STEEL

ESTABLISHED 1882

Contents

Volume 106—No. 19 **May 6, 1940**

PRODUCTION • PROCESSING • DISTRIBUTION • USE

2390 HEATS *with One Roof*

NOT a furnace man's dream but an actual fact! Nearly 2,400 heats in an Isley-controlled foundry furnace without rebuilding. Surprising? Not to men familiar with the Isley Furnace Control System. They know that Isley furnaces *last longer* and *produce more.*

Due to the push-and-pull draft, checker chambers are permanently kept open to permit a correct supply of air and thorough clearing of exhaust gases. Only when the refractory materials and the roof have been worn dangerously thin is rebuilding required. Throughout the extended life of the furnace, the record of fuel consumption shows a practically flat curve. Other savings are assured through use of low b.t.u. fuels with high air temperature; quick starting at maximum capacity regardless of furnace temperature; accurate control of fuel-air ratios; and higher production with lower maintenance costs.

There is profit for the foundryman in the Isley System. Write for the Isley Bulletin.

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WORCESTER, MASSACHUSETTS

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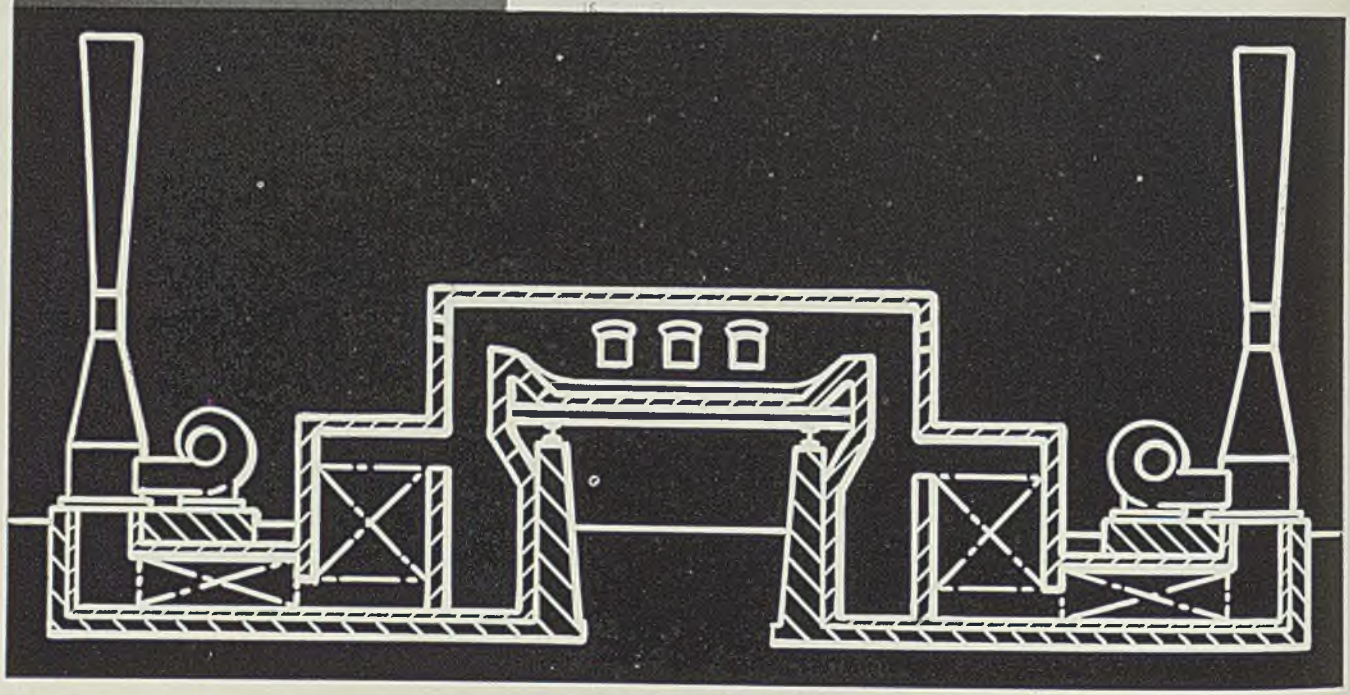

V21

ISLEY *Furnace* MORGAN WORCESTER ENGINEERS AND MANUFACTURERS *System*

As the Editor Views The News

■ STEEL production last week (p. 27) broke out of its sidewise movement with a 2-point increase to 63½ per cent of ingot capacity. In a large measure this improvement came from heavier bookings of sheets and strip at price concessions that were withdrawn May 1. The mills now (p. 91) are pressing for delivery dates so as to roll all this material before the June 30 deadline. Business in other products is steady or slightly heavier. Aside from occasional irregularities, steel prices are fairly steady. All Pacific coast steel prices are up $1 due to higher ocean freight rates. Scrap prices are firmer. Export demand continues to broaden.

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Wage Ruling Hits Mills

Affected steel producers are in a quandary over what to do now that the Supreme Court (p. 23) has sustained the secretary of labor's minimum steel wage ruling under the Walsh-Healey act. They are proceeding carefully before abandoning wage differentials that always have prevailed between certain districts. Some consider taking no more government orders . . . Three makers of rivets and rivet-setting machinery (p. 32) have been served with complaints by the federal trade commission on the ground that they are violating the Clayton act . . . Edward L. Ryerson Jr. is the new chairman of Inland Steel Co., succeeding (p. 39) L. E. Block who becomes chairman of the executive committee.

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Quarter's Profit Off

Eighteen leading steel producers, constituting 88 per cent of the industry, earned $44,983,415 (p. 21) in the first quarter of 1940. This was 39.7 per cent less than net earnings of these same companies in the last quarter of 1939. . . . The aircraft industry (p. 33) is making rapid progress in the development of mass-production methods. . . . Lake iron ore shipments this year (p. 114) have started with a bang, April shipments aggregating 464,669 tons. . . . Various government policies were condemned (p. 31) at last week's annual meeting of the United States chamber of commerce. . . . Bureau of foreign and domestic commerce (p. 32) will give more help to American manufacturers in developing export business.

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Tin Affects Rolling

Paul J. McKimm (p. 64) reports that strip steel with high or low tin content rolls normally but when the tin percentage falls in the intermediate range the product becomes extremely hard and breaks easily. . . . Colonel Ragsdale (p. 70) says the high fatigue strength of stainless steel admirably fits it for aircraft construction but that its effective use demands the development of structural shapes and forms specially created for thin metal. . . . R. O. Day (p. 46) describes simple equipment and technique by which many cast irons, including alloy and malleable irons, may be flame hardened. Applications include parts such as machine tool ways, sheave wheels, rolls and the like.

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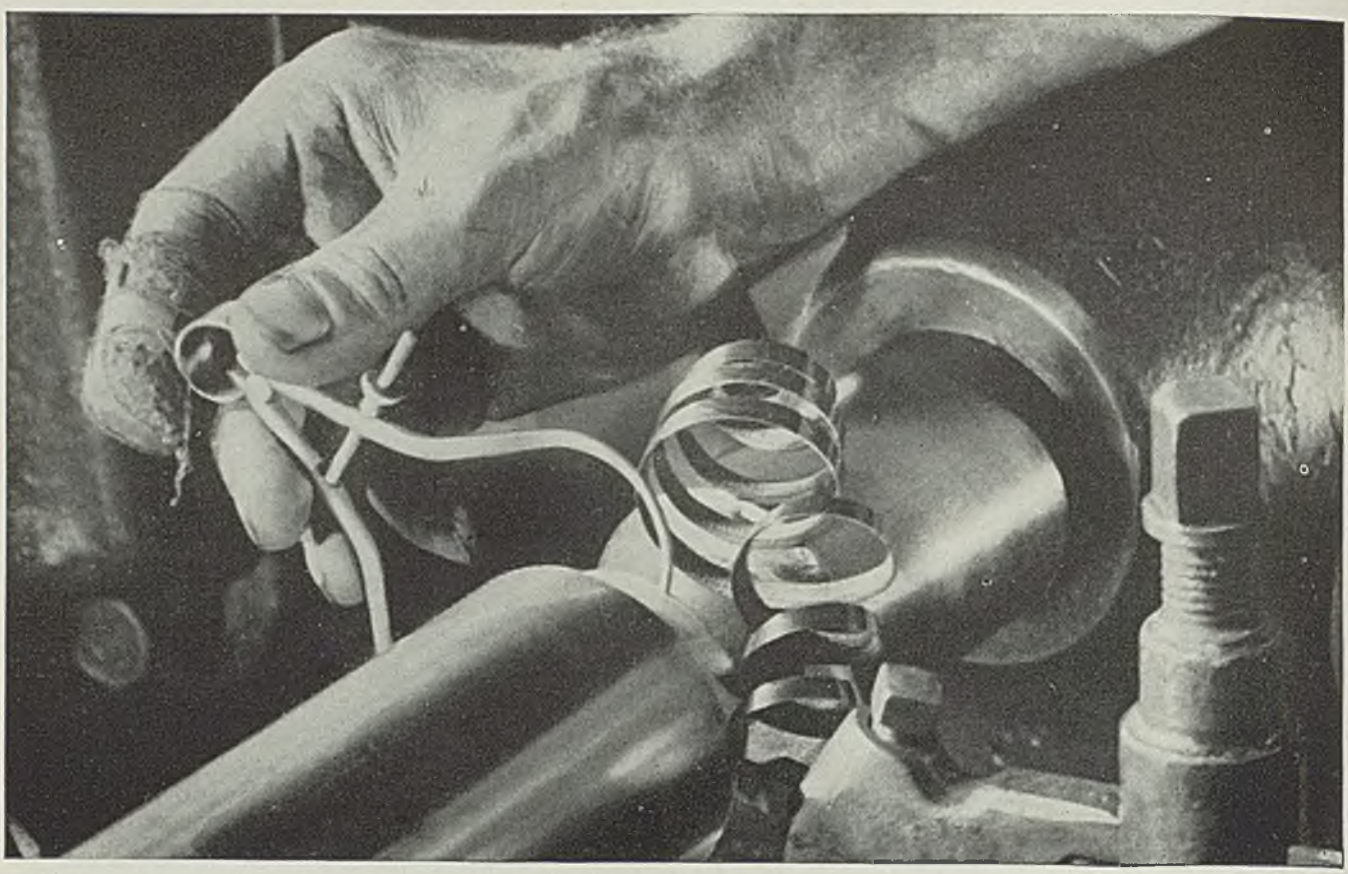
Iron Ore Blending

At several open hearth shops (p. 52) yield is increased by knocking down the silicon and manganese to obtain high temperature metal with low silicon, adding mill scale at the runner at the entrance to the ladle. . . . Establishment of an award in honor of the late F. B. McCune was announced (p. 50) at last week's annual Open Hearth conference. . . . Thirteen phases of the crane bridge drive problem (p. 58) were discussed at Pittsburgh. . . . A new iron ore blending system (p. 78) is a factor in increasing pig iron output at an English stack. . . . Of interest, due to the power situation in the Northwest (p. 78), is Charles Hart's discussion of electric furnace production of pig iron.

E C Kreutzberg



Certified Steels Help Lower Labor Costs

Labor costs, rapidly becoming today's No. 1 consideration, are in a measure dependent on materials. On most jobs where steel is used, shop costs are the largest and most variable single factor. While the cost of steel itself is relatively small, the quality plays a very important part in the control of these shop labor costs. If it is hard to fabricate—does not work uniformly—has hard spots to dull or break tools—or in the case of alloys, does not respond properly to heat treatment—then shop labor hours pile up and the job ticket shows red.

To meet this growing need for more uniform, better fabricating steels, Ryerson developed and built up stocks of CERTIFIED STEELS—steels that represent the highest quality in each class and type of material. Users are reporting savings in time, reduction in spoilage and lower labor costs.

Perhaps Ryerson Certified Steels can help you reduce costs. Why not try them on your next job?

RYERSON *Certified* **STEELS**

Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

Principal products in stock for Immediate Shipment include—Bars, Structurals, Plates, Iron and Steel Sheets, Tubing, Shafting, Strip Steel, Alloy Steels, Tool Steels, Stainless, Babbitt, Welding Rod, etc.

Steel's First Quarter Profits Moderate

Industry's spokesmen believe present prices, costs and operations should result in reasonable return for 1940. Improvement in steel buying foreseen. Export demand for commercial steel increases.

■ EIGHTEEN leading iron and steel producers, representing 88 per cent of the industry's ingot capacity, earned an aggregate of $44,983,415 in the first three months of 1940. This was the best first quarter since 1937, and exceeded by nearly four and a half times the net profit earned by the same producers in the first quarter of 1939. It was, however, 39.7 per cent less than the $74,605,995 earned by the 18 companies in the final period last year.

In the first quarter of 1938 the 18 companies reported aggregate net loss totaling $4,838,699, nearly half their total deficit for that year. In the first 1937 quarter the same companies earned $67,740,044.

Increased steelmaking rate during first quarter this year over that in corresponding 1939 period was reflected in the producers' earnings, emphasizing the industry's dependence upon a relatively high production rate for profitable operations.

Ingot Rate Higher

Steel industry's ingot rate during first 1940 quarter averaged 72.12 per cent of capacity, up 17.63 points over 54.49 per cent, first period average last year, a 32.4 per cent increase in operations. Net income in first 1939 quarter totaled $10,401,438.

Operating rate in last year's final quarter was 89.3, more than 17 points higher than in the succeeding period. Although average operations declined 19.2 per cent in that interval, net income decreased 39.7 per cent.

Steel production in first quarter, 1938, was at 31.5 per cent of capacity, well below the break-even point, with resulting net loss to all but five of the 18 producers. Operating rate during first 1937 quarter averaged 85.2, was 4.1 points or 4.6 per cent lower than in final quarter last year. Net income, however, was 9.2 per cent lower than in latter period. It must be remembered that factors other than operating rate changes alone were responsible for variations in net earnings in the periods compared.

Seventeen of these companies reported a net profit for this year's first period. All reported net profits for both the preceding period and first quarter, 1937. In first 1939 quarter 16 earned a net profit.

Accompanying tabulation presents these 18 producers' first quarter earnings since 1937, compared with fourth 1939 period.

Assuming these producers' net earnings to be typical, indicated net income for the entire industry would approximate $51,118,000 for the first quarter, equal to $3.59 per ton of ingots produced. This compares with estimated $4.72 per ton of ingots produced in last 1939 quarter, $1.10 per ton in first 1939 period, and $4.78 in first quarter, 1937. Net deficit in first quarter, 1938, was equal, for the industry, to about 92 cents per ton of ingots produced.

Favorable Returns Seen

Should first quarter's average operating rate prevail through the year, steel industry's stockholders may look forward to receiving moderately favorable returns on their investment. Based on the 18 major producers' first quarter earnings statements, indications are the industry's income after all charges except interest and dividends will approximate 5.5 per cent on total capitalization as of Dec. 31, 1939. Any such estimate, of course, is predicated on assumption the average operating rate and other factors which determine profit total remain substantially unchanged from the first period basis.

Although still well below percentage returns on capitalization enjoyed by steel producers in early years, this figure would be second highest since 1929, exceeded only by 1937's per cent return on capitalization, 6.07. Income available for dividends, in the past decade, has been consistently meager, with exception of 1937, and includes net deficits in several years.

U. S. STEEL REPORTS PROFIT, SHIPMENTS SHOW INCREASE

Steel products shipments of United States Steel Corp., New York, during first 1940 quarter were 25 per cent greater than in corresponding quarter last year, but were down 26 per cent from last 1939 period. Resulting net income for the period was $17,113,995; this was equal to $1.24 a share on common after preferred dividend requirements, and was well above the $1 dividend per common share declared last March. Much greater than $660,551 net profit earned in same 1939 period, first quarter net was 40.4 per cent less than $28,729,177 net income, equal to $2.58 a share on common, earned in final 1939 quarter.

Shipments in first quarter were 66.9 per cent of capacity, compared to 51.7 per cent in same quarter last year and 86.9 per cent of capacity in fourth 1939 period.

Report states corporation's net

Steel Producers' Financial Summary

	First 1940 Quarter	Fourth 1939 Quarter	First 1939 Quarter	First 1938 Quarter	First 1937 Quarter
United States Steel Corp.	$17,113,995	$28,729,177	$660,551	$1,292,151*	$28,561,533
Bethlehem Steel Corp.	10,891,139	13,028,928	2,409,059	994,908	8,293,833
Republic Steel Corp.	3,111,723	6,772,693	532,899	3,062,564*	5,567,063
Jones & Laughlin Steel Corp.	1,134,611	2,907,755	376,525*	1,269,725*	1,982,394
National Steel Corp.	4,009,193	5,292,331	2,426,668	1,088,635	5,695,819
Youngstown Sheet & Tube Co.	1,253,929	3,693,225	217,107	139,529*	4,886,020
American Rolling Mill Co.	1,005,194	1,741,964	793,479	197,311*	2,320,816
Inland Steel Co.	3,059,844	4,574,441	2,024,601	923,076	5,008,774
Wheeling Steel Corp.	644,652	2,152,452	728,661	531,035*	1,308,807
Colorado Fuel & Iron Corp.	564,927	554,554	163,630	389,561*	532,283
Otis Steel Co.	165,513*	650,923	180,326	297,379*	702,396
Pittsburgh Steel Co.	203,008	1,089,551	377,159*	277,230*	489,743
Allegheny Ludlum Steel Corp.	1,000,297	1,411,423	206,582	†262,776*	†944,170
Sharon Steel Corp.	309,576	455,525	7,613	151,090*	475,778
Granite City Steel Co.	43,152	258,941	13,435	155,093*	142,002
Continental Steel Corp.	211,456	477,754	279,178	55,208	279,447
Keystone Steel & Wire Co.	279,385	418,490	317,609	187,569	378,154
Rustless Iron & Steel Corp.	312,847	395,868	193,724	62,651*	171,012
Total	$44,983,415	$74,605,995	$10,401,438	$4,838,699*	$67,740,044

*Loss; †represents combined totals of Allegheny Steel Co. and Ludlum Steel Co., prior to their merger in Aug., 1938.

current assets at first quarter's end were $434,012,784, after deducting current dividend declarations, including the $1 per share dividend paid on common April 26. This compares with net current assets aggregating $431,988,446 Dec. 31, 1939, and $392,871,801 at end of first 1939 quarter, on a similar basis.

It is pointed out in the report that these foregoing net amounts are determined by including in current liabilities obligations due within one year of dates shown, and excluding from current assets receivables not collectible within the year. They do not, however, reflect the new $75,000,000 financing program.

Capital outlays for addition to and betterment of properties, less credit for properties sold, were approximately $10,500,000. Additional net of $1,640,000 in maturing capital obligations or those retired by sinking funds has also been paid.

Average number of employes in first quarter was 244,031, a 16.8 per cent increase over 208,907 in same period last year. Total payroll was $99,135,515.

BLOCK SAYS IMPROVED STEEL BUYING IS UNDERWAY

Improvement in steel buying was foreseen by P. D. Block, president, Inland Steel Co., Chicago, at the company's annual stockholders' meeting last week. Although Inland's incoming orders are still below the company's production rate, said Mr. Block, the management feels an improvement is underway. Mr. Block said he expected orders during remainder of current quarter to equal the company's April operating rate, 70 per cent of capacity. First quarter rate was 85.7 per cent.

Inland's March quarter net income was $3,059,844, equal to $1.88 per share on 1,628,105 capital shares. This compares with $2,024,601 or $1.28 per share net profit in corresponding 1939 period and $4,558,206, equal to $2.82 a share, in final quarter last year.

Company declared a $1 cash dividend per share on capital stock, payable June 1 to record of May 14.

Mr. Block declared Inland's export business has not been large, amounting to only 5 per cent of first quarter's total volume, as compared to about 15 per cent for other producers. Most of Inland's export business, he continued, has been with neutral nations, particularly South and Central American countries.

He said some business also was done with Scandinavian nations before Germany invaded Denmark and Norway. Other than some shell steel billet sales to Canada, Mr. Block concluded, Inland has sold very little war material.

NATIONAL STEEL EARNS $4,009,193 NET INCOME

Steel prices today, according to Ernest T. Weir, president, National Steel Corp., Pittsburgh, are high enough, should bring reasonable

(*Please turn to Page* 29)

More Iron, Steel Consumers Report First 1940 Quarter Net Earnings

■ FIRST quarter net income earned by 119 iron and steel consumers aggregated $60,992,129, compared to $30,280,306 net profit reported by the same companies in corresponding 1939 quarter. Only seven reported a net deficit for the period, as against 30 in last year's first quarter. Sixty-five companies were listed in STEEL, April 29, p. 26; 54 are listed below. Figures are net earnings, except where asterisk denotes loss:

	First 1940 Quarter	First 1939 Quarter
Aero Supply Mfg. Co. Inc., Corry, Pa.	$115,235	$16,768
Aircraft Precision Products Inc., Los Angeles	12,450	*8,379
Air-Way Electric Appliance Corp., Toledo, O.	9,594	261
American Bosch Corp., Springfield, Mass.	170,751	64,811
American Radiator & Standard Sanitary Corp., New York	440,754	126,579
American Steel Foundries, Chicago	1,260,960	*104,207
American Stove Co., St. Louis	111,188	102,330
Babcock & Wilcox Co., New York	829,565	*512,690
Baldwin Locomotive Works, Eddystone, Pa.	1,414,289	*1,465,780
Borg-Warner Corp., Chicago	1,776,240	1,154,705
Bower Roller Bearing Co., Detroit	368,519	219,954
Byers Co., A. M.; Pittsburgh	65,307	122,998
City Auto Stamping Co., Toledo, O.	12,453	*33,412
Consolidated Steel Corp. Ltd., Los Angeles	47,987	141,483
Crosley Corp., Cincinnati	42,807	208,916
Curtiss-Wright Corp., New York	2,414,196	1,698,157
Diamond T Motor Car Co., Chicago	22,536	46,296
Divco-Twin Truck Co., Detroit	71,011	31,542
Doehler Die Casting Co., Toledo, O.	303,775	139,585
Easy Washing Machine Corp., Syracuse, N. Y.	99,051	95,870
Electromaster Inc., Detroit	*4,473	*63,614
Evans Products Co., Detroit	12,421	*24,394
Ex-Cell-O Corp., Detroit	577,495	149,771
Federal Mogul Corp., Detroit	145,982	109,299
Food Machinery Corp., San Jose, Calif.	306,000	253,056
General Steel Casting Corp., Eddystone, Pa.	76,990	*414,685
Hoskins Mfg. Co., Detroit	149,279	97,980
International Business Machines Corp., New York	2,437,504	2,244,817
Kalamazoo Stove & Furnace Co., Kalamazoo, Mich.	*109,203	*124,485
Kelsey-Hayes Wheel Co., Detroit	578,108	324,716
Liberty Aircraft Products Corp., Farmingdale, N. Y.	26,254	5,088
Link-Belt Co., Chicago	423,956	199,161
Michigan Steel Casting Co., Detroit	3,318	*9,675
Nash-Kelvinator Corp., Kenosha, Wis.	382,941	140,535
National Acme Co., Cleveland	515,546	53,836
New Idea Inc., Coldwater, O.	184,334	84,920
Otis Elevator Co., New York	1,121,000	957,627
Outboard Marine & Mfg. Co., Waukegan, Ill.	166,563	191,542
Pittsburgh Screw & Bolt Corp., Pittsburgh	†221,198	*8,126
Pressed Steel Car Co., Pittsburgh	436,914	*237,906
Savage Arms Corp., New York	23,417	*43,868
Simonds Saw & Steel Co., Fitchburg, Mass.	393,321	216,111
Square D Co., Detroit	400,858	120,600
Studebaker Corp., South Bend, Ind.	511,503	56,914
Sullivan Machinery Co., Michigan City, Ind.	25,434	*61,908
Symington-Gould Corp., Rochester, N. Y.	499,971	18,766
United Aircraft Corp., East Hartford, Conn.	2,380,029	1,490,799
United-Carr Fastener Corp., Cambridge, Mass.	158,099	137,052
Universal Cooler Corp., Detroit	31,245	41,113
U. S. Radiator Corp., Detroit	215,328	*71,185
Wright Aeronautical Corp., Paterson, N. J.	1,237,001	1,231,725
Yale & Towne Mfg. Co., Philadelphia	214,022	6,605
Yellow Truck & Coach Mfg. Co., Pontiac, Mich.	1,023,751	388,779
Youngstown Steel Car Corp., Niles, O.	51,312	6,470

†Before income tax provision.

