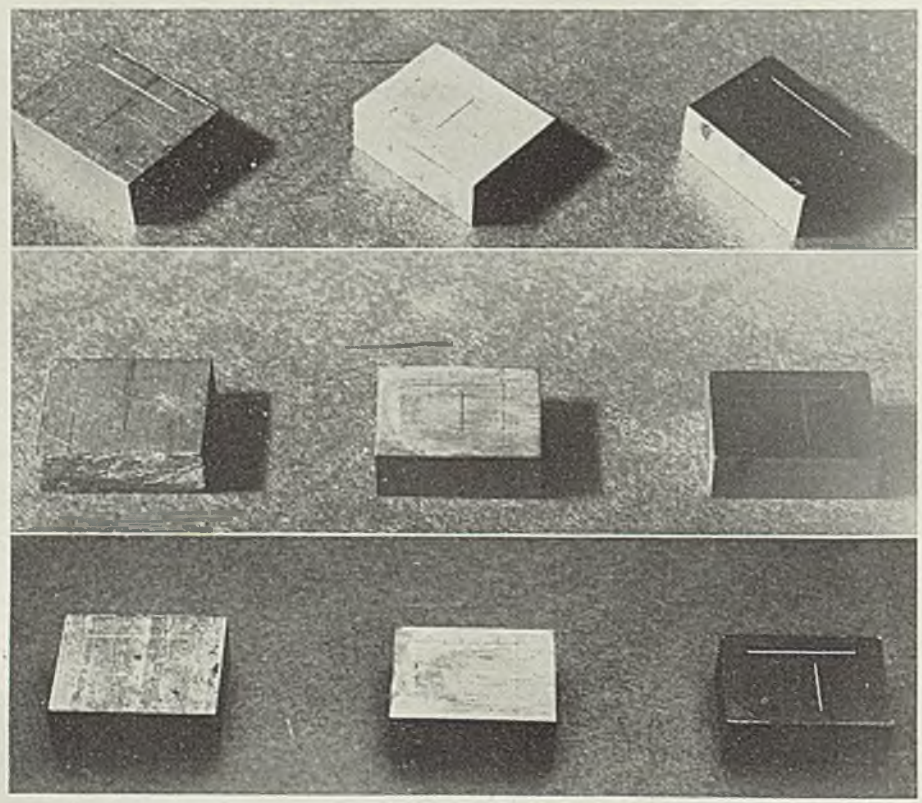


Fig. 19—Appearance of scribed lines under a directional light source and oriented for maximum visibility, at top. Center, work is placed normal to line of vision. Bottom, the same blocks under a large-area low-brightness light source

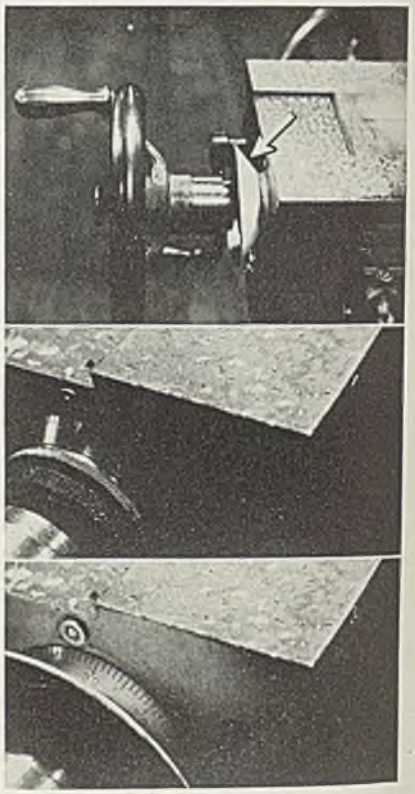


Fig. 20. (Top)—Reflecting collar applied to a graduated speed indicating dial. (Center)—Visibility without collar. (Bottom)—Visibility with reflecting collar

becomes difficult due to the short time interval between operations.

One of the most common operations with small power presses is shearing or blanking. Material usually is steel sheet of about the same color and reflection factor as the die, thus creating conditions of low contrast. This low visibility increases possibility of failure to see splinters in die which would cause damage to die or even to press.

Light for press operations, as for others described here, should come from two sources: General overhead lighting to illuminate areas in front of presses, stock and materials handling; supplementary lighting to increase level of illumination on die surfaces. Here, as elsewhere, selection of incandescent filaments or gaseous tube sources for general lighting is primarily a matter of individual choice governed by local conditions.

Angle of Light Optional

Supplementary lighting can be supplied from either front or operating point or from behind press, preferably back of press when possible. Lighting unit should be attached directly to press frame by a suitable hanger so light falls directly upon die surfaces.

For mounting behind press an angle-type reflector, either circular, rectangular or elliptical in shape, having a relatively wide, smooth distribution, is desirable. Unit should have a maximum beam candlepower of 300 to 350 maintained over an angle of 70 degrees and should be located above die, away from spray of drawing compound incident to closing of press and from flying metal when die is stripped by compressed air. Advantage of rear location is that lighting unit will not interfere with die changes made from front of press, thereby minimizing readjustments and mechanical damage to the unit. A 100-watt lamp in such a unit at back of press provides an initial illumination of as high as 30 footcandles in some dies, somewhat higher than recommended values because of high depreciation of light output encountered in this type of work.

When unit cannot be mounted on back of press, a deep supplementary lighting unit such as a projector lamp, can be used in front. Fig. 22, left, shows die with level of general illumination of 10 footcandles in front of press and illumination on die surface of less than 1 footcandle. Fig. 22, right, shows improved visibility with a new unit which stepped up light on die surfaces to 27 footcandles.

It is further recommended that inside of press frames be painted a flat white to improve seeing conditions by increasing contrast between stampings and background.

It is estimated that with energy cost of 1½ cents per kilowatt-hour, saving of one shut-down and one die repair will purchase sufficient energy to light fifty presses, each with a 100-watt lamp, for a period of 14 working days of 8 hours each.

In large power presses, dies are too large for mechanical or air-jet strippers and must be stripped by hand, thereby minimizing chances of dies not being cleared. However, when stampings are removed from dies, operators inspect for tears and wrinkles. Dies also are inspected for foreign matter.

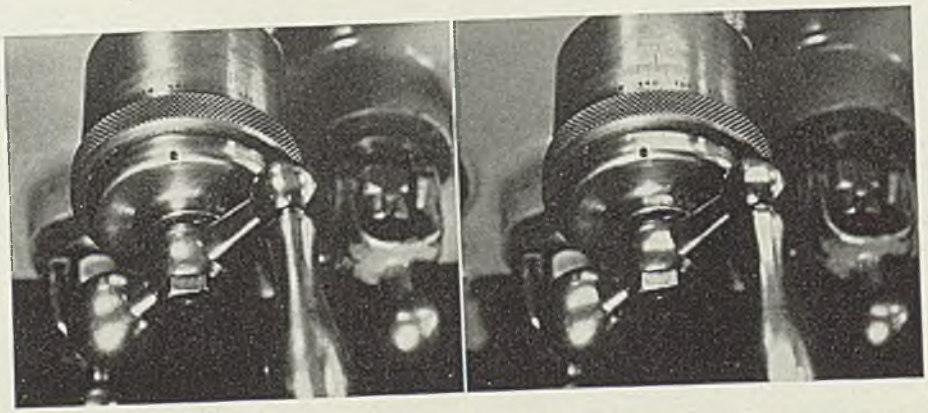
After dies have been set, continual maintenance, known as "die spotting," is necessary. This involves seeing and feeling. When retouching a die, spotter applies a layer of Prussian blue to section in question, operates press and looks for rubbed off spots in the blue which give location of high spots. Spotter must be able to see well to grind accurately. Spotting often incurs expensive delays. The better the light, the less time is needed for spotting, and production costs are lowered.

Layout of the general overhead systems should again be considered for conditions found in the pressroom. Probability of moving presses is not so great as for the smaller equipment, but in most instances presses are located in areas where lighting units must be mounted 40 to 60 feet above floor to clear cranes. Since large presses are operated from both front and rear, a general illumination of not less than 10 footcandles at the floor is desirable over entire area. A symmetrical layout of high-bay reflectors and deep-bowl type reflectors on underside of crane to offset blocking of overhead lighting equipment by the crane is recommended.

Satisfactory supplementary lighting for dies also can be accomplished by units mounted on corners of presses just above die. Type of unit recommended is the 100-watt concentrated industrial spotlight having a polished reflector and a clear or lightly stippled cover-glass projecting a 1500 to 2000-candlepower beam with a spread of 30 to 40 degrees. If clear cover-glass is used, unit should be fitted with louver rings to prevent glare to operators working at adjacent corners. A gasketed cover on glass helps reduce maintenance due to oil and compound used on presses.

Mounting height above the die opening must be carefully chosen to

(*Please turn to Page 75*)



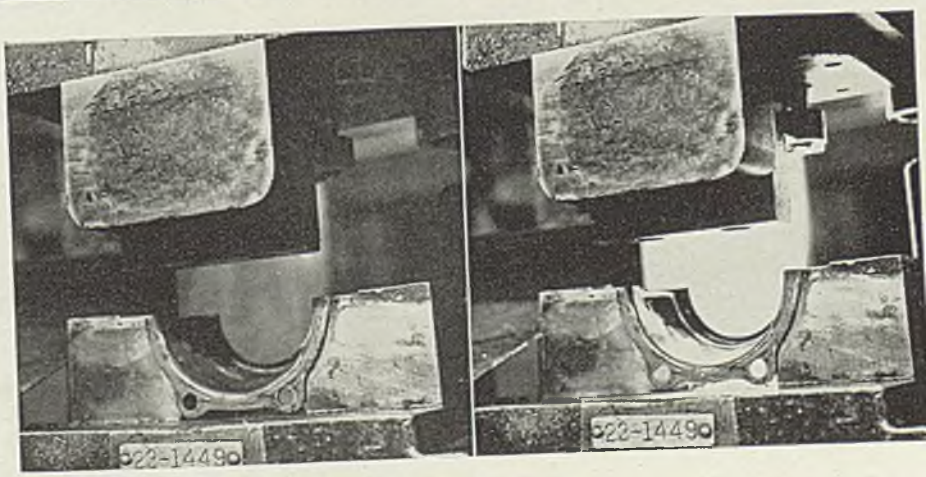


Fig. 21. (Top)—At left is a crossfeed micrometer collar of a lathe lighted by a general system of industrial reflectors. At right, improved visibility following installation of a large-area low-brightness light source

Fig. 22. (Bottom)—At left, with a general level of illumination of 10 footcandles in front of this press and die, there was less than one footcandle on the die surface. At right, improved visibility with a new source which stepped up illumination to 27 footcandles on the die surface

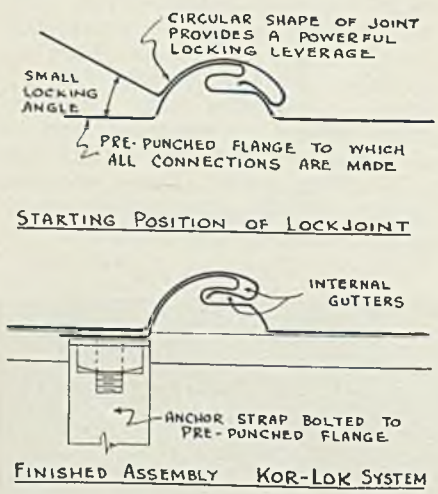
Porcelain Enameled Roof

■ A BUILDING with a porcelain enameled steel sheet roof has been erected at plant of Ferro Enamel Corp., 4150 East Fifty-sixth street, Cleveland. Stack, gables, gutters, window sash and doors also are finished in porcelain enamel.

Sheet for this roof was dipped in ground coat enamel, dried and sprayed on the "weather" side with a special weather resisting enamel to make a coating highly resistant to impact. Main portion of roof is standard-size sheet and remainder is sheet cut to size. No serious chipping of porcelain enamel resulted along cut edges since only a thin coating was used on sheet.

Roof sections are interlocked by a system developed by Kor-Lok Co., Union Commerce building, Cleveland. All bolt heads are concealed by the overlapping sheet and sheet is fastened to structural purlins by anchor straps going around purlin or clipping to purlin toe.

One side of sheet metal roof section is shaped to lock into preceding section and other side has recesses to receive next section and also has a row of holes in outer edge for bolting section to anchor strap. Illustration shows small locking angle required to assemble sections. Internal gutters in interlocking joint trap and drain water.



Sections of this porcelain enameled steel sheet roof were interlocked in place by lockjoint shown here. All roof fastenings are concealed and protected from the weather

If underside of this type of roof is not covered by a secondary facing material, such as plywood, celotex board, etc., it is possible to finish underside of roof sections in white porcelain to give white light reflectance values of 70 to 75 per cent. To clean roof it is only necessary to wash with soap and water.

This type of roofing seems to have a wide application in those industries where process fumes are severe and where a light reflecting ceiling is needed.

Metals Examination By Physical Methods

■ *Physical Examination of Metals, Vol.* 1, by Bruce Chalmers; cloth, 181 pages, 5½ x 8½ inches; published by Longmans, Green & Co., New York; supplied by STEEL, Cleveland, for $4.

The initial volume of this work deals with optical methods in the physical examination of metals; the second, now in preparation, will consider other branches of physics as applied to the investigation of metals.

While some physical methods of examining metals have been so generally adopted by metallurgists that they seem more metallurgical than physical, other physical methods have been developed which are virtually unknown to metallurgists unless they have had special training. The object of this work is to explain in as simple language as possible the physical theory underlying these methods, to describe the more important applications and, where possible, to describe the technique so the reader can apply it himself.

Geometrical optics is considered first, followed by wave optics, including interference and diffraction. Polarized light is discussed and a chapter is devoted to sources of light, pyrometry, spectrographic analysis and similar subjects.

Industrial Management Viewed as Profession

■ *Production Management*, by A. M. Simons; cloth, 597 pages, 5½ x 8¼ inches; published by American Technical Society, Chicago; supplied by STEEL, Cleveland, for $3.50.

Rise of the importance of industrial management through the past few years has been marked by increased attention in schools and universities and its literature has grown rapidly.

Society is so dependent on industry that its management must progress also, taking advantage of the experience of others who have pioneered successfully in the field. The profession is recognized as one requiring special training and those possessing it are displacing those who rely only on their own experience.

Material for this training is drawn from many fields. Within industry a growing number of engineers is applying laboratory methods to problems of handling materials, making and using machinery, location and erection of plants, transportation, application of power, care of tools, properties of metals and the best method of combining all these with the strength and skill of human beings into an effective organization. These investigators are discovering and stating in usable form a great number of laws governing the relations of these elements.

Corrosion-Resistant Treatment for Bearings

■ Fafnir Bearing Co., New Britain, Conn., announces a chemical treatment to render exposed parts of ball bearing transmissions corrosion resistant without changing physical properties or dimensions. Treatment forms a jet-black oxide layer penetrating 0.0002 to 0.0003-inch into surface of metal without changing external dimensions. This protective layer is claimed not to be affected by temperature and not to chip or peel.

According to United States navy salt-spray corrosion tests, seals, shields and collars so treated are 10 to 25 times more resistant to corrosion than untreated metal.

If all the cans were ONE BIG CAN

All tin plate manufactured each year in this country would make a single can large enough to hold New York City! That mammoth can would be approximately 7½ miles in diameter and 15 miles high! It takes that much tin plate to make all the cans for evaporated milk, soup, tomatoes, pineapple, fruits, beer, peas, corn, beans, dog food, paint, etc. that America uses every year.

This is only *one* use of steel. Our food, transportation, homes, clothing, amusements, national defense .... everything depends on steel for its material or on steel machinery for its construction. Steel, in turn, depends on *men* to make it right. Here at Youngstown we have invested millions to keep our mills as modern as science can develop. However, all the equipment in the world can't equal *men* in the making of fine steels. What we're proudest of at Youngstown are the men who are spending their lives making the finest steel that skill and care can produce.

★

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25-18C

FAIRCHILD AERIAL SURVEYS, INC., N.Y.C.

Handling Coils

Coiled strip now can easily be placed in and removed from close stacked piles as new type of multiple lifting magnet features uniqu design which prevents it from being attracted to nearby stack

Here a small cluster, or cloverleaf, magnet weighing only 2600 pounds is shown lifting a 9600-pound coil

By F. W. JESSOP
President
Ohio Electric Mfg. Co.
Cleveland

■ GROUPING of electromagnets for certain lifting applications, such as fastening two on a beam for handling pipe, is not new. In fact various combinations of conventional round and square magnets have been used for years. However, recently an interesting departure was developed for a particular type of application of interest to steel producers and users because of its unique advantages.

Coils of steel strip are produced in many different weights and with various inside and outside diameters. An important feature, however, is the fact that they are banded radially and therefore can be lifted with a magnet with entire safety, even though the top of the coil is not smooth.

Close Piles Desired

Raw coils in one instance weighed up to 10,000 pounds, had 20-inch inside diameter and not over 54-inch outside diameter. It was desired to pile them closely and to use a magnet for handling which could go down in between closely stacked piles.

These requirements resulted in the development of what is known as the duplex or three or four-cloverleaf groups of relatively small magnets designed to contact the metal in such a way as to take full advantage of its magnetic cross section.

Accompanying illustration shows

(*Please turn to Page 75*)

MORE POWER

for handling greater tonnage with Exide-Ironclad Batteries assembled in steel trays . . .

THE steel tray assembly in which Exide-Ironclad Batteries are now available saves so much space that it makes room for substantially greater battery power in the battery compartment of your truck. How much more power is indicated by a typical case in which 34% more power and 20% higher voltage were provided.

In terms of performance, this means increased speed and ease in handling today's heavier coils, greater pep and liveliness for your trucks, and more tonnage hauled per turn. The net result is to speed up production by speeding up the handling of materials.

In addition, there is the Exide System to improve your handling service further and cut costs as well. An analysis with special instruments assures you of the right Exide-Ironclad Battery for your needs. The Exide Discharge Indicator, mounted on the truck, guards against delays by flashing a warning when the battery nears discharge. The Exide Charge Control Unit on your charging panel automatically controls the rate of charge, then cuts the circuit and signals when the charge is complete. Write for new bulletin, "The Exide System for Better Material Handling."

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Irregularities in Metal Surfaces Given in Millionths of an Inch

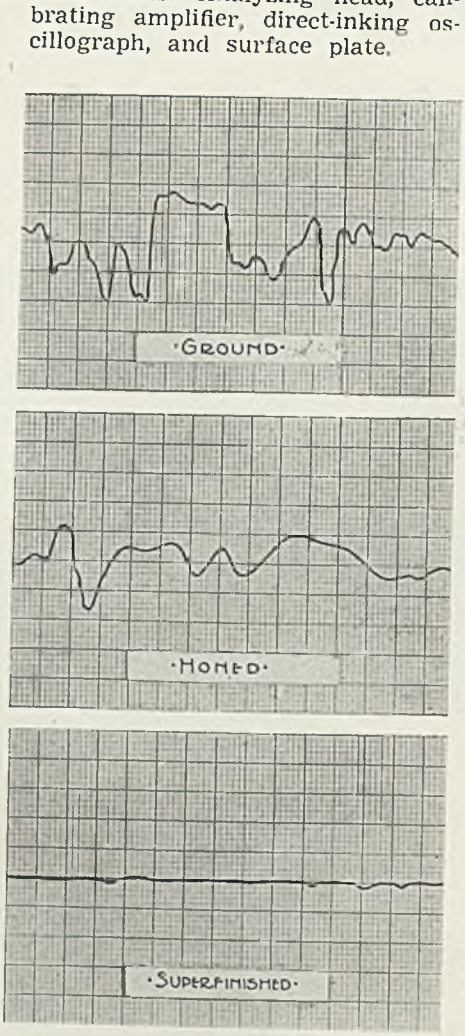
■ A NEW instrument known as the Surface Analyzer, developed by Brush Development Co., 3311 Perkins avenue, Cleveland, measures "topography" or profile of finished surfaces. Because of its unusual sensitivity, irregularities as small as one-millionth of an inch in ground, lapped, honed or superfinished surfaces can be recorded for purposes of analysis.

The instrument records actual depth or height, and form of irregularities. It also indicates whether irregularities are above or below the bearing surface and how many are within a certain area.

Measuring is accomplished by a lapped sapphire stylus which explores surface to be analyzed. Irregularities in surface displace stylus which in turn actuates a piezo-electric crystal. Small voltages generated by the crystal then are magnified by an amplifier to prevent sufficient voltage to operate a direct-inking oscillograph. Oscillograph includes a piezo-electric crystal which converts this voltage into pen movement, deflections of which are recorded in ink on a moving paper chart.

However, these deflections are directly proportional to those of the stylus on specimen surface, but magnified as much as one hundred thousand times.

The device operates directly from an alternating current power supply of 110 to 120 volts 60 cycles. For portability, it includes four separate units: Analyzing head, calibrating amplifier, direct-inking oscillograph, and surface plate.



This surface analyzer takes the "topography" of a metal surface and makes a chart recording of the variations in millionths of an inch. Sample charts are shown

Analyzing head includes sapphire stylus and calibrated piezo-electric crystal element. Stylus has a rounded tip of 0.0005-inch radius and is mounted in a protective tubing to which is attached a positioning shoe. This shoe locates stylus in a vertical plane and rides over a relatively wide area of surface to provide reference level. Tubing is attached to a freely pivoted arm suspended from a gear drive. Gear drive is actuated by motor operating the chart mechanism in the direct-inking oscillograph, and imparts either of two motions to the stylus: A rotary motion, describing a 0.050-inch diameter circle or a reciprocating motion, oscillating along a straight line 0.050-inch long.

Complete cycle of either motion takes 15 seconds. Analyzing head is mounted on a rigid stand providing both vertical and horizontal adjustment to accommodate various sizes of work.

A surface plate for mounting stand and work to be analyzed rests on four rubber mountings to prevent any possible transmission of vibration.

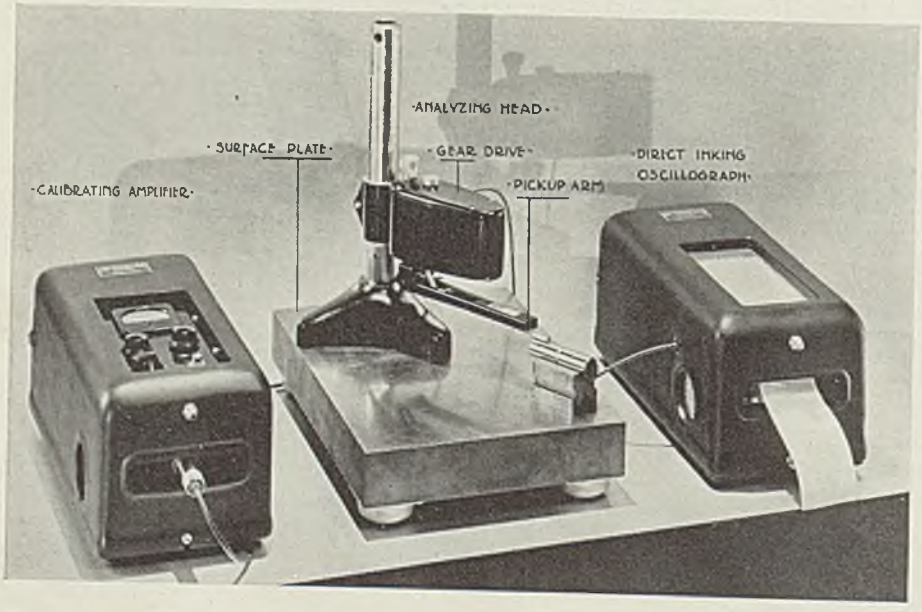
The calibrating amplifier provides various degrees of magnification in pen movement corresponding to surface irregularities: 100,000:1, 10,000:1, etc. Means also are provided for obtaining any desired deflection on oscillograph chart, accurately correlated to sensitivity of piezo-electric crystal element of analyzing head. In the most sensitive setting of amplifier, deflection on chart of oscillograph may be as high as 1/10-inch per millionth inch stylus deflection.

Records on Moving Chart

The direct-inking oscillograph makes an inked record on a continuously moving chart paper of magnified surface irregularities. Chart feed mechanism is driven by a 110 volt 60 cycle alternating current synchronous motor. This constant speed provides through a gear train three rates of feed as follows: 1/5-inch per second, equivalent to about 20 times linear magnification; 1 inch per second for 100 times, and 5 inches per second for 500 times linear magnification.

Pen of direct-inking oscillograph responds to 60 or more vibrations per second and has a maximum deflection on chart paper of ¾-inch on each side of zero axis. Piezo-electric crystal element driving pen has a thermostatically controlled heater for stabilization.

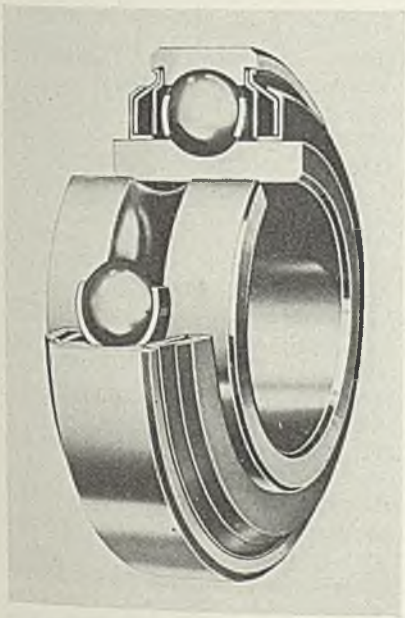
Representative charts shown indicate results obtained from different types of finished surfaces. The "topography" of a surface is shown and not simply the mean departure from a theoretically flat surface. Chart of superfinished surface shows that practically all irregularities appear below bearing surface, indicating these irregularities are small depressions in surface of material.



New Bearing Design Features Improved Mechanical Seal

■ MARKING an important step in bearing closures, Fafnir Bearing Co., New Britain, Conn., has developed a new seal design known as Mechani-Seal. It features unusually high sealing efficiency without the disadvantage of any mechanical contact between the parts of the seal. Thus no friction is generated or bearing wear produced.

An adequate closure or seal for small bearing mountings not only necessitates means for keeping the lubricant in and all foreign matter out, but also should permit easy assembly and disassembly without involving intricate or costly parts.



Mechani-Seal features new bearing made by Fafnir Bearing Co., New Britain, Conn.

While a number of ball bearings with integral sealing systems have been available for some time, there have been extremely few that did not require the designer to utilize supplementary sealing pieces in the housing. This problem was especially important under the extremely severe operating conditions experienced in many machines.

The Mechani-Seal design is an integral part of the bearing itself and provides a closure by actual test far more effective than previous methods. It requires only a housing of simple design with a minimum of machining.

Accompanying cutaway view of the new bearing shows how unusual seal efficiency is achieved without conventional felt seal or other contact material which would cause friction and heat. Two steel plate shields, widely separated to form a trap, serve as the innermost members. Both are attached to the outer bearing ring. Another steel plate, pressed on the bearing inner ring, acts as a slinger when this inner ring is rotating. Definite though extremely close clearances exist between individual members so nothing is added to total bearing friction. In addition, outer members are given a corrosion and rust-proof treatment.

During two years' testing of the Mechani-Seal design, more than 100 bearings equipped with this seal were tested under various speeds and conditions. A dozen different greases were used to make sure the seal did not pump grease from the bearing.