Steel Wages Ruling Creates New Problems in East, South

■ CONFRONTED with the necessity of increasing basic wage rates on government work as result of last week's Supreme Court decision in the Walsh-Healey minimum wage case, steel companies in several sections are weighing future policies carefully.

The effect of the decision will be most generally felt in the northeastern section where common labor rates have been around 56½ cents an hour, or 6 cents under the schedule determined by the labor department and sustained by the high court. Also affected will be some southern steel plants where the prevailing minimum wage is less than the 45 cents an hour ordered, and in scattered instances in the Middle West and northwest.

Producers affected by the court decision last week were uncertain as to their next move. Some believe the only solution is to refrain from bidding on government work. Others believe there is possibility of segregating government work from private business in their plants and that on some types of orders they will be able to process government tonnage without placing the entire common labor payroll on the higher basis.

Some companies, steel forgers, for example, are heavily booked with government work, and are finding themselves in a particularly difficult situation. The nature of their operations makes it difficult to segregate government from private work. Certain other types of companies depend on government orders for only a small portion of their business and, if necessary, can forego such orders entirely.

Year in Courts

An important consideration, in addition to the advance in common labor rates, will be the adjustment in higher wage brackets. A revised incentive program may partially solve this problem, but producers are still uncertain as to details of such a plan.

How many employes will be affected by the ruling and how much the wage advances ordered will cost steel producers at present can be only a matter for conjecture.

Last week's court ruling climaxed a legal battle of more than a year. A group of the smaller eastern producers contended that Secretary of Labor Perkins, in establishing the minimum wage rates, had exceeded the powers contemplated by congress in enacting the law. Particularly, the steel producers challenged the labor secretary's interpretation of "locality." They contended the word "locality" as used in the Walsh-Healey act meant a local center of manufacture or a small geographical area surrounding the place of performance of the government contract.

Originally the wage schedules were to become effective Jan. 31, 1939. Eastern producers asked for a delay and were granted postponement to March 1, 1939.

Seven eastern producers carried their complaint to the United States district court of the District of Columbia where three were granted a temporary restraining order. Later the court sustained a government motion to dismiss the case.

No Standing in Court

The producers appealed to the circuit court of appeals and were granted a temporary injunction and hearing April 3, 1939. In August the appellate court overruled the district court and in a 2 to 1 decision said: "Congress obviously had in mind a local center of manufacturing when using 'locality' and the secretary is not authorized to impose the predominant wage practice of an industry, viewed as a whole over broad regional areas."

The Supreme Court, however, in its decision last week passed over the question as to whether the labor secretary had exceeded her authority and in an 8 to 1 decision, delivered by Mr. Justice Black, held that because no rights of the producers had been damaged they lacked standing in court.

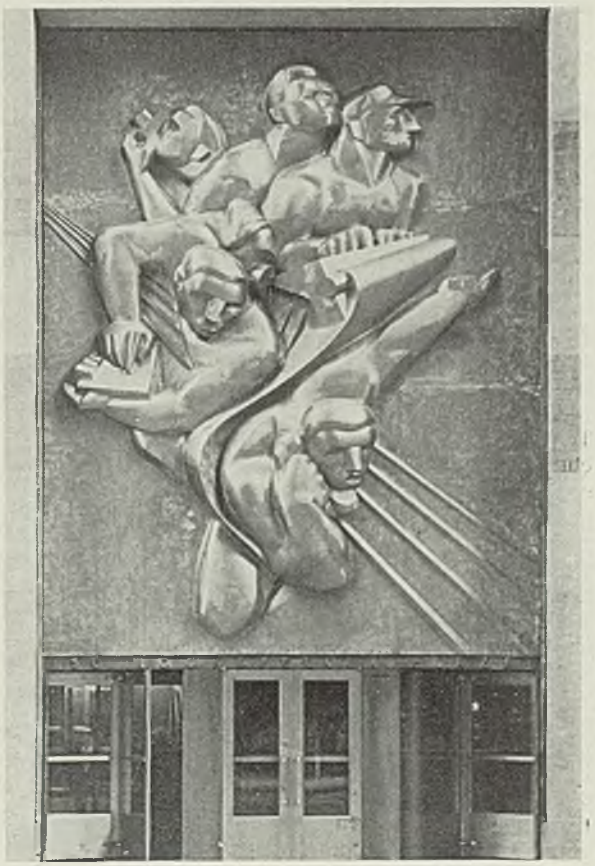
"Like private individuals and business," said the court, "the government enjoys the unrestricted power to . . . . determine those with whom it will deal and to fix the terms and conditions upon which it will make needed purchases."

The injunction of the court of appeals is still in effect. Under usual procedure of the Supreme Court it would send the mandate down to the lower court and the minimum wages would become effective after expiration of 25 days. However, the solicitor general has requested the Supreme Court to issue the mandate at once. If granted, the wage schedule would become effective immediately. The Supreme Court is scheduled to rule on the solicitor general's motion May 6.

The Walsh-Healey act, which applies to all government purchases of $10,000 or over, aroused a storm of protest from its enactment in 1936. It soon became clear that its

Stainless in Sculpture

■ Ten-ton stainless steel plaque — symbolic of "News" and depicting five men working with teletype, wirephoto, camera, telephone and pad and pencil—was erected over the main entrance to the Associated Press building, Rockefeller Center, New York, last week. The 17 x 22-foot plaque was designed by Isamu Noguchi, and was engineered and cast by General Alloys Co., Boston, under direction of H. H. Harris, president



purpose was not alone to maintain the existing minimum rates, but, as interpreted by the labor department, to fix wages artificially regardless of hardships imposed on employers. In some instances, the rates set by the labor department were the highest rates prevailing and even exceeded the highest prevailing rates in some districts. Even Philip Murray, Steel Workers' Organizing committee chairman, had recommended a minimum wage of only 60 cents an hour for eastern steel mills.

Typical of the attitude of the smaller eastern producers was the summation of Robert W. Wolcott, president, Lukens Steel Co., Coatesville, Pa., when he said the action of the department of labor fixing the higher wage scales: "Not only means an additional burden on a large number of small companies, but appears to have been taken without consideration of the factors which justify the present differential existing between such areas and which have been recognized in other areas. Study of the rates definitely indicates discrimination against the eastern area and the many small producers located therein."

The fact that the Walsh-Healey schedules impose on steel a minimum rate where government work is concerned that is more than 100 per cent higher than the government now imposes under the wage-hour act on non-government work and more than 50 per cent higher than the rate ultimately proposed under this same act only adds to the question as to the justification of the Walsh-Healey measure.

Becomes Sales Manager Of Wickwire Spencer

■ A. G. Bussman has been appointed general sales manager, Wickwire Spencer Steel Co., New York. He succeeds R. L. Foster, vice president in charge of sales, who has retired. Mr. Bussman will assume all responsibilities previously carried by Mr. Foster.

Attending Carnegie Institute of Technology, Mr. Bussman served as chemist for the New York public service commission and then for 14 years as chemist and welding engineer with American Steel & Wire Co., after which he joined Wickwire Spencer as sales manager, wire and springs department. In 1939 he was, in addition, named sales manager, Buffalo district.

Mr. Foster's retirement comes after about 40 years' active participation in the wire and wire products industries. He first served as president, J. C. Pearson Co., manufacturer of nails; then as assistant general sales manager, American Steel & Wire Co., and for the past ten years as vice president in charge of sales for Wickwire and its subsidiary, American Wire Fabrics Corp.

March Steel Industry Payrolls Slightly Lower

■ Steel industry payrolls in March totaled $68,768,000, slightly lower than the $70,847,000 total for February, but above the March, 1939, figure of $64,174,000, according to the American Iron and Steel institute.

Employment during March averaged 514,000, compared with 538,000 in February, and 455,000 in March last year.

Wage-earning employes earned an average of 83.6 cents per hour in March, against 83.4 cents in February, and 82.8 cents in March, 1939. March work week averaged 32.3 hours, compared with 34.1 in February, and 34.7 in March last year.

400,000 Tons of Steel In 1939 Home Equipment

■ MORE than 400,000 net tons of steel were used last year for kitchen ranges, refrigerators and washing machines, creating the equivalent of full-time employment for nearly 10,000 men in the steel industry, according to American Iron and Steel institute.

About 201,000 tons of the steel went into gas and electric refrigerators, 159,000 tons in kitchen ranges and 41,000 tons in washing machines.

During 1939, more than 5,217,000 refrigerators, ranges and washing machines were made, production being 35 per cent above the 3,863,000 units of 1938 but 22 per cent below the 1937 peak of 6,691,000 units.

Dr. Edwin F. Northrup Dies in New Jersey

■ Edwin Fitch Northrup, vice president and technical adviser, Ajax Electrothermic Corp., Trenton, N. J., died at his home in Princeton, N. J., April 29, at the age of 74. Born in Syracuse, he received his primary education in the public schools there; was graduated from Amherst college in 1891; attended Cornell university the latter half of the same year, and obtained his doctorate at Johns Hopkins university in 1895.

In 1903 Dr. Northrup and Maurice E. Leeds formed Leeds & Northrup Co. He was associated with that firm until 1910, and contributed largely to the design and perfection of instruments. From 1910 to 1916 Dr. Northrup did research work and taught physics and electrical engineering at Princeton university. It was while there he started development of the high frequency or coreless induction furnace, and from that time to his death was actively engaged in its development and application.

Dr. Northrup published over 100 papers of pamphlet to text book length, and was awarded over 100 patents on his inventions. He was a life member, American Institute of Electrical Engineers and American Association for Advancement of Science, and was also a member, American Electrochemical society, Inventors' guild and Franklin institute. He was awarded the Medaille de Bronze, Paris exposition in 1900; the Edward Longstreth medal in 1912; the Elliott Cresson medal in 1916, and the Edward Goodrich Acheson gold medal in 1931. Two months before his death he was cited as a "Modern Pioneer" in a national survey honoring those who have done most to advance industry.

Bryant Chucking Grinder Co. Adds Machine Shop

■ Contracts for the second 14,000-square foot addition to be built at the Bryant Chucking Grinder Co. plant in Springfield, Vt., in a six months' period have been awarded to the Austin Co., Cleveland.

Project will provide a new machine shop with three 30-foot bays, one of which will be equipped for crane operation. It will represent an investment in excess of $40,000.

Sponsors Technical Production Conference

■ New Wrinkle Inc., Dayton, O., is sponsoring a technical production conference at its laboratory for licensee manufacturing firms May 17-18. Purpose of the two-day meeting is to acquaint its licensees' production superintendents with the company's latest developments.

Electro-Galvanizing Discussed At Zinc Institute Meeting

■ NEW process for electro-galvanizing steel products was described by J. A. Singmaster, president, Singmaster & Breyer, New York, at the twenty-second annual meeting of the American Zinc institute in St. Louis, April 29-30.

The meeting was attended by approximately 200 members as well as representatives of the American Hot Dip Galvanizers association and the Galvanizers committee, the latter comprising galvanized sheet steel producers. T. M. Gregory, Hanlon-Gregory Galvanizing Co.; A. J. Blaeser, Joslyn Mfg. Co., Chicago, and Stuart J. Swensson, secretary, represented the hot dip galvanizers.

The process described by Mr. Singmaster utilizes zinc ore or zinc by-products directly with insoluble anodes in a solution of ammonia and ammonium salts as the solvent for the zinc in place of sulphuric acid.

Uses Chloride Electrolyte

It works as well in a chloride electrolyte and accordingly makes available high chlorine materials, such as sal skimmings, he said. Plating takes place therefore in an alkaline instead of an acid solution. Extraction of zinc from ordinary roasted ore, Waelz oxide and zinc by-products, generally is high, he said.

Purification of the solution is simple, said Mr. Singmaster, since many of the harmful impurities, notably chlorine, which interfere with the deposition from the sulphate solution, have no effect.

Current densities are of the same range as in the U. C. Tainton process used by the Bethlehem Steel Co. at Sparrows Point and Johnstown, he indicated. The Tainton process employs approximately 1000 amperes per square foot of cathode surface, he said.

About 100 tons of steel strip 10 inches wide have been galvanized satisfactorily in a pilot plant, he said, as well as a quantity of wire. The strip showed remarkable adherence for paint without pre-treatment, he said.

Mr. Singmaster pointed to the progress made by the Tainton process in the plants of the Bethlehem Steel Co. First operated in 1933, capacity recently has been doubled to a total of about 180 tons of wire daily, he indicated. Sheets now are being produced in a pilot plant.

In discussing electro-galvanizing with metal anodes, he estimated consumption in 1939 at 5000 tons, against 3000 tons in 1938 and 4000 tons in 1937. Zinc anodes containing aluminum, mercury, or aluminum and mercury, have found increasing application since they overcome difficulties encountered in using unalloyed anodes which become coated with a sludge, which in turn interferes with the appearance of the work, causes disturbances in the electroplating operation itself and reduces the efficiency of the process. He said consumption of alloy zinc anodes has tripled in the last six years.

Presence of tin in zinc coatings applied by the hot-dip method was stressed as one of the most important factors in coating failures by G. C. Bartells, Zinc institute field representative. In studying old tank specimens which stood up for 15 to 28 years, he found that the zinc coatings contained little tin, averaging only 0.11 to 0.37 per cent. Tanks placed in service more recently failed in one to three years and the coatings contained 0.54 up to 1.5 per cent tin. He noted that tanks produced since the early twenties generally were inferior to those produced earlier. Heavier coatings would not solve the problem if the tin content is high, he said.

It was indicated that steel sheet galvanizers are giving the matter of tin content considerable study. Generally, tin is added to the galvanizing bath to give the coated sheet a brighter appearance.

T. W. Billings, Co-operative Grange League Federation Farm Supplies Inc., New York, representing 125,000 eastern farmers, said the steel industry may be "worrying" too much about next year's automobile models and thereby losing sight of the market of millions of tons of galvanized sheets and wire in farm areas. He said present products are inferior to those of a number of years ago and blamed this on competition between manufacturers.

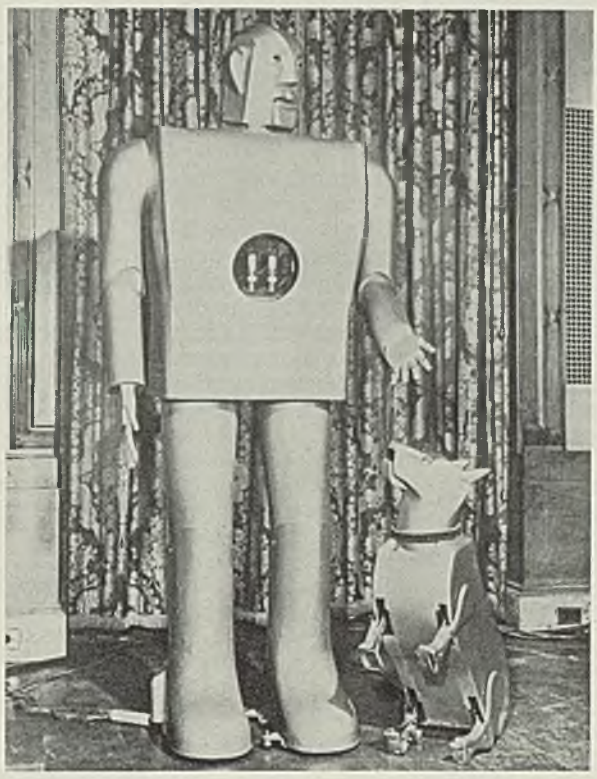
One of the serious problems facing the zinc industry results from the reduction of the protective tariff in the reciprocal trade treaty with Canada. Before outbreak of the war, considerable metal came in under most favored nation treatment. While this flow has been checked, it is expected to resume when the war ends.

Howard I. Young, president of the institute and also head of the American Zinc, Lead & Smelting Co., St. Louis, said the institute is conducting a program designed to acquaint the state department with its tariff requirements but so far little action has resulted. He said further that the industry cannot formulate a long-term program as long as it does not know what to expect in the way of protection.

Walter R. Peabody, secretary, American Tariff league, Washington, in discussing reciprocal trade

Metal Man And His Dog

■ Sparko and Elektro, the mechanical dog and his master, were previewed last week on their way to the Westinghouse exhibit at the New York World's fair. The pup walks, sits up, wags his tail and apparently obeys the commands of the metal man. NEA photo



agreements, held out little hope to the industry of obtaining a revision of the rate provided in the Canadian agreement. No provisions in any agreements have been revised so far, he declared.

James T. Hall, secretary, Callahan Zinc-Lead Co., New York, explained the new realignments now existing in the world zinc picture. Up to the beginning of the World war, Germany was the dominant producer outside the United States. Even Australian concentrates were smelted in German and German-controlled smelters in Belgium. The Allies were short on zinc when the war started, and the burden of production was placed upon the United States, imports of concentrates averaging 180,000 tons annually.

Zinc Production May Rise

England learned a lesson from this experience and after the war built up Empire producing capacity to the point where she is second only to the United States. In 1938, England's capacity was 400,000 tons annually or 35 per cent for the world total outside the United States.

During the course of the present war, zinc concentrates are likely to come to the United States only from Mexico. Further, Japan probably will take part of the Mexican surplus since she is cut off from Australia.

He explained that output declined sharply during the past war due to interference with production facilities. So far in this war there has been little such interference. In fact, with plants more evenly divided between the belligerents an upward trend in production may be looked for.

C. R. Maxon, market development division, New Jersey Zinc Sales Co., New York, reviewed the progress in zinc alloy die casting in the last decade.

"In 1930 approximately 22,000 tons of high grade zinc was used for die casting. It is conservatively estimated that in 1939 over 100,000 tons of special grade (99.99+ per cent pure) zinc was consumed by the die casting industry," stated Mr. Maxon. He traced the various steps taken by his company in developing the market through research and sales promotion.

J. L. Schueler, general superintendent, Continental Steel Corp., Kokomo, Ind., discussed developments in hot dip galvanizing. "More progress has been made in sheet galvanizing during the past four or five years than was made since the machine type pot was invented," he said. "Progress in wire galvanizing has advanced during the last 20 years, as has galvanizing for hardware and small parts . . . A great deal of progress will be made during the next few years to further enlighten us along the lines of mechanical, thermal and metallurgical control."

Officers re-elected for one year at the meeting of the new board of directors, April 30, are: Howard I. Young, president; C. Merrill Chapin Jr., John A. Robinson, and James O. Elton, eastern, midwestern and western vice presidents, respectively; John L. Good, treasurer, and Ernest V. Gent, secretary.

The following directors have been re-elected for the term expiring 1943: A. E. Bendelari, Eagle-Picher Lead Co.; C. Merrill Chapin Jr., St. Joseph Lead Co.; Frank Childress, Joplin, Mo.; C. A. Geatty; M. L. Havey, New Jersey Zinc Co.; Robert McClurkin; G. A. McCorkle, Krebs Pigment & Color Corp.; George Mixter; C. T. Orr, Athletic Mining & Smelting Co., and W. N. Smith, Vinegar Hill Zinc Co. F. F. Colcord, United States Smelting, Refining & Mining Co., New York, and E. H. Snyder, Combined Metals Reduction Co., Salt Lake City, have been elected directors to fill vacancies.

March Steel Imports Reach New Low Level

■ Imports of steel and iron products, scrap excepted, declined further in March, when 5067 gross tons were received. This total was 1400 tons less than the February imports of 6467 tons. Value of March imports, $813,303, exceeded that of February, $666,212, by $147,091. In March, 1939, imports totaled 24,589 tons, valued at $1,478,623, according to the metals and minerals division, department of commerce.

Imports for first quarter, 19,366 tons, valued at $2,398,201, are only 29 per cent by volume and 54 per cent by value of receipts during first quarter last year, 66,656 tons, valued at $4,429,827.

Leading suppliers in March were Sweden, 2716 tons; Norway, 880 tons; Belgium 579 tons; British India, 409 tons.

Scrap imports at 29 tons, valued at $160, were negligible and compared with 273 tons, valued at $3541 in February and 780 tons, valued at $11,927, in March, 1939. In first quarter scrap imports totaled 744 tons, valued at $8124, compared with 5526 tons, valued at $65,202, in the corresponding period last year.

U. S. FOREIGN TRADE IN IRON AND STEEL, INCLUDING SCRAP

Gross Tons

	1940		1939	
	Exports	Imports	Exports	Imports
Jan.	583,521	8,274	362,672	27,664
Feb.	671,301	6,740	359,690	19,149
Mar.	663,980	5,096	474,360	25,369
April	.....	.....	394,008	44,083
May	.....	.....	532,641	28,142
June	.....	.....	588,856	32,587
July	.....	.....	513,664	30,851
Aug.	.....	.....	477,078	28,328
Sept.	.....	.....	575,613	29,874
Oct.	.....	.....	591,856	19,189
Nov.	.....	.....	605,555	15,216
Dec.	.....	.....	600,437	14,709
Total	.....	.....	6,076,429	315,161

ORIGIN OF MARCH IMPORTS

Gross Tons

	Iron ore	Pig iron	Manganese ore	Ferromanganese
Sweden	37,406	.....	.....	.....
United Kingdom	53	.....	.....	.....
Canada	60	174	.....	.....
Mexico	357	.....	.....	.....
Cuba	21,049	.....	6,675	.....
Chile	108,400	.....	.....	.....
British India	.....	409	1,188	.....
Brazil	.....	.....	4,135	.....
Philippine Islands	.....	.....	1,778	.....
Netherlands Indies	.....	.....	284	.....
Soviet Russia	.....	.....	16,939	.....
South Africa	.....	.....	211	.....
Gold Coast	.....	.....	6,502	.....
Norway	.....	.....	.....	835
Total	167,325	583	37,712	835

	Sheets, skelp and sawplate	Structural steel	Steel bars	Hoops and bands
Belgium	15	235	160	99
United Kingdom	13	...	23	...
Sweden	1	...	289	1
Total	29	235	472	100

UNITED STATES IMPORTS FOR CONSUMPTION OF IRON AND STEEL PRODUCTS

(Gross Tons)

ARTICLES	Mar. 1940	Feb. 1940	Jan. thru Mar. 1940
Pig iron	583	2,032	4,529
Sponge iron	69	160	241
Ferromanganese*	835	1,595	4,375
Spiegeleisen	18	169	265
Ferrochrome†	.....	.....	.....
Ferrosilicon‡	63	40	372
Other ferroalloys§	14	100	164
Steel ingots, blooms	.....	.....	.....
Billets, solid or hollow	135	22	361
Concrete reinforce bars	7	.....	7
Hollow bar, drill steel	186	196	571
Bars, solid or hollow	472	148	1,020
Iron slabs	.....	.....	.....
Bar iron	34	39	158
Wire rods	930	499	2,466
Boiler and other plate (including skelp)	2	1	4
Sheets, skelp, sawplate	29	20	57
Die blocks, blanks, etc.	2	6	8
Tin plate, taggers' tin and terneplate	12	11	26
Structural shapes	235	83	534
Sashes and frames	.....	.....	.....
Sheet piling	.....	.....	.....
Rails, track material	2	186	297
Cast-iron pipe, fittings	.....	419	419
Mall. iron pipe fittings	.....	.....	.....
Welded pipe	.....	.....	.....
Other pipe	612	193	1,217
Cotton ties	2	.....	2
Other hoops and bands	100	52	457
Barbed wire	.....	.....	.....
Round iron, steel wire	170	120	490
Teleg., telephone wire	.....	.....	.....
Flat wire, steel strips	336	237	803
Wire rope and strand	97	82	260
Other wire	.....	.....	.....
Nails, tacks, staples	21	7	66
Bolts, nuts, and rivets	53	19	77
Horse and mule shoes	.....	.....	3
Castings and forgings	48	31	117
Total	5,067	6,467	19,366
Iron and steel scrap	29	273	744
GRAND TOTAL	5,096	6,740	20,110

*Manganese content; †chrome content; ‡silicon content; §alloy content.

March Machine Exports Near Alltime High

■ Reaching the second highest figure ever recorded, exceeded only by December, 1920, shipments, United States exports of industrial machinery in March totaled $37,559,841, a gain of 27 per cent over $29,594,195 in March, 1939, according to the machinery division of the department of commerce.

Practically all major types of equipment shared in the increase, except petroleum well-drilling and refining machinery. Power-driven metalworking machinery reached a record monthly value of $18,267,473, a gain of 51 per cent over $12,057,012 exported in March, 1939. Metalworking machinery exports, exclusive of power-driven types, were 162 per cent larger than in March last year. Construction and conveying machinery exports totaled $3,223,837, an increase of 76 per cent over the same month last year. Excavators and dredging machinery more than doubled March 1939 total.

Steel's 1939 Taxes 37% Above 1929; Output Less

■ Taxes paid by the steel industry in 1939 totaled $141,100,000, equal to more than half of the industry's net earnings remaining after all other expenses of operation had been met, according to the American Iron and Steel institute.

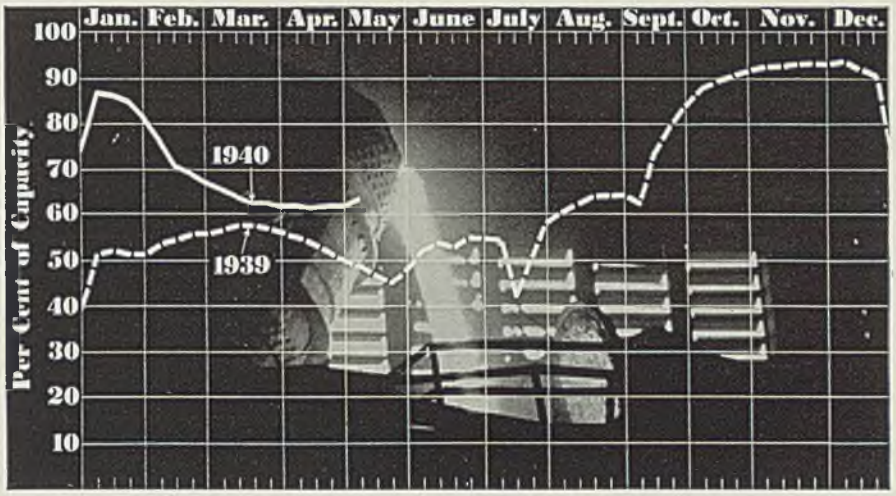
Last year's taxes were 37 per cent greater than the $103,000,000 levied on the industry in 1929, although the industry's output last year was 15 per cent below the 1929 tonnage. The 1929 tax bill consumed 21 per cent of the net earnings before taxes for that year, a share considerably less than half the portion taken by taxes in 1939.

The industry's tax bill in 1938 was $98,600,000, after paying which the industry was "in the red" to the extent of over $14,000,000.

Steel taxes in 1939 were equivalent to more than $332 per wage earner employed during the year, and if paid out in wages would have increased the year's total wages by 22 per cent. Expressed in another way, last year's taxes represented a year's pay for 92,500 workers.

In 1938 the industry's tax bill was equivalent to $254 per worker employed, or, phrased another way, it was a year's pay for 83,000 workers.

Out of every dollar received by the steel industry from the sale of its products last year, about 5½ cents went to pay taxes. The share of the sales dollar going for taxes in 1939 was substantially the same as in 1938, but was 40 per cent more than in 1929 when 3.9 cents of each dollar of total income was spent for taxes.



PRODUCTION... Up

■ STEELWORKS operations last week advanced 2 points to 63½ per cent, the first advance of more than ½-point since the first of the year. Five districts showed substantial gains, two slipped slightly and five remained unchanged. A year ago the rate was 49 per cent; two years ago it was 31 per cent.

Chicago—Increased 2½ points to 59½ per cent, several producers enlarging production. Indications are for further gains.

Birmingham, Ala.—Steady at 83 per cent, with 18 open hearths operating.

Detroit—Down 2 points to 70 per cent with probability this rate will hold through the month.

Cleveland—Unchanged at 70 per cent, with sustained schedules in early prospect.

St. Louis—Held at 42½ per cent, only slightly above the lowest level for the year to date.

Cincinnati—Jumped 10½ points to 53 per cent on restoration of furnaces closed recently as precaution against floods.

Youngstown, O.—Up 5 points to 50 per cent, with 45 open hearths and three bessemers active. Schedule for this week indicates no change.

New England—Drop of 4 points to 53 per cent.

Central eastern seaboard — Continues at 57 per cent with little indication of change.

Buffalo—Sustained at 44 per cent, although two interests made slight shifts. An addition at the end of the week carried the rate to 51 per cent.

Pittsburgh—Advance of 3 points to 58 per cent followed increased activity at several large plants. Further rise is scheduled for this week.

Wheeling—Addition of an idle plant and increased activity at another raised the rate 14 points to 94 per cent.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended May 4	Change	Same week 1939	Same week 1938
Pittsburgh	58	+ 3	44	25
Chicago	59.5	+ 2.5	47	32.5
Eastern Pa.	57	None	36	27.5
Youngstown	50	+ 5	43	30
Wheeling	94	+14	64	41
Cleveland	70	None	44.5	28
Buffalo	44	None	35	28
Birmingham	83	None	55	66
New England	53	— 4	45	30
Cincinnati	53	+10.5	52	40
St. Louis	42.5	None	51	36.5
Detroit	70	— 2	59	18
Average	63.5	+ 2	49	31

Farm Equipment Exports Gain Over Last Year

■ Valued at $3,804,738 United States exports of farm equipment during March represented a gain of 34 per cent over $6,571,059 in March, 1939, the machinery division of the department of commerce reports. Most of the advance was in tractors, parts and accessories, and tillage implements.

March tractor exports, led by wheel types, increased 45 per cent to $7,081,412, compared with $4,873,830 in March, 1939. Wheel tractor exports were 70 per cent greater than a year ago, totaling $3,417,377, compared with $2,008,217. Tillage implement exports in March were valued at $797,379 an increase of 15 per cent above March, 1939, total of $693,065. Harvesting machinery showed a decline of 10 per cent.

April Pig Iron Output Down 4 Per Cent: Three Stacks Are Blown In

■ ALTHOUGH three more stacks were put in blast during April, halting the three-month decline in number of active furnaces, United States production of coke pig iron suffered a further set-back last month. Decreased production in April brought the operating rate down to 68.9 per cent of capacity, off 0.6 point from 69.5 per cent in March. This was the fifth consecutive month in which operating rate decreased, and was down 21.4 points from last November's high, 90.3 per cent of capacity.

Average daily production in April, according to reports from operators of the country's 233 potential blast furnaces, totaled 104,635 net tons. This was 867 net tons, or 0.82 per cent lower than daily rate in March, 105,502 net tons, but exceeded by 26.6 per cent daily output in April 1939 and more than doubled daily production in April, 1938. However, it was 17.6 per cent lower than 126,956 daily average in April, 1937. Last month's daily average was smallest since August, 1939, with 96,122 net tons.

MONTHLY IRON PRODUCTION
Net Tons

	1940	1939	1938
Jan.	4,024,556	2,436,474	1,618,245
Feb.	3,304,368	2,307,405	1,463,093
March	3,270,575	2,680,446	1,646,636
April	3,139,043	2,301,965	1,554,569
Tot. 4 mo.	13,738,542	9,726,290	6,282,543
May		1,923,625	1,412,249
June		2,373,753	1,188,037
July		2,638,760	1,358,645
Aug.		2,979,774	1,674,976
Sept.		3,218,940	1,885,069
Oct.		4,062,670	2,315,599
Nov.		4,166,512	2,561,060
Dec.		4,219,718	2,478,244
Total		35,310,042	21,156,422

Total production for April, 3,139,043 net tons, was down 131,532 tons from 3,270,575 net tons in March. This was a decrease of more than 4 per cent, and was due, in part, to April's being a shorter month. Last month's total output was smallest since August, 1939, when 2,979,744 net tons was produced, but was 36 per cent greater than 2,301,965 tons produced in April a year ago.

Daily average for this year's first four months was 113,542 net tons, compared with 72,433 for corresponding period in 1939.

Total production in four months this year aggregated 13,738,542 net tons. This was 4,012,252 net tons or more than 41 per cent greater than 9,726,290 tons produced in first four months of 1939. Production in corresponding 1938 period totaled 6,282,543 net tons.

AVERAGE DAILY PRODUCTION
Net Tons

	1940	1939	1938	1937
Jan.	129,825	78,596	52,201	116,327
Feb.	113,943	82,407	52,254	120,800
March	105,502	86,465	53,117	125,385
April	104,635	76,732	51,819	126,956
May		62,052	45,556	128,083
June		79,125	39,601	116,304
July		85,121	43,827	126,501
Aug.		96,122	54,031	130,677
Sept.		107,298	62,835	127,604
Oct.		131,053	74,697	104,450
Nov.		138,883	85,369	74,929
Dec.		136,119	79,943	54,319
Ave.	113,542	96,740	57,962	112,642

Relating production to capacity, April pig iron output averaged 68.9 per cent, compared with 49.8 per cent in same 1939 month, 69.5 per cent last March, 75.0 per cent in February and 85.4 per cent in January. Operations in April were lowest, in relation to capacity, since last August, when rate was 62.4 per cent.

Stacks in blast April 30 totaled 155, up three from 152 in March. This was second lowest since August, 1939, when 138 furnaces were in operation, and compares with 157 in February, 177 in January and 191 in December. In April, 1939, 102 stacks were in blast; 186 in April, 1937.

Six blast furnaces resumed during April, and three were blown out or banked. Three merchant stacks resumed; three furnaces in the steelworks or nonmerchant classification were blown out or banked, and three others resumed. Since last December 36 stacks have been blown out or banked.

Furnaces resuming operation in April were: In Alabama: One City, Sloss-Sheffield Steel & Iron Co. In Ohio: Brier Hill No. 2, Campbell No. 4, Youngstown Sheet & Tube Co.; one Central, American Steel & Wire Co.; one Struthers, Struthers Iron & Steel Co. In Pennsylvania: Farrell No. 2, Carnegie-Illinois Steel Corp.

Stacks blown out or banked were: In New York: Lackawanna J, Bethlehem Steel Co. In Pennsylvania: Eliza Nos. 3 and 6, Jones & Laughlin Steel Corp.

APRIL IRON PRODUCTION
Net Tons

	No. in blast last day of Apr.	No. in blast last day of Mar.	—Total Tonnages— Merchant	Non-Merchant
Alabama	17	16	90,782*	167,311
Illinois	9	9	45,885	175,590
Indiana	12	12	83	344,543
New York	9	10	48,371	147,592
Ohio	36	32	87,460	591,907*
Penna.	50	51	82,874*	881,660*
Colorado	3	3		
Michigan	5	5		
Minnesota	1	1	2,306*	185,766
Missouri	0	0		
Tenn.	1	1		
Utah	1	1		
Kentucky	1	1		
Maryland	6	6		
Mass.	0	0	3,248*	283,665
Virginia	1	1		
West. Va.	3	3		
Total	155	152	361,009*	2,778,034*

*Includes ferromanganese and spiegeleisen.

Vickers Inc. To Build New Plant in Detroit

■ Construction of a substantial plant addition and new office quarters for Vickers Inc. is to be launched at once adjacent to the company's existing plant at 1400 Oakman Boulevard, Detroit. The new building is to be of welded rigid frame sawtooth design, with offices in a second story section extending along the 340-foot streamlined brick and limestone facade.

It will be built by The Austin Co., Cleveland, who designed the project and are also fabricating 580 tons of steel required for the 80,000 square foot plant, which will represent an investment of approximately $500,000.

Outstanding features of the plant will be the all-welded "tree-form" columns which eliminate all need for shadow-producing web members in the three 40-foot sawtooth aisles. These aisles will be equipped with cranes to expedite straight-line production.

RATE OF FURNACE OPERATION
(Relation of Production to Capacity)

	1940[1]	1939[2]	1938[3]	1937[4]
Jan.	85.4	51.0	33.6	76.6
Feb.	75.0	53.5	33.6	79.5
March	69.5	56.1	34.2	82.5
April	68.9	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 55,628,060 net tons, Dec. 31, 1939; [2] capacity of 56,222,790 net tons, Dec. 31, 1938; [3] capacity of 56,679,168 net tons, Dec. 31, 1937; [4] first six months on capacity of 55,454,265 net tons, Dec. 31, 1936—last six months on capacity of 55,695,065 net tons, June 30, 1937. Capacities by American Iron and Steel Institute.

FINANCIAL

(*Concluded from Page 22*)

profit to the industry at current production rate. Speaking at a press conference last week, when National's first quarter earnings statement was released, Mr. Weir declared he sees a definite trend toward more fluid steel prices and expects increasing price competition in the future.

National Steel Corp.'s first quarter net earnings were $4,009,193, equal to $1.82 a share on 2,202,167 capital shares outstanding. This compared with $2,426,668, equal to $1.10 per capital share, earned in corresponding 1939 quarter, and was highest first period net profit since 1937's $5,695,819.

Net income in first quarter this year was more than 75 per cent as large as preceding period's $5,292,331, Mr. Weir pointed out, even though the latter was "a super quarter in the steel industry from an operating standpoint."

Corporation's current operations, according to the report, are approximately 75 per cent of capacity. Mr. Weir, however, expressed doubt this operating rate could be maintained by his company throughout the present quarter. Last February he had predicted average operations for the steel industry during first half of 1940 would range between 60 and 70 per cent.

"In the light of present conditions," stated Mr. Weir, "it appears that 70 per cent of capacity is probably a high estimate of maximum average operations for the industry over this period."

Approximately 15 per cent of the industry's current output is for export, said Mr. Weir, with the remainder going to domestic consumers, whose inventories are normal. Principal export demand is for semifinished steel, with good finished steel market in South America. Normally about 5 per cent of output is for export.

WICKWIRE SPENCER REPORTS FIRST QUARTER NET LOSS

Wickwire Spencer Steel Co., New York, reports $262,701 net deficit was incurred during first 1940 quarter's operations, compared to $158,753 net deficit in corresponding 1939 period. Net profit in fourth quarter last year was $127,156.

Total 1939 net deficit was $233,358, compared to $597,980 net loss resulting from operations in 1938. Net profit earned in 1937 totaled $592,466.

♦

Alan Wood Steel Co., Conshohocken, Pa., reports first quarter net income was $297,246, equal to 86 cents a share on common stock. This compares with $233,979 net profit, equal to 54 cents a share on common, in corresponding 1939 quarter.

♦

Eastern Rolling Mill Co., Baltimore, reports first quarter net profit was $5568, compared to $28,017 net deficit incurred in corresponding 1939 period.

♦

M. A. Hanna Co., Cleveland, declared $1.25 quarterly on $5 cumulative preferred stock, payable June 1 to record of May 15.

Details of Pig Iron Production in 1939

■ Pig iron production in 1939 totaled 34,806,682 net tons, an increase of 14,037,084 tons, or 67.7 per cent over 20,771,598 tons in 1938, according to the American Iron and Steel institute.

Pennsylvania retained its position as largest producer, with 9,809,487 tons, Ohio being second with 8,033,411 tons. The Indiana-Michigan district was third with 4,786,803 tons and Illinois fourth with 2,968,606 tons.

Ferroalloy production totaled 868,415 net tons, compared with 688,566 tons in 1938, an increase of 179,849 tons, 26.1 per cent. The output consisted of 453,574 tons of ferromanganese and spiegeleisen, 362,358 tons of ferrosilicon and 52,483 tons of other ferroalloys.

Basic pig production totaled 25,437,868 tons; bessemer and low-phosphorus 5,970,634 tons; foundry 1,910,868 tons; malleable 1,386,337 tons; forge or mill 3800 tons; white and mottled, direct castings, etc., 99,175 tons.

Of the total, 30,453,073 tons, or 87.49 per cent was for maker's use and 4,355,609 tons, or 12.51 per cent for sale. In 1938 makers used 84.06 per cent. In 1937 they used 82.1 per cent.

PRODUCTION OF PIG IRON AND FERROALLOYS
(All Figures Are Net Tons)

Pig Iron	1935	1936	1937	1938	1939
Pennsylvania	6,137,367	10,195,220	12,735,786	5,416,285	9,809,487
Ohio	6,310,674	8,071,454	8,852,417	4,715,776	8,033,411
Indiana, Mich.	3,246,295	4,668,495	5,288,994	2,628,993	4,786,803
Md., Va., West Va., Ky., Tenn.	1,994,911	2,354,359	2,835,232	2,030,954	3,116,744
Illinois	2,243,795	3,267,058	3,837,250	1,855,382	2,968,606
Alabama	1,453,715	2,237,997	2,890,355	2,266,060	2,935,685
Mass., New York	1,585,646	2,486,984	3,184,480	1,459,603	2,422,844
Minn., Iowa, Col., Utah	302,048	560,965	840,633	398,545	735,102
Total	23,274,451	33,842,532	40,465,147	20,771,598	34,808,682
Ferroalloys					
Pennsylvania	246,341	370,119	489,793	184,687	309,543
Ohio, Iowa	126,724	183,874	193,064	171,078	239,197
New York, N. J.	218,715	272,357	290,733	213,282	191,802
Va., West Va., Ala., Tenn.	71,192	83,807	143,813	119,519	127,873
Total	662,972	910,157	1,117,403	688,566	868,415
Grand total	23,937,423	34,752,689	41,582,550	21,460,164	35,677,097

PIG IRON MADE FOR SALE IN 1939

States	Basic	Bess. & low phos.	Foundry	All other	Total
Massachusetts, New York	145,075	60,418	332,320	310,147	847,960
Pennsylvania	397,639	207,560	113,935	83,857	802,991
Md., W. Va., Ala., Tenn.	119,997	4,329	968,861	36,130	1,129,317
Ohio	162,791	87,938	170,026	396,325	817,080
Indiana, Illinois	106,682	7,645	106,233	441,782	662,342
Mich., Minn., Ia., Col., Utah	321	.....	76,070	19,528	95,919
Total	932,505	367,890	1,767,445	1,287,769	4,355,609

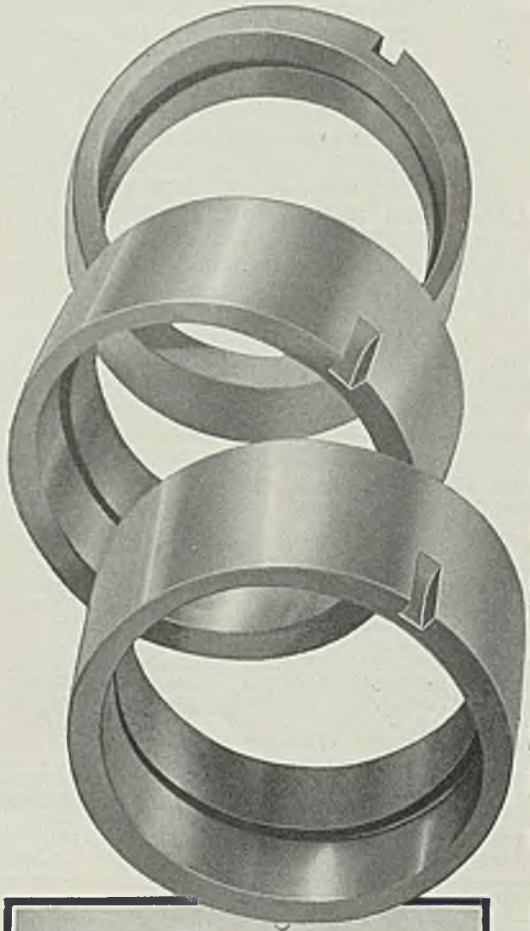
PRODUCTION OF PIG IRON AND FERROALLOYS IN 1939

(For sale and for maker's use)

Pig Iron	For sale	For maker's use	Total
Basic	932,505	24,505,363	25,437,868
Bessemer and low-phosphorus	367,890	5,602,744	5,970,634
Foundry	1,767,445	143,423	1,910,868
Malleable	1,223,552	162,785	1,386,337
Forge or mill	3,800	.....	3,800
White and mottled, direct castings, etc.	60,417	38,758	99,175
Total	4,355,609	30,453,073	34,808,682
Ferroalloys			
Ferromanganese and spiegel	219,500	234,074	453,574
Ferrosilicon	355,585	6,773	362,358
Other ferroalloys	52,483	.....	52,483
Total	627,568	240,847	868,415
Grand total	4,983,177	30,693,920	35,677,097

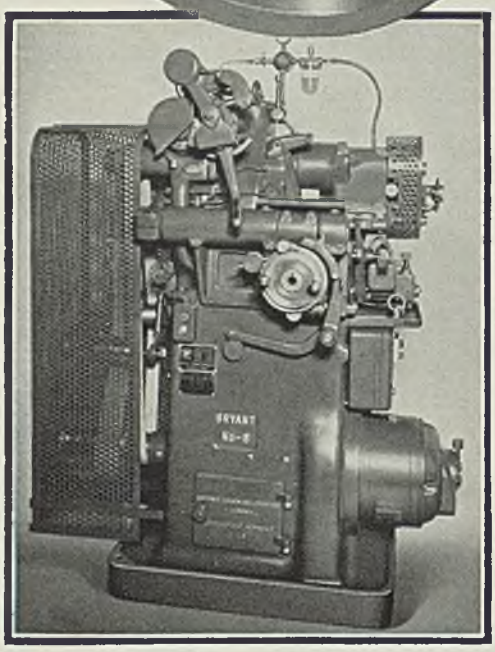
INTERNAL *Cam* GRINDING

ANOTHER PRODUCTION ASSET AVAILABLE ON THE BRYANT No. 5 GRINDER

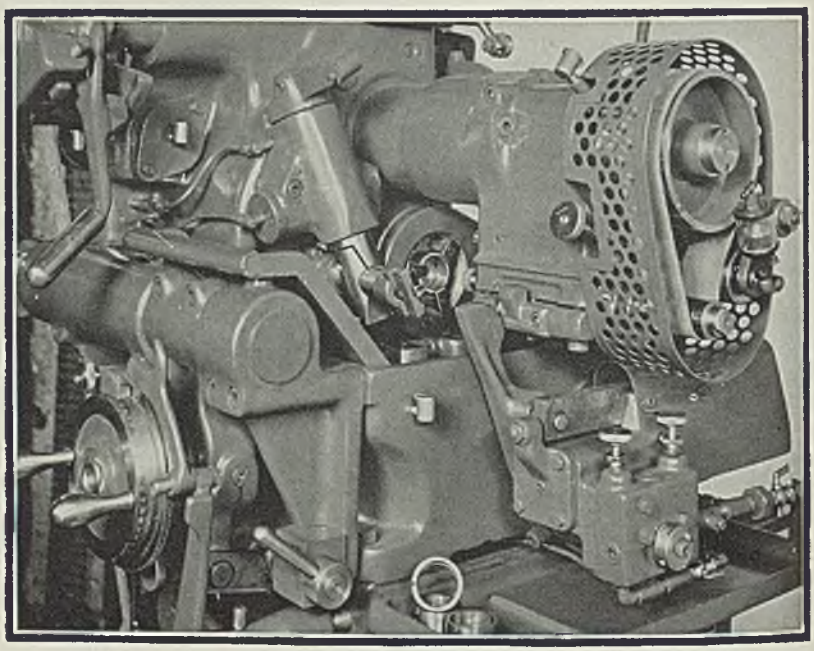


THE No. 5 Bryant Internal Grinder, with cam grinding attachment, is one of the most versatile machines offered to the industry today for grinding the bore on small parts. Straight, taper, out-of-round, and cam shaped holes (or any of these in combination) may be ground on this one machine in one set-up. The ability to grind these shapes, plus the Bryant feature of wheel suspension means absolute accuracy, fine finish, quick set-ups, no rehandling, and an increase in production that should interest all modern cost-conscious manufacturers.