Typical of the severe tests applied was the cement-dust test where a bearing was mounted with a fan of reverse pitch in a box 12 inches square and 20 inches long. A few pounds of loose cement was dumped in, the box sealed and the shaft brought up to speed. The fan, revolving at 2000 revolutions, created a veritable tornado of dry cement which tended to score all surfaces which it contacted. Bearings tested under these conditions both in horizontal and vertical applications, both inner-ring-revolving and outer-ring-revolving tests, revealed that in no case did any dust enter the bearing itself.

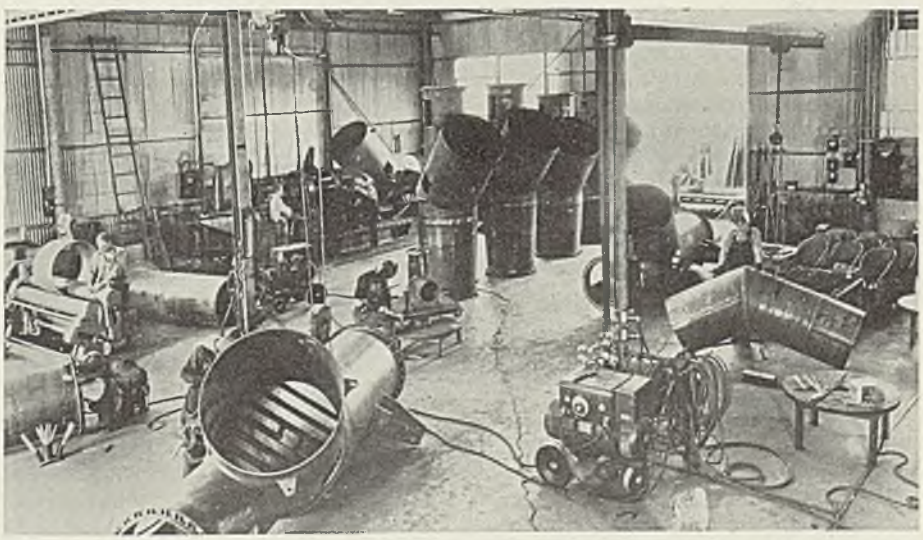
The new design is available at present in a number of different variations including single-seal, double-seal, seal-and-shield combinations, on either Fafnir, radial or wide inner ring bearings. Data sheets and literature are available from Fafnir Bearing Co., New Britain, Conn.

Corrosion-Resistant Rolled Alloy Sheet

■ Rolled sheets and plates of Hastelloy alloy C, a corrosion-resistant nickel - molybdenum - chromium-iron alloy, have been developed by Haynes Stellite Co., Kokomo, Ind., unit of Union Carbide & Carbon Corp., 30 East Forty-second street, New York. Plates weighing up to 100 pounds in practically any commercial thickness are available.

Alloy is claimed to withstand strong oxidizing agents such as acid solutions of ferric or cupric salts and aqueous solutions containing chlorine or hypochlorites. In rolled form, alloy is said to have a tensile strength in excess of 75,000 pounds per square inch and an elongation and reduction of area of about 15 per cent.

Large Pump Parts Arc-Welded



■ Thirty tons of these discharge elbows and base mountings for 16 Mixflor vertical pumps were shaped and fabricated from rolled steel plate by Pomona Pump Co., Pomona, Calif., for Contra Costa high-line canal, a part of the Central Valley water project. Mild steel and Cor-Ten steel plates and shapes varying from ¼ to 1¼ inches in thickness were used.

Both the cutting and trimming were done by oxyaceylene torch and welding with portable electric arc welding machines. Photo courtesy Hobart Bros. Co., Troy, O.

Surface Decarburization

Metallurgical laboratory research discloses that discrepancies between "apparent strength" and "effective strength" of fabricated steel automotive parts are caused by decarburized surface conditions

By L. A. DANSE

Metallurgist
Cadillac Motor Car Division
General Motors Corp.
Detroit

■ AT PRESENT we hear much critical discussion concerning the calculated strength of the various members of the European body politic. A great deal has been written regarding its thousands of men and guns and food and equipment. But only the test of actual service can prove the ability of the national machines to stand up and continue. Shock test is important, but the fatigue test of sustained and gruelling campaign is the real measure of men and nations. Only after such a test can definite and accurate judgment be made of effective strength.

Interestingly enough, this similitude carries into the mechanical arts and sciences exactly as it is evident in the social and political and military world. We have seen that without good social and political background, substantial military strength is impossible. Just so do we see that without complete knowledge, test and proof, the effective strength of a mechanical member cannot be depended upon—only apparent, or computed, strength is available. And this latter may be sadly misleading.

Surface Stresses Are High

Certain structural members used in automotive manufacture recently have come in for critical discussion. These members are such that they are highly stressed and yet it is desirable to keep them light in order to improve operating characteristics in addition to minimizing cost. This advanced design involves considerable increase of stress and the service the part undergoes is such that the maximum fiber stress, as it often is, is at the surface of a steel member.

Fatigue tests on various materials and heat treatments in the laboratory gave duplicable and definite results, but fatigue tests on fabricated car parts gave rather confusing and contradictory results. To clarify the situation, a complete metallographic and metallurgical investigation was undertaken. The microscope disclosed the cause of the early failure as being surface decarburization.

In other words, here was a structural member stressed at 150,000 pounds per square inch in the surface fibers, which surface fibers consisted entirely of free ferrite; which has a yield strength of perhaps 27,000 pounds per square inch.

By way of illustration, a comparison between two of the parts in fatigue testing may be of interest. The photomicrograph in Fig. 1 shows a part of average life in the fatigue test and the photomicrograph in Fig. 2 shows a part of good life in the same test. The fatigue test data for these two parts are shown in the accompanying table.

How could a design engineer take advantage of the metallurgical possibilities of the steel when the material was so fabricated that instead of being high carbon alloy steel in the troosto-sorbitic condition and with a brinell of 402 or higher the maximum stressed fibers at the surface of the member were iron, with some alloy, but having a brinell of about 90? Naturally, the service obtained from this sort of piece was not what might be expected from a study of laboratory strength and fatigue possibilities.

The design engineer was minded to change to another steel, but was rather chagrined when it was demonstrated to him that the steel he contemplated showed no better, if as good, physicals under similar fabricating conditions and with similar extent of decarburization. Following back through the fabricating processes, it was discovered that the supplier had expended considerable effort and a large amount of money endeavoring to minimize surface defects. Expensive control equipment and extensive modifications of furnace design had been installed and had brought about much improved surface appearance.

It was not until engineering laboratory fatigue tests were run that discrepancies were found between surface appearance and effective surface condition.

Now, no one, neither the design engineer, the fabricating metallurgist, nor the producing metallurgist, would expect pure iron to function satisfactorily when highly stressed. And the decarburized surface was only iron; not alloy high carbon steel as the interior was.

Trouble Cause Overlooked

Yet, here were three large industrial organizations engaged in the production, fabrication and design-assembly-manufacturing of a commonly known part; all of whom had passed up (until confronted by inability to obtain reasonable results in a life test) a condition which would not be tolerated, much less undertaken, by anyone of average intelligence.

Information concerning surface decarburization has been available in the literature for some time past. Discussions concerning this defect have been many and furious. Specifications for structural parts of not only high, but medium stress, have long required freedom from surface decarburization. Furnace equipment has been available and reams have

been written concerning the feasibility of producing, by the use of this special furnace equipment, parts free from "surface decarb."

Still, here existed a condition which was, to say the least, highly detrimental. The combination of circumstances which resulted in the troublesome condition may be peculiar; yet are they? Until brought to light through the effort to reduce weight and save material, as well as to improve functioning, the condition continued.

There is a commonly-current saying among metallurgists as to "What is the elastic modulus of a bubble?", when referring to shrinks, pipes, or other cavities or discontinuities. Worse yet, because decarburization is on the surface and not deep seated nor difficult of detection; "What is the elastic modulus of the iron surface of a high-stressed part?"

Heating Practice Is Faulty

Since the original work of the department of engineering research, University of Michigan, Ann Arbor, Mich., in 1930-32, great strides have been made in so-called "bright annealing", "scale-free heat treating", hardening so as to have parts "come out clean", etc. But not in all instances have the proponents of the various systems realized that in most parts, or tools, or material, the most desirable condition is that where decarburization is prevented, while holding scale at a minimum. It is not enough to prevent scale and minimize decarburization; what is needed to prevent decarburization and minimize scale.

Many of the gas-blanketing schemes which are proposed to cut out scale and produce bright work actually create more decarburization than if the work were run in the ordinary oxidizing atmosphere. Investigators have frequently pointed out that the ordinary fuel-fired furnace does a better job when it is kept "raw", or "lean" (that is, fuel on the low side) than when it is "rich" (fuel in the heavy or high proportion to air).

But this work, for some unaccountable reason, seems to have been confined to heat treating operations and has not been applied to forging or rolling mill heating. It would seem that, with the higher temperatures maintained in the rolling and forging furnaces, there would be greater need of special precautions to prevent decarburization than there is in heat treating.

Of course, on finished parts or tools, the working surface must be protected and maintained. That much is self-evident. But many highly-stressed members are worked in the "as-forged" or "as-rolled" surface condition. These parts should have the same thought and consideration and care as the parts commonly referred to as "finished."

The degree of care exercised in guarding against decarburization should be in direct relation to the stress or wear imposed in service. It should not be influenced by, nor bear any relation to, the surface appearance of the part. Just as many pains should be taken to prevent decarburization as to prevent nicks, dents, notches, sharp shoulders or other surface defects.

This new thought on an old difficulty offers possibilities of immense savings in weight of highly stressed parts, by making available in production practice the strength possibilities of the steel as computed by the engineer and checked by metallurgical laboratory tests on prepared specimens.

Three bulletins of the department of engineering research, University of Michigan, Ann Arbor, Mich., first pointing the way toward a solution of the problem discussed in this article should be mentioned in view of their generally helpful nature. These are listed not in the nature of a bibliography but simply to point the way toward a solution of other problems of similar nature:

Bulletin No. 18. "Surface Decarburization of Steel at Heat Treating Temperatures," by W. E. Jominy.

Bulletin No. 21. "Influence of Atmosphere and Temperature on the Behavior of Steel in Forging Furnaces," by D. W. Murphy and W. E. Jominy.

Bulletin No. 25. "Scaling of Steel at Heat Treating Temperatures," by Claire Upthegrove.

Fatigue Test Data on Automotive Parts

Photomicrograph No.	Life	Number of Cycles	Brinell Hardness No.	Decarburization, Inches
Fig. 1	Average	83,000	415—444	0.0016
Fig. 2	Good	144,000	415	None

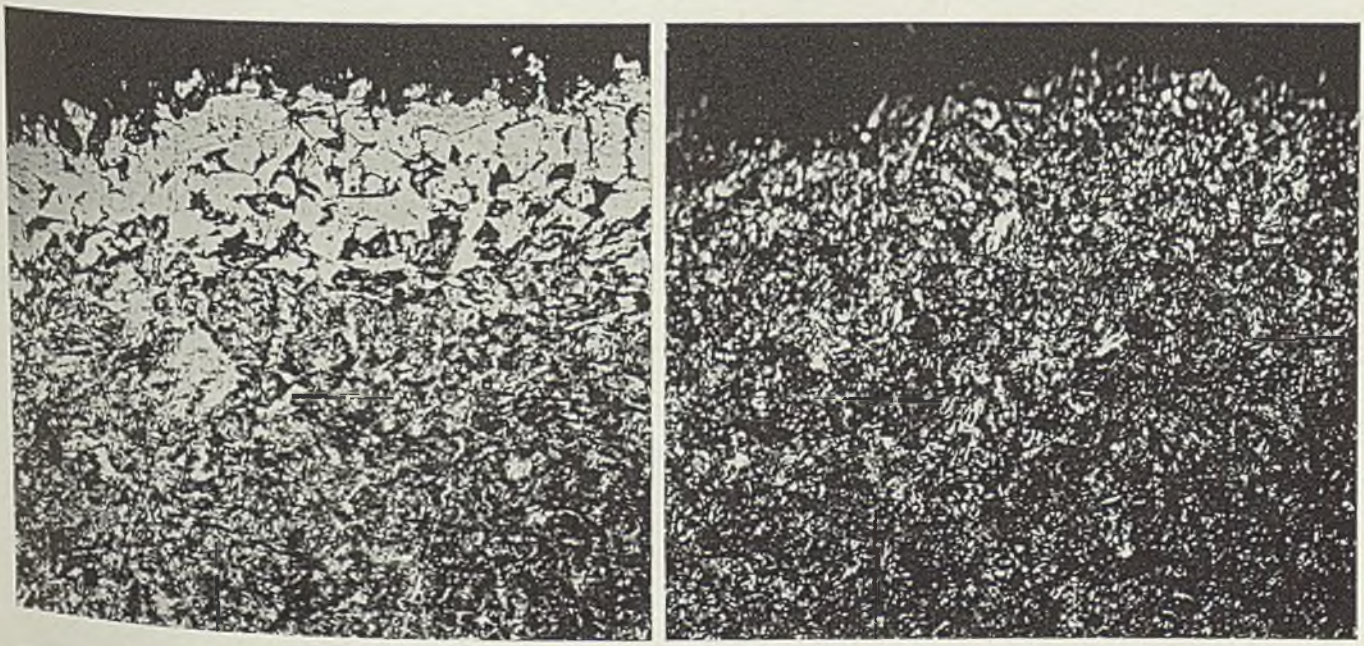


Fig. 1 (left)—The automotive part from which this photomicrograph was made gave only average life in the fatigue test. Surface decarburization amounted to 0.0016-inch. Fig. 2 (right)—The part from which this photomicrograph was made gave good life in fatigue; the surface showed no decarburization. Magnification 500 diameters

Carbon Determination Method

Open-hearth operators now have at hand a rapid, simple, inexpensive and accurate method of determining carbon content of the bath. Equipment unaffected by mill vibration and stray magnetic fields

By H. K. WORK
And
H. T. CLARK
Jones & Laughlin Steel Corp.
Pittsburgh

■ RECENTLY the magnetic determination of carbon content of steel at the open hearth has been found a most important aid to the furnace melter. The new method is sufficiently accurate to fill a need of the industry, is relatively inexpensive, requires little upkeep and may be used in the open-hearth shop in any reasonably clean location.

The accuracy of determination on a single sample is good, while the average of three or more samples taken in rapid succession is highly accurate.

This method was developed originally to facilitate operation of the pilot-sized open-hearth furnace in the Jones & Laughlin research development laboratory. In this small furnace with its shallow bath, the drop in carbon is accelerated, so a rapid reliable test for carbon content is indispensable.

That there is a direct relation between carbon content and magnetic permeability of specimens was recognized as far back as 1839. In fact, a number of tests had been made to determine the carbon content of steel by determining and calibrating a relationship between these two factors.

From paper presented at Chicago meeting of American Institute of Mining and Metallurgical Engineers, October, 1939.

Methods by which fundamental magnetic quantities may be measured have been known for many years. The Carbanalyzer described here is a special form of permeameter which measures the changing flux in a bar produced by a known change in magnetizing force. The change in magnetizing force in this case is produced by reversing the current in the magnetizing coil. The absolute values of permeability and magnetizing force here are of no interest, however, as attention is paid solely to galvanometer deflections for reversal of a given magnetizing current. These deflections are calibrated in terms of carbon content. Main objectives in designing the present instrument have been accuracy in reproducibility of results, ease and speed of operation, and simplicity of equipment.

Fig. 1 shows the electrical circuit employed. Coils 1 and 2 are the primary and secondary of a special induction coil. Current in solenoid coil 1 is supplied by battery 7, measured by meter 3, controlled by rheostat 8 and reversed by switch 5. Switch 4 permits the same meter to be used in setting the steady current in the primary circuit and also as a ballistic instrument to read the induced current in the secondary circuit. It is a millivoltmeter, designed to be short circuited by switch 9 in the normal position. This protects the meter during the several reversals of current necessary to put the specimen in a standard state. Switch 9, when pushed down for reading, releases

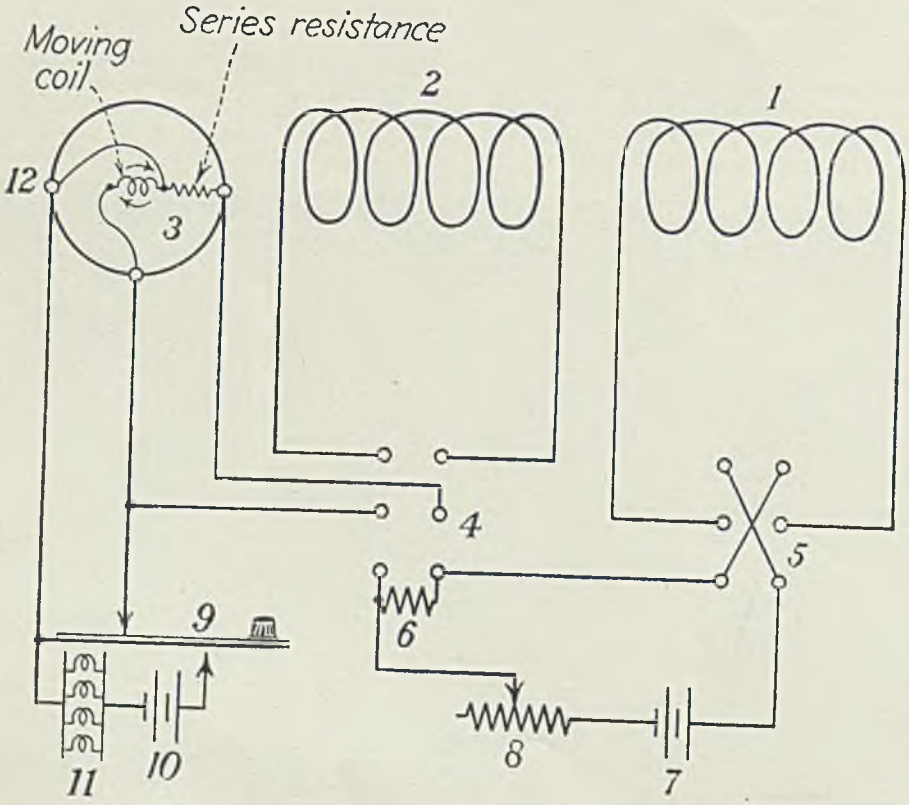


Fig. 1—Electrical circuit of the Carbanalyzer. One meter is used to set primary current and to measure the transient which is induced in secondary circuit when primary current is reversed

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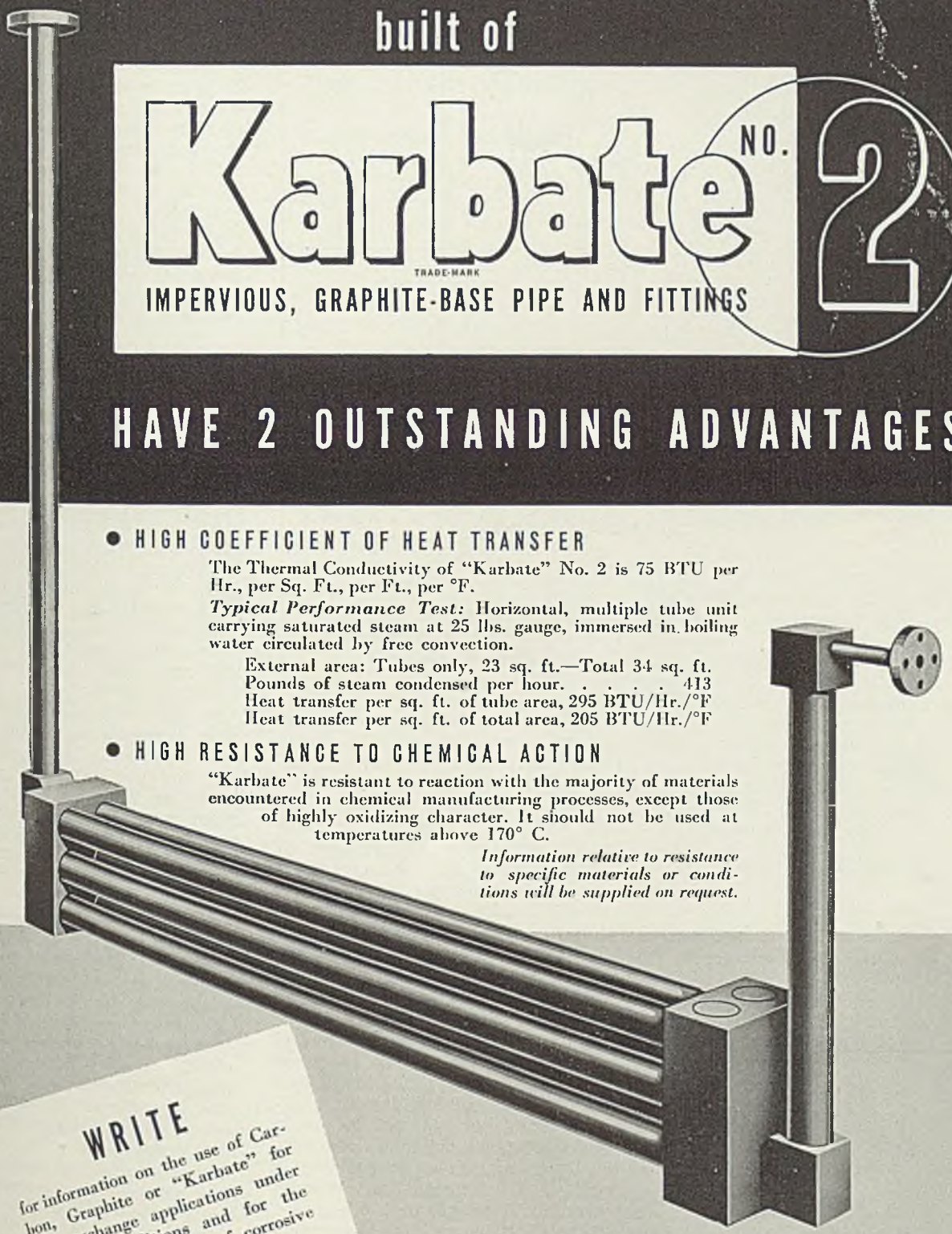

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Typical Performance Test: Horizontal, multiple tube unit carrying saturated steam at 25 lbs. gauge, immersed in boiling water circulated by free convection.

External area: Tubes only, 23 sq. ft.—Total 34 sq. ft.
Pounds of steam condensed per hour. 413
Heat transfer per sq. ft. of tube area, 295 BTU/Hr./°F
Heat transfer per sq. ft. of total area, 205 BTU/Hr./°F

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the meter and lights a group of flashlight bulbs, 11, above the meter scale.

The millivoltmeter has a fairly rapid motion when used as a ballistic instrument, does not require leveling, holds its zero setting well, stands up in portable usage and may be read accurately by the small 2-power reading glass mounted above its face. Also the meter is not affected by normal mill vibration.

Magnetic circuit shown in Fig. 3 is closed when the specimen is inserted, thus eliminating effects of stray magnetic fields. The primary and secondary induction coils are wound on a hollow bakelite form and held in position between the two heavy steel plates forming vertical sides of the yoke. The cylindrical specimen is thrust through the holes in the yoke to rest in the core of the coil. Specimen may be inserted and withdrawn readily.

Repeated tests on the same specimen have demonstrated that the readings are reproducible, evidence that the same magnetic coupling is obtained each time the specimen is inserted. Size and shape of specimen may be varied through relatively wide limits, although only specimens of the type for which the machine was calibrated should be used.

Since one machine may be required to follow at the same time two or more heats with widely different carbon contents, the Carbanalyzer is designed to take alternate readings on high-carbon and low-carbon samples with no change in the instrument. The deflections do not overlap and accuracy is quite satisfactory.

In studying magnetic characteristics of specimens quenched under various conditions, it was found that a delayed quench was satisfactory for steels with carbon content below 0.40 per cent but that readings were not sufficiently selective for higher contents. A rapid quench then was tested for the range from 0.20 up to 1.50 per cent carbon and the results indicated this method gave selective values from 0.35 to 1.50 per cent carbon or higher.

Fig. 2—Carbanalyzer as used by Jones & Laughlin Steel Corp. Photo courtesy Fisher Scientific Co., 711 Forbes street, Pittsburgh

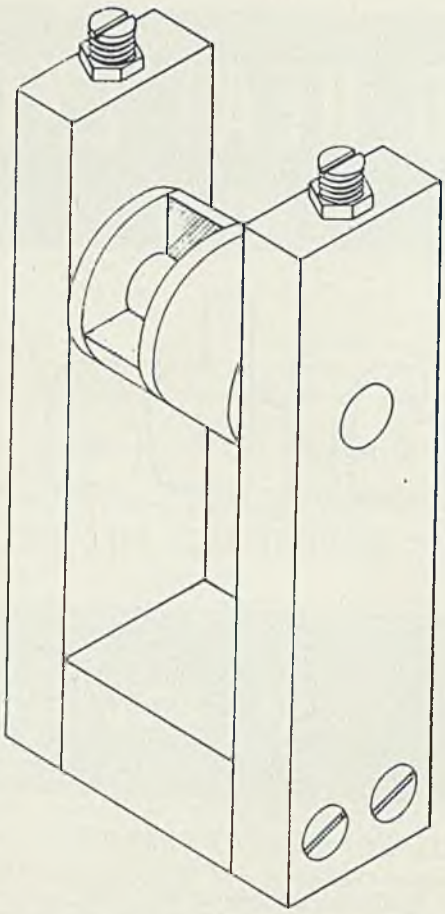


Fig. 3—The magnetic unit, showing construction and arrangement of the magnetic elements

Procedure now used in testing is as follows: A sample of metal is taken from the bath, killed with a measured quantity of aluminum and cast in a split mold. The specimen is removed from the mold and quenched immediately for high carbon content, or left in the mold for a predetermined time—one minute—and then cooled in cold water for low-carbon steel. Steels known to contain from 0.30 to 0.50 per cent carbon, but where the amount is known only approximately, are tested by each procedure. Then the appropriate range in carbon value is selected from the two readings. It is standard practice to break each sample after a reading has been taken to be sure the internal structure is sound.

In developing the instrument, a portable model was used in the Jones & Laughlin open-hearth shop and several minor changes in design developed to improve accuracy of the readings.

Data taken to calibrate and check these instruments have shown 94 out of 112 samples to check within plus or minus 0.02 per cent carbon of the value determined by chemical analysis.

Of course it is obvious that calibration curves will be shifted for steels containing nickel, chromium, etc. It is necessary to calibrate the instrument for individual conditions for type of steel being handled.

Temperature changes cause the magnetizing current to vary slightly, but the instrument is easily returned to correct calibration by resetting to the correct value of steady current.

Pittsburgh Open Hearth Men in Seventh Meeting

■ INCREASING use of basic brick for new open-hearth applications was noted at the seventh meeting of Pittsburgh district open-hearth men, Jan 26. The conference was sponsored by the national open hearth committee of the American Institute of Mining and Metallurgical Engineers and conducted by the local committee. Attendance was about 120. Discussion was informal and based on questions submitted in advance.

Three general topics were covered—refractories, steel melting and oxidation. Refractory discussion brought out many new viewpoints on basic brick. It was indicated with the completion of recent campaigns at local plants that new economies have been effected through the use of basic brick for roofs and front walls.