Complete details on the Bryant No. 5, plus hints on handling a variety of internal grinding jobs, will be found in the Bryant No. 5 Catalog. Your copy will be sent on request.



No. 5 Bryant Internal Grinder



Close-up of work showing Cam Grinding Attachment

BRYANT CHUCKING GRINDER CO., Springfield, Vermont

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ TAX revision, more adequate financial as well as military preparedness and changes in the national labor relations act were subjects of main resolutions adopted by the twenty-eighth convention of the United States chamber of commerce held here last week.

Adjustment of tax rates was urged to encourage maximum productive activity, along with removal of punitive tax features. Greater ease and simplicity of administration, "and development of a long term revenue structure that will afford stability and certainty in the federal taxing system" were stressed by the resolution, which also provided corporate rate should not be above 15 per cent, restoration of consolidated returns, and that provisions should be made for depreciation, depletion and obsolescence to protect capital against impairment.

Must Pay Debts

"Carefully but surely we must reduce federal expenditure and balance our national budget," stated W. Gibson Carey Jr., president of the national chamber, "including our vast federal corporations. Then we must begin paying our debt, encourage productivity and full use of resources by reducing taxes. As we release our present restrictions on business, substitute clear laws applying alike to all men, we shall develop new industry, improve our present product and give to our people, through lower prices, more real purchasing power."

Solution of the tax problem lies in the adoption of a permanent revenue system from which no departure would be permitted, according to Ellsworth C. Alvord, member of committee on federal finances who addressed the convention. Annual tinkering and emergency levies can be obviated if congress attacks the problem through budget committees in each house which would fix maximum expenditures for any given year. Ways and means and finance committees then could devise tax legislation to suit. Committees could also be charged with fixing statutory debt limit and with control of deficit financing through borrowing.

A choice lies between private enterprise and complete government regimentation, according to Mr. Alvord. Two plans tried out by the New Deal, restriction of private enterprise on one hand and stimulation of consumer power by government spending on the other, have proved failures which should be admitted, he said.

Number of unemployed was placed at 9,500,000 by Mr. Alvord, who pointed out the large deficit in new capital flow into industry and the continuing governmental spending.

Government, agreed the convention, should refrain from entering any field of business which can successfully be conducted by private enterprise. "Tax-free, rent-free, and cost-free competition," read a resolution, "with the lawful enterprises of private citizens is destructive and should be ended."

NLRB Attacked

National labor relations act was attacked as a serious deterrent to recovery. "This act," said the convention, "has failed to produce the economic benefits for the public predicted by its proponents. Instead, great economic loss and waste have resulted, and recovery has been distinctly impeded." It was pointed out that in the year following enactment of the Wagner act there were more strikes than in any of the preceding 15 years.

A resolution expressed dissatisfaction with the wage-hour law and urged outright repeal, saying "amendments cannot cure the essential defects of this character."

Pointing out that financial preparedness is just as necessary as military preparedness, a resolution urged "our government must be prepared to defend our country and our people against any aggressor. Adequate armament for national safety must be our first concern." Delegates also urged government to safeguard foreign trade and "that our department of state continue prompt diplomatic action against discriminations and interferences prejudicial to our rights."

S. Wells Utley, president, Detroit Steel Castings Co., Detroit, addressed the convention. "If it be true," he said, "that every step of our progress exists first as a mental picture, then as long as institutions which stimulate the formation of such mental images may be translated into useful goods and services, our horizon will continue to expand. When such laws, whatever their alleged purpose, retard and discourage formation of such images, frontiers will necessarily draw in and contract."

Oppose Walsh-Healey Act

Opposition to any extension of the Walsh-Healey act, with a request for its repeal, was also expressed by the convention.

Charles E. Wilson, president, General Electric Co., Schenectady, N. Y., discussed research and invention, saying "obviously, it is difficult to definitely predict, but of this we may be sure. Never before has there been so much knowledge, so much eager public-spirited effort, so much money being applied to the search for new services as there is today—and, therefore, at no time has there been a better prospect of finding new services than there is today. Certainly, with such opportunities and prospects, progressive industry must and does look

forward confidently and courageously to the building of a better America under the distinctly American free enterprise system."

Another resolution suggested appointment of a committee to consider reciprocal trade agreements and present recommendations to the national chamber.

The convention was well attended, about 2000 leading executives of the country being present.

RECOMMENDS TNEC POSTPONE HEARINGS AFTER ELECTION

Advisory committee of temporary national economic committee last week advised that no further hearings be held until after the presidential election in November. A meeting will be held early this wek to take action on this recommendation which apparently is supported by a majority of the committee members.

U. S. WARPLANES TO HAVE LATEST FIGHTING EQUIPMENT

Testifying before a senate appropriations subcommittee last Friday, Maj. Gen. H. H. Arnold, chief of United States army air corps, revealed that most of the 1900 combat planes recently ordered by the army will be equipped with rubber self-sealing gasoline tanks, heavy protective armor and latest 37 millimeter guns. These features now are known to be incorporated in German warplanes.

Glenn L. Martin Co., Baltimore, announced that on May 9 it will demonstrate at its Baltimore plant the new self-sealing fuel tank the company has had under development for several years.

RIVET MAKERS WARNED BY FEDERAL TRADE COMMISSION

Because of provisions in license and lease agreements which allegedly tend to lessen competition or create a monopoly in interstate commerce, three makers of rivets and rivet-setting machinery were served with complaints by federal trade commission for alleged violation of the "exclusive dealing" section of the Clayton act.

Milford Rivet & Machine Co., Milford, Conn., Judson L. Thomson Mfg. Co., Waltham, Mass., and Tubular Rivet & Stud Co., Boston, making a majority of the rivet-setting machines and tubular bifurcated rivets entering interstate commerce, were accused of leasing and licensing their rivet-setting machines with the condition, agreement or understanding that lessees or licensees would use the rivet-setting machines only to set rivets made by the companies or sold by their authority. A further condition was that lessees allow companies to inspect the machines at all reasonable times.

NLRB OPENS 4 OHIO OFFICES FOR REPUBLIC STEEL CLAIMS

National labor relations board has opened offices in four Ohio steel towns to ascertain the claims for back pay and reinstatement of a number of claimants under the order of the circuit court of appeals for the third circuit enforcing the board's order against the Republic Steel Corp.

Offices are in Youngstown, Canton, Massillon and Niles and are under the direction of Oscar Smith, regional director for the board at Cleveland. A special staff will keep open these offices for a period of about two weeks to ascertain the names, eligibility, and necessary facts concerning employment of workers claiming back pay and reinstatement.

Claims must be filed before July 1, or rights to back pay under the order may be forfeited.

MORE DATA ON FOREIGN GOODS TO BE AVAILABLE

To furnish American exporters and importers with more current and more specific information on business opportunities abroad, bureau of foreign and domestic commerce, according to James W. Young, director, will adopt new foreign regulations which will provide for personal canvassing of buyers and distributors in foreign countries.

Foreign officers of the bureau also will be required to recommend to the bureau responsible firms which express an interest in handling commodities in question and more specific information regarding commodities.

Information collected by foreign officers will be transmitted directly to the bureau and made available to foreign traders in this country.

INDUSTRY ABSORBS 1,250,000 WPA WORKERS

About 1,250,000 workers left WPA rolls voluntarily in the last year, according to statement last week of Col. F. C. Harrington, commissioner of work projects. Nearly half the two million workers now on WPA rolls, he said, are 40 years of age or older and belong to the group of stable and experienced workers, many with heavy family responsibilities.

NLRB FINDS FORD MOTOR "CRUSHING" ST. LOUIS CIO

National labor relations board last week decided Ford Motor Co., had undertaken an "active and open campaign to crush" United Automobile Workers of America (CIO), at its St. Louis plant. Company was accused of refusing to bargain with union, discriminating against 94 employes because of union membership, and dominating and interfering with St. Louis division of the Liberty League of America.

In order "to effectuate the purposes and policies of the act," board ordered company to bargain with union on request, reinstate the 94 employes with back pay, and refute the Liberty League as a collective bargaining agency.

Board also directed company to post notices in the plant that company would not interfere in any manner with right of employes to organize and that company would not disseminate "among its employes statements or propaganda which disparage or criticize labor organizations or which advise its employes not to join such organizations."

MANGANESE ORE BIDS SOUGHT BY GOVERNMENT

Bids will be received May 16 by procurement division, treasury department, for quantities up to 25,000 long tons of ferro grade A, B and C manganese ore.

From 2000 to 20,000 tons are sought for delivery, f.o.b. cars, United States army ordnance depot, Curtis Bay, South Baltimore, Md., or c.i.f., Baltimore Harbor, Baltimore; from 1000 to 5000 tons for delivery, f.o.b. cars, United States army ordnance depot, Ogden, Utah.

GOVERNMENT WALSH-HEALY PURCHASES TOTAL $417,763

During week ended April 20, government purchased $417,763.92 worth of iron and steel products under Walsh-Healy act as follows: Widin Metal Goods Co., Garwood, N. J., $12,042; MacWhyte Co., Kenosha, Wis., $13,817.95; Elastic Stop Nut Corp., Elizabeth, N. J., $25,997.59; Air Associates Inc., Garden City, N. Y., $28,596.69; Aluminum Co. of America, Washington, $26,577.83; Corbin Screw Corp., New Britain, Conn., $12,555.77; Telephonics Corp., New York, $17,160; Colorado Fuel & Iron Corp., Denver, $25,000; United States Pipe & Foundry Co., Chicago, $17,403.24; Snap-On Tools Corp., Kenosha, Wis., $15,915.46; Link-Belt Co., Indianapolis, $15,125.01; Crown Iron Works Co., Minneapolis, $36,738; United States Pipe & Foundry Co., Philadelphia, $40,863.54; National Cast Iron Pipe, division of James B. Clow & Sons, Kansas City, Mo., $12,629; Chicago Bridge & Iron Co., Chicago, $68,960.24; American Steel & Wire Co., Chicago, $34,851.60 (estimated); and Otis Steel Co., Cleveland, $13,530 (estimated).

Aircraft Industry Adopting Mass Production Methods

■ INTENSIFICATION of demand for aircraft of all types is causing the industry and its equipment suppliers to concentrate on development and application of mass-production methods. Considerable progress is being made, particularly as a result of study of mass-production methods in the automobile industry.

For example, a new machine now under construction will form complete sets of wing ribs automatically. Because the ribs vary in width according to position in the wing—each member being slightly smaller than the one next to it—the automatic forming of these parts up to a short time ago was looked upon as an impossibility. This machine, with capacity for turning out tapering-size ribs in large volume, is to be placed in operation soon.

Automatic Forming

Other forming operations in connection with the manufacture of aircraft now are being performed automatically as a result of slight modifications of machines in use by the automobile and other mass-production industries. Stainless steel parts are being formed on automatic machines equipped with a larger number of rolls so as to make the forming operation a more gradual one. High-tensile, low-alloy sheets are being formed by using specially designed rolls embodying minor changes such as fillets of larger radius. One company producing such automatic forming machinery reports a 500 per cent increase in its sales to the aircraft industry within the past year.

Magnaflux inspection of channels and other structural sections formed from flat-rolled material has been speeded up by the development of a new machine. It is equipped with rollers and inspection for cracks and other defects is continuous.

Aircraft manufacturers also are considering automatic tube-welding machines for making tubing out of stainless steel strip.

To speed production of forming and drawing operations, some plane-makers are returning to use of all-metal dies in preference to the Guerin method which uses a rubber compression pad between ram and die to distribute pressure.

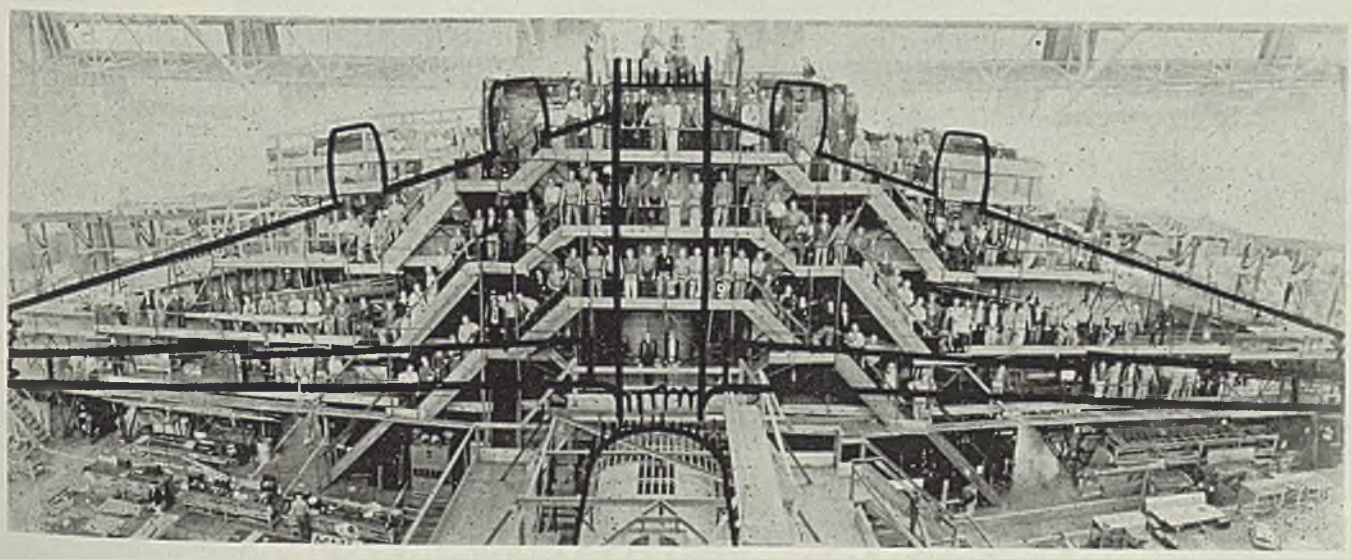
Progress also is being made in materials for aircraft construction. A special high-strength bronze with hardness up to 400 brinell has been developed by Ampco Metal Inc., Milwaukee, for use in landing gear bearings. It is designed to prevent "squashing out" under high impact shocks in landing. A welding rod for this bronze now is being developed.

A mid-western tube manufacturer reports development of a high structural strength stainless steel which does not cold work. It accomplishes this result by adding chromium and molybdenum, keeping the nickel content low. Tubes rolled from such material, this company says, will permit greater strength in airplane structural members without increasing weight. Production costs now are high but will be reduced soon.

A bright future for the use of metals in light planes is seen by J. H. Torrens, president, Luscombe Airplane Corp., West Trenton, N. J. "It is our belief," he writes to STEEL, "that eventually small airplanes will be produced on a scale so large as to practically preclude the use of all structural materials other than metal. We feel that a repetition of the automobile production methods will be duplicated in the manufacture of light aircraft."

New Giant Bomber

■ **Approaching the shape of the "flying wing" of the future, world's largest plane, the Douglas B-19 bomber, is being built for United States army. The all-metal plane has a wing spread of 210 feet, 16-foot 3-blade propellers, four engines delivering 8000 horsepower, and will weigh 70 tons when carrying a 28-ton load. Cruising range is 6000 miles. Courtesy Douglas Aircraft Co., Santa Monica, Calif.**

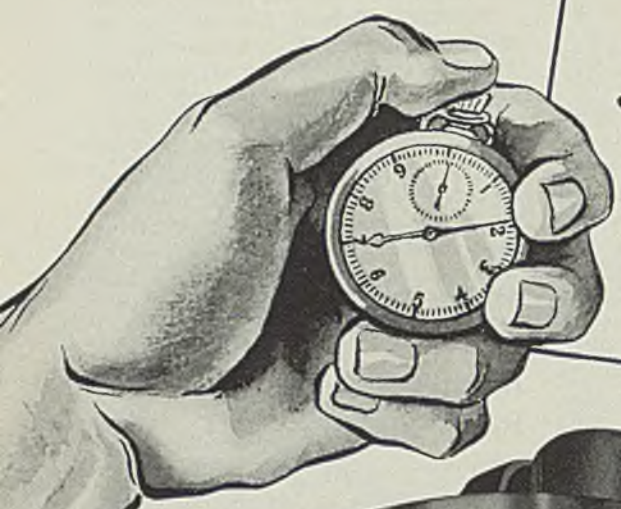


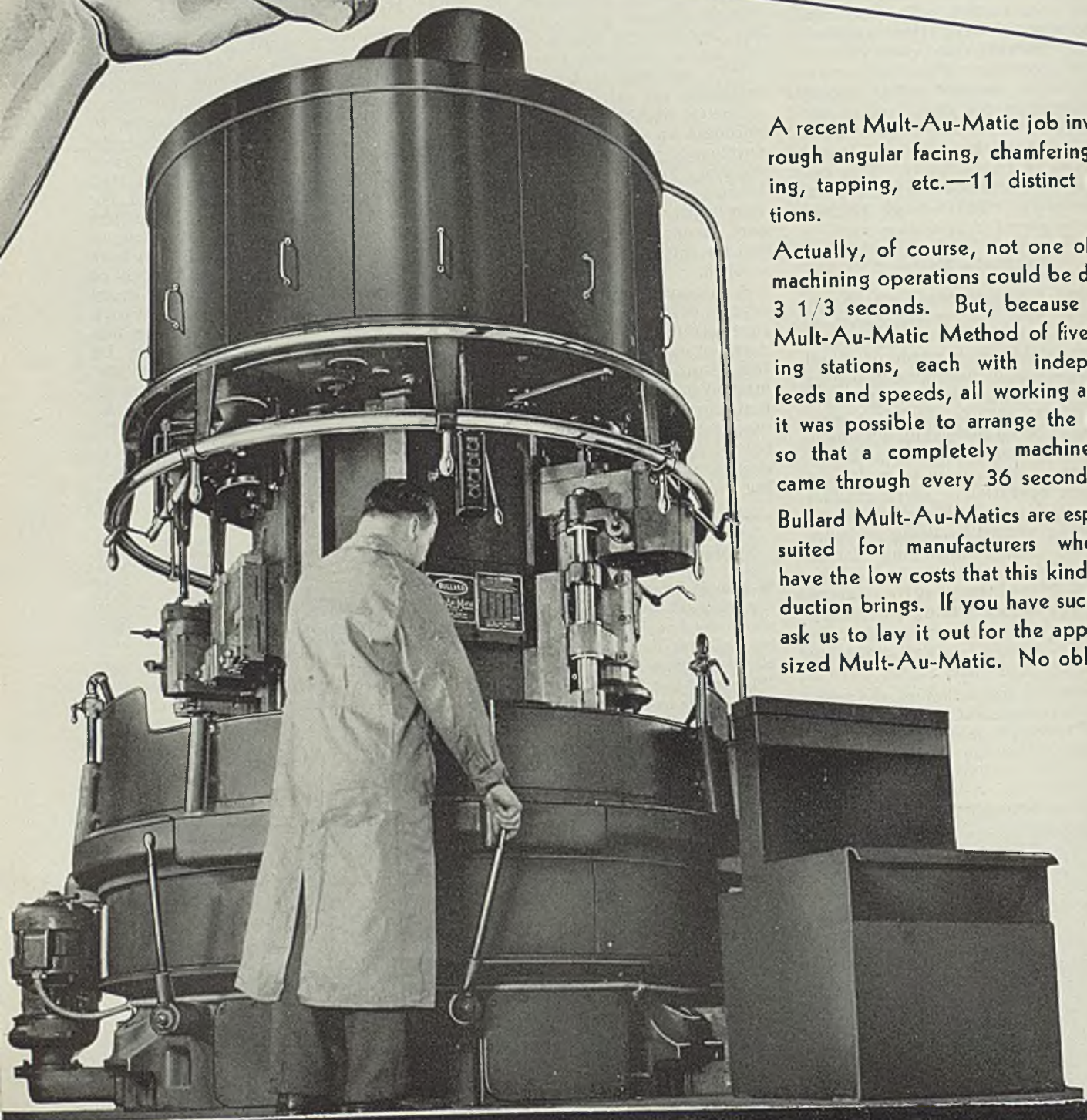
Airlines Fly to New Record in March

■ Flying a record 73,096,779 revenue passenger-miles in March, domestic airlines plan expanding operations to care for increasing traffic; United Airlines will increase schedules by 25 per cent. Predicting commercial developments of 1940, Harold Crary, vice president, United Airlines, stated commercial airlines would cut fares 10 per cent, increase business 40 per cent, pave way for use of 4-engine transports and 13½-hour transcontinental service by end of 1941, launch a drive to serve every American city with a vast network of feeder lines. Following is a tabulation of revenue-miles flown by domestic airlines from January, 1938, according to Air Transport association, Chicago. Per cent increase shown is over corresponding month of previous year.

	Revenue-Passenger Miles 1938	1939	Per Cent Increase
Jan.	27,110,800	34,457,270	27.09
Feb.	26,155,235	31,046,932	18.7
March	34,565,609	44,441,846	28.57
April	37,929,046	47,423,868	25.03
May	42,100,250	57,407,080	36.36
June	40,284,317	63,576,325	57.82
July	42,273,067	66,018,295	56.17
Aug.	46,073,161	67,977,118	47.54
Sept.	49,480,616	69,120,405	39.69
Oct.	51,350,752	70,221,520	36.75
Nov.	41,374,119	60,610,808	46.49
Dec.	37,342,924	65,024,044	74.13
Total	476,039,896	677,325,511	42.28
		1940	
Jan.		55,234,672	60.29
Feb.		53,025,818	70.78
March		73,096,779	64.48
Total		181,357,269	65.18

3⅓ Sec. each for 11 Operations





A recent Mult-Au-Matic job involved rough angular facing, chamfering, boring, tapping, etc.—11 distinct operations.