Future developments in brick were outlined. It was stated that brick for ordinary use in the near future would support a load of 50 pounds per square inch at temperatures of around 3100 degrees Fahr. Some brick having these qualities already are in service. Performance and life of sea-water magnesite was discussed, with the consensus showing this product to vary little from other types.

Considerable disagreement arose over the value of automatic control. Opinion was expressed that closer attention is paid to the melt and to the checker temperatures without control than when automatic systems are used. Other testimony showed refractory life is lengthened under automatic control.

Development and operation of a new type drainable slag pocket was described. Slag control came in for considerable discussion although no new developments were reported. Minimum necessary FeO content

of slag to insure good rimming steel evoked considerable argument and little agreement.

Steel pouring practice at Bethlehem Steel Co. was outlined in a paper presented by E. H. Hollenbach. After quickly sketching development in the art of pouring steel, Mr. Hallenbach emphasized the complete control of this phase of steelmaking now held by metallurgists. Citing the many variables included in the pouring process, he stated there can be no one ideal method. Constant attention and close control of all factors by skilled men is the only successful answer. Some factors in the process still can not be controlled by scientific methods, and trial and error is the only resort.

Cleaner pouring and the many factors involved therein were discussed. Use of sinkheads, hot tops and insulating material was recommended to aid in cleaner pouring. Ingot mold design, according to the speaker, is more important in high-quality steels than in ordinary material, which probably accounts for the more widespread use of fluted, big-end-up ingot molds in the quality field.

Study of all requirements, which differ widely between plants, is the only possible procedure by which the method of handling the various pouring variables can be determined for any given plant.

Stresses Importance Of Industrial Health

■ *Industrial Health*, by Dr. C. O. Sappington; 244 pages 5¾ x 8¾ inches, with appendix of examination forms; published by Industrial Commentaries, Chicago; supplied by STEEL, Cleveland, for $3.75.

Industrial health is a vital question, seriously concerning the millions in the working population and also the social and economic status of the nation. The author is a foremost authority in this country on this subject and for 25 years has been consultant for many prominent industrial firms.

Cost of poor health to industry and the individual is incalculable. To industry it is measured in terms of employe absenteeism, labor turnover, spoilage, inefficiency, fatigue, poor morale, accidents, occupational disease and unemployment compensation. To the employe it is equally costly.

The book is not in a humanitarian vein and it regards business as business and good health as good business. It deals with economics of health on a practical basis. It is written in terms the professional and the layman may understand.

It treats of the evolution and organization of an industrial health service, application to the small group, fundamentals of an ideal service, philosophy of health, occupational and nonoccupational factors compared, special problems, administration of industrial health, the industrial physician and nurse, company relationships and general conclusions.

Heavy Nickel Plating

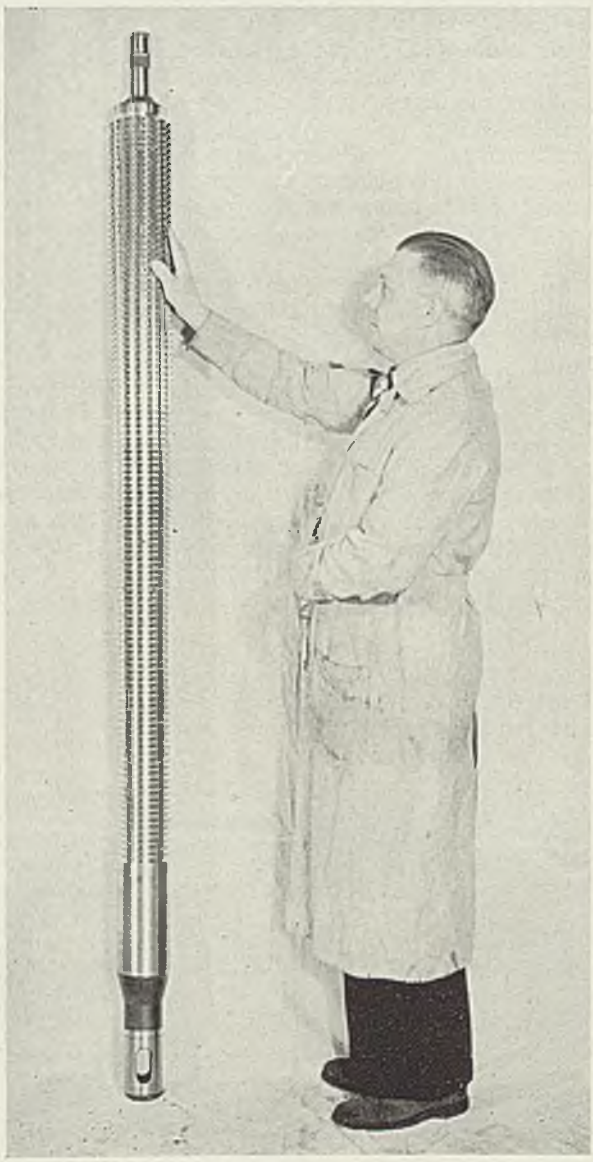
■ According to Louis Weisberg, 71 West Forty-fifth street, New York, who recently spoke before a Philadelphia branch meeting of American Electroplaters' society, heavy nickel deposits of the order of 0.005-inch are being applied for resistance to wear, or combined corrosion and wear; deposits of 0.010 to 0.030-inch for building up worn or undersized parts, and as much as 0.1 to 0.2-inch deposits for building up large worn parts and in electroforming complete pieces.

Porosity is a pressing problem in thin deposits, but it usually disappears when thickness reaches 0.002-inch or thereabouts and is seldom encountered in thick deposits.

Advantage of electrodeposited nickel in many applications is that its physical properties may be varied over an extremely wide range to meet specifications. In electrodeposited nickel, tensile strengths varying from about 50,000 to 130,000 pounds may be produced by comparatively simple changes in operating conditions. Range of variation for electrodeposited nickel is from 125 to about 500 brinell.

In comparing elongation, it is necessary to distinguish between softer varieties of electrodeposited nickel for which this property compares favorably with the 15 to 30 per cent for ordinary nickel which has not been annealed, and hard deposits for which the elongation drops off sharply and may fall to almost zero. After annealing, electrodeposited nickel approaches the same physical state as other forms of nickel and shows a corresponding change in properties.

Large Single-Piece Broach



■ This 5-inch diameter, 80-inch single-piece hardened and ground broach was made by Colonial Broach Co., 147 Jos. Campau street, Detroit, for a tractor manufacturer. It will be used to completely finish splines of tractor drive bevel gears at a single pass in a machine with a 6-foot stroke

Welding Tool Steels

Successful method of welding tool and die steels permits important economies in die construction, facilitates quick repair of worn or damaged dies. Thus it is valuable aid to lower tool and die costs

By H. A. GONSER
Development Engineer
Darwin & Milner Inc.
Cleveland

MOST manufacturers of die and tool steels have been queried concerning the possibility of welding their material. In more than one instance, the steel manufacturer has had to confess that the material can be welded only with great difficulty if at all. However, a process recently developed appears to afford a reliable means of repairing all types of alloy tool and die steels.

Such a process has great importance because it permits dies with chipped or worn surfaces to be rebuilt. Also, in many cases accidents will happen in press operation, two parts will jam the die or the die will be damaged accidentally by other means. In such instances, it is extremely important to have a ready means of repairing the die without holding up production while a new die is obtained. In fact, the weldability of weld material is assuming such importance that many shops are reluctant to use a material which cannot be welded satisfactorily.

This was the principal factor which led to the development of the process described here. In addition, the method has been found extremely valuable for other purposes as will be pointed out.

Welding tool steels requires that weld metal duplicate the original grain structure as well as original hardness. Casting satisfactory tool and die steels by the usual welding procedure is extremely difficult if not impossible. However, by employing a simple variation in procedure and selecting the rods carefully, the desired result can be obtained. When making air-hardening arc-welded deposits, the welding operation is extremely critical.

Proper application of the following method of welding cast iron overcomes the difficulty. Four different types of rod are used, deposits from these being placed one on top of another in the sequence specified. First deposit is made with a soft nickel-alloy rod which fuses to the base metal very well and gives a good mechanical joint.

Second deposit is made with a mild steel rod containing a small percentage of tungsten to give a slightly harder deposit, ranging from about 30 to 35 Rockwell C.

Third layer is deposited using a low-alloy tungsten-molybdenum electrode which gives a still harder surface, testing about 45 Rockwell C.

Fourth and last layer is applied using a high alloy of tungsten molybdenum to give a final surface sufficiently hard to use as a cutting edge, about 58 to 60 Rockwell C. At the same time, use of the soft rod in the first layer provides good fu-

Fig. 2—Here two castings have been welded together and a hard cutting surface deposited on one edge at A. The opposite edge at B is rounded off to act as a forming edge, illustrating how combination dies can easily be made by this process

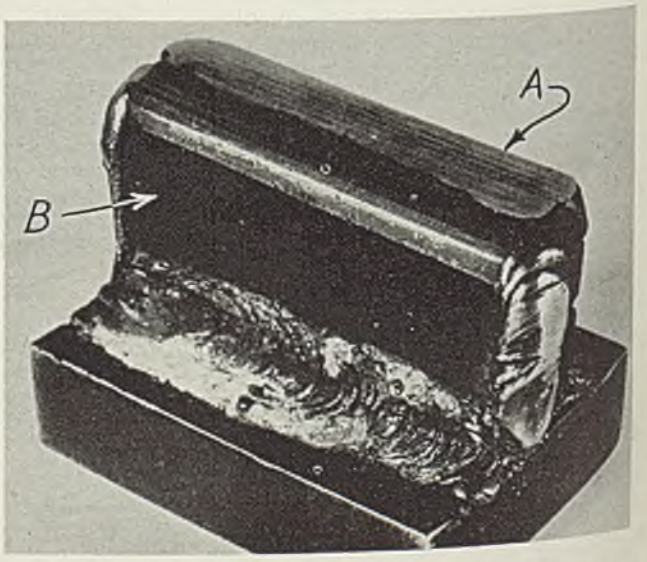
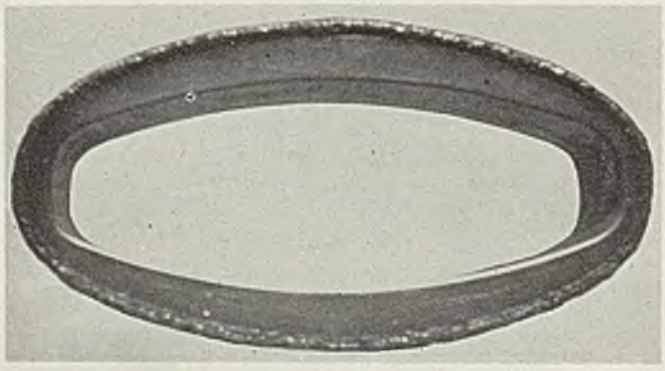


Fig. 1—This 480-pound casting was made into a combination forming and trimming die by building up a hard cutting edge



STEEL

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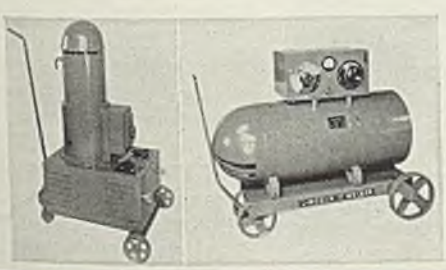

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sion and a good high-strength joint which keeps the harder metal deposited later from chipping off.

As an example of how this procedure is used, a large die was recently built by McKinney Tool & Mfg. Co., 1688 Arabella road, Cleveland. This oval die measured 5 feet in circumference. Shown in Fig. 1, the die has a 9-inch opening at its largest point. It is a combination forming and trimming die used in making a gasoline tank end. The die was cast from Meehanite iron into a ring weighing about 480 pounds. This cast iron ring formed the base for the outside cutting edge which was built up using the four different rods described above.

Normally a separate cutting die would be made from a permanent steel ring. However in this case a ½-inch step, ⅜-inch wide, was milled into the forming die, ring itself and a cutting edge built up in this step by use of the four different rods applied successively as detailed.

Before laying down the first layer, the casting was preheated to about 400 degrees Fahr. The first bead was the low-nickel-bearing electrode. It was deposited in steps or beads about 2 inches long with a gap of about 2 inches at the beginning but with smaller gaps as the work proceeded. These gaps were filled in on the second time around. The second layer then was deposited, using the mild steel electrode with a small amount of tungsten. This was followed by the third and fourth layers using respectively low-alloy and high-alloy tungsten-molybdenum electrodes. Thus the surface was built up successively in steps without developing excessive stresses and with proper grain structure at each stage. A direct-current welding machine was used and all electrodes were ⅛-inch in diameter. Current value was such that the metal flowed freely during deposition. Final hardness obtained was 58 Rockwell C.

Fig. 2 shows a short section of a similar built-up die used for blanking as well as forming. The cutting edge at A was deposited on a cast iron blank, using the method described to give an edge of sufficient hardness. The opposite corner at B was rounded off by machining to give a forming edge. This demonstrates how combination blanking and forming dies are built using this procedure.

In addition to permitting repair of tool and die steels, this method has many other advantages. Most important from cost-saving angle is its application in building up dies as described above, using Meehanite or a similar high-strength cast iron as the base material and applying hard surfaces where they may be desired for cutting or forming operations. Such a scheme affords important reductions in original cost of die material and also permits economies in making the die. As there it is not necessary to harden the finished die, no allowances need be made for hardening distortion or shrinkage. A die can be produced in this manner to have the same hardness of wearing surfaces as an alloy steel die.

Also, by using a combination die for blanking and forming, or forming trimming, one die can be eliminated entirely. Addition of a hard cutting edge to the forming die produces a double-action die at a cost of only $80 to $85 on a ring such as that in Fig. 1. If a separate trimming die had been made in this instance, it would have cost about $450. In addition, use of the double-action die eliminates repeating the setup in processing the material as the work needs to be placed in the press only once and is completely finished upon removal. Thus not only is one handling eliminated but also the cost of setting up the press and taking it out of production while preparing the second die for operation. In addition, cost of making the second press run is eliminated.

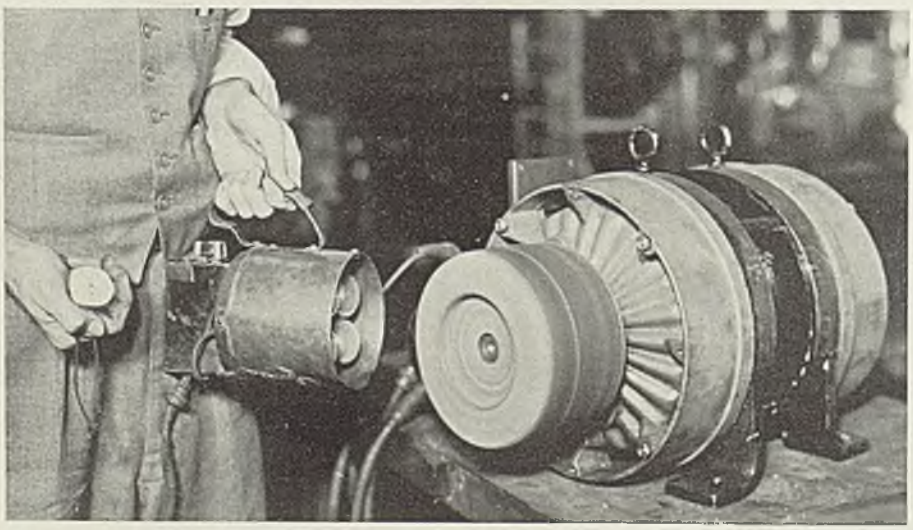
Operator Training Important

Needless to say, simply using the four different rods mentioned about will not be a guarantee of good results. Of utmost importance is correct training of the operator in the procedure employed. In those plants in which the above method has been applied successfully, it has been found necessary to train the operators in the special procedure involved. Correct training appears essential. In seeking information on procedure for welding tool steels, it has been noted there is almost a complete lack of any details available. To demonstrate and instruct operators in the technique recommended for this work, a school, Tool Steel Welding Service, has been established at 5005 Euclid avenue, Cleveland.

The building up of deposits in sucessively harder layers as described above appears an important development in tool and die work as the satisfactorily repairing tool and die steels as well as the building up of combination dies can be of immense value in many plants.

At the present time, Arrow Electrode Co., 5515 Hough avenue, Cleveland, is conducting research in conjunction with Darwin & Milner Co., 1260 West Fourth street, Cleveland, for developing electrodes for welding of tool and die steels similar to the application mentioned above.

Neon Glow Lamps Used In Stroboscope



A simple, portable stroboscope using neon lamps has been devised by Reliance Electric & Engineering Co., 1088 Ivanhoe road, Cleveland, to obtain slip-speed of alternating-current motors operating at a slip from synchronous speed of less than 100 revolutions per minute. Four standard lamp bases are mounted on a small board, arranging four clear-bulb three-watt neon glow lamps in a group as shown. A cylindrical steel hood painted black inside keeps out other light rays. On back of board is mounted a 3-pole, 2-way switch. Thrown in one direction, this switch connects lamps two in series, two parallel, for 220-volt circuits. In the opposite direction, switch connects all lamps in series for 440-volt circuits. Device is used by directing light on end of shaft and counting number of revolutions per minute of some part on rotating element such as a keyway. Marking end of shaft with a single chalk mark simplifies counting, and using a stop watch increases accuracy of observance of time interval.

Odd-Shaped Cases Machined Easily on Tilting Faceplate

■ IN MANUFACTURING gear drives at Farrel-Birmingham Co. Inc., 344 Vulcan street, Buffalo, it sometimes is necessary to machine triangular-shaped cases of fairly large size, the included angles of which vary with different orders. To facilitate setting up for machining these jobs, the 10-foot planer shown in accompanying illustration has been equipped with a rather unusual fixture.

This consists of a standard 10 x 10-foot floor plate with adjustable legs under one side. Pivots are provided at both upper and lower ends of these two legs and provision is made so both upper and lower pivot points can be moved. Thus it is possible to tilt the heavy faceplate through a wide range of angles.

Long Anchor Blocks Provided

It will be noted the anchor blocks at the top pivot points are quite long. This permits them to be moved to a position giving the approximate angle desired. Final setting of the faceplate is made by changing the adjusting screws which move the lower pivot points in and out on the horizontal faceplate, permitting an extremely accurate setting to be made.

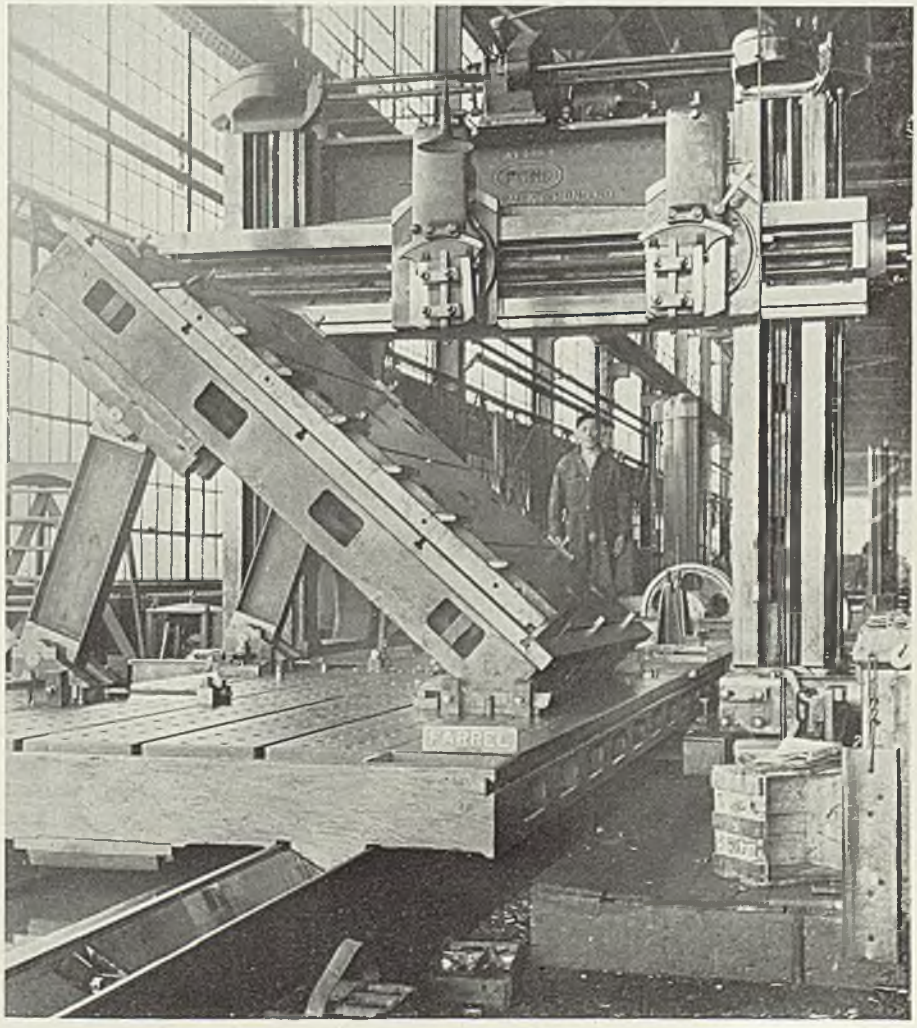
Angular setting is measured by using two pins especially designed for that service and inserted a known distance apart in the end of the inclined faceplate. This, then, forms the hypotenuse of a right triangle, the horizontal side of which is the projected horizontal distance between the two setting pins on the horizontal faceplate. The third, or vertical side of the triangle is measured by determining the difference between the vertical distances from the two pins to the horizontal faceplate.

In setting up the plate, the hypotenuse distance is known and the vertical leg is calculated for the angle desired. This distance then is measured using pin gages extending down from the setting pins and with Johansson blocks between ends of pin gages and the horizontal plate. This means, of course, that the pin gages must be selected of such a size as to permit use of the Johansson blocks.

For example: Assume fixture is to be set for 42 degrees. This means vertical side must measure 48.177 inches. A 9-inch and a 57-inch pin gage are selected. Difference between the 57-inch pin gage and the dimensions desired, 48.177 inches, is 8.823 inches. Difference between the 9-inch pin gage and this dimension is 0.177-inch. When using Johansson blocks between the ends of the pin gages and the horizontal faceplate, the distance from this plate to the end of the 57-inch pin gage must be 0.177-inch greater than the distance between the end of the 9-inch pin gage and the faceplate. Obviously any length of pin gages within the range of the angles can be used.

One must remember, a length should always be selected that will permit the use of Johansson blocks between pin gages and the horizontal faceplate.

Having arrived at the correct angle at the front end of the fixture, an indicator is attached to the planer rail resting on the face of the fixture and the planer table traversed forward. The necessary correction then is made on the rear end of the fixture to get a zero indicator reading the entire length of the inclined faceplate. When this is done, the inclined faceplate is parallel with the bed of the planer and tilted at the angle desired.



This 10-foot planer is fitted with a unique tilting base which makes mounting odd-shaped cases an easy matter. Tilted plate is easily positioned accurately to any desired angle

Addition Agent for Pickling Baths

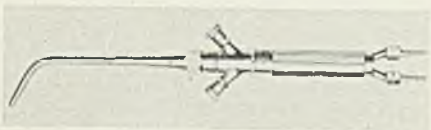
■ An addition agent for pickling baths, "Pickleen," has been developed by Enthone Co., New Haven, Conn. It is said to lower surface tension of sulphuric or hydrochloric acid pickling solutions and save acid by drag-out.

Although agent is not an inhibitor, its addition to a solution is claimed to save acid by an inhibiting action. It is further claimed the acid pickle containing the addition agent functions also as a cleaner and permits smoother and more rapid pickling action on iron or steel which has not been thoroughly cleaned of all grease or oil.

Pickleen is claimed to be stable in hot sulphuric acid solutions up to 15 per cent concentration and in cold hydrochloric acid up to 1:1 concentrations by volume.

Welding Blowpipe

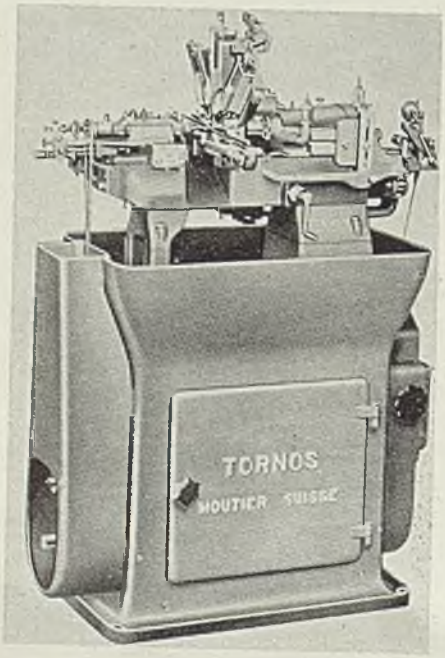
■ The Linde Air Products Co., 30 East Forty-second street, New York, announces W-29 oxyacetylene welding blowpipe for welding metals up to ¾-inch thick. Both valves are at forward end of handle for ready



adjustment by thumb and forefinger, leaving other hand free. "Pencil point" welding flame is said to be concentrated, yet "soft" enough for control of welding puddle. Packless valves and valve stems are shielded against knocks, and 3/16-inch hose is used.

Automatic Screw Machine

■ George Scherr Co. Inc., 128 Lafayette street, New York, has placed on the market a new Tornos Swiss automatic screw machine. Seven models with spindle bores to take bars from 5/32 up to 13/16-inch in diameter are available. Headstock feeds longitudinally on bed for a distance corresponding to

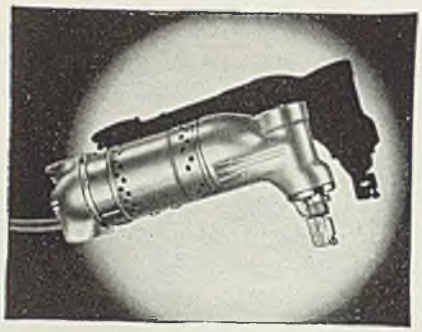


length of work. Five turning tools are arranged radially around bar stock, which is held in a rapidly rotating spindle in headstock and is fed forward past turning tools.

To turn different diameters, shoulders, tapers or to generate forms of any kind, tools move in and cut by cam motion. No box or forming tools are employed. Spindle speeds up to 12,000 revolutions per minute are possible. Tool setting is done by micrometer screws on which backlash is taken up by spring pressure. These machines are claimed to be suitable for producing long, thin work, fine shafts and delicate pivots requiring great accuracy and fine finish.

Portable Nibbler

■ Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago, has introduced Thor portable electric nibbler for cutting all kinds of sheet metal. Yoke-type front head incorporates a punch and die that "nibbles" out a rectangular shaving of metal at each upward stroke of punch. Nibbler will cut up to No. 18 gage (0.049-inch) in steel

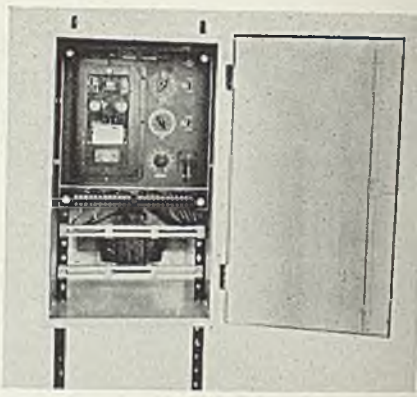


and up to No. 15 gage (0.072-inch) in aluminum.