Actually, of course, not one of these machining operations could be done in 3 1/3 seconds. But, because of the Mult-Au-Matic Method of five working stations, each with independent feeds and speeds, all working at once, it was possible to arrange the tooling so that a completely machined part came through every 36 seconds.

Bullard Mult-Au-Matics are especially suited for manufacturers who must have the low costs that this kind of production brings. If you have such a job, ask us to lay it out for the appropriate sized Mult-Au-Matic. No obligation.

THE BULLARD COMPANY

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ SIX days of bargain steel, or the interval between announcement of withdrawal of the $4 per ton price concession and May 1, failed to produce any marked rush to place forward orders in this district. It is true there was a fair movement on the part of smaller users in the 10 to 50 tons per month class to get their requirements on order books, but the large automotive buyers were unmoved by the price bait, if indeed it was intended as bait.

It is far too early in the year to have sizes determined for 1941 model steel and the large tonnage buyers, who incidentally have not been in the steel market except for fill-in buys so far this year, were content to pursue their normal courses as far as steel buying is concerned. Their reaction to the price cutting and its almost immediate cancellation was mainly one of amusement. They could see no reason for the reduction in the first place and finally passed it off as an internal affair of the steel industry, with little significance as far as indicating actual market conditions.

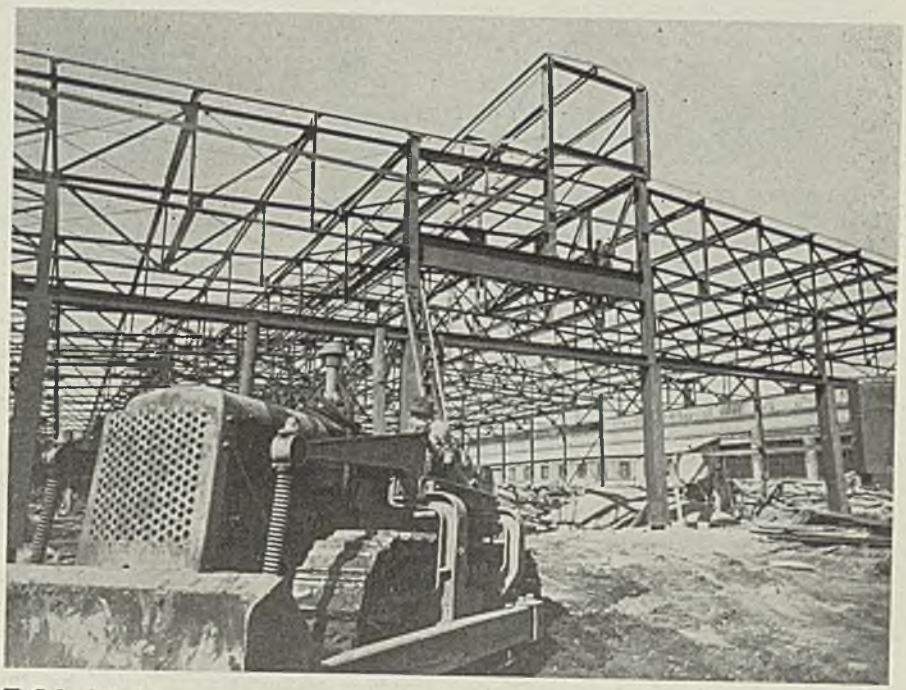
Large steel buyers here are a smug lot and they know from past experience that when they are ready to buy there is no difficulty in obtaining the best price possible. Some steel sales representatives went so far as to cover important customers on blanket tonnage before the deadline last Wednesday, purely on their own initiative and without instructions from buyers. But such material will have to be shipped from mills by June 30 and it is problematical whether sizes and weights can be determined by that time on any appreciable tonnage for 1941 models.

Probably because of the brief period of price weakness, April bookings of most steel companies were the largest for any month this year, even without the added impetus of automotive orders. The outlook for coming months in steel is decidedly good. One local sales office analyzes the situation thusly:

Without any important automobile tonnage this year, the steel rate has been maintained at around 70 to 75 per cent. Export tonnage is mounting steadily and will continue to grow from month to month. In about six weeks the first releases of automotive steel, for die tryouts, etc., will be coming through, to be followed shortly by production buying. This should serve to boost the steel rate substantially and probably will mean near-peak operations through the summer months.

In the Detroit area, steelmaking operations started off the year at better than 90 per cent of capacity and dropped steadily to a low last week of 70 per cent. Great Lakes Steel Corp. is operating ten of its 16 open hearths and likely will continue at this pace for around six weeks when an upward

Steelwork Erected for Buick's New Axle Plant



■ Scheduled for occupancy by June, steelwork now is in place for the new rear axle plant being built by the Buick Motor division at Flint, Mich., as a part of plant expansion for 1941 model production. Contracts will be let shortly for a 3000-foot conveyor system to carry finished axles from the new building to the final assembly line

movement is expected. Ford Motor Co. has been operating steadily with eight or nine of its ten furnaces, and plans to continue this rate indefinitely, even through the model changeover period. Great Lakes does not have a large stock of ingots or semifinished steel and conceivably could boost the present rate of steelmaking to build up inventories preparatory to later rolling schedules.

Meanwhile new car sales continue at a strong rate, marking the 1940 season as a four-star new car year. In the second ten-day period of April, Buick sales totaled 9667, a 35 per cent increase over March; Pontiac in the same period moved 7716 cars, a gain of 52 per cent over the same period last year; Olds in the same ten days reports sales of 6927, or 56 per cent ahead of last year; Hudson for the week ended April 20, sold 2575 units, a 97 per cent gain over the same week a year ago.

■ LOW, long and wide is a thumbnail description of next year's bodies, now in process of development. Road clearances are being further reduced in the interest of obtaining a design which "hugs" the road; inches are being added to body widths, reflecting the popularity accorded GM's Torpedo bodies introduced this year; some wheelbases will be lengthened for improved riding qualities. Chrysler divisions stole a march on some competitors last fall when wheelbases were increased several inches to provide a "full-floating" ride.

The so-called "fast" back and Torpedo back will be fairly general throughout the industry. Nash, for one, will offer both types of back on its three series of cars—a small six, a regular six and an eight cylinder car.

A number of Pontiac dealers, on their own initiative and without factory sponsorship have announced the "arrival" of a Torpedo Six model, inferring the adaptation of the Torpedo-type body to the 6-cylinder chassis. According to Pontiac spokesmen, there has been no new model of this type introduced. The car so identified apparently is the "special six," introduced last fall, which carries a body similar to the Chevrolet, with lines resembling the Torpedo style, but in no sense a duplication of the latter.

■ FORD MOTOR CO. announced last week through Edsel Ford, president, that it has accepted invitation of the Automobile Manufacturers association to participate in the forty-first annual automobile show in Grand Central palace, New York, Oct. 12-20. The appearance of Ford in the national show breaks a 40-year precedent, for with the exception of the year 1935 show which was sponsored by New York dealers, Ford has never taken part in this national display, preferring to schedule a simultaneous showing of new models in Hotel Astor and the Ford showroom in New York.

Decision to participate this year was reported to have been made as a "convenience to the public." Observers here were wondering whether the move might mark a more liberal policy on the part of Ford in co-operating with the A.M.A. of which Ford is not a member.

The first manufacturers' trade association in the auto industry was the National Association of Automobile Manufacturers, formed in 1900, Ford being a member until 1913 when the association was combined with the Automobile Board of Trade to form the Automobile Chamber of Commerce Inc., later the National Automobile Chamber of Commerce Inc., and since 1934 the A.M.A.

The Automobile Board of Trade was originally the Association of Licensed Automobile Manufacturers, a group of 18 manufacturers organized in 1903 to operate under the famous Selden patent granted in 1895. The Selden patent actually was the *raison d'etre* of the original A.M.A. and until its dissolution in 1911 was a potent and profitable piece of paper. Dissolution of the Selden patent was effected by the Ford Motor Co. after suit brought by the owners in 1903 and a subsequent legal fight finally carried to the U. S. circuit court of appeals in 1911.

Thus for 27 years Ford has pursued an independent course in the industry as far as trade association activities are concerned. A.M.A. membership in 1922 was up to 131, but it has decreased steadily since, in view of the heavy mortality among car manufacturers, until at present membership is confined to about 30 companies. In one sense Ford was a member of the A.M.A. until the days of NRA because of ownership of Lincoln Motor Car Co. which had been a member continuously. This affiliation was dropped when the NRA codes were the order of the day.

■ TRIALS of a motorist in war-torn Finland are described by Heikki H. Herlin in a letter recently received by the Packard plant here. In part, he says: "My Packard has been run about 40,000 miles in its original form and about 2600 miles in its present shape as a converted charcoal burner. Formerly maroon in color, it is now white as a simple protection against blitzkrieg and bolshevik bombers.

CO Gas from Charcoal

"The gasoline shortage has brought all passenger motor traffic to a standstill. With many works to look after I was badly handicapped without a car. After a month of bicycling, I decided to try a charcoal generator. It works splendidly and the car is only slightly less powerful than with gasoline.

"The system, placed in the back of the car, comprises a generator, the upper part of which is used as a charcoal container, a gas cleaner and the cooler. Necessary piping, valves and fan are under the car hood. The charcoal, made of Finnish wood, usually birch, is inserted in the large cylinder. The cover is closed air-tight, a small fan using battery current is started and fire set to the generator. After 6 to 10 minutes the gas production is going so that the motor can be started and the fan stopped. Primary air is regulated so that carbon monoxide is generated and passed through cleaner and cooler and on to the motor."

The letter was dated Feb 5. Where Mr. Herlin and his charcoal burner are today can well be anyone's guess.

On the matter of gasoline substitutes, successful tests are reported from Chicago using "liquid coal" as fuel. It is described as a colloidal suspension of 300-500 mesh ground coal in a mixture of gasoline, fuel oil and lubricating oil. Test car was started on regular gasoline and after the engine came up to heat, the liquid coal was cut into the carburetor from which one fine-screen filter had been removed.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1938	1939	1940
Jan.	226,952	356,962	449,314
Feb.	202,597	317,520	421,820
March	238,447	389,495	439,911
April	237,929	354,266	.....
May	210,174	313,248	.....
June	189,402	324,253	.....
July	150,450	218,494	.....
Aug.	96,946	103,343	.....
Sept.	89,623	192,678	.....
Oct.	215,286	324,688	.....
Nov.	390,405	368,541	.....
Dec.	406,960	469,120	.....
Year	2,655,171	3,732,608	.....

Estimated by Ward's Reports

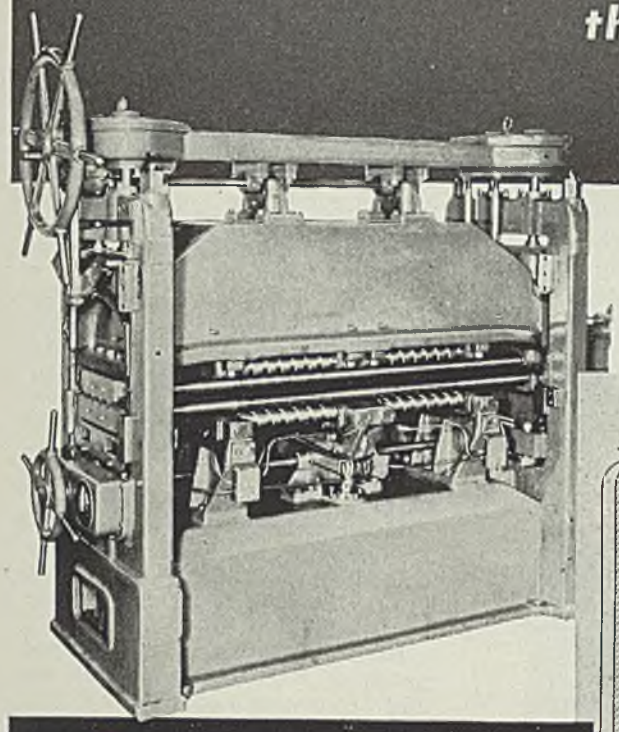
Week ended:	1940	1939†
April 6	101,655	87,019
April 13	101,940	88,050
April 20	103,725	90,280
April 27	101,405	86,640
May 4	99,305	71,420

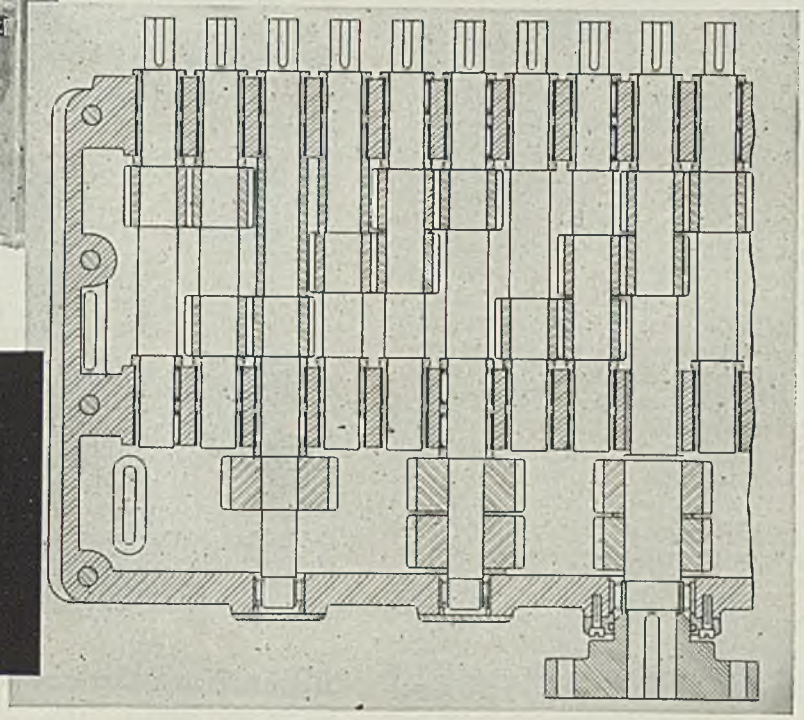
†Comparable week.

REDUCED POWER INPUT 50%

through use of TORRINGTON NEEDLE BEARINGS"

SAYS PATCH-WEGNER CORPORATION, BUILDER OF THE J. I. BERNITZ, INC. PATENTED AMERICAN ROLLER LEVELER





(Above) Maximum anti-friction characteristics in this intricate Leveler assure long, trouble-free performance.

(Right) Cross-section illustrates the compact design made possible with Torrington Needle Bearings. 100 Needle Bearings permit smaller rollers, closer spacing.

EFFICIENCY in a metal straightener is gauged largely by the smallness in diameter of its rollers, and how closely they are spaced. With conventional anti-friction bearings, the factor of bulk naturally limits the size and spacing of the rollers. Take the case of the "Patented American Roller Levelers" for example: a metal straightening machine manufactured for J. I. Bernitz, Inc., New York by the Patch-Wegner Corporation . . .

This problem was solved by the use of the small, compact Torrington Needle Bearing. Result: Diameter of rollers was reduced; spacing between them closed up; speeds were increased and straightening efficiency stepped up; and a *decrease in power consumption was gained*—permitting the use of a 25 h.p. motor in place of the 50 h.p. motor formerly used.

Thus, a modification in design made possible the manufacturer's present claim of "unsurpassed straightening efficiency". And as proof of the wisdom of such a change, we quote the maker's statement that: "Supplied more than four years ago, the first Leveler is still in uninterrupted service with the original Torrington Needle Bearings."

The Torrington Engineering Department will be glad to work with *you* in adapting the advantages of the Needle Bearing to *your* products. For further information, write for Catalog No. 10. For Needle Bearings in heavier service, request Booklet 103X from our associate, Bantam Bearings Corp., South Bend, Ind.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit
Cleveland Chicago London, England

TORRINGTON
NEEDLE BEARING

MEETINGS

IRON AND STEEL INSTITUTE TO MEET IN NEW YORK MAY 23

■ AMERICAN Iron and Steel institute will hold its forty-ninth general meeting at the Waldorf-Astoria hotel, New York, May 23. Speakers at the general session will include E. T. Weir, chairman of National Steel Corp., Pittsburgh, and president of the institute; Frank Purnell, president, Youngstown Sheet & Tube Co., Youngstown, O.; and E. L. Ryerson Jr., chairman, Inland Steel Co., Chicago.

Technical session will be held in the afternoon, with James E. Lose, vice president, Carnegie-Illinois Steel Corp., Pittsburgh, as chairman. Speakers will be: Earl C. Smith, chief metallurgist, Republic Steel Corp., Cleveland, on "The Control of Steel Composition and the Problems It Presents;" A. C. Cummins, assistant manager of operations, Pittsburgh district, Carnegie-Illinois Steel Corp., on "Dimensional Variations in Rolled Steel Products;" and C. H. Herty Jr., research engineer, Bethlehem Steel Co., Bethlehem, Pa., on "Producing Steel to Meet Physical Test Requirements."

A luncheon will be held at noon, the annual banquet in the evening. Attendance at all sessions will be restricted to individual members. Further details of the meeting will be announced soon.

EXTENSIVE PROGRAM SET FOR A.S.T.M. ANNUAL MEETING

American Society for Testing Materials is shaping up the program for its forty-third annual meeting at Chalfonte-Haddon hall, Atlantic City, N. J., June 24-28. A number of important sessions and symposiums are being planned.

Opening session will take place on the morning of June 25 at which the president will present his address, administrative committees will report, and honorary memberships and certificates to 40-year members will be presented.

Throughout the week, sessions will be devoted to iron and steel, nonferrous metals, corrosion, radiographic testing, methods of testing, and similar subjects. Symposiums will be conducted on tools of analytical chemistry, significance of the tension test in relation to design, spectrochemical analysis, and classification of natural waters intended for industrial use.

METAL TRADES ASSOCIATION TO MEET IN NEW YORK

"Mutual Understanding—The Key to Sound Employer-Employe Relations" by William Carson, president, Sunbeam Electric Mfg. Co., Evansville, Ind., will keynote the forty-second annual convention of the National Metal Trades association, Biltmore hotel, New York, May 21-22. Tuesday morning session will be devoted to reports of officers, and J. Fulton Lewis Jr. will speak on "Events in Washington." A panel discussion of important industrial relations subjects will be held Tuesday afternoon.

The annual banquet on Tuesday evening will be addressed by Raymond E. Baldwin, governor of Connecticut.

Papers and speakers scheduled for the second day include: "What Makes America a Great Country," by Carl Taylor, Milwaukee; "Putting Job Rating To Work," by A. S. Redway, Farrel-Birmingham Co., Ansonia, Conn.; "The International Situation," by J. Anton De Hass, Graduate School of Business Administration, Harvard university, Boston; "Forward in Peace or Backward in War," by Ray Murphy, past national commander of the American Legion; "What the Engineer Needs To Know About Management," by H. M. Hubbard, Harris-Seybold-Potter Co., Cleveland; "Whither Business," by Phil Hanna, editor, *Chicago Journal of Commerce.*

Program will be concluded with election of officers for the coming year which include: A. H. Timmerman, Wagner Electric Corp., St. Louis, for president; Roe S. Clark, Package Machinery Co., Springfield, Mass., first vice president; H. H. Kerr, Boston Gear Works Inc., North Quincy, Mass., second vice president and treasurer.

Allies Place Orders for $200,000,000 in Warplanes

■ OBTAINING from United States government releases on military planes in which it was interested, Allied aircraft procurement commission has placed orders in this country for $200,000,000 of planes and engines. Pursuit planes bought include the Lockheed P-38, Bell P-39, Curtiss P-40 and P-40-D. Bombers include Douglas A-20, B-17 Boeing "Flying Fortresses," Martin B-7, Consolidated B-24 and Lockheed attack bombers.

Said to be in line for sale of about 750 bombers to Allies, Douglas Aircraft Co., Santa Monica, Calif., is considering subletting certain steel and aluminum assemblies such as cowlings and firewalls to meet expected peak demand. It is expected orders also will be placed with outside sources for welded tubular assemblies such as engine mounts, landing gear supports, flexible gun mounts. Should facilities of companies regularly making aircraft parts become overtaxed, auto parts manufacturers will probably be called upon to make parts like coolers and radiators.

In addition, Douglas received orders for 20 transports from United Airlines, amounting to $4,875,000.

In first quarter this year Douglas delivered about $11,000,000 worth of planes compared to $6,408,000 of first quarter 1939, according to Donald W. Douglas, president. Planemakers in this country are conservatively protected on war orders against sudden ending of war, says Mr. Douglas, by a 35 per cent minimum down payment and progress payments as work proceeds.

Besides Allied procurement orders, Lockheed Aircraft Corp., Burbank, Calif., received a $3,600,000 order for 49 reconnaissance bombers from Australian government. Because British government commandeered most of its planes for war purposes, South African Airways placed a $2,100,000 order with Lockheed for 13 two-motored airliners. Repeat orders from airlines amounted to about $1,000,000, mostly for the new 14-passenger "Lodestar."

In first quarter this year Lockheed produced $9,000,000 worth of aircraft, compared to $3,400,000 in first quarter last year. On March 31, backlog was $55,000,000, to which have been added above orders. March quarter earnings were around $1,000,000 or about $1 a share. Issuing a state-wide appeal for skilled aircraft workers, Lockheed disclosed services of 3000 more men will be required by June 15.

Carnegie-Illinois Will Install New Soaking Pits

■ Carnegie-Illinois Steel Corp. will install at its Gary, Ind., works a number of new soaking pits to be supplied by Amsler-Morton Co., Pittsburgh. Demolition work has started at Gary works on old pits which will be replaced by the first group of eight pits, which are now in the engineering stage. New pits are of recirculation type, will have a setting capacity of 100 to 125 tons, and are expected to be ready for operation by Aug. 1.

Builds Electric Plane

■ Interesting experiment by Curtiss Reid Aircraft Co. at Montreal, Canada, is an all-electric plane powered by new type lightweight storage batteries, ordinary batteries being too bulky. Although still in construction stage, plane is reported to be designed for a speed of 300 miles an hour and a cruising range of three hours.

MEN of INDUSTRY

■ EDWARD L. RYERSON JR., has been elected chairman of the board, Inland Steel Co., Chicago. He succeeds L. E. Block, who has become chairman of the executive committee. P. D. Block, president, and all other officers and directors have been re-elected.

Mr. Ryerson has been vice chairman of Inland since acquisition of Joseph T. Ryerson & Son Inc. by Inland in 1935. He was associated since 1909 with Ryerson, and was president of that company from 1929 to 1937, and has since been chairman.

Mr. Block, associated with Inland continuously since 1897, had been chairman over 20 years. Prior to that he was a vice president. He served many years as a director, American Iron and Steel institute, and on his retirement last year was elected honorary vice president of that organization.

♦

George Haas has been appointed sales manager, Stran-Steel division, Great Lakes Steel Corp., Detroit.

♦

R. B. Kane has been placed in charge of purchases, National Twist Drill & Tool Co., Detroit. He succeeds the late William Base.

♦

G. F. Doughty has been appointed manager, New York office, Simplex Wire & Cable Co., Cambridge, Mass. He has been identified with that office 17 years.

♦

H. Denbigh Ellis has been elected president, Wilson & Bennett Mfg. Co., Chicago, succeeding Wilfred Sykes, who was chairman and president. Mr. Sykes remains as chairman of the board. Mr. Ellis was formerly vice president and treasurer of Wilson & Bennett, which is a wholly owned subsidiary of Inland Steel Co., Chicago.