Tool cuts its own clearance and will cut wide strips without distorting or curling sheet even if sheet is corrugated or has a curved outline. Punch is recessed to prevent too much stock being fed to cutting edge. Front head can be loosened and turned to either right or left and set at an angle of 30 or 90 degrees if desired. Tool is 9 inches long and weighs 3¾ pounds.

Weld Recorder

■ General Electric Co., Schenectady, N. Y., has developed a weld recorder to record and indicate variations in variables affecting quality of spot welds. Weld recorder acts as a recording instrument, signaling device and lockout control. It measures electrical input to spot-welding machine for each spot weld, and when electrical input to welder varies sufficiently to cause a defective weld, a bell gives a continuous audible signal. Weld-initiating circuit then is automatically opened, preventing subsequent welding until a pushbutton is pressed. In addition, recorder chart indicates visually that weld was not within preset allowable limits for proper welding and shows whether heat was above or below normal.



Motor-Truck Scales

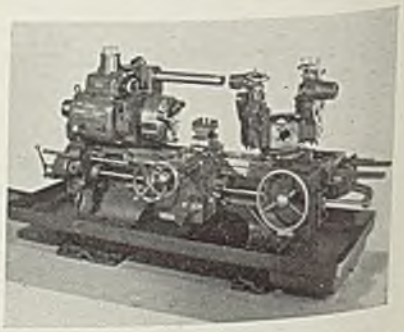
■ Toledo Scale Co., Toledo, O., offers three complete lines of motor-truck scales, comprising 128 different styles with weighing capacities up to 70,000 pounds. "Toledo A. R. E. A." scales are engineered to specifications sponsored by American Railway Engineers association, are produced in 40 regular styles and have a capacity of 70,000 pounds. The Truckmasters, for installation where usage is less severe, are made in 48 styles and have capacities up to 65,000 pounds. Truckweigh beam-type commercial scales come in 40 styles and capacities up to 61,000 pounds.

Models cover full range of lever sizes for platforms up to 10 x 40 feet. Also available is complete selection of weight-indicating methods such as automatic dial, beam, type-registering beam, beam indicator and printweigh ticket-printer.

Turret Lathe

■ Warner & Swasey Co., 5701 Carnegie avenue, Cleveland, announces 2-A saddle-type turret lathe with an effective swing of 20 inches and bar capacity through spindle of 3½ inches. Improvements are claimed to include heavier walled hexagon turret, redesigned aprons, single-lever control for feed selection, head brake and system for lubricating head stock. Warner & Swasey preselector is standard equipment.

Machine has rigid bed design and



12 spindle speeds running in geometric progression from 17 to 460 revolutions per minute. Equipped with a 2-speed motor, double this speed range is available.

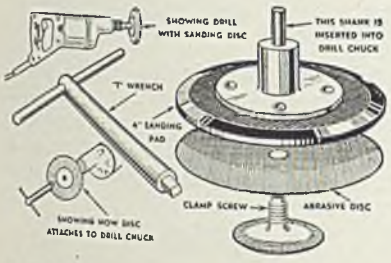
Erasing Shield

■ Eugene Dietzgen Co., 2425 Sheffield avenue, Chicago, announces a nonskid erasing shield of high-grade safety-razor steel 2⅜ x 4⅜ inches with 14 openings. Shield has cupped

openings for finger and thumb which grip shield firmly to paper and prevent shield from slipping.

Sanding Pad

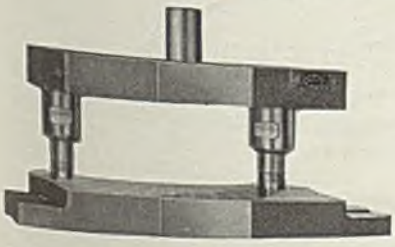
■ Mall Tool Co., 7740 South Chicago avenue, Chicago. announces sanding pad for use on any make, model or size of portable electric drill. Pad is suitable for occasional sanding jobs where amount of work does not warrant a standard sanding machine. Equipment includes a 4-inch



sanding pad, one abrasive, a clamp screw to hold abrasive and pad in place, and a T-wrench to remove or fasten pad and abrasive. Shank on sanding pad is inserted into drill chuck and tightened in same manner as drill bit. Price of complete tool is $7.

Guide Post Cover

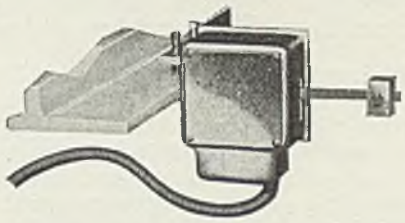
■ Danly Machine Specialties Inc., 2130 South Fifty-second avenue, Chicago, offers safety guide post covers for use in die operations where bushings "leave" guide post. Covers



are claimed to prevent catching of stock or operator's hand or arm in gaps. Single and telescoping covers for gap only and telescoping covers to protect entire guide post and gap are available.

Cut-Out Switch

■ International Derrick & Equipment division, International-Stacey Corp., Columbus, O., has developed a power cut-out switch to cut off source of power immediately upon any breakdown which disturbs regular rhythmic motion of part upon which it is mounted. Pivoted and weighted arm is held in operating position by a permanent magnet. When force on arm exceeds force



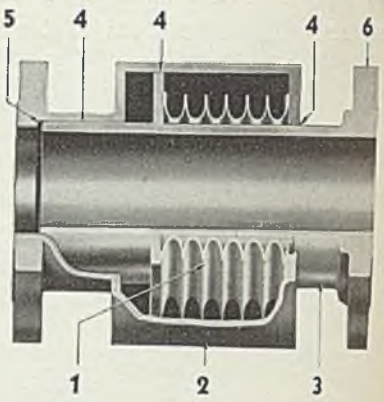
of attraction in magnet, arm drops by gravity and mercury switch grounds magneto in an internal combustion engine or de-energizes magnetic switch of an electric motor. Adjustment of sensitivity of

switch is accomplished by moving weight along lever arm.

Packless Expansion Joint

■ American District Steam Co., North Tonawanda, N. Y., has developed a simplified, compact packless expansion joint, U-ring type, for steam and hot water lines for low and high pressure and temperature service.

Expansion element operates on principle of cold springing used in installation of pipe bends. Expansion element (1) consists of a series of die-formed corrosion-resistant steel U-rings welded together to steel body and to guide on movable sleeve. Expansion element is housed completely within a wrought steel case (2) of same material, thickness and quality as the pipe line in which joint is installed. A pipe sleeve chromium plated on exposed position extends entire length of joint (3). Sleeve is guided at both ends and in body (4) throughout the entire traverse of joint. Expansion joint is designed with limit stop (5) so sleeve cannot pull out of body of expansion joint. Joint is furnished in the 150-pound American Standard with flanges (6) faced and drilled



for 125 pounds or 150 pounds working steam pressures and for 300 pounds standard with flanges faced and drilled for 250 pounds or 300 pounds working steam pressures.

The element is compressed axially or cold sprung one-half of total traverse for installation in cold line. As line expands with application of heat, compression in element is relieved and it passes through the neutral position and into tension for remaining half of traverse.

Flow through joint is full and unrestricted, and element is enclosed in a steel case so no dirt or scale can interfere with its operation. Flanged or beveled ends are available for welding for pressures to 300 pounds with traverses of 1, 2, 3 and 4 inches in single joints with or without anchor base.

Carbide Tool Grinder

■ Baldor Electric Co., 4351 Duncan avenue, St. Louis, announces carbide tool grinder said to operate with minimum amount of vibration as it has a short, heavy shaft. It is

claimed finer grinding is made possible by armature which has no end play in either direction. Grinder is priced at $87 without grinding wheels.

Correction

■ Zenith Electric Co., 845 South Wabash avenue, Chicago, developed a new transfer switch which was announced in STEEL of Jan. 15, p. 71. It incorrectly listed its price at $7. The price of this equipment is $70.

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*

Hollywood Finds Copper Most Photogenic Metal

High Polish Gives Soft Sheen Under Klieg Lights

Far off the beaten track of applications for copper is the star role it plays in the production of motion pictures, where it is regarded as one of the most photogenic of all materials.

Reason for the popularity of copper with movie producers and "props" men is the high polish it has as it comes from the factory. Its surface photographs with a soft sheen that allows plenty of scope for artistic settings. At the same time, it creates no "hot spots" or undue halations to cause difficulties for the camera men.

Hollywood finds copper a money-saving way of producing its effects, too, for copper requires no special treatment or processing before being photographed. It does not reflect glare even under the high-intensity lights needed in motion picture work. Many of the other materials that might be substituted for copper must be sprayed with wax to kill the highlighting.

Helps Attain Realism in Props

Because copper photographs so well, it gives plenty of opportunity for attaining realism in settings through its use in the many places where copper would be used in real life. A particularly interesting example of such a use of copper was in "Rulers of the Sea," Paramount's recently released tribute to the merchant marine of a bygone day. For this film the studio constructed a complete duplicate of an early merchant ship, and copper was used almost as liberally as it is on a modern sea-going vessel. Railings, steam pipes, and fittings all made very extensive use of copper.

Here is the engine of the studio ship built for "Rulers of the Sea," made realistic by the use of copper for handrails and steam lines.

Memos on Brass—No. 6

Brass is readily adapted to a variety of decorative finishes. It can be plated with nickel or chromium-over-nickel; lacquered; or colored by electrolytic processes.

Bronze Welding Extensively Used For Fabrication and Repair Work

Bridgeport's Line of Welding Rods Contributes To Efficiency of This Modern Industrial Tool

In the fabrication of tanks and other metal structures—in the repair and building up of worn or broken parts—in joining large pipes—the bronze welding process is playing an increasingly important part.

An outstanding advantage of bronze welding, particularly as applied to the joining or repairing of cast iron and steel, is the relatively low temperature at which the bronze welding rod melts. When the bronze welding process is employed it is not necessary to preheat the entire part to the high temperature necessary when welding with iron or steel rods. Only local preheating is necessary, and the temperature need only attain a dull or cherry red. As a consequence, warping, cracking, and changes in physical properties of the joined metals are lessened.

Tank Fabrication

A typical example of the utility of bronze welding is in the fabrication of tanks, water heaters, and equipment for the chemical and process industries. Shapes of this type are quickly and easily fabricated from corrosion-resisting copper silicon alloys with the aid of silicon bronze welding rods.

The bronze welding process is equally well adapted to joining cast iron, malleable iron, wrought iron, nickel, and many other metals in a wide variety of fabricating applications. Bronze welds are usually more economical than iron or steel welds, yet are considerably stronger, often, in fact, being stronger than the parent metal.

Maintenance Welding

Another wide field for bronze welding is in general repair work. Applications include the welding of broken parts and the building up of worn surfaces on pistons, shafts, gear teeth, and many other pieces.

Effectiveness of bronze welding depends largely on the rods used. Because of the wide variety of industrial applications for bronze welding, Bridgeport Brass Company manufactures a comprehensive line of welding rods—each with specific advantages for certain uses—all produced under the strict supervision of Bridgeport metallurgists.

Low-Fuming Rod

Among the newer additions to Bridgeport's

(*Continued on Following Page, Column 2*)

BRIGHT DIP FINISH

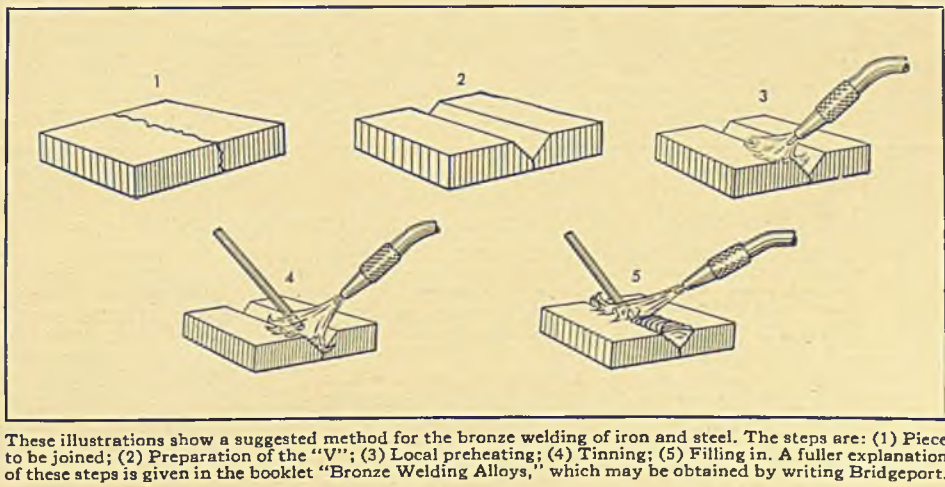
A typical formula for bright dip finish on brass and copper consists of:

Sulphuric acid	2 gallons
Nitric acid	1 gallon
Water.	1 quart

One ounce of hydrochloric acid is added to every 5 gallons of this mixture, and the solution used at room temperature.

Brass and copper parts should be free from scale, grease, or dirt before immersing. Immersion time is approximately 5 seconds, and parts should be thoroughly rinsed in water after immersion.

Proportions of the mixture may be varied if desired. A higher proportion of nitric acid hastens the action of the bright dip; a larger amount of sulphuric acid retards it.



These illustrations show a suggested method for the bronze welding of iron and steel. The steps are: (1) Piece to be joined; (2) Preparation of the "V"; (3) Local preheating; (4) Tinning; (5) Filling in. A fuller explanation of these steps is given in the booklet "Bronze Welding Alloys," which may be obtained by writing Bridgeport.

COPPER ALLOY BULLETIN

ALLOYS OF COPPER

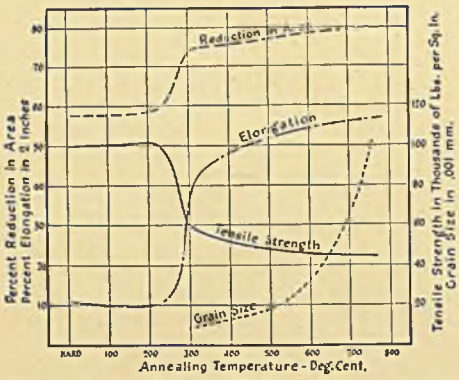
This is the eighth of a series of articles on the properties and applications of the copper alloys, and begins the subject of Low Brass.

LOW BRASS

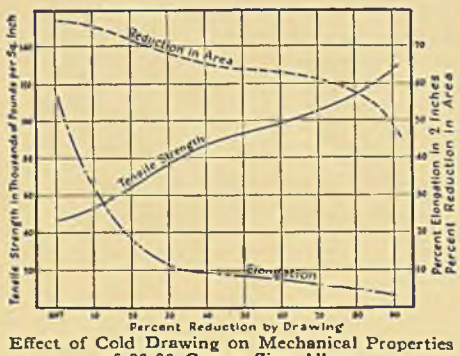
As the quantity of zinc added to copper is increased, the brass alloy produced changes in physical properties, as might be expected from the study of the copper-zinc equilibrium diagrams and knowledge of solid solution alloys. These changes, however, are not uniform, and there is not a proportional relation between zinc content and physical properties. Thus, the changes between the 85-15 copper-zinc alloy and the 80-20 alloy (Low Brass) are pronounced compared with the changes between the 90-10 and 85-15 alloys.

The 80% copper alloy is appreciably stronger than the 85-15, and it hardens by cold working at a more rapid rate. The per cent elongation of the annealed 80% alloy is greater, and is affected more definitely by the annealing temperature than the 85% alloy. Alloys containing 85% or more of copper have rather flat elongation curves, while those below about 85% copper show an increasing elongation with increasing grain size and annealing temperature. The mechanical properties of the 80-20 alloy are shown in the curves below.

(The subject of Low Brass will be concluded in next month's issue.)



Effect of Annealing on Mechanical Properties of 80-20 Copper-Zinc Alloys.



Effect of Cold Drawing on Mechanical Properties of 80-20 Copper-Zinc Alloys.

Copper Alloys Joined By Oxide Mixtures

Extremely strong joints can be produced in copper, brass and bronze by a new patented soldering process carried out in a reducing atmosphere, it is reported. Outstanding advantage claimed for the new process is that the temperatures required are low enough to leave the physical properties of the joined metals unimpaired.

A soldering mixture which has been found especially suitable for the copper alloys consists, according to the patent, of 10% silver oxide and 90% tin oxide. The pieces to be joined are coated with this mixture and heated in a reducing atmosphere. The oxides are reduced to metals and form an alloy with a melting point of about 300° C.

Copper Roofing Gains In Popularity

The beauty and economy of copper, in addition to its durability, lightness and fire resistance, are making it more and more popular among contractors and architects—for new building as well as for remodeling. On roofing, flashing, gutters, down-spouts—and as termite protection—copper has few equals, for when it is exposed to atmosphere it forms a patina which stops any further chemical action, and protects the copper from corrosion. Nor is the beautiful, soft green sheen of copper's patina to be found in any other metal.

For building purposes, Bridgeport furnishes copper in roll form.

Bronze Welding Widely Used

(Continued from Preceding Page, Column 3)

welding rod line is its No. 192† low-fuming rod, which is a special type of manganese bronze which "tins" readily and produces an exceptionally dense strong weld.

Another welding rod of wide utility is Bridgeport's No. 1232 Silicon Bronze, which is especially adapted to the welding of silicon bronze tank stock, and is suitable for either gas or arc.

For the welding and repairing of iron and steel, Bridgeport's line includes Bridgeport Bronze and Manganese Bronze, suitable for gas welding.

These rods represent only a few of Bridgeport's complete line, which is described in the booklet "Bronze Welding Alloys," available on request.

†Mfd. under U. S. Patent No. 1,525,058.

NEW DEVELOPMENTS

Atomic welding of copper, brass, bronze, and other metals is said to be possible with a recently developed welding paste, which is brushed onto the metal at the point of weld. Welding rod is then applied and subjected to heating to about 450° F. The process is reported to be especially suitable for light-gage work. (No. 1)

A protective coating for brass can be applied by brushing, dipping, or spraying and requires no special equipment, it is reported. The coating is said to be sufficiently thin and transparent to be practically invisible after application. (No. 2)

Portable degreasers are said to be ready for use within a few minutes after plugging into an electrical outlet. The degreasing solvent is distilled and reclaimed within the unit, and the manufacturer claims that from 1 to 3 tons of work can be cleaned with 1 to 1½ gallons of solvent. (No. 3)

A soldering flux is said to have been developed primarily for use with hard and silver solders. According to the manufacturer, it begins to fuse at about 850° F.; becomes thoroughly liquid and flows evenly at 1150° F.; maintains its volume at temperatures up to 1600°. Flux is reported to be suitable for soldering brass, bronze, and copper. (No. 4)

A mold dressing has recently been improved to adapt it to the casting of brass, it is reported. According to the maker, the dressing is a chemical compound supplied in concentrated form. Mixed with water, it is applied by means of air pressure to molds, dies, and similar parts. Use of the dressing is said to produce a smoother casting surface, reducing the amount of buffing and cleaning required. (No. 5)

A portable pH set is said to be suitable for determining the acidity or alkalinity of plating solutions by the colorimetric comparator method. Set includes nine color standards, test tubes, pipette, indicator solution, and accessories. (No. 6)

A cleaning material is reported to be intended for cold dipping of metal parts to remove dirt, grease or gum. It also softens and loosens paint and lacquer, according to the manufacturer. It is said to be fire-safe, non-toxic, and non-corrosive. (No. 7)

Insulating joints for tanks and pipe lines in plating shops are reported to reduce the danger of electrical grounds. The joints consist of compressed fiber insulating rings which encircle ball members at two places. The maker states that joints are tested for 125 volts DC and for steam pressures of 200 pounds per square inch. (No. 8)

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.

Handling Coils

(*Concluded from Page* 56)

such a duplex magnet made by the Ohio Electric Mfg. Co., 5906 Maurice avenue, Cleveland. It consists of two 25-inch specially designed magnets having greatly increased magnetic cross section and solidly connected together. It easily lifts a 9260-pound coil.

This magnet meets the two desired characteristics; namely, it is a light-weight magnet, the one shown weighing 2600 pounds, and it is narrow enough to go between closely stacked piles. The magnet has no tendency to pick up anything below or beyond the coil of strip which it is handling because its magnetism is completely satisfied within body of the coil of strip.

A special design of the contact face of this magnet causes all of the lines of magnetic force to be confined to the coil it is lifting and also prevents any stray lines of magnetic force from attracting the magnet to adjacent piles.

Lectures on Modern Steels Form New Text

■ *Modern Steels;* cloth, 374 pages, 6 x 9 inches; published by American Society for Metals, Cleveland; supplied by STEEL, Cleveland, for $3.50.

A series of lectures organized by the Pittsburgh chapter of American Society for Metals, edited by Ernest E. Thum, editor of *Metal Progress,* book relates to manufacture, inspection, treatment and uses of steel.

The lectures, which were by metallurgical experts residing in the Pittsburgh district, have been expanded by notes and suggestions for further reading. Groups of examination questions written in the modern manner are appended.

Max W. Lightner, chief metallurgist, Homestead Works, Carnegie-Illinois Steel Corp., Munhall, Pa., covered raw materials and production of pig iron and also the steelmaking process; G. R. Fitterer, professor of metallurgy, University of Pittsburgh, steel pouring and inspection and testing of steel; Ernest E. Thum, rolling and forging; Franklin H. Allison Jr., chief metallurgist, United Engineering & Foundry Co., Pittsburgh, gave three lectures on metallography; A. W. Demmler, metallurgist, Vanadium Corp. of America, Bridgeville, Pa., two lectures on heat treatment; James P. Gill, chief metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., three lectures on various steels.

Industrial Illumination

(*Concluded from Page* 53)

prevent a reflected filament image from reaching the operator at the opposite corner. When such a reflected filament image cannot be kept from reaching the operator's eyes, an opaque shield should be placed over the lamp bulb. Both operators and die repairmen prefer a concentrated beam of light rather than light from a diffusing reflector.

Such a 100-watt supplementary unit, when new, provides 45 foot-candles or more 6 feet away. This should provide sufficient illumination for most die repair work even after the severe depreciation of light output common in this type of work.

Other studies undertaken by the committee on industrial and school lighting of Illuminating Engineering society include: Studies in lighting of intricate production, assembly and inspection processes; report on lighting in the textile industry—gray goods and denim; lighting in the candy manufacturing industry; lighting in the shoe manufacturing industry; lighting for silk and rayon throwing and wide goods weaving; and lighting in the printing industry.

To those interested, these reports are available at a very small cost from Illuminating Enginering society, 51 Madison avenue, New York.

Activities of Steel Users, Makers

■ YOUNGSTOWN Alloy Casting Corp.. Youngstown, O, has appointed Bertram Brady Co., 549 West Washington boulevard, Chicago, sales representative in that district.

♦

York Ice Machinery Corp., York, Pa., has moved its Canton, O., branch to York.

♦

Waukesha Foundry Co., Waukesha, Wis., has completed a $50,000 combination office and machine shop building, largest expansion program undertaken by the company in 30 years. According to R. F. Smith, vice president and general manager, a $35,000 building for a new aluminum foundry may be built this summer.

♦

Padan Bearing Co., 1010 Georgia avenue, Chattanooga, Tenn., recently organized by J. Dan Malone, president, will carry complete stocks of roller and ball bearings, oil seals, speed reducers, roller and silent chains and similar equipment. The Padan company represents the following firms: Shafer Bearing Co., Chicago; Bearing Corp. of America, Lancaster, Pa.; Torrington Co., Torrington, Conn.; Bantam Bearings Corp., South Bend, Ind.; Orange Roller Bearing Co., Orange, N. J.; Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.; Victor Mfg. & Gasket Co., Chicago; Winfield H. Smith Inc., Springville, N. Y.

♦

Pittsburgh Tool-Knife & Mfg. Co., Pittsburgh, has changed its name to Pittsburgh Saw & Tool Co.

♦

A. N. Miller Co., Milwaukee, has changed its name to Schuppert Tool & Mfg. Co. Oscar H. Schuppert is president.

♦

Meehanite Metal Co. (South Africa) (Pty.) Ltd., Johannesburg, subsidiary of Meehanite Metal Corp., Pittsburgh, has licensed J. Begbie & Co., Middelburg, Transvaal, South Africa, to manufacture Meehanite castings.

♦

A. J. Lindemann & Hoverson Co., Milwaukee, maker of stoves, ranges and heaters, has completed a $120,000 modernization program, including addition of presses and shears. According to Eugene Lindemann, president, sales in 1939 were 35 per cent over 1938.

♦

Lea Mfg. Co., Waterbury, Conn., has established a research and technical development department for cutlery industry. This work will be under direction of Edwin C. Jarm, formerly with Carborundum Co., and William D. Starr, technical director of the Lea company.

♦

Foreign business departments of General Electric Co., Schenectady, N. Y., and Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., have formed a new company, Electrical Export Corp., to provide the mechanism for bidding, financing and handling an electrification project in Brazil on which bids are being submitted. Details of project have not been disclosed.

♦

Elwell-Parker Executive On Leave of Absence

■ Fred G. Heiss, who has been treasurer and a director of Elwell-Parker Electric Co., Cleveland, the past 20 years, started on a six months leave of absence Jan. 31. He was given a testimonial dinner by his associates Feb. 1 in the Terminal club, Hotel Cleveland. Mr. Heiss plans to locate in Florida. William A. Scott, auditor, who has been with the company over 20 years, will assume duties performed by Mr. Heiss.

Steel Buying Still Lags; Production Off Further

Orders hold near 50 per cent of capacity. Previous purchases and weather retarding factors. Pig iron output down in January

MARKET IN TABLOID ★

Demand
Unchanged or quieter for most products.

Prices
Holding; scrap markets turn soft.

Production
Drops 5 points to 76½ per cent.

■ VARIOUS factors continue to restrict finished steel buying, and with tonnage being shipped faster than it is being supplanted on mill books, steelmaking has been curtailed more sharply. Last week showed a 5-point drop to 76½ per cent, lowest rate since September but comparing with 53 per cent a year ago.

Notwithstanding the lag in orders and steadily declining operations, there is little pessimism in the industry. Considering the unusually heavy buying last fall, the severe weather the past few weeks and the fact that January and February are normally quiet months for some consumers, steel producers regard present demand as far from discouraging. Most interests are disposed to await further reductions in unfilled orders and in consumers' inventories before drawing any too adverse conclusions regarding prospects for coming months.

January pig iron production was the largest in history for that month despite a 4.5 per cent decline from December. Total output was 3,595,467 tons, against 3,767,605 tons in December and 2,175,423 tons a year ago. At the end of January, 179 blast furnaces were active, a decrease of 12 stacks from Dec. 31.

Influence of the weather is noted in activity in pipe, building materials, wire products and galvanized sheets. This situation is seen as only temporary, however, since revival in building construction is indicated for spring and favorable prospects for increased cash income of agriculture compared with a year ago enhance the outlook for sales of various steel products in farm areas.

Steel buyers in many instances are depending on inventories for part of their requirements. With considerable tonnage still being taken against orders placed last fall, new buying of about 50 per cent of producing capacity is indicative of fairly active consumption.

Fabricated structural shape orders hold at the slower pace of recent weeks and compare unfavorably with the volume a year ago. Shipments also have moderated from last quarter's rate, with no appreciable reversal of this trend expected before March. A somewhat similar situation prevails in concrete reinforcing bars, prices of which have weakened under quieter demand and availability of additional bar mill capacity through curtailment of merchant bar backlogs.