E. L. Ryerson Jr.

L. E. Block

♦

S. F. Newman has been elected president, Landis Tool Co., Waynesboro, Pa. Identified with the machine tool industry many years, Mr. Newman was associated with Landis Tool from 1899 to 1908 when he joined Landis Machine Co., Waynesboro, serving that company in an executive capacity for many years. Mr. Newman is a director, National Machine Tool Builders association.

M. A. Hollengreen, heretofore assistant general manager, Landis Tool, has been promoted to vice president. Mr. Hollengreen was associated with Landis Machine Co. from 1926 to 1936 as assistant chief engineer. He joined Landis Tool in 1936 as assistant general manager.

♦

M. E. Stover, controller, Evans Products Co., Detroit, has been elected treasurer, while J. C. Goldrick, director of public relations, has been made a vice president.

♦

P. W. Foster has been appointed manager, steam division, Foster Wheeler Corp., New York. Martin Frisch, heretofore chief engineer of the steam division, has been named chief engineer of Foster Wheeler Corp.

♦

John P. McWilliams, president, Youngstown Steel Door Co., and Newell C. Bolton, both of Cleveland, have been elected directors, Youngstown Sheet & Tube Co., Youngstown, O., succeeding the late Henry G. Dalton and George T. Bishop, retired.

♦

Joseph H. Carter, since June, 1938, vice president in charge of operations, Pittsburgh Steel Co., Pittsburgh, has been elected vice president in charge of operations, Sharon Steel Corp., Sharon, Pa. A graduate of Rose Polytechnic institute in 1916, he began his career as a slagger with the former Youngs-

H. Denbigh Ellis

M. A. Hollengreen

S. F. Newman

town Iron & Steel Co., Lowellville, O. When the firm was purchased by Sharon Steel Corp. he worked up through the open-hearth department, becoming assistant superintendent in 1919, and two years later superintendent. Subsequently he served as assistant works superintendent and works superintendent. In March, 1936, he was transferred to Pittsburgh as general superintendent of Pittsburgh Steel.

♦

L. P. Thayer retired May 1 as vice president in charge of foreign sales, International Harvester Co., Chicago, after 39 years' service. He has been succeeded by E. A. Brittenham, director of foreign sales for several years.

♦

Bob Koch, associated with Morse Chain Co., Ithaca, N. Y., 13 years, the past five as assistant sales manager, has been transferred to Houston, Tex., to take charge of the new branch office recently established there.

♦

O. L. Bard, the past 17 years secretary, Michigan Tool Co., Detroit, and identified with the company almost since its inception, has been elected president and treasurer. Marvin R. Anderson has been made vice president, and Arvid Lundell, secretary.

♦

G. W. Sweeny has been appointed auditor, and C. S. Wardley, treasurer, H. C. Frick Coke Co., Pittsburgh, and other coal producing subsidiaries of the United States Steel Corp. Mr. Sweeny has been with Steel corporation subsidiaries 32 years, and Mr. Wardley, 45 years.

♦

Malcolm F. McConnell, associated with subsidiaries of United States Steel Corp. 35 years, and since 1933 general superintendent of Homestead works, Carnegie-Illinois Steel Corp., has been promoted to manager of technical development.

James W. Kinnear Jr., since 1937 assistant general superintendent at Homestead, has been named assistant manager of operations, Pittsburgh district. He joined the former Carnegie Steel Co. in the open-hearth department at Homestead in 1923; was appointed assistant superintendent, open-hearth department, in 1928; and assistant chief metallurgist in 1932.

Howard G. McIlvried has become general superintendent at Homestead, succeeding Mr. McConnell. Mr. McIlvried, general superintendent of Irvin works since its construction in 1938, has been associated with Steel corporation subsidiaries since 1902. Lawrence S. Dahl, heretofore assistant general superintendent, Irvin works, has been made general superintendent, succeeding Mr. McIlvried. John H. Elliott, assistant to general superintendent at Irvin works since Aug. 1, 1939, has been named assistant general superintendent, succeeding Mr. Dahl.

♦

William B. Dobson has been named works manager, Oil City Tank & Boiler Co., Oil City, Pa. For many years Mr. Dobson was superintendent of the heating boiler division of Struthers-Wells-Titusville Corp., Warren, Pa., and before that was associated with Petroleum Iron Works Co., Sharon, Pa., in a similar capacity.

♦

A. H. Nicoll has been elected vice president, Graybar Electric Co. Inc., New York. Since last November he has served as assistant to the president and for eight years previous to that was district manager of Graybar's San Francisco territory.

J. H. Redhead has resigned as vice president and general manager, Erie Malleable Iron Co., Erie, Pa., in order to devote all his time to the Lake City Malleable Co., Cleveland, and the Columbus Malleable Iron Co., Columbus, O. Mr. Redhead is president of the latter two companies.

♦

A. G. Bruck, associated with the refrigerator production of Crosley Corp., Cincinnati, since 1931, has been named manager, production division.

John D. Moran has been appointed superintendent of planning for Crosley. He formerly was with Chrysler Corp., Detroit, where he held a similar position.

♦

R. G. McElwee has been placed in charge of a newly created foundry department of Vanadium Corp. of America, with headquarters in Detroit. He has been with Vanadium since early in 1936 as consultant, and before that was with Ecorse Foundry Co., Ecorse, Mich.

♦

Frank J. Schuman has been appointed works manager, Federal Machine & Welder Co., Warren, O. Prior to joining Federal Machine & Welder, Mr. Schuman was associated with Standard Tube Co., Detroit, as works manager, and S. R. Dresser Mfg. Co., Bradford, Pa., as plant superintendent.

♦

W. F. Rambo has retired from active service with American Rolling Mill Co., Middletown, O., after 51 years' association with George M. Verity, chairman of the board. Mr. Rambo was the first bookkeeper of American Steel Roofing Co., Cincinnati, under Mr. Verity, and went with him to Middletown 11 years later when Mr. Verity founded American Rolling Mill in 1900.

♦

Charles W. Trust has been appointed general traffic manager, United States Steel Corp. subsidiaries. He succeeds William S. Guy, who is retiring upon completion of 49 years of service with subsidiaries and predecessor companies. Mr. Trust has been with the traffic department of Carnegie Steel and Carnegie-Illinois Steel Corp., 36 years, and since 1938 has been traffic manager of the eastern division. He is president, Traffic Club of Pittsburgh.

M. F. McConnell

J. W. Kinnear Jr.

H. G. McIlvried

L. S. Dahl

Activities of Steel Users, Makers

■ INTERNATIONAL NICKEL CO. INC., New York, has approved details of plans whereby about $132,000 will be spent for improvements at its Huntington, W. Va., plant. Program calls for expenditure of $63,000 in the cold draw department, where an additional car-type electric heat-treating furnace and other equipment will be installed, and $69,000 for erection of a building, 40 x 72 feet, which will permit concentration under one roof of metallurgical and physical testing equipment, as well as technical personnel. All details of expansion are being handled from Huntington plant. It was announced no further new equipment is being purchased at this time.

♦

Peninsular Steel Co., Cleveland, has moved its office and warehouse to 2222 Lakeside avenue.

♦

American Steel & Wire Co., effective April 26, moved its New York office from the Empire State building to 71 Broadway.

♦

Landers Frary & Clark, New Britain, Conn., has purchased O-Pan-Tap Co., Newark, N. J., and will transfer operations of that company to New Britain.

♦

Industrial Steel Service, warehouse division of Dayton Fabricated Steel Co., Dayton, O., is now stocked with the complete line of tool steels produced by Carpenter Steel Co., Reading, Pa.

♦

Uddeholm Co. of America Inc., New York, has taken over the warehouse tool steel business of SKF Steels Inc., New York. Henceforth, SKF Steels will confine its efforts to manufacture of chrome steel tubing, bars, billets and forgings, centerless ground spindle steel, hot-rolled round and flat rods, and hollow and solid drill steel.

♦

Wheeling Corrugating Co., a subsidiary of Wheeling Steel Corp., Wheeling, W. Va., has begun operations in its new 60,000-square foot warehouse and plant in New Orleans. The new plant, engaged in manufacture of corrugated metal roofing, will serve Louisiana, Mississippi, southwest Alabama and northeast Texas. E. E. Hummel is plant manager.

♦

Vincent Steel Process Co., Detroit, is erecting an addition to its heat treating plant. Two heat treating furnaces, one a continuous type with belt 36 inches wide for normalizing and quenching, and the other a special furnace for heat treating bars of any type up to 20 feet in length, are being installed. With the new addition, the company will have capacity for handling 125 tons of heat treated work daily.

♦

Gibson Electric Co., Pittsburgh, has moved into the three-story plant at 8344 Frankstown avenue, Pittsburgh, which it recently purchased. The new plant contains 15,000 square feet of floor space, and plans for expansion include installation of modern equipment.

Died:

■ WALTER S. RUGG, 74, retired vice president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in New York recently. He joined Westinghouse in 1892 as a student engineer; later was transferred to Chicago as district engineer, and after a period as manager of New York office, ending in 1917, he went to East Pittsburgh as manager, railway department. In 1922 he was promoted to general sales manager and in 1925 became vice president in charge of sales and engineering activities. He retired in 1935.

♦

Arthur Cromie, 58, superintendent of export, Penberthy Injector Co., Detroit, in that city, April 23.

♦

Granton Hall Dowse, 60, president and treasurer, Matheson-Higgins Co., Boston, tool maker, April 28 at his home in Weston, Mass.

♦

Alexander P. White, 78, who retired 20 years ago as vice president, General Fireproofing Co., Youngstown, O., April 27 in Montclair, N. J.

♦

John E. Walker, vice president, Eastern Malleable Iron Co., Naugatuck, Conn., at his home in Cheshire, Conn., April 17.

♦

Alfred L. Hohlfelder, 42, vice president and factory manager, F. Hohlfelder & Co., Cleveland, foundry supply manufacturer, April 23 in Baltimore.

♦

Edgar Lehman Mitchell, 50, associated with the Beardsley & Piper Co., Baltimore, a number of years as foundry superintendent and a sales engineer, April 2.

♦

Walter J. Kohler, 65, chairman, Kohler Co., Kohler, Wis., in that city, April 21. At one time he was national vice president, National Association of Manufacturers, and vice chairman of the National Industrial Conference board.

♦

Henry Franklin Holloway, retired district manager of sales in the New York territory, for Jones & Laughlin Steel Corp., April 19 at his home in Montclair, N. J.

♦

Herman Lehn, 56, production manager, Kerite Insulated Wire & Cable Co., New York, April 21 in that city. He had been with the company 31 years.

♦

Hugh A. Gillies, 58, vice president in charge of sales, American Brakeblok division, American Brake Shoe & Foundry Co., Detroit, April 23 in New York.

♦

William P. Turner, 72, professor emeritus of practical mechanics, Purdue university, in Lafayette, Ind., April 28. For 50 years Prof. Turner was machine shop instructor, retiring in 1938.

♦

Robert F. Fitzsimons, 68, founder, Fitzsimons Iron & Steel Co., Chicago, in Evanston, Ill., April 29. In 1911 he organized the Fitzsimons company which he headed until retiring about ten years ago.

♦

Robert G. Schram, 53, who in 1923 formed Superior Pattern Works, Detroit, in that city, April 28. In 1926 when the plant became Superior Pattern Mfg. Co. Inc. he was named vice president and treasurer, retiring in 1937.

♦

Alphonse Joseph Lavoie, 64, since 1934 president and general manager, Lavoie Corp., April 24 in Defiance, O. He formerly was research engineer with General Motors Corp., Cord Corp., and Auburn Automobile Co.

♦

James J. Korecky, 58, president, Barmatic Products Co., Cleveland, screw machine manufacturer, April 28 in that city. He had been engaged in automobile parts manufacturing business 35 years, founding the Barmatic company in 1926.

♦

Harris Sussman, 69, president, Mohegan Tube Co., Brooklyn, N. Y., until his retirement in 1927, at his home in Mt. Vernon, N. Y., April 24. He organized the company in 1910 and sold it to Steel & Tubes Inc., a subsidiary of Republic Steel Corp., in 1927.

♦

William Abendroth Mills Sr., 71, inventor and a retired foundry owner, at his home in Port Chester, N. Y., April 21. He was president of Abendroth Brothers Foundry from 1901 to 1905; in 1906 he organized Globe Foundry Co., and in 1916, organized William A. Mills Brass Foundry, retiring three years ago.

They Can Stew in Their Own Juice!

■ LAST Monday the Supreme Court upheld the validity of the secretary of labor's ruling as to minimum steel wages. It thus becomes mandatory for all steelmakers executing government contracts exceeding $10,000 in value to observe minimum wages of 62½ cents an hour in 17 Northeastern and middle Western states, 60 cents in 11 Western states, 58½ cents in seven middle Western states and 45 cents in 13 Southern states.

Many smaller steelmakers protested orally and in written form over the arbitrary method employed in fixing minimum wage rates. It was pointed out that wage differentials always have existed between certain districts, that to disturb them would bring grave dislocations. It was shown that higher wages, in some cases, would bring increased costs that would materially alter competitive positions.

Law's Application Goes Far Beyond Intent of Congress in Wage Control

Francis E. Walter, Pennsylvania, a member of the house judiciary committee which drafted the bill, and a member of the subcommittee which had it directly in charge, testified that it was not the intention that the secretary of labor should fix wages. All congress had in mind, he said, was to take care of the situation in the "sweated" industries. Congress, he said, had intended minimum wages in the respective localities to be taken into consideration. He declared this had not been done in the steel study.

The Supreme Court apparently considered all such evidence as immaterial.

"It is not enough", states the opinion, "that the secretary of labor is charged with an erroneous interpretation of the term 'locality' . . . Nor can respondents vindicate any general interest which the public may have in the construction of the act by the secretary and which must be left to the political process. Respondents, to have standing in court, must show an injury or threat to a particular right of their own, as distinguished from the public's interest in the administration of the law. They claim a standing by asserting they have particular rights under and even apart from statute to bid and negotiate for government contracts free from compliance with the determination made by the secretary of labor . . . Respondents point to Section 3709 of the revised statutes and to the public contracts act itself.

"Section 3709 . . . requires for the government's benefit that its contracts be made after public advertising. It was not enacted for the protection of sellers . . . the government enjoys the unrestricted power to determine with whom it will deal, and to fix its own terms . . . This act's purpose was to impose obligations . . . and to obviate the possibility that any part of our tremendous national expenditures would go to forces tending to depress wages and purchasing power and offending fair social standards of employment".

Decision Puts Heavy Burden of Adjustment on Industry and Public

That is, government has no interest in the problem in the South where the minimum wage rate goes to 45 cents from a range of 30 to 40 cents. None of its affair is Eastern Pennsylvania where the minimum rate now must go from 56½ cents to 62½ cents. Producers, employes, communities affected will have to work the thing out for themselves.

They are left to stew in their own juice!

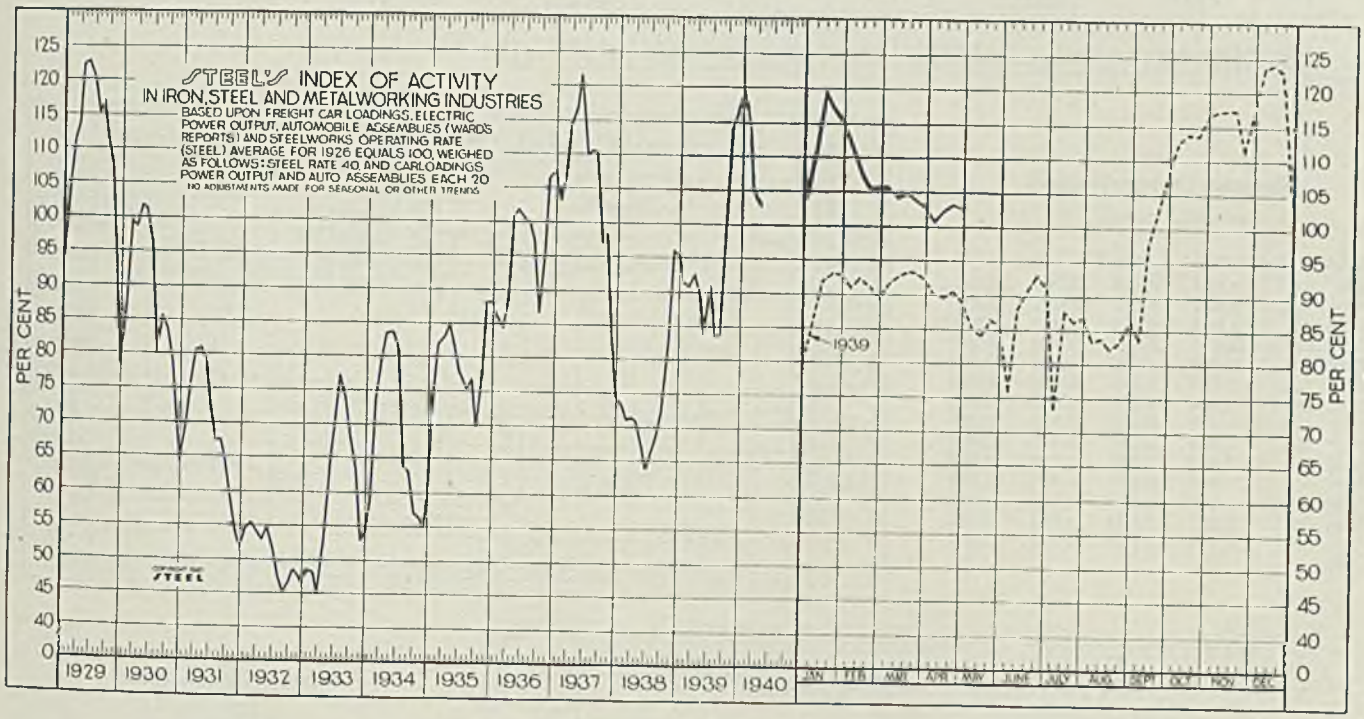
The BUSINESS TREND

April Index Average Below March Level

■ ENCOURAGING factors in the current business situation are moderate improvement in the volume of incoming orders in a number of industrial lines, further re-adjustment of inventories and recent display of strength in the commodity markets.

The weekly average of STEEL'S index of activity during April was 102.7, down from the 104.1 average reported for March, but compares favorably with the 89.8 level recorded in April last year. The average last month represented a decline of 16.2 points from the peak last year of 118.9 registered during December.

In the week ended April 27, STEEL'S weekly index declined 0.6 point to 102.8. This compares with the index figure of 89.2 recorded in the same 1939 period. Declines in electric power consumption and automobile production more than offset the contra-seasonal improvement recorded in revenue freight traffic during the latest period. Steelmaking operations remained unchanger in the week ended April 27. However, an encouraging increase was recorded in this important industrial indicator during the week of May 4, reflecting increased orders placed during recent weeks.



STEEL'S index of activity declined 0.6 points to 102.8 in the week ended April 27:

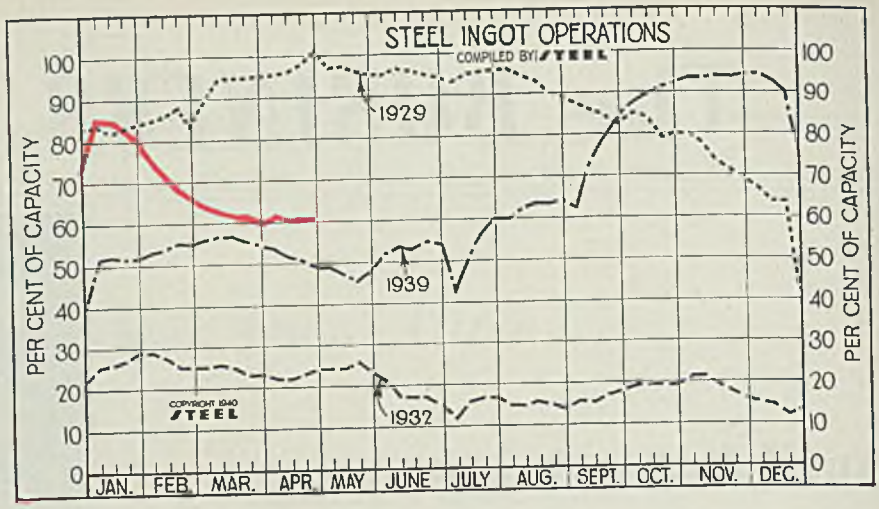
Week Ended	1940	1939
Feb. 17	105.1	91.1
Feb. 24	105.4	89.3
Mar. 2	105.6	91.5
Mar. 9	104.7	92.7
Mar. 16	104.9	93.3
Mar. 23	103.7	93.2
Mar. 30	103.2	92.2
Apr. 6	101.8	90.0
Apr. 13	102.7	89.7
Apr. 20	103.4	90.4
Apr. 27	102.8	89.2

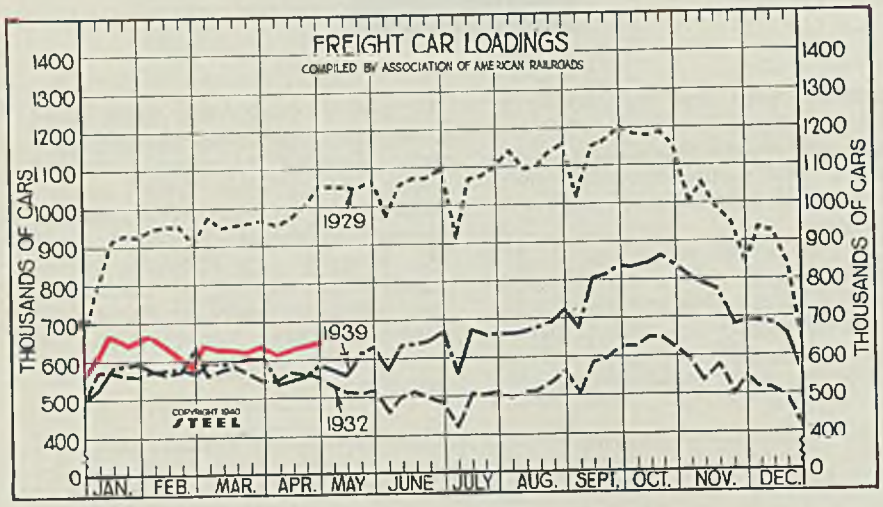
Mo. Data	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	104.1	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	102.7	89.8	70.8	116.6	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	1940	1939	1938	1937
Jan. 27....	81.5	51.5	33.0	76.0
Feb. 3....	76.5	53.0	31.0	79.5
Feb. 10....	71.0	54.0	30.0	81.0
Feb. 17....	69.0	55.0	31.0	83.0
Feb. 24....	67.0	55.0	30.5	84.0
Mar. 2....	65.5	56.0	29.5	86.0
Mar. 9....	63.5	56.5	30.0	87.0
Mar. 16....	62.5	56.5	32.0	89.0
Mar. 23....	62.5	55.5	35.0	90.0
Mar. 30....	61.0	54.5	36.0	91.5
Apr. 6....	61.5	53.5	32.0	91.5
Apr. 13....	61.0	51.5	32.0	91.5
Apr. 20....	61.5	50.5	32.5	91.5
Apr. 27....	61.5	49.0	32.0	91.0