Finished steel prices generally are being maintained —not so rigidly as during the sellers' market of last fall but without evidence of serious weakness. Speculation as to the probable effect of recent developments in the iron ore market on pig iron and finished steel quotations has produced no tangible conclusions.

Weakness again dominates steel scrap prices, the composite being off 21 cents to $17.38. Principal reductions were at Pittsburgh and Chicago, although an easy tone prevails in most districts.

Pig iron shipments have declined rather substantially the past few weeks. This is more a reflection of reduced needs of steelworks than of curtailment in foundry operations, since foundry coke demand has been well sustained. Blast furnace schedules are being trimmed, last week seeing three stacks banked at Youngstown and one at Chicago, while one Birmingham unit was shut down for relining.

Tin plate production has dropped 4 points to 65 per cent. Mill backlogs now are light, and adequate stocks in hands of both producers and consumers cause operations to depend largely on current demand. Export inquiries for tin plate are steady and somewhat better than a year ago, although foreign sales still are retarded by difficulties in arranging satisfactory credit.

Railroad equipment inquiries and orders generally are small. New York Central contemplates purchase of 2000 freight cars, but business actively pending includes no large lots.

Sharpest decline in steelmaking last week was at Youngstown, where ingot output slumped 17 points to 51 per cent and will go lower this week. Most other districts also were down, reductions including 5 points to 73 at Pittsburgh, 5½ points to 85½ at Chicago, 2 points to 78 in eastern Pennsylvania, 6½ points to 60½ at Buffalo, 4 points to 90 at Birmingham, 9 points to 66 in New England, 10 points to 64½ at Cincinnati and 13 points to 70 at St. Louis. Partially offsetting these losses were gains of 6 points to 93 at Detroit, 2 points to 82 at Wheeling and 1 point to 75 at Cleveland.

COMPOSITE MARKET AVERAGES

	Feb. 3	Jan. 27	Jan. 20	One Month Ago Jan., 1940	Three Months Ago Nov., 1939	One Year Ago Feb., 1939	Five Years Ago Feb., 1935
Iron and Steel	$37.07	$37.09	$37.07	$37.09	$37.50	$36.37	$32.54
Finished Steel	56.10	56.10	56.10	56.10	55.90	56.50	54.00
Steelworks Scrap	17.38	17.59	17.38	17.48	20.06	14.87	11.66

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Feb. 3, 1940	Jan. 1940	Nov. 1939	Feb. 1939
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.25
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Terre Haute, Ind.	2.15	2.15	2.15	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.275	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.00	2.15
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.00	2.15
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.00	2.00	1.92	1.92

Pig Iron

	Feb. 3, 1940	Jan. 1940	Nov. 1939	Feb. 1939
Bessemer, del. Pittsburgh	$24.34	$24.34	$24.34	$22.34
Basic, Valley	22.50	22.50	22.50	20.50
Basic, eastern, del. Philadelphia	24.34	24.34	24.34	22.34
No. 2 foundry, Pittsburgh	24.21	24.21	24.21	22.21
No. 2 foundry, Chicago	23.00	23.00	23.00	21.00
Southern No. 2, Birmingham	19.38	19.38	19.38	17.38
Southern No. 2, del. Cincinnati	22.89	22.89	22.89	20.89
No. 2X, del. Phila. (differ. av.)	25.215	25.215	25.215	23.215
Malleable, Valley	23.00	23.00	23.00	21.00
Malleable, Chicago	23.00	23.00	23.00	21.00
Lake Sup., charcoal, del. Chicago	30.34	30.34	30.34	28.34
Gray forge, del. Pittsburgh	23.17	23.17	23.17	21.17
Ferromanganese, del. Pittsburgh	105.33	105.33	105.33	85.27

Scrap

Heavy melting steel, Pittsburgh	$18.25	$18.15	$21.90	$15.65
Heavy melt. steel, No. 2, E. Pa.	16.50	16.80	19.25	13.25
Heavy melting steel, Chicago	16.25	16.45	17.45	14.00
Rails for rolling, Chicago	18.75	19.05	20.50	17.25
Railroad steel specialties, Chicago	18.50	18.50	20.50	16.00

Coke

Connellsville, furnace, ovens	$4.75	$4.75	$5.00	$3.75
Connellsville, foundry, ovens	5.75	5.75	6.00	5.00
Chicago, by-product fdry., del.	11.25	11.25	11.25	10.50

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

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

Sheet Steel

Hot Rolled

Pittsburgh	2.10c
Chicago, Gary	2.10c
Cleveland	2.10c
Detroit, del.	2.20c
Buffalo	2.10c
Sparrows Point, Md.	2.10c
New York, del.	2.34c
Philadelphia, del.	2.27c
Granite City, Ill.	2.20c
Middletown, O.	2.10c
Youngstown, O.	2.10c
Birmingham	2.10c
Pacific Coast points	2.60c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

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

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

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

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold strip	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c
Philadelphia, del.	2.15c
Boston, delivered	2.46c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c

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 points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

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

Mfg. Terne Plate (base box)

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

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points	2.75c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Detroit, delivered	2.25c
Cleveland	2.15c

Buffalo	2.15c
Birmingham	2.15c
Gulf ports	2.50c
Pacific Coast points	2.75c

Iron

Chicago, Terre Haute	2.15c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

*New Billet Bars, Base**

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

*Rail Steel Bars, Base**

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

**Subject to a deduction of 25 cents per 100 lbs. in lots of 20 tons or over of one size, in lengths of 30 feet or over, for shipment at one time to one destination.*

Wire Products

Pitts-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard and cement coated wire nails	$2.55
(Per pound)	
Polished fence staples	2.55c
Galv. barbed wire, standard 12½ gage two-point hog, 80-rod spool $2.88; two-point cattle, 80-rod spool	$2.70
Annealed fence wire	3.05c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	67.00
Single loop bale tie, (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh $3.85

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	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo. 0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni. 1.10
5100 0.80-1.10 Cr. 0.45
5100 Cr. spring flats 0.15
6100 bars 1.20
6100 spring flats 0.85
Cr. N., Van. 1.50
Carbon Van. 0.85
9200 spring flats 0.15
9200 spring rounds, squares 0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.10c
Detroit, del.	2.20c
Philadelphia, del.	2.42c
New York, del.	2.46c
Pacific Coast points	2.70c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.20c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Chicago	3.05c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, for full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts separate 72.5 off; with nuts attached add 15%; bulk 83.5 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Plow bolts	68.5 off

Nuts

	U.S.S.	S.A.E.
Semifinished hex. 6-inch and less	67	70
⅞-1-inch	64	65
1⅛ and larger	62	62

Hexagon Cap Screws

Upset, 1-in., smaller	70.0 off

Square Head Set Screws

Upset. 1-in., smaller	75.0 off
Headless set screws	64.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.85c
Pacific coast ports	2.90c

Rivets, Washers

Structural. Pittsburgh, Cleveland. Chicago	3.40c
⅞-inch and smaller, Pitts., Chi., Cleve.	65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers	
and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75	off

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55
11 and 12	63½	54

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64
10-inch lap weld	63½
12-inch, lap weld	62½

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½"O.D.	13	$ 9.72	$23.71
1¾"O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼"O.D.	13	13.79	21.68
2¼"O.D.	12	15.16	.....
2½"O.D.	12	16.58	26.57
2¾"O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½"O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1 "O.D.	13	$ 7.82	$ 9.01
1¼"O.D.	13	9.26	10.67
1½"O.D.	13	10.23	11.79
1¾"O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼"O.D.	13	14.54	16.76
2¼"O.D.	12	16.01	18.45
2½"O.D.	12	17.54	20.21
2¾"O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½"O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½"O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$45.00-46.00
4-in., Birmingham	48.00-49.00
4-in., Chicago	56.80-57.80
6-in. & over, Chicago	53.80-54.80
6-in. & over, east fdy.	49.00
Do., 4-in.	52.00

Class A Pipe $3 over Class B Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅝-inch incl. (per 100 lbs.)	$2.00
Do., over ⅝ to 41/64-in. incl.	2.15

Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.45.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt.	1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$4.50- 4.75
Connellsville, fdry.	5.00- 5.75
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.25- 6.50
Wise county fdry	5.50- 6.50
Wise county fur.	5.00- 5.25

By-Product Foundry

Newark, N. J., del.	11.38-11.85
Chicago, outside del.	10.50
Chicago, delivered	11.25
Terre Haute, del.	10.75
Milwaukee, ovens	11.25
New England, del.	12.50
St. Louis, del.	11.75
Birmingham, ovens	7.50
Indianapolis, del.	10.75
Cincinnati, del.	10.50
Cleveland, del.	11.05
Buffalo, del.	11.25
Detroit, del.	11.00
Philadelphia, del.	11.15

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	25.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (less than 1000 lbs.)	14.75c
Do. (1000 lbs. or over)	13.75c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	6.75c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birdsboro, Pa.	24.00	24.50	23.50	25.00
Birmingham, Ala.§	19.38	.....	18.38	24.00
Buffalo	23.00	23.50	22.00	24.00
Chicago	23.00	23.00	22.50	23.50
Cleveland	23.00	23.00	22.50	23.50
Detroit	23.00	23.00	22.50	23.50
Duluth	23.50	23.50	.....	24.00
Erie, Pa.	23.00	23.50	22.50	24.00
Everett, Mass.	24.00	24.50	23.50	25.00
Granite City, Ill.	23.00	23.00	22.50	23.50
Hamilton, O.	23.00	23.00	22.50	.....
Neville Island, Pa.	23.00	23.00	22.50	23.50
Provo, Utah	21.00	.....	.....	.....
Sharpsville, Pa.	23.00	23.00	22.50	23.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	24.00	24.50	23.50	25.00
Toledo, O.	23.00	23.00	22.50	23.50
Youngstown, O.	23.00	23.00	22.50	23.50

†Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.31	25.31	24.81	25.81

	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis, northern	23.50	23.50	23.00	.....
St. Louis from Birmingham	†23.12	.....	22.62	.....
St. Paul from Duluth	25.63	25.63	.....	26.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $28.50, base; $29.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$22.50	Lake Superior fur.	$27.00
Pitts. dist. fur.	22.50	do., del. Chicago	30.34
		Lyles, Tenn.	26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $28.50; 6.51-7—$29.00; 7-7.50—$29.50; 7.51-8—$30.00; 8-8.50—$30.50; 8.51-9—$31.00; 9-9.50—$31.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

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.	22.00
Do. barge	22.00
No. 2 lump	22.00

Ferroalloy Prices

Ferromanganese, 78-82%, lump and bulk, carlots tide., duty pd. $100.00
Ton lots 110.00
Less ton lots 113.50
Less 200 lb. lots 118.00
Do., carlots del. Pitts. 105.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 32.00
Do., 26-28% 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 82.00
Do., 75 per cent 126.00
Do. ton lots 142.00
Spot, $5 a ton higher.

Silicomanganese, c.l., 2½ per cent carbon, 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 2.00-2.10

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c
Do., ton lots 11.75c
Do., less-ton lots 12.00c

67-72% 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. spot carlots, bulk 7.00c
Do., ton lots 7.50c
Do., less-ton lots 7.75c
Do., less 200 lbs. 8.00c
Spot, ¼c higher.

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 84.00c
Do., spot 89.00c
88% chrome, contract 83.00c
Do., spot 88.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ¼-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $69.50
Ton lots 79.50
Less-ton lots, lb. 3.75c
Less 200 lb. lots, lb. 4.00c
Spot ¼-cent higher.

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton $97.50
Do, spot 102.50

34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. $2.60
200-lb. kegs, lb. 2.75
Do, 100-200 lb. lots 3.00
Do, under 100-lb. lots

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.98	4.16	5.16	3.85	3.85	5.66	3.81	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	5.23	3.51	4.09	8.59	7.19
Philadelphia	3.85	3.85	4.35	3.55	3.55	5.25	3.55	4.55	4.75	3.51	4.06	8.56	7.16
Baltimore	3.95	4.05	4.45	3.70	3.70	5.25	3.55	....	5.05	....	4.05	....	....
Norfolk, Va.	4.15	4.25	....	3.90	3.90	5.45	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	6.40	4.20	4.40	4.50	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.75	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.72	3.20	3.75	8.15	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.84	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.67	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.85	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	5.00	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.98	3.54	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.95	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	3.90	3.90	3.85	3.85	5.68	3.65	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.71	....	4.69	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.88	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.	4.05	6.20	6.20	4.05	4.05	5.75	4.20	....	5.25	....	....	....	....
Seattle	4.00	4.00	5.35	3.40	3.50	5.75	3.95	6.50	4.75	....	5.75	....	....
Portland, Oreg.	4.25	4.50	6.10	4.00	4.00	5.75	3.95	6.50	4.75	....	5.75	....	....
Los Angeles	4.15	4.65	6.45	4.00	4.00	6.40	4.30	6.50	5.25	....	6.60	10.65	9.80
San Francisco	3.50	3.70	6.00	3.35	3.35	5.60	3.40	6.40	5.15	....	6.80	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	4.10	7.31	5.86	5.61	8.56
Baltimore	4.10	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.48	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base. 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston: 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 300-4999 in San Francisco, Portland; any quantity in Twin Cities; 300-1999 in Los Angeles.

Galvanized Sheets: Base, 0-1499 pounds in New York, 150-1499 pounds in Cleveland, Milwaukee, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-4999 in Portland, Seattle, San Francisco; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, St. Louis, Tulsa; 1500 and over in Chattanooga, Philadelphia; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Feb. 1

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports: £ s d	Continental Channel or North Sea ports, gross tons: Quoted in dollars at current value	**Quoted in gold pounds sterling: £ s d
Foundry, 2.50-3.00 Si.	$23.94 6 0 0	$29.82	3 10 0
Basic bessemer	....	19.59	2 6 0
Hematite, Phos. .03-.05	24.94 6 5 0	.....	.....
Billets	$29.43 7 7 6	$31.95	3 15 0
Wire rods, No. 5 gage	45.39 11 7 6	61.34	7 4 0
Standard rails	$37.90 9 10 0	$48.99	5 15 0
Merchant bars	2.18c 12 5 0	2.91c	7 13 0
Structural shapes	1.98c 11 2 6	2.92c	7 13 6
Plates, ¼ in. or 5 mm.	2.11c 11 17 6	3.75c	9 17 6
Sheets, black, 24 gage or 0.5 mm.	2.78c 15 12 6	3.52c	9 5 0°
Sheets, gal., 24 ga., corr.	3.23c 18 2 6	4.62c	12 3 0
Bands and strips	2.18c 12 5 0	2.77c	7 6 0
Plain wire, base	3.47c 19 10 0	3.04c	8 0 0
Galvanized wire, base	4.14c 23 5 0	3.61c to 3.66c	9 10 0 to 9 12 6
Wire nails, base	....	3.52c	9 5 0
Tin plate, box 108 lbs.	$ 6.28 1 11 6	.....	.....

British ferromanganese $100.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich §§Mark
Fdy. pig iron, Si. 2.5.	$21.54	5 8 0(a)	$17.81	788	$27.20	800	$25.33	63
Basic bess. pig iron	20.25	5 1 6(a)	.....	.....	27.20	800	27.94	(b)69.50
Furnace coke	5.84	1 9 2	5.09	225	10.54	310	7.64	19
Billets	33.42	8 7 6	26.28	1,163	29.24	860	38.79	96.50
Standard rails	1.81c	10 3 0	1.46c	1,455	2.06c	1,375	2.38c	132
Merchant bars	2.28c	12 16 0††	1.45c	1,454	2.06c	1,375	1.98c	110
Structural shapes	2.03c	11 8 0††	1.41c	1,414	2.06c	1,375	1.93c	107
Plates, †¼-in. or 5 mm.	2.05c	11 10 6††	1.85c	1,848	2.42c	1,610	2.29c	127
Sheets, black	2.87c	16 2 6§	2.19c	2,195‡	2.85c	1,900‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.32c	18 12 6	2.85c	2,850	4.58c	3,050	6.66c	370
Plain wire	3.20c	18 0 0	2.25c	2,250	3.00c	2,000	3.11c	173
Bands and strips	2.41c	13 11 0††	1.63c	1,632	2.18c	1,450	2.29c	127

†British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions.

**Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1.	16.50-17.00
Bos. dock No. 1 exp.	15.00-15.50
New Eng. del. No. 1	15.50
Buffalo, No. 1	16.50-17.00
Buffalo, No. 2	14.50-15.00
Chicago, No. 1	16.00-16.50
Chicago, auto, no alloy	15.00-15.50
Chicago, No. 2 auto	13.00-13.50
Cincinnati dealers	13.50-14.00
Cleveland, No. 1	16.50-17.00
Cleveland, No. 2	15.50-16.00
Detroit, No. 1	†13.00-13.50
Detroit, No. 2	†12.00-12.50
Eastern Pa., No. 1	17.50-18.00
Eastern Pa., No. 2	16.50
Federal, Ill.	14.00-14.50
Granite City, R. R.	15.00-15.50
Granite City, No. 2	14.00-14.50
Los Angeles, No. 1	16.00-16.50
Los Angeles, No. 2	15.00-15.50
L. A., No. 1 f.a.s.	17.00-18.00
L. A., No. 2 f.a.s.	16.00-17.00
N. Y. dock No. 1 exp.	14.50
Pitts., No. 1 (R. R.)	19.50-20.00
Pittsburgh, No. 1	18.00-18.50
Pittsburgh, No. 2	16.00-16.50
St. Louis, R. R.	†14.75-15.25
St. Louis, No. 2	†14.00-14.50
San Francisco, No. 1	16.50-17.00
San Francisco, No. 2	15.50-16.00
Seattle, No. 1	14.50-15.50
Toronto, dlrs., No. 1	11.00
Valleys, No. 1	17.50-18.00

COMPRESSED SHEETS

Buffalo, new	14.50-15.00
Chicago, factory	15.50-16.00
Chicago, dealers	14.00-14.50
Cincinnati, dealers	13.00-13.50
Cleveland	16.00-16.50
Detroit	†13.50-14.00
E. Pa., new mat.	18.00
E. Pa., old mat.	14.00-14.50
Los Angeles	13.50-14.00
Pittsburgh	18.00-18.50
St. Louis	†11.50-12.00
San Francisco	13.50-14.00
Valleys	17.00-17.50

BUNDLED SHEETS

Buffalo, No. 1	14.50-15.00
Buffalo, No. 2	12.50-13.00
Cleveland	12.50-13.00
Pittsburgh	16.00-16.50
St. Louis	†11.50-12.00
Toronto, dealers	9.75

SHEET CLIPPINGS, LOOSE

Chicago	10.50-11.00
Cincinnati, dealers	9.00- 9.50
Detroit	†9.25- 9.75
St. Louis	†9.50-10.00
Toronto, dealers	9.00

BUSHELING

Birmingham, No. 1	14.00
Buffalo, No. 1	14.50-15.00
Chicago, No. 1	15.00-15.50
Cincin., No. 1, deal.	10.00-10.50
Cincinnati, No. 2	3.50- 4.00
Cleveland, No. 2	10.50-11.00
Detroit, No. 1, new	†12.50-13.00
Valleys, new, No. 1	16.00-16.50
Toronto, dealers	5.00- 5.50

MACHINE TURNINGS (Long)

Birmingham	6.00
Buffalo	10.00-10.50
Chicago	9.50-10.00
Cincinnati, dealers	5.50- 6.00
Cleveland, no alloy	9.50-10.00
Detroit	†7.50- 8.00
Eastern Pa.	12.00-12.50
Los Angeles	4.00- 5.00
New York	†7.00- 7.25
Pittsburgh	11.50-12.00
St. Louis	†7.50- 8.00
San Francisco	5.00
Toronto, dealers	6.50
Valleys	11.50-12.00

SHOVELING TURNINGS

Buffalo	13.00-13.50
Cleveland	10.50-11.00
Chicago	10.00-10.50
Chicago, spcl, anal.	12.50-13.00
Detroit	†9.50-10.00
Pitts., alloy-free	13.00-13.50

BORINGS AND TURNINGS
For Blast Furnace Use

Boston district	†5.65- 6.00
Buffalo	10.50-11.00
Cincinnati, dealers	4.50- 5.00
Cleveland	10.50-11.00
Eastern Pa.	10.50-11.00
Detroit	†7.50- 8.00
New York	†7.00- 7.50
Pittsburgh	11.00-11.50
Toronto, dealers	6.00

AXLE TURNINGS

Buffalo	16.50-17.00
Boston district	†9.50-10.00
Chicago, elec. fur.	16.00-16.50
East. Pa. elec. fur.	16.50-17.00
St. Louis	†10.50-11.00
Toronto	6.00- 6.50

CAST IRON BORINGS

Birmingham	8.50
Boston dist. chem.	†8.50- 9.00
Buffalo	10.50-11.00
Chicago	9.50-10.00
Cincinnati, dealers	4.50- 5.00
Cleveland	10.50-11.00
Detroit	†7.50- 8.00
E. Pa., chemical	14.50-15.00
New York	†7.00- 7.50
St. Louis	†6.50- 7.00
Toronto, dealers	6.00

RAILROAD SPECIALTIES

Chicago	18.25-18.75

ANGLE BARS—STEEL

Chicago	18.25-18.75
St. Louis	†16.00-16.50

SPRINGS

Buffalo	19.50-20.00
Chicago, coil	19.00-19.50
Chicago, leaf	18.00-18.50
Eastern Pa.	22.00-22.50
Pittsburgh	22.00-22.50
St. Louis	†17.50-18.00

STEEL RAILS, SHORT

Birmingham	17.50-18.00
Buffalo	21.50-22.00
Chicago (3 ft.)	19.00-19.50
Chicago (2 ft.)	19.50-20.00
Cincinnati, dealers	20.00-20.50
Detroit	†19.50-20.00
Pitts., 3 ft. and less	22.00-22.50
St. Louis, 2 ft. & less	†19.00-19.50

STEEL RAILS, SCRAP

Birmingham	15.50
Boston district	†14.00-14.50
Buffalo	17.00-17.50
Chicago	16.25-16.75
Cleveland	19.00-19.50
Pittsburgh	21.50-22.00
St. Louis	†15.50-16.00
Seattle	18.00-18.50

FROGS, SWITCHES

Chicago	16.00-16.50
St. Louis, cut	15.50-16.00

ARCH BARS, TRANSOMS

St. Louis	†14.50-15.00

PIPE AND FLUES

Chicago, net	11.00-11.50
Cincinnati, dealers	10.50-11.00

RAILROAD GRATE BARS

Buffalo	11.50-12.00
Chicago, net	10.50-11.00
Cincinnati, dealers	9.00- 9.50
Eastern Pa.	15.00
New York	†12.00-12.50
St. Louis	†11.00-11.50

RAILROAD WROUGHT

Birmingham	15.00
Boston district	†9.50-10.00
Eastern Pa., No. 1	18.00-18.50
St. Louis, No. 1	†10.75-11.25
St. Louis, No. 2	†14.50-15.00

FORGE FLASHINGS

Boston district	†10.75-11.00
Buffalo	14.50-15.00
Cleveland	15.00-15.50
Detroit	†12.00-12.50
Pittsburgh	16.00-16.50

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	18.50-19.00

LOW PHOSPHORUS

Cleveland, crops	21.50-22.00
Eastern Pa., crops	22.00-22.50
Pitts., billet, bloom, slab crops	23.50-24.00

LOW PHOS. PUNCHINGS

Buffalo	19.50-20.00
Chicago	18.50-19.00
Cleveland	18.50-19.00
Eastern Pa.	22.50-23.00
Pittsburgh	21.50-22.00
Seattle	15.00
Detroit	†13.75-14.25

RAILS FOR ROLLING
5 feet and over

Birmingham	17.50
Boston	†15.75-16.00
Chicago	18.50-19.00
New York	†17.50-18.00
Eastern Pa.	21.50-22.00
St. Louis	†18.00-18.50

STEEL CAR AXLES

Birmingham	19.00-20.00
Boston district	†16.00-16.50
Chicago, net	20.50-21.00
Eastern Pa.	22.00
St. Louis	†18.50-19.00

LOCOMOTIVE TIRES

Chicago (cut)	18.50-19.00
St. Louis, No. 1	†15.75-16.25

SHAFTING

Boston district	†18.50-18.75
New York	†18.00-18.50
Eastern Pa.	23.00-23.50
St. Louis, 1¼-3¾"	17.50-18.00

CAR WHEELS

Birmingham, iron	19.00-20.00
Boston dist., iron	†14.50-15.00
Buffalo, steel	21.00-21.50
Chicago, iron	17.00-17.50
Chicago, rolled steel	18.50-19.00
Cincin., iron, deal.	16.50-17.00
Eastern Pa., iron	20.00-20.50
Eastern Pa., steel	22.00-22.50
Pittsburgh, iron	19.50-20.00
Pittsburgh, steel	22.00-22.50
St. Louis, iron	†17.00-17.50
St. Louis, steel	17.00-17.50

NO. 1 CAST SCRAP

Birmingham	16.00
Boston, No. 1 mach.	†15.00-15.25
N. Eng. del. No. 2	14.00-14.50
N. Eng. del. textile	18.25-18.75
Buffalo, cupola	16.50-17.00
Buffalo, mach.	17.50-18.00
Chicago, agri. net	13.00-13.50
Chicago, auto net	15.00-15.50
Chicago, railroad net	14.00-14.50
Chicago, mach. net	14.50-15.00
Cincin., mach. deal.	16.00-16.50
Cleveland, mach.	20.00-21.00
Detroit, cupola, net	†14.50-15.00
Eastern Pa., cupola	19.50-20.00
E. Pa., No. 2 yard	15.50-16.00
E. Pa., yard fdry.	16.50-17.00
Los Angeles	15.50-16.00
Pittsburgh, cupola	18.50-19.00
San Francisco	15.50-16.00
Seattle	16.00-16.50
St. Louis, breakable	†14.00-14.50
St. Louis agri. mach.	†17.00-17.50
St. L., No. 1 mach.	†17.75-18.25
San Francisco	16.00-17.00
Toronto, No. 1 mach., net dealers	15.50

HEAVY CAST

Boston dist. break.	†15.00-16.00
New England, del.	15.00-15.50
Buffalo, break	14.50-15.00
Cleveland, break. net	15.25-15.75
Detroit, auto net	†15.50-16.00
Detroit, break	†11.00-11.50
Eastern Pa.	17.50-18.00
Los Ang., auto, net	14.50
New York break.	†14.50-15.00
Pittsburgh, break	16.00-16.50

STOVE PLATE

Birmingham	11.00
Boston district	†11.00-11.50
Buffalo	13.00-13.50
Chicago, net	9.50-10.00
Cincinnati, dealers	8.50- 9.00
Detroit, net	†9.00- 9.50
Eastern Pa.	15.00
New York, fdy.	13.00
St. Louis	†11.50-12.00
Toronto dealers, net	11.50

MALLEABLE

Birmingham, R. R.	17.50
New England, del.	20.00-21.00
Buffalo	16.50-17.00
Chicago, R. R.	18.50-19.00
Cincin., agri., deal.	13.50-14.00
Cleveland, rail	21.50-22.00
Eastern Pa., R. R.	21.50-22.00
Los Angeles	12.50
Pittsburgh, rail	21.50-22.00
St. Louis, R. R.	†16.50-17.00

Ores

Lake Superior Iron Ore

Gross ton, 51½ %
Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract.	9.00-10.00

Foreign Ore
(Prices nominal)

Cents per unit, c.i.f. Atlantic

Manganiferous ore, 45-55% Fe., 6-10% Mn.	14.00-15.00
Swedish low phos.	14.00
North African low phos.	14.00
Spanish, No. African basic, 50 to 60%	14.00
Chinese wolframite, short ton unit, duty paid	$23.75-24.00
Scheelite, imp.	$24.00-25.00
Chrome ore, 48% gross ton, c.i.f.	$26.00-28.00

Manganese Ore
Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	48.00-50.00
So. African, 50-52%	48.00-50.00
Indian, 49-50%	nom.
Brazilian, 48-52%	46.00-48.00
Cuban, 50-51%, duty free	61.20

Molybdenum

Sulphide conc., per lb., Mo. cont., mines	$0.75

Sheets, Strip

Sheet & Strip Prices, Pages 78, 79

Pittsburgh—Production is off, sheets averaging about 70 per cent and strip mills doing about 60. Galvanized production is likewise lower at 65 per cent. Weather has had considerable effect on merchant sheets, with farm buying of galvanized light. Ordinarily this would be the beginning of a fairly heavy buying season, but warehouse stocks are in good shape and it may be 30 days before spring buying is active. Automotive orders are slow, although inquiries are heavy. Reported price shading is neither widespread nor large.