Freight Car Loadings

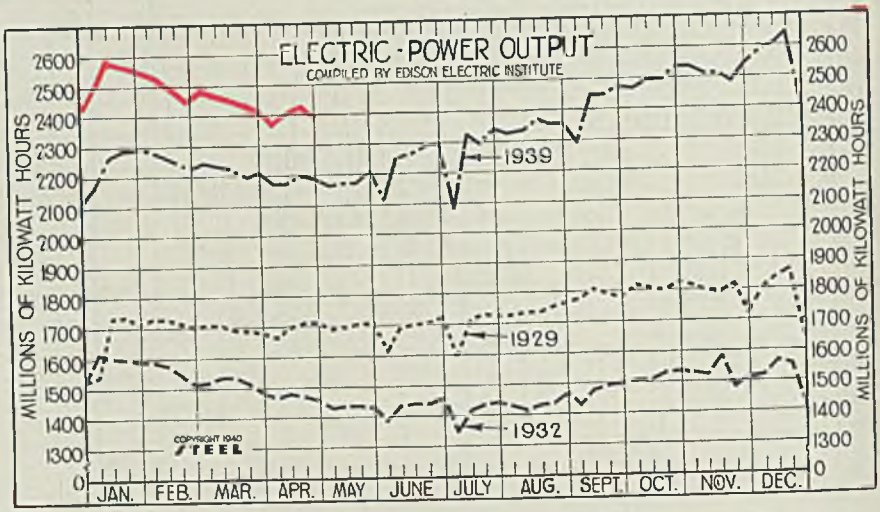
(1000 Cars)

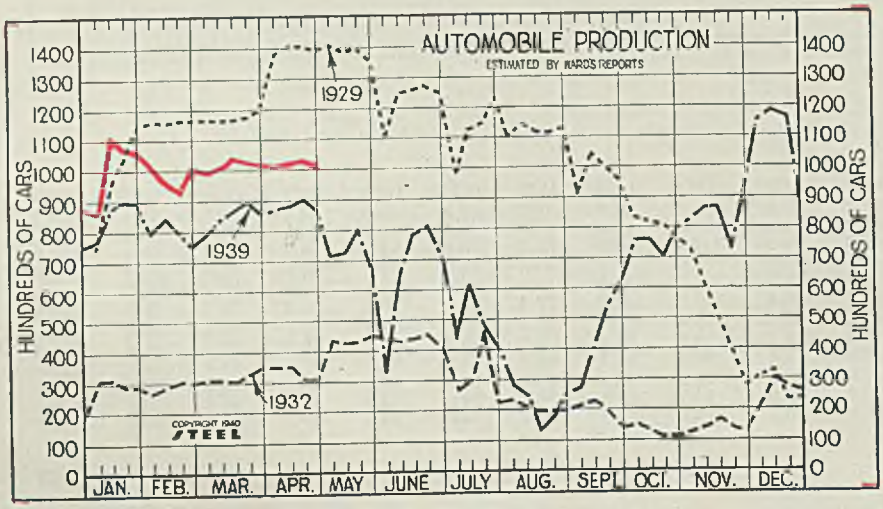
Week ended	1940	1939	1938	1937
Jan. 27.....	650	594	553	660
Feb. 3.....	553	577	565	675
Feb. 10.....	627	580	543	692
Feb. 17.....	608	580	536	715
Feb. 24.....	595	561	512	697
Mar. 2.....	634	599	553	734
Mar. 9.....	621	592	557	749
Mar. 16.....	619	595	540	759
Mar. 23.....	620	605	573	761
Mar. 30.....	628	604	523	727
Apr. 6.....	603	535	522	716
Apr. 13.....	619	548	538	751
Apr. 20.....	628	559	524	761
Apr. 27.....	645	586	543	782

Electric Power Output

(Million KWH)

Week ended	1940	1939	1938	1937
Jan. 13...	2,566	2,293	2,099	2,215
Feb. 3...	2,541	2,287	2,082	2,201
Feb. 10...	2,523	2,268	2,052	2,200
Feb. 17...	2,476	2,249	2,059	2,212
Feb. 24...	2,455	2,226	2,031	2,207
Mar. 2....	2,479	2,244	2,036	2,200
Mar. 9....	2,464	2,238	2,015	2,213
Mar. 16...	2,460	2,225	2,018	2,211
Mar. 23...	2,424	2,199	1,975	2,200
Mar. 30...	2,422	2,210	1,979	2,147
Apr. 6...	2,381	2,173	1,990	2,176
Apr. 13...	2,418	2,171	1,958	2,173
Apr. 20...	2,422	2,199	1,951	2,188
Apr. 27...	2,398	2,183	1,939	2,194

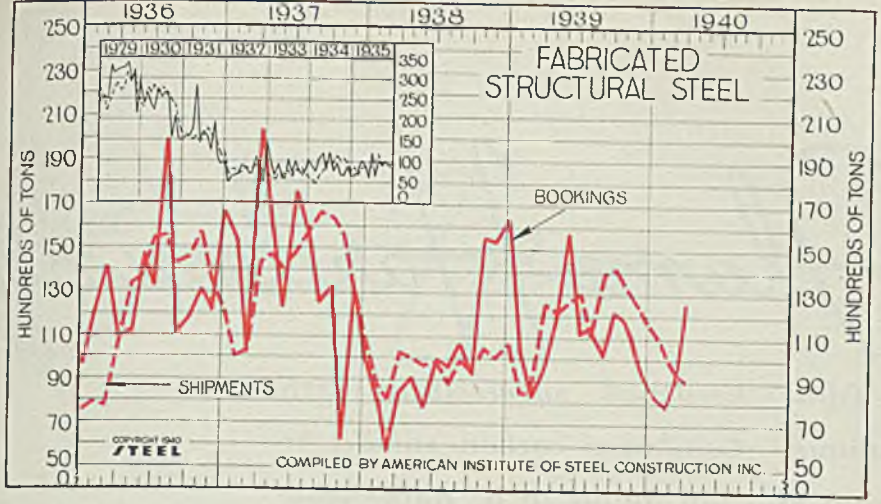




Auto Production

(1000 Units)

Week ended	1940	1939	1938	1937
Jan. 27....	106.4	89.2	59.4	74.1
Feb. 3....	101.2	79.4	51.4	72.3
Feb. 10 ...	96.0	84.5	57.8	72.8
Feb. 17....	95.1	79.9	59.1	95.7
Feb. 24....	102.6	75.7	57.0	111.9
Mar. 2....	100.9	78.7	54.4	127.0
Mar. 9....	103.6	84.1	57.4	101.7
Mar. 16....	105.7	86.7	57.5	99.0
Mar. 23....	103.4	89.4	56.8	101.0
Mar. 30....	103.4	86.0	57.5	97.0
Apr. 6....	101.7	87.0	70.0	99.2
Apr. 13....	101.9	88.0	62.0	125.5
Apr. 20....	103.7	90.3	60.6	133.2
Apr. 27....	101.4	86.6	50.7	139.5



Fabricated Structural Steel

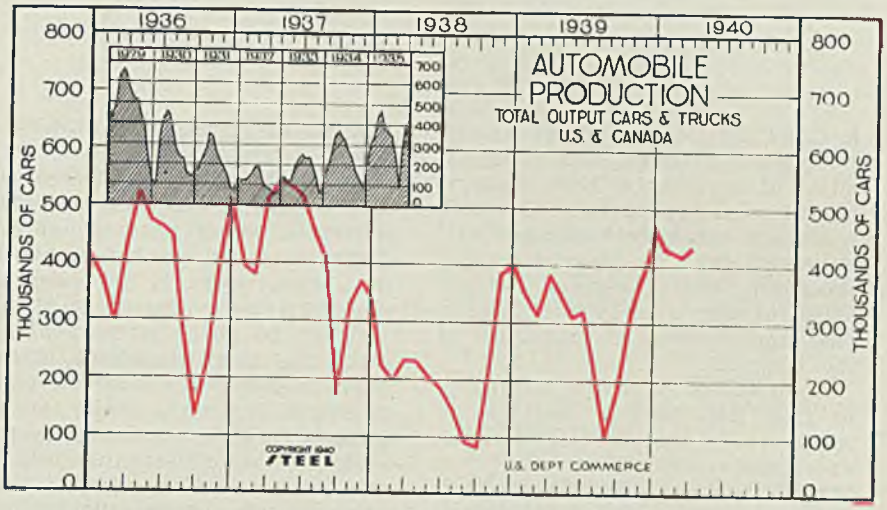
(1000 tons)

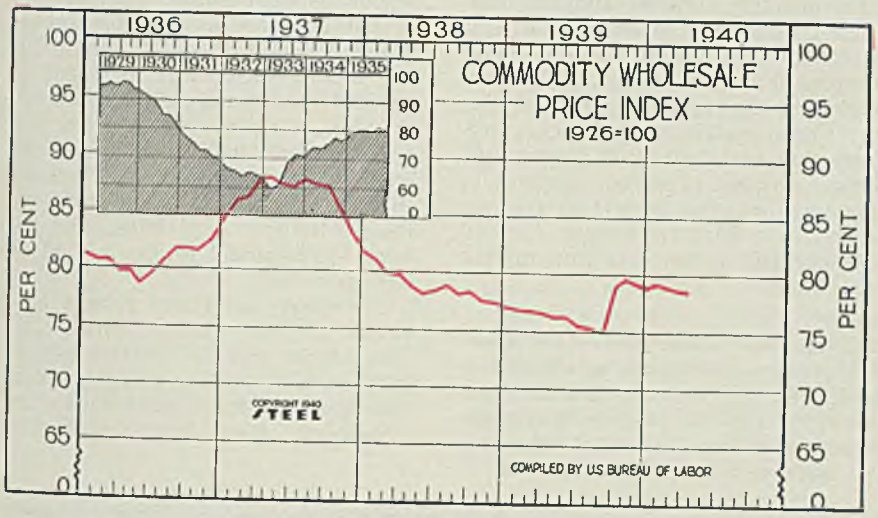
	Shipments			Bookings		
	1940	1939	1938	1940	1939	1938
Jan.	110.2	84.3	87.8	81.2	101.7	80.3
Feb.	95.5	84.4	81.2	93.7	82.7	57.1
Mar.	91.8	125.3	103.3	127.7	95.1	84.3
Apr.	.....	120.9	100.0	....	118.3	91.2
May	.....	125.9	96.4	....	156.9	77.3
June	.....	130.1	98.6	....	111.6	99.9
July	.....	110.5	88.0	....	114.1	96.0
Aug.	.....	139.7	98.6	....	100.9	106.8
Sept.	.....	140.8	93.5	....	121.4	92.5
Oct.	.....	133.8	105.0	....	118.8	154.8
Nov.	.....	128.2	99.9	....	99.3	153.1
Dec.	.....	116.2	106.5	....	84.4	163.4
Total	....	1440.1	1158.8	....	1305.0	1256.6

Automobile Production

(Unit: 1000 Cars)

	1940	1939	1938	1937	1936
Jan.	449.3	357.0	227.1	399.2	377.2
Feb.	421.8	317.5	202.6	383.9	300.8
March	439.9	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	139.8
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
Ave.	.....	311.0	221.3	418.0	384.7





All Commodity Wholesale Price Index U. S. Bureau of Labor

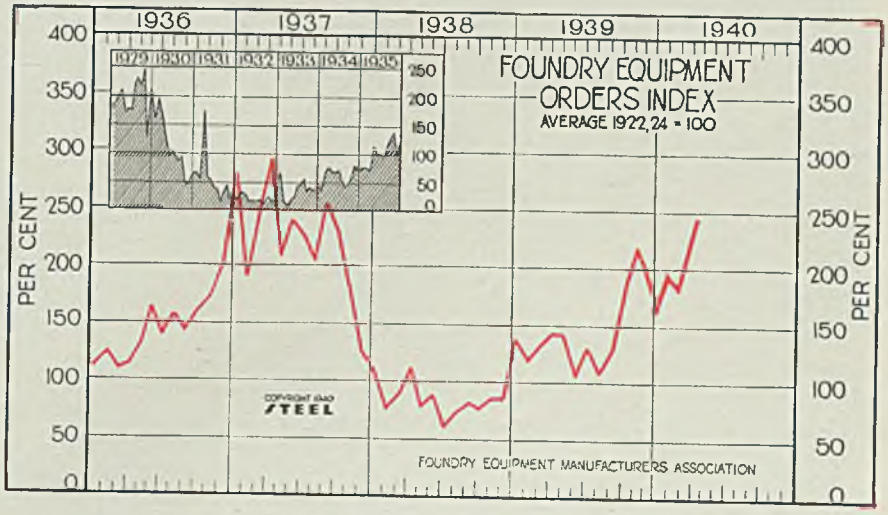
(1926 = 100)

	1940	1939	1938	1937	1936
Jan.	79.4	76.9	80.9	85.9	80.6
Feb.	78.7	76.9	79.8	86.3	80.6
March	78.4	76.7	79.7	87.8	79.6
April	....	76.2	78.7	88.0	79.7
May	....	76.2	78.1	87.4	78.6
June	....	75.6	78.3	87.2	79.2
July	....	75.4	78.8	87.9	80.5
Aug.	....	75.0	78.1	87.5	81.6
Sept.	....	79.1	78.3	87.4	81.6
Oct.	....	79.4	77.6	85.4	81.5
Nov.	....	79.2	77.5	83.3	82.4
Dec.	....	79.2	77.0	81.7	84.2
Ave.	....	77.1	78.6	86.3	80.8

Foundry Equipment Orders Index

1922-24 = 100

	1940	1939	1938	1937	1936
Jan.	197.9	122.3	76.8	190.9	127.0
Feb.	179.4	135.3	90.4	249.5	110.4
Mar.	243.4	146.6	114.6	294.2	115.0
April	.....	146.0	79.3	208.3	134.0
May	.....	108.8	90.6	242.0	165.4
June	.....	134.6	61.2	228.2	141.4
July	.....	111.9	74.2	204.0	159.5
Aug.	.....	131.4	83.3	257.5	144.8
Sept.	.....	184.4	78.7	231.8	161.0
Oct.	.....	220.4	87.9	185.2	173.8
Nov.	.....	203.1	89.7	128.0	200.4
Dec.	.....	164.8	141.8	111.2	283.3
Ave.	.....	150.8	89.4	210.9	159.7



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Flame Hardening

Many cast irons can be flame hardened successfully with simple equipment and technique. Combined carbon should be 0.60 to 0.80 per cent. Alloy irons also are found to be hardenable

■ CAST IRON, the oldest known ferrous cast material, still retains position of importance. Even today it almost is indispensable. Research work has resulted in changes and improvements in manufacturing procedure, heat treatment and analyses of cast iron, in turn causing vast improvement in properties of the material.

Applications of flame hardening to cast iron include machine-tool ways, sheave wheels, rolls, sleeves, liners and many others. Cast iron parts are given a wearing surface of high hardness by this method without in any way altering chemical composition of the material or changing physical properties of the untreated core.

Heat Penetration Shallow

Flame hardening employs an oxy-acetylene torch to heat the surface of the part rapidly, followed by an immediate quench. The process thus is a simple heat-and-quench operation. Outstanding feature of flame hardening is the way in which the heat and subsequent quench are applied to the surface under treatment with such speed as to prevent penetration for more than a small fraction of an inch below the surface.

Cast iron may be considered as a steel matrix in which are embedded numerous small particles of free graphitic carbon. In hardening cast iron, this matrix is hardened, the embedded carbon particles playing little or no part. In hardening a steel, the most important ingredient to be considered is carbon which, of course, is always in the form of cementite. It is a general rule that a steel containing less than 0.40 per cent carbon, unless aided by the presence of certain alloying elements, will not quench harden to a sufficient degree to make flame treatment worth while. Continuing then the analogy between the cast iron matrix and steel, it follows that cast iron must have a sufficient amount of carbon present in the form of cementite if it is to respond to quench hardening. Cementite present in the cast iron matrix is referred to as the combined carbon content of the cast iron and is a matter of first consideration in determining whether a cast iron can be flame hardened effectively.

Most commonly encountered combined carbon range for cast irons to be flame hardened is from 0.60 to 0.80 per cent. Irons containing from about 0.40 per cent to slightly in excess of eutectoid composition also may be treated by this process. When combined carbon drops below 0.40 per cent, response to hardening is so low the treatment seldom is worthwhile. As combined carbon content increases beyond the eutectoid point, the danger of cracking during treatment increases so the eutectoid composition is recommended as upper limit. As a general rule, cast iron to be flame hardened must be "pearlitic," containing not less than 0.40 and not more than 0.90 per cent combined carbon. Preferable range is 0.60 to 0.80 per cent.

Obviously to create a hard case extending for only a small fraction of an inch below the treated surface, a relatively steep temperature gradient must exist during the treatment. By virtue of this tem-

Fig. 1A. (Left)—Unetched view showing graphite distribution at 100 diameters. Fig. 1B. (Center)—Pearlitic base material. Fig. 1C. (Right)—Martensitic structure of case immediately below surface, both at 500 diameters

Cast Iron

perature gradient at time of quench, a hardness gradient is produced. This hardness gradient is not so steep as to change abruptly from hardened material to unhardened core. A transition zone always exists for an appreciable depth between case and core where there is a comparatively gradual change from hard to soft material. This transition zone is highly desirable as an abrupt change in hardness from case to core would lead to spalling in service.

Alloys Affect Heat Treatment

Temperatures recommended for flame hardening are no different from those recommended for furnace hardening of similar material. Temperature to be used depends upon chemical analysis of the iron with respect to combined carbon content and to presence of added alloying elements. Thus composition of the iron should be known.

Many cast irons contain small amounts of alloying elements such as chromium, nickel, molybdenum, vanadium and perhaps others, either singly or in combination. Presence of these elements affects temperatures to be used during the hardening treatment. Plain cast iron can be flame hardened just as easily as low-alloy cast iron of same combined carbon content.

However, certain alloying elements reduce transformation temperatures of the material, permitting the treatment to be conducted at lower temperatures. Alloying elements which tend toward carbide stabilization will require higher temperatures for complete solution prior to quenching. Thus while alloying elements greatly affect physical properties, either plain or alloy cast iron will flame harden satisfactorily if proper allowance is made for the alloy content.

Graphite in cast iron plays no part in flame hardening. The time during which the material is at hardening temperature is so short that little graphite is re-absorbed. As will be seen in photomicrographs to be discussed later, the graphite flakes are plainly discernible in the hard case immediately under the treated surface.

Flame hardening of completely malleablized cast iron is not entirely successful. This material essentially has all carbon present in the form of free graphite, the ferrite matrix being almost entirely free from any carbides. The time element involved in flame hardening is insufficient to allow re-absorption of carbon by the matrix to such a degree as to create a hardenable material. By proper pretreatment prior to flame hardening, a sufficient amount of carbon can be recombined to form a material that will respond to quench hardening. However, such a procedure greatly alters the physical properties of the material. See STEEL, March 25, 1940, p. 44, for special properties obtainable in heat-treated malleable irons.

Some Malleables Hardenable

Certain malleable cast irons contain a sufficient amount of combined carbon to produce a material capable of hardening and these so-called "pearlitic" malleable cast irons are being flame hardened with excellent results.

For microstructure developed in a flame-hardened cast iron case see illustrations. Fig. 1 shows structure of an average gray cast iron before and after flame hardening. Fig. 1A reveals size and distribution of graphite flakes at 100 diameters. Pearlitic structure of untreated material is shown in Fig. 1B. Matrix of this material is essentially 100 per cent pearlite with an occasional small patch of ferrite to be seen. The analysis is total carbon, 3.44 per cent; combined carbon, 0.87 per cent; silicon, 1.35 per cent, manganese, 0.70 per cent; phosphorus, 0.116 per cent; sulphur, 0.094 per cent.

Fig. 1C shows martensitic structure of the case immediately under

From left to right—Fig. 2A—Martensitic structure immediately below treated surface. Fig. 2B—Martensitic structure 0.04-inch below surface. Fig. 2C—Transition zone about 0.15-inch below surface. Fig. 2D—Pearlitic structure of untreated base metal. All at approximately 500 diameters

Fig. 3A. (Left)—Coarse martensitic structure resulting from treatment at excessive temperature. Fig. 3B. (Right) —Excessive temperatures produced this structure in the case near treated surface. Both at 500 diameters

the flame-hardened surface at 500 diameters. Stringers of graphite plainly seen here indicate little free carbon, if any, was absorbed by the matrix during hardening.

Micrographs Fig. 2 illustrate structures developed at different points between treated surface nd untreated core. This material is another high-test cast iron with 2.97 per cent total carbon, 0.66 per cent combined carbon, 1.62 per cent silicon, 0.78 per cent manganese, no nickel, 0.045 per cent chromium.

Fig. 2A shows comparatively coarse martensitic structure immediately below treated surface. A considerably finer martensitic structure about 0.04-inch below the surface is shown in Fig. 2B. This difference in degree of coarseness indicates a relatively steep temperature gradient, otherwise these structures could not exist in the same case and at such small distance apart. Transition zone between hard martensitic material and unaffected core is shown in Fig. 2C. Martensitic structure has almost entirely disappeared, while indications of the original pearlitic base are plainly discernible. Fig. 2D shows pearlitic structure of untreated core. Note graphite particles in hard martensitic zone of the case as shown by Figs. 2A and B.

Quality Undamaged

Degree of coarseness of the martensitic structure in the case, particularly at a point immediately below the treated surface, is dependent largely upon temperatures during hardening. For example, Fig. 3A shows extremely coarse martensite resulting from treatment at an unnecessarily high temperature. While this structure does not damage quality of the treated article, it is somewhat coarser than is to be desired. Hardness of this coarse structure invariably is lower than that of a finer structure in the same material.

Structure in Fig. 3B was found at the surface of a cast iron bar after treatment at an excessively high temperature where such graphite as had originally existed was absorbed to create this structure which borders closely upon that of white cast iron.