Chicago—Sheet and strip production is being curtailed in response to restricted volume of orders. Buying is unchanged or slightly lower, with automotive needs offering the most promising source of heavier bookings. Consumption in this industry and among farm equipment builders continues outstanding.

Boston—Cold strip orders are barely steady and in some instances have receded slightly to not much better than 50 per cent of shipments. Specifications continue heavy, maintaining shipments and production. Backlogs are declining, but are sufficient to assure high schedules for at least six weeks. Orders are expected to accelerate this month. With consumption upward, producers of shanks, tacks, shoe nails and other accessories entering into the manufacture of footwear are heavily stocked or booked on material. Sheet buying is slack, distributors and consumers being well stocked and operating largely on inventories.

Philadelphia — Leading autobody builder is operating at 80 per cent and anticipates relatively active operations in February, based on scrap offerings for this period. New business continues slow and deliveries show further improvement, especially from smaller interests. Despite reports of price weakness on hand mill sheets in the Detroit area, no deviations are noted here. Holland has placed 500 tons of hot-rolled.

Buffalo—Sheet and strip production is fairly steady despite its heavy dependence on backlogs. A small volume of automotive orders is hoped to be the forerunner of more substantial buying soon. Consumers' inventories are considered only fairly heavy and will require bolstering before many weeks.

New York—Sheet sellers generally anticipate improvement this month. Manufacturers of electric refrigerators and other household appli-

ances are increasing production and some automobile accessory manufacturers regard their operations as likely to gain. The delivery situation should continue to improve over the next few weeks, as producers work off backlogs. At present shipments on hot and cold sheets average around four weeks.

Narrow cold strip specifications are holding, and there are few suspensions. Orders, however, are more spotty, volume varying from day to day, and incoming tonnage totals about 50-55 per cent of shipments. With production still near capacity, backlogs are being lowered but are sufficient for high output well into March. Before that period sellers confidently look for heavier buying.

Cincinnati—Output has been reduced but not enough to match buying which accounts for 55 to 60 per cent of capacity. Mills still have backlogs, but production of this tonnage will be spread through the quarter. January shipments to warehouses were heavy, representing fourth quarter purchases, and buying now is light. Unfavorable weather has dampened interest in galvanized.

St. Louis—Production has declined moderately and shipments of both sheets and strip are also lower. Consumers are subsisting on inventories, which is taken to indicate that a resumption of buying may be looked for soon.

Birmingham, Ala.—Sheet output remains high and orders are being received in good volume. Production is estimated at approximately 85 per cent. Strip is exceptionally quiet.

Toronto, Ont.—Inquiries for sheets were more numerous during the past week, largely for war requirements. Local interests, however, state no sheets are available for spot delivery and practically all production has been booked to the end of June. Prices beyond April 1 will be quoted at time of delivery.

Plates

Plate Prices, Page 78

Boston—Scattered small orders for prompt shipment make up most plate buying, which is slack. Demand is limited to immediate needs and forward buying is absent. Firebox steel and floor plates share in dullness. While little additional ship tonnage has been booked by district yards, specifications for such construction lead in a rather drab picture.

New York—A slight increase in incoming specifications is noted by plate sellers. Demand is diversified, with little outstanding tonnage from any one source. Meanwhile, shipments are well in excess of orders and deliveries are steadily improving. Most eastern sellers can offer shipments within 10 days or sooner; however, they look for a more appreciable improvement as February gets under way. Several hundred tons of new car and locomotive business is active here, with railroad demand otherwise confined largely to specifications.

Philadelphia — Plate fabricators, including tank shops, still are operating at an active pace but generally report new work slow. Plate mills in some instances can make deliveries in a week or less. Reading Co. has released several hundred tons which will be fabricated into car sides by a Reading, Pa., interest. Navy has deferred bids until Feb. 9 on 2 cruisers taking about 6000 tons each. Central Iron & Steel Co., Harrisburg, has been awarded 1300 tons stock plates for eastern navy yards.

Birmingham, Ala.—Plate production is steady, largely because of

backlogs carried over from 1939, continued bookings from tank manufacturers and plates for shipbuilding, which is taking a considerable tonnage.

Seattle—Two major projects are developing which are expected to require large tonnages. The 320-mile crude oil pipeline proposed to tap the Cut Bank, Mont., fields for Inland Empire Refineries, Spokane, is expected to be approved shortly. Cost is estimated at $3,000,000. Utah capitalists are planning a $7,500,000 project to pipe natural gas from northern Utah fields to southern and eastern Idaho, having applied for a franchise to the state of Idaho. Bellingham, Wash., opened bids Feb. 1 for a 24 to 48-foot welded steel pipe, welded steel specials and traveling water screen.

Toronto, Ont. — Award of large shipbuilding contracts has stimulated interest in plates and inquiries for large tonnages have appeared. Canadian producers, it is stated, have no plates available and their production is absorbed for several months. On this account, it is stated, most of the plate contracts will go to the United States.

Plate Contracts Placed

160 tons, three 50 x 30-foot tanks, Daughtery refinery, Petrolia, Pa., to Hammond Iron Works, Warren, Pa.

Bars

Bar Prices, Page 78

Pittsburgh—A revised list covering cutting extras on hot-rolled carbon steel bars, issued recently, leaves charges unchanged from the schedule of last July. Language used is slightly different in order to clarify certain points.

Chicago—Buying of carbon and alloy bars is restrained, although a slight increase in alloy inquiries at some mills is reported. An upturn is expected within two weeks.

Boston—Bar consumption by machine tool builders, small forgers and shipyards holds, but new buying is light. Alloys are relatively more active than carbon bars, deliveries on the latter approaching normal. Warehouse purchases are confined mostly for fill-in needs and specifications are spottier. Distributors are still pressing for earlier deliveries on alloy stock, but mills to date have made little progress in speeding up shipments.

New York—While jobbers have accumulated fair stocks of bars, this is not so true of consumers, who in some instances are still pressing mills for deliveries. However, the

general situation is much easier, with leading producers able to make shipments on carbon material within two to three weeks and on cold-drawn bars within three or four weeks. Alloy bar deliveries appear to be averaging around five to six weeks, but where special heat treatment is involved shipments are much further extended.

Philadelphia — Bar consumption continues active especially among tool builders, chain makers, small and large forge shops and makers of material handling and auxiliary ship equipment. Most consumers are well covered, however, for the next two to four weeks and little incentive exists for additional buying.

Birmingham, Ala.—Merchant bars have shown some gain in recent weeks and output remains consistently high, aided by a carry-over from the last quarter. Concrete reinforcing demand also is brisk.

Toronto, Ont.—Business developed a better tone during the week and several good orders were closed, bringing contract commitments close to the end of this quarter. Producers are maintaining almost capacity production schedules to keep pace with delivery dates and have nothing available for immediate shipment.

Buffalo—Bar production is heavy, but at a slower pace than late last year. Backlogs have been worked down materially but substantial tonnages remain for first quarter delivery.

Pipe

Pipe Prices, Page 79

Pittsburgh—Pipe orders are still ahead of December in oil country divisions, but standard pipe demand has been hard hit by weather conditions and buying for consigned stocks is light. Production in both integrated and nonintegrated mills is steady at considerably better than the ingot rate for the industry. Prices have been slipping in the secondary market in many sections as a result of lighter demand.

Boston—Steel pipe buying is light, but has gained slightly in a few centers. Industrial demand is subnormal and slowness in the building trade tends to restrict sales. Prospective housing projects continue to offer the most promising outlet. Cast pipe is inactive and little improvement is expected for some weeks. Seamless steel tubing consumption is increasing in some industries, but buying is light, users running on inventories.

New York—Department of purchase, New York, is expected to ask bids soon on a substantial tonnage of cast pipe for immediate laying to be followed in the early spring by a larger volume. More inquiries are beginning to appear. Purchases include several hundred tons for the procurement division, Newark, N. J., part of the material being short lengths for culverts and drainage. Foreign inquiry is substantial, mostly from South America.

Cold weather has adversely affected the merchant pipe market, with January sales light all around. Meanwhile, resale pipe prices are weak.

Birmingham, Ala.—Current pipe orders are rather disappointing, the sustained output being occasioned largely to catch up holiday slack. Inquiries are not so numerous and most bookings are in small lots of miscellaneous items.

St. Louis—City of Memphis, Tenn., received bids Jan. 26 for 25,000 lineal feet of 1 inch, 30,000 feet of 1¼-inch; 8000 feet of 2-inch and 160 feet of 4-inch standard black steel pipe, threaded and coupled with standard couplings. Greenup, Ill., will open bids Feb. 8 for waterworks improvements, including 3360 lineal feet of 6-inch and 1500 feet of 4-inch cast

iron pipe. Russell & Axton, St. Louis are engineers.

Seattle—Business is slow but is epected to improve as the weather moderates. Seattle is considering bids for a quantity of water valves. Cle Elum, Wash., has state WPA approval for proposed $160,000 water system improvement. Seattle has called tenders Feb. 7 for 54,000 feet of galvanized wrought iron and steel pipe.

Cast Pipe Placed

200 tons, 4 to 8-inch, for Leavenworth, Wash., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

Cast Pipe Pending

200 tons, 16-inch, Class 200, for Seattle; Crane Co., low.

200 tons, 36-inch for Spokane, Wash.; bids in.

100 tons, 4 to 8-inch, for Pasco, Wash., bids in.

Wire

Wire Prices, Page 79

Pittsburgh—Wire bookings are off considerably in the merchant market, manufacturers' wire releases are steady and export inquiries are active. Demand for merchant products has suffered from the weather. Manufacturers' wire buying is quiet, although some auto partsmakers have come in for fair tonnages. Export buying of some products has been good. Inquiries have been received from South America, India, Africa, Dutch East Indies and other points recently. Export prices are lower where credit is satisfactory, and merchant prices have weakened somewhat in the domestic market.

Chicago—Buying of wire and wire products has been below the December rate, though better than expected. Better demand is expected late this month to fill in stocks, with second quarter covering probable during March. Agricultural and automotive demand are expected to aid materially.

Boston—Wire buying reflects the influence of heavy purchasing and shipments late last quarter. Numerous consumers are operating on inventories which are larger than generally admitted in many cases. Orders are estimated close to 55 per cent of shipments. Specifications are holding. As a result, mills are cutting into backlogs and this will be reflected in finishing operations unless new buying improves within a few weeks.

New York—Sustained heavy shipments are reducing wire mill backlogs, especially those products pro-

cessed quickly. However, enough tonnage is on books to hold production at a high rate at least into March. Buying has flattened out to close to 55 per cent of shipments. Cold weather has helped rope demand, but has retarded merchant products. Early improvement in spring wire demand by the furniture trade is expected. Wire rod producers are booked well ahead.

Birmingham, Ala.—Wire products specifications are active, especially nails and fencing. New business is in satisfactory volume and some backlog remains to be worked off.

Rails, Cars

Track Material Prices, Page 79

A tentative program for the purchase of 2000 freight cars and 25 locomotives is under consideration by the New York Central, which will open bids Feb. 6 on 25 to 40 passenger coaches. Locomotive buying is featured by the placing of 10 diesel engines by the Oliver Iron Mining Co., seven going to American Locomotive Co., New York, and three to Baldwin Locomotive Works, Eddystone, Pa. Oliver Iron company is still in the market for 33 stripping cars and three diesel shovels.

St. Louis Car Co. has booked 31 trackless trolleys for Georgia Power Co., Atlanta, Ga.

Car Orders Placed

Lehigh Valley, 24 caboose cars, to own shops, Sayre, Pa.

Minneapolis & St. Louis, 10 covered hopper cars, to General American Transportation Co., Chicago.

St. Louis Car Co., 31 trackless trolleys for Georgia Power Co., Atlanta, Ga.

Locomotives Placed

Northern Pacific, three 660-horsepower diesel-electric locomotives to American Locomotive Co., New York.

Oliver Iron Mining Co., 10 diesel-electric locomotives, seven to American Locomotive Co., New York, three to Baldwin Locomotive Works, Eddystone, Pa.

Rail Orders Placed

Southern Railway, 4000 tons, to Bethlehem Steel Co., Bethlehem, Pa.

Car Orders Pending

New York Central, 2000 freight cars, tentative; as noted in last week's issue this railroad will open bids Feb. 6, on 25 to 40 passenger coaches.

Oliver Iron Mining Co., 33 stripping cars, pending.

Locomotives Pending

New York Central, 25 locomotives, tentative.

Oliver Iron Mining Co., three diesel shovels, bids asked.

Shapes

Structural Shape Prices, Page 78

Pittsburgh—A heavy tonnage is pending, but structural inquiries are slower, being in about the same volume as awards. New work is equally divided between public and private projects. Prices are reported firm in all sections on mill quantities, although eastern seaboard quotations have not been so good in the secondary market. Local warehouses report prices relatively steady.

Chicago—Structural inquiries continue light, with awards moderately active. Orders are coming largely from public projects, but an increase in private construction is expected to be more prominent before spring.

Philadelphia — Bethlehem Steel Co., Bethlehem, has booked 380 tons for addition to open-hearth department, Central Iron & Steel Co., Harrisburg. Actual awards are slow currently but somewhat more pending business is reported.

Boston—Contracts are light, few projects taking more than 100 tons. Inquiry is slightly heavier, includ-

ing an industrial plant addition, Groton, Conn., 775 tons, and buildings at the army air station, Chicopee, Mass., 710 tons. Bridge inquiries are small, beam and stringer spans being involved. Massachusetts closes Feb. 20 on five such projects.

Buffalo—The market is slow, with only a few jobs pending. It is reported a new $900,000 apartment house will be built on Sheridan drive in Tonawanda, but plans have not yet reached the bidding stage.

St. Louis—A few small lettings, the largest 45 tons, constitute the only new business in the structural shape market. No large projects are pending and backlogs have declined to the lowest point in a number of months.

Seattle—Fair tonnages are on the books of Seattle and Portland fabricators, additional placements to be made shortly for the navy's Alaska air bases and projects at Bonneville.

Shape Contracts Placed

1540 tons, state highway bridge, Maxville, Mo., to Stupp Brothers Bridge & Iron Co., St. Louis.

840 tons, eight bridges, Winnetka, Ill., to Duffin Iron Works, Chicago.

800 tons, sewage disposal plant, Coney Island, New York, to American Bridge Co., Pittsburgh; Stock Construction Co., New York, contractor.

550 tons, underpass, Forty-sixth street, Denver, for state, to Bethlehem Steel Co., Bethlehem, Pa.

385 tons, power plant, University of Illinois, Champaign, Ill., to Joseph T. Ryerson & Son Inc., Chicago.

380 tons, extension to open-hearth department, Central Iron & Steel Co., Harrisburg, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

320 tons, overpass, Tucumcari, N. Mex., for state, to Missouri Valley Bridge & Iron Co., Leavenworth, Kans.

280 tons, gymnasium, Northwestern university, Evanston, Ill., to Joseph T. Ryerson & Son Inc., Chicago.

250 tons, county home, West Burlington, Pa., for Bradford county, to Lehigh Structural Steel Co., Allentown, Pa.

220 tons, state bridge, Battle Creek, Mich., to Wisconsin Bridge & Iron Co., Milwaukee.

190 tons, state bridge, Lansing, Mich., to Fort Pitt Bridge Works, Pittsburgh.

190 tons, laboratory and shop buildings, Fort Monmouth, N. J., to Bethlehem Steel Co., Bethlehem, Pa.

185 tons, clinker storage building, Diamond Portland Cement Co., Middlebranch, O., to Canton Structural Steel Co., Canton, O.

175 tons, Bradford county home, West Burlington, Pa., to Lehigh Structural Steel Co., Allentown, Pa.

175 tons, extension 2, oil tempering plant, for Midvale Co., Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.

170 tons, extension to hammer shop, for Midvale Co., Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.

130 tons, bridge No. 448, Chicago & North Western railroad, Quarry, Iowa, to American Bridge Co., Pittsburgh.

115 tons, theater, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa., through Golder Construction Co., Philadelphia.

110 tons, extension to heat treating building No. 108, for Aluminum Co. of America, Cleveland, to American Bridge Co., Pittsburgh.

105 tons, Circle theater, Brookline, Mass., to West End Iron Works, Boston.

105 tons, bridge FAP-447-(1), Falls City, Neb., to St. Joseph Structural Steel Co., St. Joseph, Mo.

100 tons, viaduct reconstruction, Twenty-third street and Outer drive, Chicago, to Bethlehem Steel Co., Bethlehem, Pa.

100 tons, shapes and bars, addition, post office, Stamford, Conn., to Portchester Iron Works, Portchester, N. Y., and Concrete Steel Co., New York; Ross

Shape Awards Compared

	Tons
Week ended Feb. 3	7,415
Week ended Jan. 27	15,880
Week ended Jan. 20	10,838
This week, 1939	21,575
Weekly average, year, 1940	12,633
Weekly average, 1939	22,411
Weekly average, January	13,938
Total, to date, 1939	152,124
Total, to date, 1940	63,167

Includes awards of 100 tons or more.

Engineering Co., Washington, contractor.

Shape Contracts Pending

1100 tons, buildings, Willowbrook hospital, state school for mental defectives, Staten Island, N. Y.; Silverblatt & Lasker Inc. New York, low.

1000 tons, 12 intake gates and appurtenances for Bonneville dam; Willamette Iron & Steel Co., Portland, low Alternate B; Puget Sound Machinery Depot, Seattle, low Alternate A.

770 tons, plant extension, for Electric Boat Co., Groton, Conn.

700 tons, barracks and mess hall, Chicopee Falls, Mass., war department.

600 tons, transfer bridges 11 and 12, Greenville, N. J., for Pennsylvania railroad.

500 tons, radial gates FO-54, for Colorado river, Parker, Colo., for United States Indian irrigation service.

450 tons, warehouse, for Calco Chemical Co., Bound Brook, N. J.

380 tons, state buildings 4 and 18, Willowbrook, N. Y.

275 tons, apartment house, for 9000 Jefferson Avenue East Corp., Detroit.

250 tons, United Airlines terminal, Portland, Oreg.; Reimers & Jolivette, Portland, low.

250 tons, addition, C. A. Reed Co., Williamsport, Pa.

225 tons, reconstruction of Cross Bay boulevard, New York, for New York city parkway authority.

210 tons, building, for Lindsay Wire Weaving Co., Cleveland.

190 tons, trusses for bridge, North State street, Chicago, for city.

165 tons, school building, for St. Gabriels parish, Elmhurst, N. Y.

160 tons, crossing, Northern Pacific railway, Seattle, for state.

120 tons, Roza dam project, Washington state; J. A. Terteling & Sons, Boise, Idaho, low; materials by bureau.

110 tons, addition to laundry building 47, Orangeburg, N. Y., for state.

110 tons, housing project, Gary, Ind., for Gary housing commission.

110 tons, garage and shop, Ogden air depot, Arsenal, Utah, for United States government.

100 tons, administration and infirmary building, Marshalltown, Del.; state board of health, Dover, Del., takes bids Feb. 9.

100 tons, stadium and athletic field, Wilmington Park Corp., Wilmington, Del., bids in.

100 tons, housing project, Wilmington, Del.

Unstated, 131 steel towers, transmission line Bonneville project; bids to Portland, Oreg., Feb. 13.

Unstated, two 90-inch tube valves and other items for Wickiup dam, Oregon; bids to Denver, Feb. 12.

Reinforcing

Reinforcing Bar Prices, Page 79

Pittsburgh—Concrete bar prices have weakened in some sections, certain jobs in the Midwest reported going as much as $7 a ton below the 2.15c market. Competition is heavier now that mill backlogs of merchant bars are lower and permit additional rolling capacity for concrete bars. A substantial tonnage is pending, but awards are lighter. Inquiries are few.

Chicago—Inquiries are light and unchanged, but more activity is noted among architects, leading to expectations of better demand later this quarter. Awards are boosted by placing of 7500 tons for the local filtration plant.

Boston—Pending volume of reinforcing steel, bid or being estimated, is not impressive. Multiple housing projects continue to account for a substantial part of inquiry. Current buying is in small lots. Bridge inquiries are absent and reduced highway programs this year in several states augur for a lower volume. Price shading continues.

New York—Reinforcing steel contracts involve approximately 2000 tons, including 710 tons for a sewage disposal plant, Coney Island, N. Y., and a furniture warehouse, 340 tons. Inquiry is seasonally slack, notably for engineering project requirements. Prices continue to sag, competition even on rela-

tively small tonnages bringing out shading as mill deliveries improve.

Philadelphia—More private industrial work is reported, being mostly for additions and alterations and generally involving less than 100 tons individually. Prices so far are holding surprisingly well.

Seattle—With backlogs nearly exhausted and no large tonnages in sight, rolling mills will curtail operations sharply unless new business develops immediately. The market at present is more barren than in months. Some small tonnages are being placed by fabricators but no large tonnages are in sight.

Reinforcing Steel Awards

7500 tons, filtration plant, west substructure, Chicago, Michael Pontarelli & Son, Chicago, to Joseph T. Ryerson & Son Inc., Chicago.

3553 tons, for Coulee dam, to Bethlehem Steel Co., Bethlehem, Pa.

900 tons, viaduct, Central avenues, Chicago, to Inland Steel Co., Chicago; through Joseph T. Ryerson & Son Inc., Chicago. Thomas McQueen Co., contractor.

700 tons, sewage disposal plant, Coney Island, New York, to Bethlehem Steel Co., Bethlehem, Pa.; Stock Construction Co., New York, contractor.

640 tons, power plant and laundry building, Willowbrook hospital, state school for mental defectives, Staten Island, N. J., to Capital Steel Co., New York; Cayc Construction Co., New York, general contractor.

563 tons, highway tunnel, Williamsburg, Va., to Virginia Steel Co.; J. G. Attaway Construction Co., Statesboro, Ga., contractor.

500 tons, bridge, Massachusetts avenue, Washington, to Bethlehem Steel Co., Bethlehem, Pa., through Hudson Supply & Equipment Co.; Potts & Callahan, contractors.

340 tons, furniture warehouse, Warmkill Realty Co., New York, to Igoe Bros., Newark; Wilcox Construction Co., New York, contractor.

238 tons, grade elimination, Orange county, New York, to Truscon Steel Co., Youngstown, O.; Lane Construction Co., contractor.

225 tons, appraisers' building, Houston, Tex., to Ceco Steel Products Corp., Houston, through Weitz Co., Des Moines, Iowa, contractor.

200 tons, bridge and viaduct, Western avenue, Chicago, to O. J. Dean Co., Chicago.

188 tons, bridge and viaduct, Thirty-first street and Western avenue, Chicago, to Republic Steel Corp., Cleveland.

175 tons, state highway bridge, Huntington, Mass., to Northern Steel Co., Boston; B. A. Gardetto Inc., contractor.

135 tons, unit for Roza dam, Washington state; J. A. Terteling & Sons, Boise, Idaho, low; materials by bureau.

125 tons, shop foundations, Chapman Valve & Mfg. Co., Indian Orchard, Mass., to Concrete Steel Co., New York; E. F. Carlson Inc., Springfield, Mass., contractor.

118 tons, gymnasium, Northwestern university, Evanston, Ill., to Ceco Steel Products Corp., Chicago.

115 tons, state bridge, Stonington, Conn., to Truscon Steel Co., Youngstown, O.; A. I. Savin Construction Co., East Hartford, Conn., contractor.

115 tons, highway bridge, route 5, McLain county, Mo., to Missouri Rolling Mill Corp., St. Louis.

100 tons or more, power plant and laundry building, Chilocco, Okla., to St. Joseph Structural Steel Co., St. Joseph, Mo.

100 tons, Tilton road bridge, Pennsylvania-Reading Seashore Lines, Atlantic county, New Jersey, to Carroll-McCreary & Co., Inc., Brooklyn; Cayuga Construction Co., New York, contractor.

Unstated, state underpass, Rigby, Idaho;

Concrete Bars Compared

	Tons
Week ended Feb. 3	16,530
Week ended Jan. 27	3,331
Week ended Jan. 20	6,036
This week, 1939	11,699
Weekly average, year, 1940	9,234
Weekly average, 1939	9,197
Weekly average, January,	7,410
Total to date, 1939	70,169
Total to date, 1940	46,171

Includes awards of 100 tons or more.

J. W. Brennan, Pocatello, Idaho, general contractor.

Reinforcing Steel Pending

1000 tons, plant, for Fred Sanders, Detroit.

600 tons, Delaney community housing, Gary, Ind.; bids Feb. 15.

475 tons, holder, Prince George's Gas Corp., Prince George's, Md.

400 tons, Latrobe homes, housing project, Baltimore, bids February 14.

327 tons, public opening, city of Cleveland, bids Jan. 26; Patterson-Leitch Co., Cleveland, low.

250 tons, East river housing project, New York; bids in.

225 tons, second building group, Willowbrook hospital, Staten Island, N. Y.; bids in.

200 tons, Toby creek outlet works and pumping station, Edwardsville, Pa.; war department, Washington, takes bids Feb. 12.

150 tons, animal building, Parke Davis, Inc., Detroit.

105 tons, waterworks shaft, Weston, Mass.

Unstated tonnage, top-story addition, customs house, Chicago.

Unstated tonnage, store building, John Smythe & Co., Evanston, Ill.

Unstated tonnage, headquarters and administration building re-bidding, army air corps, Chanute field, Rantoul, Ill., bids Feb. 15.

Pig Iron

Pig Iron Prices, Page 80

Chicago — January shipments were 30 to 35 per cent below those of December, a decrease larger than expected. February outlook is vague, and total tonnage this month may not be improved. By-product foundry coke shipments were close to 10 per cent above the previous month, indicating little slack in foundry melt. New buying is small, and mostly of a fill-in nature.

Boston—Pig iron shipments are lighter and buying has not developed beyond spot lots for prompt delivery. Foundry melt, however, is maintained except in a few scattered instances. Those meeting requirements of the machine tool trade are the most active. Larger consumers have fair stocks, but several will place more tonnage for second quarter. Mystic Iron Works furnace, Everett, Mass., will go down shortly.

New York—Foundry melt is gaining momentum slowly, with the general rate for January well under that of December. Sellers regard the present lull as seasonal and anticipate a better daily average in February. At present the major consuming group are machine tool builders and jobbers engaged on machinery castings. Export inquiry has improved over the past fortnight, but orders have shown little gain.

Philadelphia—Most pig iron sellers report quietness but one or two consumers who did not cover sufficiently before the last price rise may enter the market for around 1000 tons each. One is a user of basic. Great Britain is taking shipments against a large order placed in December.

Buffalo—January shipments to foundries held up well, showing an increase in the last few days. Some foundries have dropped from five to four days a week. Backlogs for first quarter delivery are heavy. Republic Steel Corp. has banked one blast furnace as demand for hot iron for open hearths has lessened.

Cincinnati—Demand for machine tool castings is keeping foundries busy and pig iron shipments are at a good rate. Foundries serving stove and agricultural implement manufacturers are on light schedules. Most buying is in small lots for spot delivery. Stocks generally are light.

St. Louis—Pig iron buying is confined to a few small lots for prompt shipment. The movement has receded further, owing to smaller steel mill requirements and heavy tonnages of scrap acquired by those interests. Gray iron foundries are still quite active, but report dimin-

ishing backlogs of unfinished orders and a decline in new business.

Birmingham, Ala.—For the first time in months pig iron production has slowed down with removal of No. 4 blast furnace by Sloss-Sheffield Steel & Iron Co. for relining, leaving 17 stacks active of the district's 18. The furnace is expected to be down 30 days.

Toronto, Ont.—Indication of improvement was revealed during the week. Placing of large war orders is credited for increased inquiries for spot and future delivery. Sales, however, continue around 1000 tons weekly with spot orders up to 200 tons. Deliveries against contract are responsible for shipments running about 4500 tons per week.

Scrap

Scrap Prices, Page 82

Pittsburgh — Scrap prices have sagged appreciably, influenced both by better weather and by completion of shipments against high-priced orders. All low-phos grades and turnings are lower, and No. 1 steel is down 50 cents. Nominal status of the latter is due mainly to lack of buyer interest which has prevented sales establishing the market. Scrap consumption is retarded to a certain extent by the heavy blast furnace capacity still active.

Cleveland—Scrap prices are soft and numerous reductions have been made in absence of buying. Quotations have been marked down 50 cents to $1.50 on most grades. Little material is coming to yards and shipments to melters are light.

Chicago—The market is soft, and No. 1 steel at $16 to $16.50 averages 25 cents less than a week ago. A number of other grades also are lower. Mill buying is quiet following the last purchase of No. 1 steel at $16.50, and with stocks large in the face of declining consumption, prospects for more active demand are unfavorable.

Boston—Iron and steel scrap buying is light, especially in cast grades for district consumption, foundries operating on inventories and buying little new material. Several thousand tons for export were loaded, the first vessel to arrive in weeks. Little new buying was required to fill the ship. The downward tendency in prices, both export and domestic, has not been arrested.

New York—Buying for export against contracts is heavier, with prices unchanged at $14.50 and $13 for heavy melting steel grades. More cargo space is available, several ships loading for England and Italy. Negotiations are under way for additional purchases by these two countries and contracts not yet closed may reach several hundred thousand tons. Domestic buying has improved in spots and an eastern Pennsylvania steelworks is reported to have bought more than 8000 tons of No. 1 heavy melting steel at $18.75, delivered. Foundry buying is spotty. Most prices are unchanged.

Philadelphia — Cast scrap prices have eased 50 cents and adjustments have been made in certain specialties. Some steelmakers are holding off on new purchases in anticipation of lower prices. E. G. Budd Mfg. Co. received close to $17 per ton, f.o.b., for 4000 tons of new compressed sheets. Evidence of renewed export activity is appearing with 7000 tons scheduled for England in the next few days on one boat and a smaller tonnage on a second. December exports from Philadelphia were 4856 tons, of which 3387 went to England, 1290 to Japan and 179 to China.

Buffalo—Despite absence of mill buying, dealer trading has resulted

in a 50-cent reduction in most scrap grades. No. 1 steel now is $16.50 to $17. Mills practically have cleared dealers' books of old orders placed at higher prices, but stocks are ample to cover near-future needs.

Detroit—Possibility of important automotive steel orders being placed imminently is being watched carefully by scrap interests, the market remaining in the static position of the past two weeks. Sentiment is bearish and it is believed some further weakening in prices may develop, especially in view of the fact a reduction in open-hearth activity locally is expected. Prices appear to be holding up better in this district than elsewhere.

Cincinnati—Absence of consumer buying and reduction in steelmaking activity caused prices to weaken, heavy melting steel going down 50 cents per ton, followed by several other grades. Movement is light, though small tonnages are being handled. Deliveries on contracts continue but in reduced volume.

St. Louis — Somewhat mixed trends will prevail in scrap. Certain grades are apparently firmer, while on others quotations have dropped. Demand is better from gray iron foundries, reflecting reduced scrap inventories and a higher rate of operations in some instances. Cast items have been marked up fractionally.

Seattle — Export business is confined to small shipments on a day to day basis. Shippers expect few orders from Japan in the near future as heavy consignments have been forwarded in the last 60 days. The latest full cargo charter, January loading, was done at $11.50, within 50 cents of the high record. Mills are not active as their needs are covered. Seattle will shortly offer two miles of double track street railway rails for sale, other large lots thereafter as the system is abandoned for buses and trackless trolleys.

Toronto, Ont.—Owing to unfavorable weather conditions trading in iron and steel scrap continues slow. Most consumers have stocks sufficient for immediate needs. Steel mills are taking all steel scrap offered. Foundries show only minor interest in cast and stove plate. Because of poor condition of roads comparatively little scrap is reaching dealers' yards. Local dealers look for upward price revision within a few days, but made no changes in list for the week.

Warehouse

Warehouse Prices, Page 81

Boston—Buying from warehouses is well maintained, and while the seiond half of January was less active than the first, totals for the month compare favorably with December. Prices are generally firm except on some sheet transactions in which seconds are involved.

New York—Volume with warehouses has declined slightly. The number of individual orders is maintained, but aggregate tonnage is down and with few exceptions, January totals were moderately below December. Slackening during the last 10 days of the month was less pronounced than during the corresponding period in December.

Philadelphia — January business was about 75 per cent of that for December but some improvement is indicated this month. Orders currently are small in size, reflecting improved mill deliveries. Prices are holding.

St. Louis—Warehouse sales and shipments are measurably below those of December, attributed in part to the record cold weather. Tubular

goods and some other repair materials are reported in brisk demand.

Buffalo—January business was slightly under December but for the majority of sellers was the best for the month, excepting 1937, in nine or ten years.

Cincinnati—Sales are off, the decline being attributed largely to better mill deliveries. Some warehouses report a 15 per cent drop in late-January business.

Seattle—Milder weather and increased home construction account in part for the marked increase of volume in January compared with last year. Sheets are in good demand and items for the navy yard and other public projects are moving freely.

Steel in Europe

Foreign Steel Prices, Page 81

London—(*By Cable*)—Basic and hematite pig iron output is expanding in Great Britain. Demand for iron and steel for export is increasing as British prices are below Continental, but export licenses are strictly limited. The situation in semifinished steel is improved by better deliveries from Belgium. Sheetmakers are better able to supply domestic commercial users and also meet export demand. Trade in tin plate is satisfactory.

War conditions will force continued imports of steel and iron scrap, the house of commons has been told by Col. Llewellin, secretary to the ministry of supply. Efforts to increase domestic supplies have yielded results but present high steel production will force supplementary imports.

It is understood a large order for tin plate has been placed with Welsh producers by the British and French governments. The plate is said to be of heavier gage than usual.

Belgium and Luxemburg report export demand continues strong, exceeding supplies available, domestic markets having priority.

Tin Plate

Tin Plate Prices, Page 78

Production has dropped 4 points to 65 per cent. Buying continues light, and backlogs are small. Better releases are expected within the next two weeks, although stocks of mills and canmakers are sufficient to make operations dependent on current demand. Export inquiry is steady and somewhat better than a year ago but is less than might be expected in view of world conditions. Credit troubles have hampered foreign trade in some instances. Domestic prices are firm but slightly lower on export tonnage, especially where credit risk is good.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 79

Bolt and nut production is tapering more rapidly, as sellers are fairly well caught up with orders. New business the past four or five weeks has been slack in most lines and had it not been for at least a full month's backlog as the new year got under way, production by now would have been down far more sharply. A bright spot has been automotive specifications, which were off only slightly this past month.

Semifinished

Semifinished Prices, Page 79

Pittsburgh—Releases have moderated, with nonintegrated mills cut-

ting down inventories slightly. Sheet bar movement in particular has declined, while skelp orders remain good and releases steady. Wire rod tonnage is off somewhat although export inquiries are active. The 50,000 tons of semifinished placed by England with Carnegie-Illinois Steel Corp. is part of recent purchases estimated to total 200,000 tons.

New Stainless Extras

A new extra list covering stainless steel products has been issued by Carnegie-Illinois Steel Corp. in conjunction with American Steel & Wire Co. The card supersedes the list of March 10, 1939.

Numerous changes have been made, affecting bars, billets, wire and flat-rolled products. Revisions in quantity extras include a 50 per cent reduction in quantity charges on 4 to 6 per cent chromium stainless.

Ferroalloys

Ferroalloy Prices, Page 80

New York—Foreign demand for ferroalloys is increasing noticeably, but little actual business is being done because of the government's attitude with respect to exportation of what it regards as strategic materials. Some of this inquiry is coming from belligerent nations, although not in the volume that might be expected. Most of the inquiry, it is said, is from neutrals, who have been cut off from their normal sources of supply by the European war. Incidentally, no importations of ferromanganese have been seen for some time.

Domestic shipments of ferromanganese in January declined from the preceding month and a further drop may be noted this month. This is regarded as likely in view of the fewer working days in February and of the probability of a further decline in steelmaking operations.

The current market on ferromanganese is $100, duty paid, eastern seaboard, and on domestic spiegeleisen, $32, Palmerton, Pa., for 19 to 21 per cent material.

Ore Imports Continue Despite War Conditions

Baltimore — Iron ore shipments arriving here from Nov. 29 to Dec. 15, inclusive, involved several sizable cargoes including several from Narvik, Sweden. Arrivals were 21,000 tons from Cruz Grande, Chile, Nov. 30; 9049 tons, Narvik, Nov. 30; 5556 tons, Narvik, Dec. 2; 7251 tons, Narvik, Dec. 6; 1500 tons of chrome-bearing iron ore from Masinloc, Dec. 11; 21,300 tons, Cruz Grande, Dec. 14; and 5086 tons, Narvik, Dec. 14.

Manganese ore importations comprised 5700 tons from Durban, Nov. 29; 7330 tons, Poti, Dec. 1; 8500 tons, Rio Janiero, Dec. 1; 2200 tons of manganese ore (also 177 tons of silliminite rock), Calcutta, Dec. 1; 3380 tons, Durban, Dec. 2; 6000 tons, Rio Janiero, Dec. 2; 4600 tons, Santiago, Dec. 4; 7550 tons, Takoradi, Dec. 9; 6860 tons, Durban, Dec. 10; 5400 tons, Poti, Dec. 10; 7500 tons, Takoradi, Dec. 12; 7600 tons, Poti, Dec. 14; and 500 tons, Calcutta, Dec. 15.

Chrome ore arrivals comprised 805 tons, Santa Cruz, Dec. 4; 8550 tons, Masinloc, Dec. 8; 7800 tons, Lourenco Marques, Dec. 15; and 1000 tons, Madras, Dec. 15.

Arrivals also included 195 tons of silicate ore, Nov. 30, and 228 tons, Dec. 12, both from Calcutta.

Ask New Manganese Ore Bids for Army Supply

Washington —Procurement division, treasury department, has rejected manganese ore bids opened

in December and will open bids Feb. 20 for 2000 to 105,000 gross tons of ore for delivery at United States army ordnance depots at South Baltimore, Md., Ogden, Utah, and in Baltimore harbor. A minimum of 48 per cent manganese is required.

U. S. Steel Defends Basing Point System

(*Concluded from Page 24*)

ly unforeseeable. Its exponents propose it in the name of abstract theory, and have outlined its characteristics and effects only with respect to the elimination of supposed evils of the basing point method. They have never described the operation of the system nor analyzed its effects in relation to the economic facts of the steel industry.

Uniform f.o.b. mill price system is expected by its exponents to eliminate high cost, inefficient and supposedly uneconomically located mills and to break up concentration of production facilities, by forcing the erection of small mills in all parts of the country. Such results, even if they would be accomplished by the system, would conflict with basic economic factors, and necessarily increase present production and transportation costs.

System Increases Competition

The system is also expected to produce theoretical "perfect competition," or at least to increase competition. This is to be accomplished by the extraordinary means of arbitrarily limiting the competition between mills not adjacent to each other to marginal territory. Each mill, or group of mills, would be restricted in distribution to a circumscribed area subject to only slight possible variations in size. Each customer would be confined to a single or a very few sources of supply. The capacities of mills would be limited to the consumption in the prescribed territories, and any existing additional capacity would have to be scrapped. Serious dislocations in the steel industry and in industries dependent upon it would be inevitable.

Under a uniform f.o.b. mill price system, local monopolies and high assembly and production costs would displace the present widespread competition and low costs.

A. A. Dornbusch, general sales manager, Newport Rolling Mills Co. was another witness called by the trade commission. Mr. Wooden introduced a letter written by Mr. Dornbusch to A. K. Andrews on Aug. 17, 1935, when Mr. Andrews was president of the Newport company. Letter dealt with determination of prices. Mr. Wooden attempted to reveal collusion in fixing prices, an allegation which Mr. Dornbusch denied.

A. B. Custer, administrative officer of the navy department in connection with purchases was put on the stand by Mr. Wooden and introduced abstracts of certain steel bids. In one of these abstracts were 51 bidders with only six exceptions to uniform bids. In the other abstract, also for steel bids for the navy, there were 31 bidders, all of the prices being identical. He said that speaking of steel only between 60 and 70 per cent of the bids received were identical.

Hugh White on the stand for the federal trade commission contended U. S. Steel figures showing that a high percentage of awards made by the government went to lowest bidders on steel products could not be reconciled with an analysis made by government statisticians.

The Corporation figures show awards were made by the government for $10,500,000 of steel products during 1938 and the first quarter of 1939, of which 80 per cent went to lowest bidders and only 16.5 per cent awarded by lots, indicating tie bids.

He claimed his breakdown of U. S. Steel figures shows steel rolling mill products accounted for only a part

Behind the Scenes with STEEL

198 Interesting Years

■ A year and a half ago C. H. Vivian, editor, *Compressed Air Magazine,* says he happened in on the tail end of our search for the oldest industrial concern in the country that is still in business. As you may remember, the Taylor-Wharton Iron & Steel Co. of High Bridge, N. J., antedated any other outfit by a wide margin, first beginning operations in 1742, just a few months after the negro slave plot to burn New York City, which resulted in 13 burned at the stake and 18 hanged. Mr. Vivian decided there must be an exceptionally interesting story in such a company and took steps to get it. You will find it in the January issue of *Compressed Air,* and an interesting story it is.

Off The Record

■ Supporters of F. D. R. for reelection (which of course does not include John L. Lewis, John N. Garner, or John D. Rockefeller) are being tentatively labelled *Third Termites* and are reported to be all set to pull the plug on their new slogan: *Life Begins At* '40.

Have You Heard?

■ Along with a dozen new Confucius sayings every day we've been on the receiving end of a flood of such things as this: "What's a *mirage?*" (*pause*) "Give up?" (*pause*) "Why that's where the little man who wasn't there keeps his car!"

Excuse It, Please

■ We reached our pinnacle last week in the art of mathematical jumbling. First to catch us, of course, was the boss who modestly admits of a C. E. sheepskin, Purdue '12. Apparently even Ann could figure that 1800 companies out of a total of 160,000 is really 1.2 per cent doing over half the business in the country and not 12 per cent as we said. Mr. A. Nonymous of Carnegie-Illinois agrees the situation is more amazing than we stated, and he's right.

Southern Hospitality

■ Isaac Tigrett, president of the Gulf, Mobile & Northern Lines railroad is the kind of a guy we'd like to shake hands with good and hard. During the South's recent cold wave, with thirteen inches of snow amazing and discomforting the people of Alabama, Mr. Tigrett notified each of his station agents: "When you go off duty at night, leave the waiting rooms unlocked, have good fires going and see there is enough coal on hand to last the hoboes all night."

Mr. Cohen Goes Vest

■ The most three piece suits Cohen could buy last week was 30, but even then he'd be stuck with 3 pair of trousers and 54 sleeveless vests which seems sort of silly. We wonder, along with H. F. Hedderich (Pittsburgh Testing Lab), what he's going to do with them all. Mr. H. bets he'd clear his stock easier if he bought 3 coats, 141 trousers and 3 vests. When asked about this, Mr. Cohen just shrugged his shoulders and said, "Vell, I'll tink about it."

A Toughie

■ Walter (Erie R. R.) Cronenwett practically dares anyone to get this one: *If a two-pound weight is dropped* 11 *feet,* 6 *inches, upon a spring scale, the pound divisions of which are one-fourth inch, what will be the scale reading at the maximum extension?* We double-dare you.

SHRDLU

of the awards. He said that they were covered by 153 different awards, of which 137 were on tie bids or 89.45 per cent.

Mr. Wooden stated that the White analysis was based on the material supplied by U. S. Steel.

Chairman O'Mahoney of the committee suggested complete accuracy could have been assured had the figures used in the analysis been taken from government procurement department files.

The summation by Wooden and White, attacking the basing point system asserted, "The constitutional power of congress to regulate interstate commerce could find no more appropriate exercise, assuming that our long established public policy of preserving competition and free enterprise is to be something more than an abstraction," than outlaw the system.

System an "Invented Device"

"From the time the system became the complete framework of the industry's price structure down to the present, it has been a device invented for the purpose of producing identical delivered prices and perfectly adapted to that result.

"The steel industry should be prevented from continuing to restrain price competition through use of the basing point system or through any equivalent method.

"If the debate as to the competitive or monopolistic status of the system can be prolonged indefinitely, the system will doubtless be continued as long as those who employ it and defend it find profit in it. It is to be hoped that the last word on the factual side of the matter can be said before the temporary national economic committee, and that the only question remaining will be one of government policy."

Business Curbs Direct Unemployment Cause

■ That decrease in number of going concerns since 1929 explains a substantial part of the increase in unemployment since that year is the conclusion reached by A. W. Rucker and N. W. Pickering, business economists, in a study just published by Farrel-Birmingham Co. Inc., Ansonia, Conn.

Figures are quoted from the 1937 United States census of manufactures to show four shifts have occurred in job opportunities. They are, from durable and heavy goods industries to consumers' light goods; from largest and smallest to medium-sized concerns; from New England and Atlantic seaboard states to the Mid-West, South and Pacific coast; from the largest and

smallest industrial areas to either the medium-sized cities or smaller cities outside the principal industrial areas.

The authors attribute the first shift to New Deal "reforms." They conclude from the second that machinery is not responsible since the smallest decline was among large concerns, presumably best able to substitute machinery. The cause of the third shift is attributed to labor troubles, increased taxes and advanced social legislation. The fourth change they also conclude is caused by antibusiness political moves, excessive taxation and extreme labor legislation.

As a remedy they suggest that "if management can induce employes, legislators and public officials to see the relation between profit possibilities and the number of going concerns, between these and the number of jobs, much of the task can be accomplished."

Advises More Political Activity by Business

■ Business no longer can depend on the courts for aid, and specifically it cannot depend on the United States Supreme Court for favorable decisions, declared Thomas I. Parkinson, president, Equitable Life Assurance Society of the United States, before the thirty-ninth annual dinner, Traffic Club of Pittsburgh, Jan. 26.

According to Mr. Parkinson, it is now necessary for business to get into politics and root out the cause of this court attitude rather than to attempt to find legal aid in the form of a favorable court.

Speaking before 1700 major railroad executives and industrial leaders, he stated confidence in the future has been exhibited by his company in purchasing $150,000,000 worth of railroad bonds over the past two years.

Instead of proper policing, the New Deal is seeking domination of business, according to the speaker, and this must be stopped in the only possible way—through active election participation and use of every possible influence to form a united front against bureaucracy.

J. L. Perry, president, Carnegie-Illinois Steel Corp., acted as toastmaster. He was introduced by C. W. Trust, president of the Traffic Club.

■ Output of steel barrels and drums in December was 1,468,963 units, compared with 1,636,273 units in November, department of commerce reports. Total output for 1939 was 12,188,005 units, compared with 8,557,174 in 1938 and 9,850,539 in 1937.

Nonferrous Metal Prices

Jan.	Electro, del. Conn.	Copper Lake, del. Midwest	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
27	11.62½	12.00	11.62½	45.50	45.12½	5.50	5.35	5.50	20.00	14.00	35.00
29	11.62½	12.00	11.25	46.00	45.62½	5.25	5.10	5.50	20.00	14.00	35.00
30	11.62½	12.00	11.25	45.87½	45.50	5.25	5.10	5.50	20.00	14.00	35.00
31	11.62½	12.00	11.25	45.62½	45.25	5.25	5.10	5.50	20.00	14.00	35.00
Feb. 1	11.62½	11.62½	11.25	45.50	45.00	5.25	5.10	5.50	20.00	14.00	35.00
2	11.62½	11.62½	11.25	45.12½	44.62½	5.25	5.10	5.50	20.00	14.00	35.00

*Nominal.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 11.62½c Conn. copper

Sheets

Yellow brass (high) 18.40
Copper, hot rolled 20.25
Lead, cut to jobbers 8.50
Zinc, 100 lb. base 11.00c

Tubes

High yellow brass 21.15
Seamless copper 20.75

Rods

High yellow brass 14.34
Copper, hot rolled 16.75

Anodes

Copper, untrimmed 17.50

Wire

Yellow brass (high) 18.65

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York 7.25-7.50
Cleveland 7.75-8.00
Chicago 7.75-8.00
St. Louis 7.75-8.00

Heavy Copper and Wire

New York, No. 1 .....9.00-9.25
Cleveland, No. 1 .....9.00-9.25
Chicago, No. 1 .....9.00-9.25
St. Louis 9.00-9.25

Composition Brass Turnings

New York 7.00-7.25

Light Copper

New York 7.00-7.25
Cleveland 7.00-7.25
Chicago 7.00-7.25
St. Louis 7.00-7.25

Light Brass

Cleveland 3.75-4.00
Chicago 4.50-4.75
St. Louis 4.50-4.75

Lead

New York 4.50-4.60
Cleveland 4.37½-4.50
Chicago 4.25-4.50
St. Louis 4.00-4.25

Zinc

New York 3.00-3.25
Cleveland 3.00-3.25
St. Louis 3.25-3.50

Aluminum

Mixed, cast, Cleveland 10.25-10.50
Borings, Cleveland 7.25-7.50
Clips, soft, Cleveland 15.75-16.00
Misc. cast, St. Louis 8.75-9.00

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads..12.25
Standard No. 12 aluminum...14.50-15.00

Nonferrous Metals

New York—Tendency in nonferrous metal prices last week was downward as producers lowered quotations in an attempt to stimulate business. Shipments continued to maintain an active pace and the outlook for consumption during the first quarter is promising. If sales do not improve, lead and copper producers likely will curtail output.

Copper—Mine producers lowered electrolytic prices ⅜-cent on Thursday to the basis of 11.62½c, Connecticut. This was the same level at which metal had been available from custom smelters since Jan. 25. Rolled and drawn copper and brass product prices were revised downward in proportion. Red metal scrap and brass and bronze ingot prices, however, held unchanged.

Lead—Due to general unsettlement in nonferrous metal markets, consumers of lead were cautious in making new commitments. Total sales for the week compared favorably with the preceding week's improved figure since the usual average-price business was placed on the first of the month. All leading sellers reduced prices ¼-cent on Monday, Jan. 29, to the basis of 5.10c, East St. Louis, and 5.25c, New York. St. Joseph Lead Co. continued to ask $1 premium on certain brands in the East and limited sales to regular customers.

Zinc—Leading sellers are still waiting for the pickup in new business which has been expected for several weeks. Consumers bought only light tonnages last week on the basis of 5.50c, East St. Louis, for prime western.

Tin—Although prices declined to a new low since Feb. 16, 1939, consumers failed to show any increased buying interest. Only a moderate volume of business was done on the decline with Straits spot closing at 45.12½c.

Antimony—Only routine business was done on the unchanged price basis of 14.00c, New York, for American spot in cases.

■ Roots-Connersville Blower Corp., Connersville, Ind., has appointed territorial representatives as follows: John A. Dodd, 191 Marietta building, Atlanta, Ga.; Smith & Berry, 1316 First avenue, North, Birmingham, Ala.; L. W. Oakley, 408 West Clinch avenue, Knoxville, Tenn.; Leo L. Roussel, 2733 Dumaine street, New Orleans; B. G. Peterson, 6235 Florence boulevard, Omaha, Nebr.; George A. McLaughlin, 741 Stanton avenue, Springfield, O.; W. B. Simons, 2324 Briarwood road, Charlotte, N. C.; Empire Gas & Equipment Co., 722 Twelfth street, Denver.

Equipment

New York—Deliveries have become the paramount problem in the domestic machine tool industry. What mild recession in new buying is evident is due to deferred deliveries, some heavier tools being booked for shipments late this year. Most builders are giving domestic orders priority. Heavy buyers include government shops and the aircraft industry, the latter expanding and tooling for a new engine model. Miscellaneous industrial demand holds brisk. Plenty of foreign volume is available and the French commission is buying heavily. Representatives from Australia, Belgium and Holland are also in this country for machine tools.

Boston—With heavy backlogs and operating full schedules, machine builders in most instances are giving priority to domestic orders. While foreign buyers also stress early deliveries, considerable export volume is being booked, notably from the French commission. The aircraft industry continues the heaviest purchaser with indications this will continue for some time as tooling for a new American government engine model looms.

Chicago—Orders for larger machines have slackened off somewhat but a considerable volume of small items is pending. January machinery business generally showed improvement over December, in some cases close to 20 per cent better. February prospects are difficult to analyze, but sentiment is good in the machinery trade. Some railroad work is pending but industrial demand leads, with buying interests widely scattered.

Seattle—Electrical items lead the equipment field with activity showing in ship repair jobs. Pacific Electric Mfg. Corp., San Francisco, seems to be low for furnishing the Bonneville project with oil circuit breakers, potential devices and other machinery for substations, as follows: Four breakers for St. Johns, with three potential devices, $19,928 each nine breakers, same station, $9640 each; two 115-kv breakers for Salem, $17,945 each; three 69-kv breakers, same station, $9215 each; Hood River station, $8990. Various alternates were submitted. Other bidders included General Electric, Westinghouse and Allis-Chalmers. Bids are in for two pumping units for the Indian irrigation service, Monse, Wash.

■ Railroad locomotives produced in December numbered 41, against 37 in November, according to the department of commerce. For 1939 the total was 356, compared with 261 in 1938 and 519 in 1937.

Construction and Enterprise

Pennsylvania

PITTSBURGH, PA.—Aluminum Co. of America plans $30,000,000 expansion program to include additions to alumina works at Mobile, Ala.; additions to metal producing plants at Alcoa, Tenn.; improvements to hydroelectric stations along Little Tennessee river. In Alcoa, Tenn., company is extending its rolling mill to increase production of sheet more than 1,000,000 pounds per month.

PITTSBURGH, PA. — Westinghouse Electric & Mfg. Co. has awarded contracts for new factory at East Pittsburgh to cost $60,000.

Michigan

DETROIT, MICH.—Ideal Tool and Die Co. incorporated at $24,000 to manufacture tools, dies and automotive parts. Walter H. Chapman, 433 Brady street.

DETROIT, MICH.—Square D. Co. has purchased 8-acre factory site at Milwaukee to construct a new plant this year with 120,000 square feet of floor space. Major part of company's Milwaukee operations will be transferred there.

DETROIT, MICH.—Hanson & Co., 6527 Russell street, incorporated at $10,000 to manufacture dies, gages, steel rolls. Dana A. Hanson, 16235 Windamere avenue.

FLINT, MICH.—Chevrolet Motor is planning plant for valve manufacture.

LANSING, MICH.—John Deere Plow Co., Moline, Ill., contemplates four-story addition to its factory here.

WAYNE, MICH.—Metal Craft Die & Mfg. Co. incorporated at 100,000 shares no par value to manufacture dies and tools. Arthur W. Knebusch, Wayne.

Ohio

BEREA, O. — City, John J. Baesel, mayor, and C. C. Unnewehr, chairman light and water committee, are considering additional generating equipment and improvements of municipal light plant. Details and engineer have not been decided upon.

CLEVELAND, O. — Triangle Stamping Co., has been incorporated with capital of 100 shares of no-par common stock.

DAYTON, O.—War department, Wright Field, contracting officer will receive bids to Feb. 13 for 43 arbor presses of various sizes, circular 40-1004; and bids to Feb. 16 for 17 universal horizontal shapers, circular 40-1022.

MT. ORAB, O.—Village, Walter Baumgardner, mayor, plans general waterworks system and elevated tank to cost $60,000. WPA grant of $25,000 is expected soon since supply well test has been approved. C. J. Simon & Associates (Frank Bonawith, representative), Van Wert, O., are engineers.

Missouri

JEFFERSON CITY, MO.—Joseph O'Neil Construction Co., Leavenworth, Kan., was low at $31,500 for water works system for state; Keene & Simpson, 15 West Tenth street, Kansas City.

ST. LOUIS, MO.—Carter Carburetor Co. will erect a four-story plant addition costing $175,000.

ST. LOUIS, MO.—Ervine Meyer, 3970 Connecticut street, will erect $10,000 warehouse.

Arkansas

OSCEOLA, ARK.—Cartwright Hardware Co., Raymond Finley, plans rebuilding burned warehouse.

Oklahoma

BLACKWELL, OKLA.—Fire damage to workhouse of Blackwell Milling Co. is estimated at $100,000.

Wisconsin

MADISON, WIS. — Craftsman Industries Inc., has been incorporated in Wisconsin to deal in chemicals, wood, plastics, steel, iron and other metals. Incorporators are D. R. Parker, J. K. Kenehan and A. R. Parker.

Minnesota

ALEXANDRIA, MINN.—REA has allotted $20,000 to Douglas county light and power co-operative, Clifford R. Hove, superintendent, for extensions to 200 consumers along existing transmission lines.

BENSON, MINN.—REA has allotted $30,000 to Stevens-Big Stone power co-operative, Victor Hanson, superintendent, for 42 miles of transmission lines for 105 consumers in Swift, Pope and Stevens counties.

MANKATO, MINN. — Blue Earth-Nicollet electric co-operative, E. M. Nash, superintendent, is planning generating plant.

RED LAKE FALLS, MINN.—Red Lake county co-operative association, John W.

Dysart, county agent, is planning transmission lines. Ellerbe & Co., 1021 E. First National bank building, St. Paul, are consulting engineers.

ST. JAMES, MINN.—REA has approved contract to E. W. Wylie, St. Paul, at $56,415 by south central electric association, Edward C. Meier, superintendent, for 85 miles of transmission lines to serve 190 consumers. Banister Engineering Co., 1586 University avenue, St. Paul, is consulting engineer.

Texas

AUSTIN, TEX.—City, Guiton Morgan, city manager, plans improvements to power plant, distribution system and water intake system at filtration plant, to cost $154,000.

BONHAM, TEX.—John Arledge proposes to erect cold storage plant.

HAMILTON, TEX. — Taylor Construction Co., Taylor, Tex., was low at $22,661 for 41 miles of transmission lines in Hamilton, Mills and Coryell counties for Hamilton county electric co-operative association; Texas Engineering Co., 110 East Tenth street, Austin, Tex., is engineer.

MARSHALL, TEX.—Fire damage to Marshall Compress Co.'s plant, operated by Cameron McElroy Jr. was $150,000.

STEPHENVILLE, TEX.—R. W. McKinney Construction Co., Nacogdoches, was low at $69,826 for electric distribution system for Erath electric co-operative association.

WHARTON, TEX. — Fire damage to handle factory, Sam Huston, manager, was $30,000.

North Dakota

VERENDRYE, N. DAK.—Hearing will be held before state railway commission on application of Verendrye electric co-operative, H. H. Blackstead, president, for 65 miles of transmission lines in McHenry and Ward counties to serve 190 consumers. General contract subject to REA approval has been awarded to W. A. Patterson Construction Co., 1955 University avenue, St. Paul, at $65,925. M. S. Hyland, 1114 Eighth avenue North, Fargo, N. Dak., is consulting engineer.

Nebraska

HASTINGS, NEB.—City, Raymond L. Crosson, city clerk, has authorized plans for a 3500-kilowatt generator to cost $280,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

SCOTTSBLUFF, NEB.—Western Public Service Co. has plans for a 2500-kilowatt steam turbo-generating power station operating at 400 pounds steam pressure by oil or gas fired boiler, to cost $300,000.

Iowa

ATLANTIC, IOWA—City, George Alexander, city clerk, will complete plans about March 1 for sewage disposal plant to cost $107,000. It is undecided whether to make this a contract job or a WPA job. Buell & Winter Engineering Co., 508 Insurance Exchange building, Sioux City, Iowa, is consulting engineer.

BOXHOLM, IOWA—WPA has approved new waterworks system, including a well, pumping equipment, tower and tank and auxiliaries, to cost $33,610.

CRESCO, IOWA—Chamber of commerce is considering building a new power plant. H. G. Addie is mayor.

INDEPENDENCE, IOWA—REA has approved contract by Buchanan county rural electric co-operative, Alvin J. Tonn, superintendent, to E. W. Wylie, St. Paul, at $18,499 for 31 miles of transmission lines to serve 61 consumers. A. W. Grubb, Vinton, Iowa, is consulting engineer.

Idaho

ASHTON, IDAHO—REA recently allotted $89,000 to Fall river rural electric co-operative for 91 miles of transmission lines. Plans are completed, bids to be taken soon. H. S. Nixon, Grain Exchange building, Omaha, is consulting engineer.

BOISE, IDAHO — State officials are considering natural gas pipeline from northern Utah fields to Ashton and Payette, Idaho, to cost $7,500,000. Harry S. Joseph, Salt Lake City, Utah, represents syndicate.

LEWISTON, IDAHO—Addition 94 x 222 feet, part reinforced concrete, is being built at wood briquet plant of Potlatch Forests Inc., Roy Huffman, manager.

Pacific Coast

ASTORIA, OREG.—State board of higher education is planning fish processing laboratory here.

ASTORIA, OREG.—Pacific Power & Light Co. is planning 10 miles of 6600-volt power lines near Seaside.

EUGENE, OREG.—City water board proposes to build a 7500-kilowatt power plant costing $510,000. Steam standby power unit is planned.

MARSHFIELD, OREG.—A $1,000,000 plywood plant at Lebanon for Evans

Products Co., Detroit, is planned this year, according to Max D. Tucker.

PORTLAND, OREG.—Reimers & Jolivette were low at $87,583 for Portland Airlines building. Albert Kahm, Detroit, is architect.

PORTLAND, OREG.—Bonneville project has awarded to Bennett & Taylor, Los Angeles, low at $33,784, contract to erect the Bonneville-The Dalles ship canal crossing power line.

SALEM, OREG.—Proposals for creation of nine public utility districts will be on ballot May 17. Largest district will be 67 square miles within Portland city limits.

COULEE CITY, WASH.—A. A. Elmore, president state prospectors' and miners' association, plans custom mining mill above Coulee dam to be built in units and increased as area develops. Eventually a smelter will be installed.

KENNEWICK, WASH. — Walla Walla Canning Co. is planning a branch plant here.

LACROSSE, WASH.—LaCrosse Grain Growers Inc. has awarded contract to W. J. Morrell, Lewiston, Idaho, for a 130,000-bushel electrically operated grain elevator of 23 bins.

LEAVENWORTH, WASH.—State WPA has approved a local water and sewer system to cost $190,935.

MT. VERNON, WASH.—S. A. Moffett and associates, Seattle, are planning a fruit and vegetable freezing plant.

MT. VERNON, WASH.—S. A. Moffett and associates, Seattle, are planning a $120,000 vegetable and fruit canning plant here, contract to be let in February. Quick freezing equipment to have 50 tons daily capacity and storage for 60 cars of produce will be provided.

NORTH MILTON, WASH. — Directors of Walla Walla grain growers will build $60,000 grain elevator.

SEATTLE, WASH. — Sound Construction & Engineering Co. is low at $90,825 to Maurice Thompson, state adjutant general, for rebuilding Seattle armory.

SEATTLE, WASH. — Transportation commission has condemned 247,866 square feet of land for a proposed $225,000 central garage and shops for municipal trackless trolley system.

SEATTLE, WASH.—King county commissioners plan a $300,000 fireproof addition to county hospital subject to approval of a 1-mill tax by voters on March 12. Plans are by James M. Taylor Jr.

SEATTLE, WASH.—Alaska railroad plans early purchase of rolling stock, bids to be asked soon. Specifications include two freight locomotives, 30 freight cars, two passenger coaches, ten refrigerator and ten flat cars.

SPOKANE, WASH.—Washington Water Power Co. will build $120,000 substation, outdoor type, for 110,000-volt power line.

SPOKANE, WASH.—Directors of Inland Empire Refineries are considering 320-mile pipeline to cost $3,000,000 to bring crude oil from Cut Bank, Mont., field to refinery here. William H. McIntyre, Salt Lake City, is president. W. A. Bechtel & Co., San Francisco and Los Angeles, is expected to receive contract if proposition is approved. Line will have a capacity of 6000 barrels each 24 hours, and two pump stations will be built. Two additional units to local refinery will be built to cost $50,000. Montana Headlight Co. will participate in project, if approved.

YAKIMA, WASH.—J. M. Jannsen, Spokane, is planning $110,000 stockyards here, first unit to begin in February. John A. Maloney, architect.

YAKIMA, WASH. — Reclamation bureau is preparing plans at Denver for proposed garage and warehouse at Roza dam, Washington state; bids soon.

YAKIMA, WASH.—J. A. Terteling & Sons, Boise, Idaho, are low at $98,870 to reclamation bureau for structures and other items on Yakima ridge canal, Roza project.

Alaska

KETCHIKAN, ALASKA—Bids will be received Feb. 21 at Washington, for fish products laboratory here.

Canada

NEW WESTMINSTER, B. C.—Pacific Veneer Co., Ltd., will build plant additions 70 x 400 feet and 35 x 42 feet. Piling contract awarded to Vancouver Pile Driving & Contracting Co., Ltd., Vancouver. Arthur Pearson, 850 West Hastings street, Vancouver, is engineer.

UCLUELET, B. C.—Canadian war supply board, Ottawa, is receiving tenders for single seaway hangar, slipway and apron to be built here.

CAMP BORDEN, ONT.—War supply board, Ottawa, W. R. Campbell, chairman, is receiving tenders for sewage pumping plant, pipe line and sewage disposal plant at Royal Canadian Air Force station here.

JOLIETTE, QUE.—Joliette Steel, Ltd., has awarded contract for pattern and foundry building to cost $20,000 to Corinthian Construction Co., Ltd., 5726 Sherbrooke street West, Montreal. Perry, Luke & Little, 1405 Bishop street, Montreal, is architect.

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Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Midvale Co., The Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
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Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
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Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

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BEARINGS (Radial)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
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Timken Roller Bearing Co., The, Canton, O.

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Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.
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Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Self-Aligning Roller)
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

BEARINGS (Thrust)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
Garlock Packing Co., The, Palmyra, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

BENDING AND STRAIGHTENING MACHINES
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

BENZOL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jones and Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BINS (Storage)
Petroleum Iron Works Co., Sharon, Pa.

BLAST FURNACE CLEANING (Gas)
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

BLOWERS
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

BLOWPIPES (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

BLOWPIPES (Hand and Stand)
American Gas Furnace Co., Elizabeth, N. J.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Oil Well Supply Co., Dallas, Texas.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

BOLT AND NUT MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Landis Machine Co., Inc., Waynesboro, Pa.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Townsend Co., New Brighton, Pa.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Tracks)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9370, Scranton, Pa.

BORING MACHINES (Precision)
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.
Petroleum Iron Works Co., Sharon, Pa.
Treadwell Construction Co., Midland, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Petroleum Iron Works Co., Sharon, Pa.
Treadwell Construction Co., Midland, Pa.

BRAKE LININGS
Garlock Packing Co., The, Palmyra, N. Y.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Hydraulic)
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

BRAZING EQUIPMENT
American Gas Furnace Co., Elizabeth, N. J.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

BRICK (Silicon Carbide)
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, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., Sharon, Pa.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

BRUSHES (Industrial)
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., 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.

CARBURIZERS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Grant Bldg., Pittsburgh, Pa.

CARS (Dump)
Pressed Steel Car Co., (Koppel Div.) Grant 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.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Car Co., (Koppel Div.) Grant Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTINGS (Acid Resisting)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Mechanite Metal Corp., 311 Ross St., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.

CASTINGS (Controlled Grain Structure)
Sorbo Mat Process Co., 1004 Market St., St. Louis, Mo.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Columbia Steel Co., San Francisco, Calif.
Detroit Gray Iron Foundry Co., Foot of Iron St., Detroit, Mich.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

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.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.

WHERE-TO-BUY

CASTINGS (Steel)—Con.
Pittsburgh Rolls Corp., 41st and Willow Sts., 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 Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

CASTINGS (Wear Resisting)
Meehanite Metal Corp., 311 Ross St., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. Sl-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Baldwin Duckworth Div. of Chain Belt Co., 326 Plainfield St., Springfield, Mass.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 6028 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

CHAIN (Roller)
Baldwin Duckworth Div., of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIRS (Steel)
Harter Corp., The, Sturgis, Mich.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Broelus, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Pickands Mather & Co., Union Commerce Bldg., Cleveland, O.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANING SPECIALTIES
American Chemical Paint Co., Box 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Twin Disc Clutch Co., 1379 Racine Ave., Racine, Wis.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.

CLUTCHES (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., Pittsburgh, Pa.
Koppers Coal Co., 100 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., 100 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COILS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

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 Sales Corp., 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., 2698 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, 100 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Combustion)—See COMBUSTION CONTROLS

CONTROLLERS (Electric)
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Oven)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Box 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9370, Scranton, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 401 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Poole Fdy. & Mach. Co. Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
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 (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

CRANES (Jib)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Traveling)
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon, O.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.,
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

DIES (Cast)
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

WHERE-TO-BUY

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES

Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

DRUMS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

DRUMS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid 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., 310 So. Michigan Ave., Chicago, Ill.
Lindemuth, Lewis B., 134 E. 47th St., New York City.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

ENGINES (Diesel)
Cooper-Bessemer Corp., Mt. Vernon, O.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

FANS (Crane Cab)
Truflo Fan Co., Harmony, Pa.

FANS (Exhaust Ventilating)
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Truflo Fan Co., Harmony, Pa.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Truflo Fan Co., Harmony, Pa.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

FANS (Wall)
Truflo Fan Co., Harmony, Pa.

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
Kidde, Walter, & Co., 140 Cedar St., New York City.

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., 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
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Box 310, Ambler, Pa.

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.

FORGING ROLLS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., Dept. SI-29, 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)
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Leard, Wm., Co., Inc., 16th St., and 5th Ave., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.,
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp. Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.

FURNACES (Brazing)
American Gas Furnace Co. Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp. P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., 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.
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Gas or Oil)
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O. Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.

FURNACES (Open Hearth)
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 134 E. 47th St., New York City.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Harter Corp., The, Sturgis, Mich.

GAGE BLOCKS
Dearborn Gage Co., 22036 Beech St., Detroit, Mich.

GAGES
Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.

WHERE-TO-BUY

GALVANIZING (Hot Dip)—Con.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS SCRUBBERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)
American Hard Rubber Co., 11 Mercer St., New York City.
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City

GAUGES (Draft)
Peabody Engineering Corp., 580 Fifth Ave., New York City.

GAUGES (Indicating and Recording)
General Electric Co., Schenectady, N. Y.

GEAR BLANKS
Ampco Metal, Inc., Dept. SI-29, 2830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Broach & Machine Co., Shoemaker at St. Jean, Detroit, Mich.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GEARS (Spur, Bevel, Miter)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3280 E. 80th St., Cleveland, O.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., 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.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GOGGLES (Cleanser)
Lenco Laboratories, Inc., The, 623 Bondi Bldg., Galesburg, Ill.

GRABS — FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDERS (Pedestal, High Speed)
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.

GRINDERS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

GRINDERS (Precision Thread)
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

GRINDING WHEELS
Abrasive Co., Taconey & Fraley Sts. Philadelphia, Pa.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segment)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HACK SAWS
Armstrong-Blum Mfg. Co., 5737 Bloomingdale Ave., Chicago, Ill.
Simonds Saw & Steel Co., Fitchburg, Mass.

HAMMERS (Chipping, Riveting, Calking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
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 (Steam)
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 Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland, O.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

HEATERS (Air)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

HEATERS (Electric Space)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

HEATERS (Oven)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard-Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Ingersoll-Rand Co., 11 Broadway, New York City.

HOOKS (Chain)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOOPS AND BANDS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
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 (Rubber)
United States Rubber Co., 1790 Broadway, New York City.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Treadwell Construction Co., Midland, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

INDICATORS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Box 310, Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INJECTORS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Building)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON 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.

JETS (Steam, for Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Petroleum Iron Works Co., Sharon, Pa.

KEYS (Machine)
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Flying)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LADLES
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Treadwell Construction Co., Midland, Pa.

WHERE-TO-BUY

LAMPS (Filaments)
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.

LAMPS (Mercury Vapor)
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.

LAMPS (Neon Glow)
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
National Broach & Machine Co., Shoemaker at St. Jean, Detroit, Mich.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHE DOGS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

LATHES
LeBlond, R. K., Machine Tool Co., Dept. J-11, 2694 Madison Rd., Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret) (Automatic Vertical)
Bullard Company, the, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEAD WORK
Dietzel Lead Burning Co., Coraopolis, Pa.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Treadwell Construction Co., Midland, Pa.

MACHINERY (Second Hand)
Emerman, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Broach & Machine Co., Shoemaker at St. Jean, Detroit, Mich.

MACHINERY (Special)—Con.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

MARKING DEVICES
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL FINISHES
American Nickeloid Co., 1310 Second St., Peru, Ill.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
National Broach & Machine Co., Shoemaker at 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

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

NAILS
(*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NAILS (Special Only—All Metals)
Townsend Co., New Brighton, Pa.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NOZZLES (Descaling)
Aldrich Pump Co., The, Allentown, Pa.

NUTS
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2934 E. 79th St., Cleveland, O.
Elastic Stop Nut Corp., 1001-S Newark Ave., Elizabeth, N. J.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Self Locking)
Elastic Stop Nut Corp., 1001-S Newark Ave., Elizabeth, N. J.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, Palmyra, N. Y.

OILS (CUTTING)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Box 310, Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

PACKING (Asbestos or Rubber)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flan and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, Palmyra, N. Y.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, P

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Box 310, Ambler, Pa.

PAINT (Industrial)
Carey, Philip Co., The, Dept. 71, Lockland, Cincinnati, O.
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.

PAINT (Marking)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Box 310, Ambler, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Box 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

PENSTOCKS
Treadwell Construction Co., Midland, Pa.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co. 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUND
American Chemical Paint Co., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 100 Widener Bldg., Philadelphia, Pa

PICKLING EQUIPMENT
International Nickel Co., Inc., The 67 Wall St., New York City.

PICKLING MACHINERY
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
American Hard Rubber Co., 11 Mercer St., New York City.
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.

PIG IRON—Con.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, 100 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINS (Clevis)
Townsend Co., New Brighton, 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, 2301 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper—Rubber or Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Welded Steel)
Treadwell Construction Co., Midland, Pa.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., 836 So. Michigan Ave., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE FITTINGS
American Hard Rubber Co., 11 Mercer St., New York City.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
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.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

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.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

PIPING 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
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leard, Wm., Co., Inc., 16th St. and 5th Ave., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 540 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.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

PRESSES (Bending)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

PRESSES (Forging)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.

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.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Stamping)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bdlg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Boiler Feed)
Aldrich Pump Co., The, Allentown, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Centrifugal)
Aldrich Pump Co., The, Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Hydraulic)
Aldrich Pump Co., The, Allentown, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)
Aldrich Pump Co., The, Allentown, Pa.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Emerson, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

RECEIVERS
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Standard Arch Co., Frostburg, Md.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., The, Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.
*Townsend Co., New Brighton, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Kidd Drawn Steel Co., Allquippa, Pa.

RODS (Piston)
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., 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.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

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.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry Co., First National Bank Bldg.,
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ROLLS (Bending)
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 Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machines)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Garlock Packing Co., The, Palmyra, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

RUST PREVENTIVES
American Chemical Paint Co., Box 310, Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

WHERE-TO-BUY

RUST PREVENTIVES—Con.
Koppers Co., Tar & Chemical Div., 1100 Koppers Bldg., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Box 310, Ambler, Pa.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES
Lenco Laboratories, Inc., The, 623 Bondi Bldg., Galesburg, Ill.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

SAND CONDITIONING AND PREPARING MACHINERY
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWING MACHINES (Hot and Cold)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Armstrong-Blum Mfg. Co., 5737 Bloomingdale Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Toledo Scale Co., 3216 Monroe St., Toledo, O.

SCALES (Dial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The Bridgeport, Conn.
Toledo Scale Co., 3216 Monroe St., Toledo, O.

SCALES (Monorail)
American MonoRail Co., The, 13192 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

SCALING TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCHOOLS
International Correspondence Schools, Box 9370, Scranton, Pa.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Progressive Mfg. Co., The Torrington, Conn.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Windsor, Vt.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., The, Torrington, Conn.
Townsend Co., New Brighton, Pa.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Townsend Co., New Brighton, Pa.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Townsend Co., New Brighton, Pa.

SCREWS (Hardened Self-Tapping)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Progressive Mfg. Co., The, Torrington, Conn.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Thread-Cutting)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SEPARATORS (Sand)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAKERS
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

SHEARS
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEET LIFTERS AND CARRIERS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 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 and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
*International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jessop Steel Co., 584 Green St., Washington, Pa.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
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.

WHERE-TO-BUY

SHEETS—HIGH FINISH—Con.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLENOIDS (Electric)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co., 3280 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLES
Leard, Wm., Co., Inc., 16th St., and 5th Ave., New Brighton, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

STAMPINGS (Blanking)
Van Syoc, G. W., 5-220 General Motors Bldg., 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., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.

STEEL (Alloy)—Con.
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.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Chrome Cobalt)
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

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. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Crucible Steel Company of America, 405 Lexington Ave.,
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa. New York City.
Crucible Steel Company of America, 405 Lexington Ave.,

STEEL (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago. New York City.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick Ct., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST. Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 540 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.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) *(Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
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.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Treadwell Construction Co., Midland, Pa.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Machine Co., Shoemaker at 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.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Treadwell Construction Co., Midland, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

STOPPERS (Cinder Notch)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SWITCHES (Electric)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TACHOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)
American Hard Rubber Co., 11 Mercer St., New York City.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
United States Rubber Co., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)
American Gas Furnace Co., Elizabeth, N. J.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Steel Tank Co., Oak St. and Andrews Ave., Youngstown, O.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)
American Hard Rubber Co. 11 Mercer St., New York City.
Dietzel Lead Burning Co., Coraopolis, Pa.
United States Rubber Co., 1790 Broadway, New York City.

TANKS AND TOWERS
Treadwell Construction Co., Midland, Pa.

TANTALUM CARBIDE
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

TESTING MACHINES
National Broach & Machine Co., Shoemaker at St. Jean, Detroit, Mich.

TERMINALS (Locking)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

THERMOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Chain Pipe)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 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.

TOOL HOLDERS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tantalum Carbide)
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.

TOOLS (Tipped, Carbide)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St, New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

TORCHES AND BURNERS (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TOY PARTS
Townsend Co., New Brighton, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

TRANSMISSIONS—VARIABLE SPEED
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.,) 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Elwell-Parker Electric Co., The 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE MILL MACHINERY
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE REDUCTION
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBING (Cold Drawn Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBING (Copper, Brass, Aluminum)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Shenango-Penn Mold Co., Dover, O.

TUBING (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.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TUNGSTEN CARBIDE (Tools and Dies)
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 315 No. 12th St., 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)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.

VALVES (Electrically Operated)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

VALVES (Gate—Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

VALVES (Globe)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Hunt, C. B., & Son, Salem, O.

VALVES (Hydraulic De-Scaling)
Hunt, C. B., & Son, Salem, O.

VALVES (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

VALVES (Needle)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Steam and Water)
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

VISES (Bench)
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

WALKWAYS—See FLOORING—STEEL

WASHERS (Gas)
McKee, Arthur G., Co., 2422 Euclid Ave., Cleveland, O.

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., The, Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHERS (Spring)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WELDERS (Electric—Arc, Spot, Seam, Flash, Butt, Automatic Projection, Hydromatic, Etc.)
Federal Machine & Welder Co., Dana St., Warren, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Bronze)
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS OR WIRE
Air Reduction Sales Co., 60 East 42nd St., New York City.
American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Champion Rivet Co., The, Harvard Ave. at E. 108th St. Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-2.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.

WHERE-TO-BUY

WIRE (High Carbon)—Con.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Round, Flat, Square, Special Shapes)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Lucede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE (Threaded)
Progressive Mfg. Co., Torrington, Conn.
Townsend Co., New Brighton, Pa.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.

WIRE BUGGIES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

WIRE CLOTH
Cyclone Fence Co., Waukegan, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., Bridgeport, Conn.

WIRE FORMS, SHAPES AND SPECIALTIES
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Seneca Wire & Mfg. Co., Fostoria, O.
Townsend Co., New Brighton, Pa.

WIRE MILL EQUIPMENT
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Townsend Co., New Brighton, Pa.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)
American Cable Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE ROPE SLINGS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.

WIRE STRAIGHTENING AND CUTTING MACHINERY
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Shuster, F. B., Co., The, New Haven, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.
Williams, J. H., & Co., 225 Lafayette St., Buffalo, N. Y.

WRENCHES (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

ZINC (Rolled Sheets, Strips, Coils)
New Jersey Zinc Co., 160 Front St., New York City.

ZINC SLABS (High Grade)
St. Joseph Lead Co., 250 Park Ave., New York City.

ZINC SLABS (Spelter)
New Jersey Zinc Co., 160 Front St., New York City.

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✦ ✦ ADVERTISING INDEX ✦ ✦

Where-to-Buy Products Index carried in first issue of month.

ADVERTISING INDEX

Where-to-Buy Products Index carried in first issue of month.

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