A complete study of a flame-hardened case includes not only a microscopic examination of grain structures but also a careful hardness exploration, made on a cross section of the case or preferably on a taper-ground specimen. The author's method is to taper grind a specimen at a slope of one to sixteen and to take hardness readings at intervals of ⅛-inch on the ground surface from the treated surface to

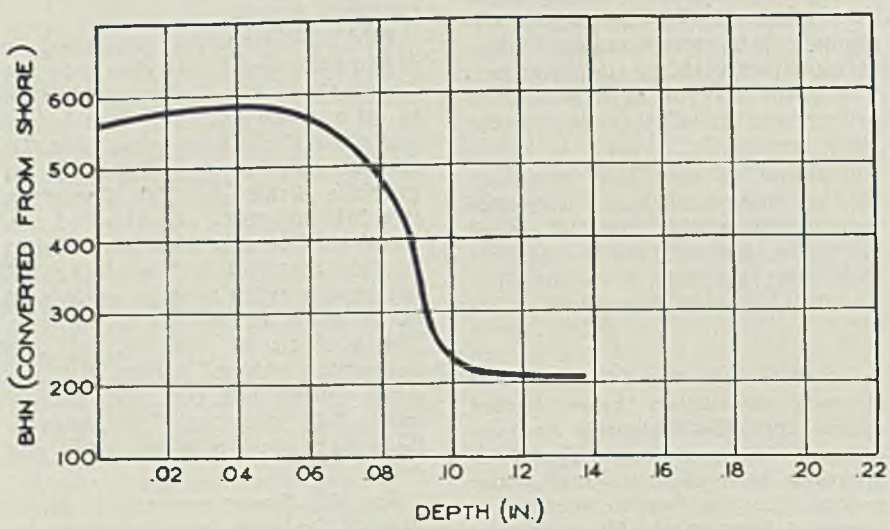

Fig. 4. (Upper)—Hardness penetration curve of comparatively light case on cast iron

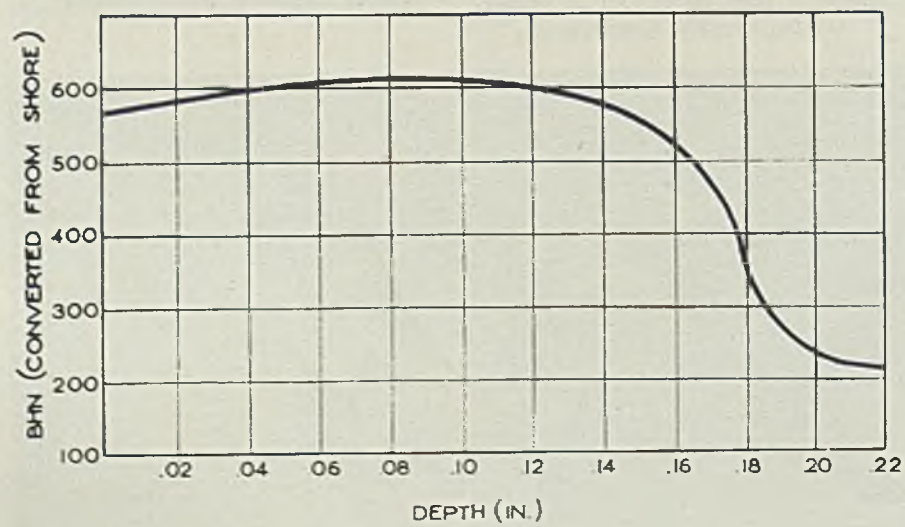

Fig. 5. (Lower)—Hardness penetration curve of heavy case on cast iron

well within the unaffected core, equivalent to a vertical interval of about 0.008-inch. Hardness readings are plotted against depth below treated surface to form hardness-penetration curves, Fig. 4 and 5. These show maximum hardness obtained in the case, hardness gradient and hardness of base material.

Method of hardness testing has a considerable bearing upon results obtained. Cast iron is not only a heterogeneous composite mixture from a structural standpoint but, in the flame-hardened case, is also a composite material from the viewpoint of rapidly changing physical properties through depth of case. Any penetrator type of hardness test will affect the material under and around the point of test for an appreciable distance so as light a load and as shallow a penetration as possible should be used. Crumbling under the testing load causes other difficulties. Fig. 6 shows indentations made by two types of penetrator tests, the larger using a load of 150 kilograms and the smaller with 30 kilograms. Crumbling around these indentations is easily noted. A scleroscope in the hands of an experienced operator usually gives more uniform and more reliable results than a penetrator.

Distortion during flame hardening is important in many applications. It appears to be governed by no general rule, so must be dealt with in each particular application. Certain conditions, however, influence distortion.

Internal Stresses Minimized

The two most important conditions in all hardening applications are: Volume changes which occur upon transformation to hard martensite, internal stress set up as a result of heating and cooling cycle.

Little can be done regarding volume changes. However internal stresses can be minimized by preventing excessive temperatures or excessive penetration during heat treatment. One method to minimize distortion is to submerge partially the article under treatment in water. This procedure is particularly useful in treating comparatively light sections.

An appreciable amount of stress set up by flame hardening can be removed by a stress-relieving treatment in either air or oil at a temperature of 300 to 350 degrees Fahr. This should follow all flame-hardening operations.

It is difficult to point any narrow range of chemical analyses of cast iron to give best results in flame hardening. Entirely satisfactory results have been obtained over a considerable range. The desirable range of combined carbon content already has been mentioned. This factor, of course, is controlled by other variables of which the silicon content is important. Irons with total carbon content from about 2.80 to 3.45 per cent with silicon from 1.30 to 2.00 per cent have been treated with excellent results.

Alloy content apparently does not tend to make cast iron as sensitive to heating and quenching as is the case with steel. Cast irons containing nickel up to 4 per cent, chromium up to about 0.50 per cent, molybdenum to about 0.75 per cent and vanadium to about 0.30 per cent either singly or in various combinations, have been flame hardened with satisfactory results. Presence of free carbon appears to permit adjustments which minimize the danger of cracking.

Combined carbon is most important regardless of whether the material is plain or alloy cast iron. Range from 0.60 to 0.80 per cent appears most suitable. Cast irons with tensile strength from 30,000 to 50,000 or more pounds per square inch generally are suitable for flame hardening.

Table I gives analyses of a few of many cast irons known to have been flame hardened satisfactorily.

Fig. 6—This illustrates difficulties encountered in penetration testing gray cast iron. Note crumbling even on edge of small indentation made with 30-kilogram load

Steelmakers Establish F. B. McKune Award

■ ESTABLISHMENT of the F. B. McKune award by the Open-Hearth Committee of the A.I.M.E. was announced by President L. F. Reinartz at the close of the annual conference held at the William Penn hotel, Pittsburgh, April 24-26. The award, consisting of $100 and a certificate, will be presentetd for the best paper of not more than 5000 words dealing with open-hearth practice, refractories, combustion, etc. The recipient must be 35 years of age or younger.

Starting immediately, the Open-Hearth committee will maintain a full scholarship at Massachusetts Institute of Technology. Heretofore its scholarship has been partially supported.

Next year National Open-Hearth Steel conference and Blast Furnace and Raw Materials committee will be held at the Palmer House, Chicago, April 23-25.

At the basic open-hearth session on refractories, opinion was divided regarding the cause of fire clay inclusion in killed steel. Some agreed that inclusions do not come from pouring pit refractories. Others believed that inclusions are traced to refractories. In this category three types of inclusions were mentioned, namely those which arise from oxidation and are evenly distributed, those which are washed into the steel and partway inclusions which come from the ladle or nozzle. The hot acid test will show up partway inclusions. The position of those washed into the steel is shown by the petrographic microscope. All of these type inclusions will show the presence of quartz. It was also brought out that the X-ray is most valuable when crystalline phases are present.

In discussing improved runner lining as a method for minimizing inclusions in steel, one operator at a plant in the Pittsburgh district told of using a cast runner lined with crushed basic brick bats and luminite cement. Some of the advantages are improved life, lower cost, and a reduction in the amount of mud required. The runner requires only a slight wash and the steel skull peels away readily.

Nozzles

Magnesite nozzles are being employed in England, according to one speaker. He cautioned that refractory nozzles are hard to get seated. If a groove is cut by the steel, it is difficult to stop the leak which gets worse unless the seat is soft enough for the stopper to be squashed down. The solution, he pointed out, is to make a 2-part nozzle. Another operator mentioned that a tapered oval nozzle decreases cutting out appreciably.

Nozzles of 1½ inches are recommended by a Pittsburgh operator. Better chipping results are secured than with larger sizes and there is less lamination in sheet steel.

A Canadian operator was of the opinion that the inclusions do not come from nozzle brick but that their inception depends upon the pouring of steel and its degree of sluggishness. When making soft heats large refractory nozzles paralleling cone No. 27, are better than those of lower cone rating.

L. F. Reinartz, manager Middletown division, American Rolling Mill Co., Middletown, O., and general chairman, National Open-Hearth Committee, A.I.M.E.

Suitability of two types of pouring pit refractories may be determined by the fusion test, though the physical problems and permeability are also important, according to one operator. The service test is considered the most important criterion of refractories by a Pittsburgh operator. He pointed out that at his plant the erosion characteristics of nozzles are secured by the use of a small camera, the photographs being calibrated and correlated for certain distances.

Olivene-Chrome Mixture

This mix is used by one shop for the gas bulkheads, up along the skewbacks and around the monkey. At another plant the material is bought in rock form and is applied to the backwall with a Quigley gun, the material lasting for one campaign. Another plant is using a few blocks in the backwall with good results recorded.

Ramix Refractory

A Canadian operator reports that 100 per cent of this refractory was rammed up in an electric furnace bottom at his plant, and that 3500 heats have been tapped in two years with little or no trouble experienced. Since then he has employed this refractory in a new 100-ton open-hearth, but because it has only been in operation approximately a month, no results are available. His electric furnace is rated at 10 tons, though 12-ton heats are tapped. The lining is 24 inches thick and required no burning in.

At another Canadian plant an open-hearth bottom of this material was put in a few weeks ago. Insulation, 2½ inches thick, first was applied and then the hearth contour formed with 5 inches of chrome brick and 6 inches of Ramix and on top of that, 10 inches of grain magnesite was burned in. No results are available because of short operating period.

In discussing the use of this mixture for patchwork in the bottom, one operator announced that he had patched a hole 10 to 15 inches with an area of 3 feet square with this material, and then charged up the furnace one hour afterwards.

At another plant, a 100-ton furnace installed Ramix in the bottom two years ago. The furnace operated for a six-month period and then shut down for a year. No difference was observed between this material and a burned-in bottom.

A shop along the Ohio river has two furnaces in operation, one having run for a period of 5 years, in which K. N. material is installed 6 inches over the chill box and then shaped off to approximately 3 inches over the tap hole. A chrome patch was used in the second furnace for one year and in both cases the operator reported satisfactory results.

Basic Roof Construction

This type roof costs five times as much as a silica roof. European furnaces built with basic roofs show greater production and less interruptions than silica roofs with representative costs of ingots, showing a saving.

Basic refractories were tried at a Pittsburgh plant about a year ago along the skewback. The patch ran about 30 feet along the backwall. A saving in magnesite and dolomite was recorded. At this plant all furnaces have basic frontwalls and

HERE is a new way to *control* costs—a new way to keep production on schedule.

Every time a tool dulls or falls short of its job in any way—a press must be shut down until the tool has been reground or replaced. When this occurs in your plant, it may mean an hour—a half day—or several days, depending upon the nature of the tool trouble. Meanwhile, you have an expensive piece of equipment standing idle—production is interrupted—schedules are upset—and unit costs go higher. The more presses you have, the more money the "shutdown problem" is costing you.

The remedy is—*improve* your tool performance! Carpenter Matched Tool Steels make it possible. They have helped solve the "shutdown problem" for many plants. Send for the new Carpenter booklet that shows how to get tools that yield higher output per machine, and lower cost per piece.

THE CARPENTER STEEL CO. - READING, PA.

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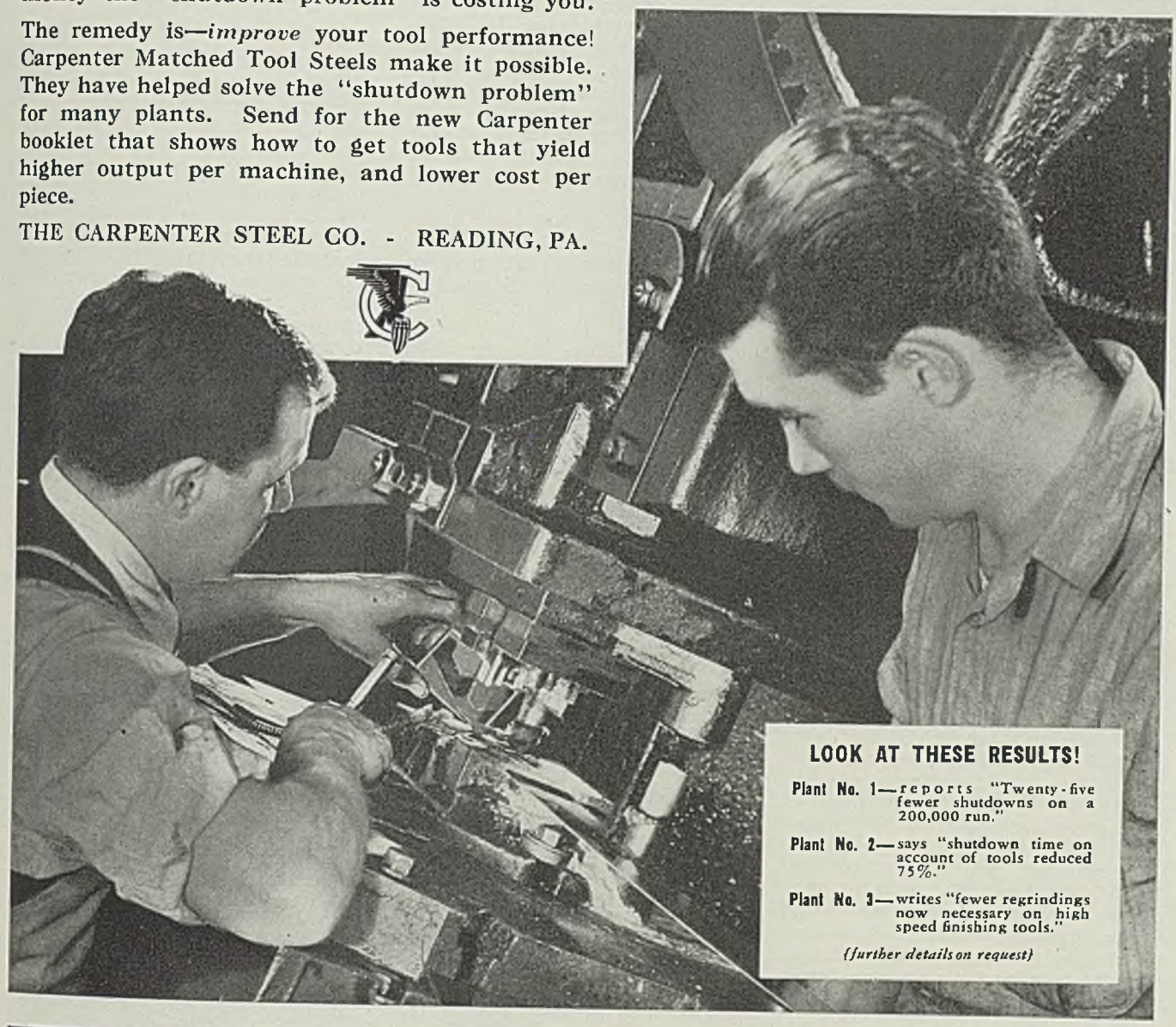

LOOK AT THESE RESULTS!

Plant No. 1—reports "Twenty-five fewer shutdowns on a 200,000 run."

Plant No. 2—says "shutdown time on account of tools reduced 75%."

Plant No. 3—writes "fewer regrindings now necessary on high speed finishing tools."

(further details on request)

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there never has been any occasion to put in arches.

At a plant in the East, basic brick is used along the skewback and when operated on high-scrap charges, no trouble is experienced.

At another plant, four large patches of basic brick were used along the skewback. The first ran 201 heats and then was repaired. The second ran 228 heats when the patch buckled and came out. The third ran 208 heats before a buckle occurred, and the fourth, 240 heats with no trouble. This operator recommended basic brick for skewback construction.

Auxiliary Slag Pocket

Further experimentation with the Crow slag pocket is being conducted at a plant in the Chicago district. Recently one-third of the auxiliary pocket filled up with slag which froze on the wall over which it flowed. Plans are afoot to raise the incline of the auxiliary pocket roof so that the actual heat exposure is increased. The inner wall also is to be moved in toward the high zone in the main slag pocket.

The purpose of the auxiliary pocket is to provide for an accumulation of slag and thus keep the B.t.u. down and the tons per hour up during the campaign of the furnace.

Stud Tube Door Design

This type door uses 2½-inch tubing to which is welded rods, the whole or part thereof between the studs being packed with plastic chrome ore. On furnaces making 13 to 14 tons per hour, the average water-cooled door lasts about 5½ days compared with 7 months with stud tube water-cooled design. The melting point at the face of the door is 3300 degrees Fahr., whereas the brick face on the door melts at 2800 degrees. It is claimed that the stud type door radiates heat back into the furnace and that furnaces so equipped will save 1,000,000 B.t.u. per heat. The cost of the doors exceeds the cost of brick units, but this added cost is returned in a period of six months due to heat and maintenance savings.

Scale Addition to Iron

Adding scale to blast furnace hot metal for the purpose of reducing the silicon content has been practiced for a period of 3 months at an Ohio plant and no detrimental effects to the steel made with this iron have been reported.

At a plant in the Chicago district, the practice followed is to knock the silicon and manganese down to give the open-hearth high temperature metal with low silicon. Scale is added at the runner just at the entrance of the ladle. The resultant viscous slag analyzes 15 per cent iron, 32 manganese oxide, and 40 silica. By adding 5000 pounds of mill scale per cast of iron, this plant was able to reduce its silicons from 0.96 to 0.63 per cent. By this treatment the yield increased and 65 per cent of the scale added was recovered as hot metal. All grades of steel were made with this scale treated iron and all were pronounced satisfactory.

One shop reported that by having the silicon lower, hotter iron is available. When hot metal is added, it starts working on the scrap. Lower silicon requires less time and hence the time of melting is reduced. Best results are obtained by by-passing the mixer and taking the iron direct from the blast furnace to the open-hearth. Material benefit is claimed under this operation.

At this plant it has been found that when hot metal is used below 2425 degrees the time from charging to tapping increases. From 2400 to 2500 degrees it decreases. In fact, the time of the heat is decreased from ½ to ¾ hour when using iron ranging from 0.60 to 0.70 per cent silicon.

Silicon content of molten iron is reduced about 50 per cent and manganese about 40 per cent at an Ohio plant where scale is added in the iron runner. Some turbulence occurs as well as an overflow of slag. The temperature of the iron is increased. In fact, the affect is a little bessemer blow, oxygen being received from air and the scale additions. Time of open-hearth heats has been reduced 35 minutes. When the blast furnace is on slack wind the addition of scale is particularly attractive.

Hot Metal Made with Scrap

Consensus of opinion is that there is no difference in the open-hearth quality when charging hot metal made with 10 per cent scrap iron in the blast furnace.

Some few years ago a plant had left on its hands 20,000 tons of scrap contaminated with alloys. To prepare this for use in steelmaking, it was necessary to impregnate the material with carbon. A blast furnace was burdened with 100 per cent of this steel scrap with a complete recovery of 18,000 net tons. No difference was noted in the pig iron over the regular run. Coke consumption was not as good at the time this scrap was charged as it is today because 17 per cent ash then was common. However, conversion averaged 0.46 tons coke per ton of iron. A normal slag had to be carried because 98 per cent of the silica going in the blast furnace enters with the coke and hence this means of elimination.

One blast furnace operator reported his practice involves a small amount of scrap which results in a smoother operating furnace. For this reason, he explained, a better product results.

Another blast furnace operator reports that there are periods when high alloy bearing scraps are melted in his blast furnace. When the occasion arises, 50 per cent is used on the burden which results in a smoother operating furnace and double the tonnage with ½ the fuel rate.

Light Scrap on Steel Quality

At a plant where considerable No. 2 compressed scrap is charged, the open-hearth department is always on the alert for contamination. When a car of this scrap is unloaded, the material is inspected every so often. Bundles are taken out of the car and broken and if there is the least suspicion of alloy contamination, the entire shipment of scrap is rejected. On certain grades of steel this plant charges this type of scrap heavily with good operating results.

Ore Additions

A Chicago operator in discussing whether later ore additions are more detrimental to quality steel than longer time required to work heats without ore additions was of the opinion that speed reactions down to certain points make no difference in the quality of steel.

One operator in making low-carbon heats ores down and then uses crops to knock the heat flat instead of using ore.

An unique method is employed by one operator in securing agitation of the bath. On killed steel he employs stirring rods which have been stored in the open for a year and on which salt is applied in order to obtain an oxide to promote agitation.

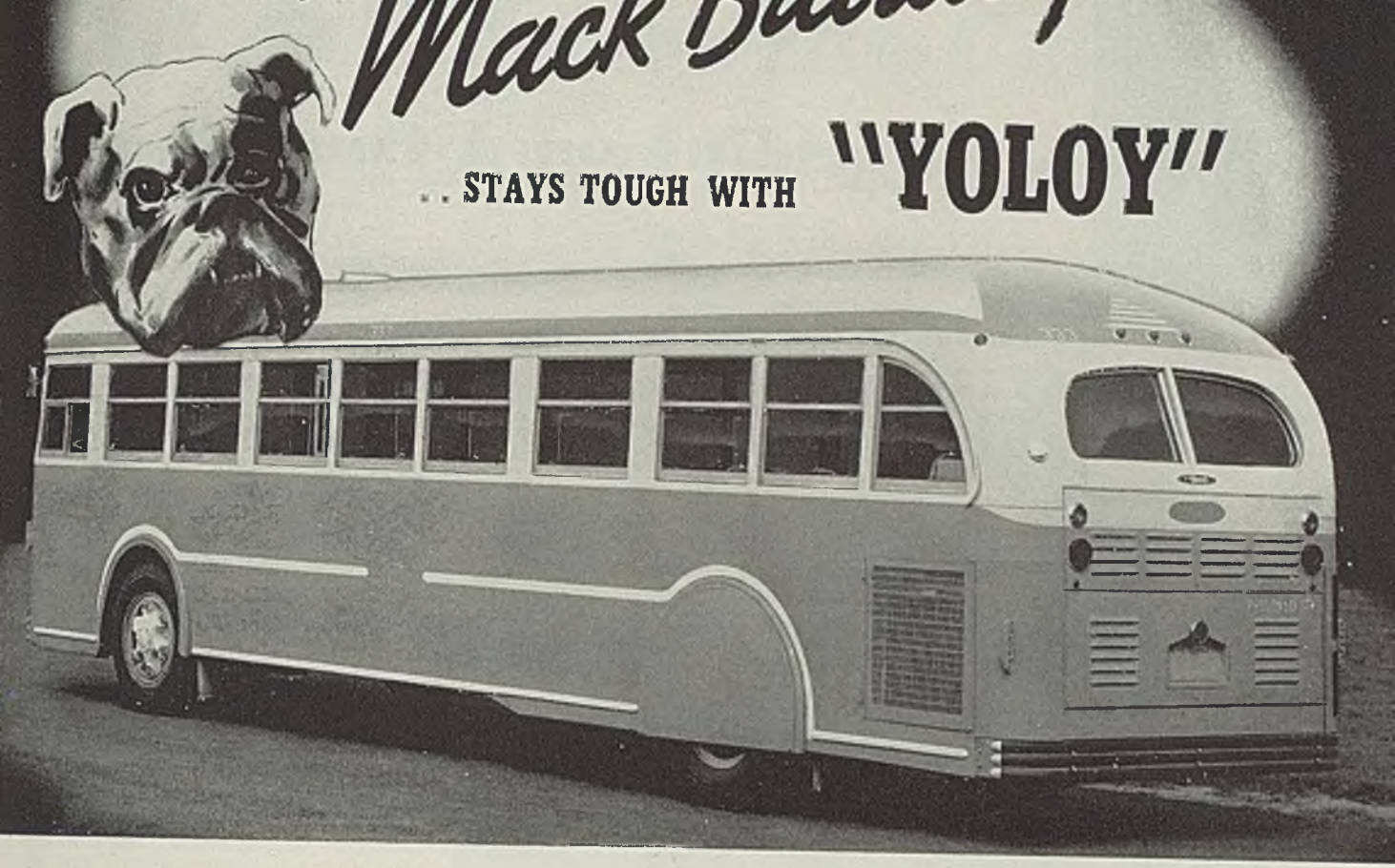
One operator limits the last ore additions to 45 minutes before tapping the heat. Adding butts for agitating the bath seems to be a loss of time, in his estimation. Under proper regulation, the final addition of ore can be made on a sharp furnace down to the tapping time, he explained.

Soaking Pits and Blooming Mills

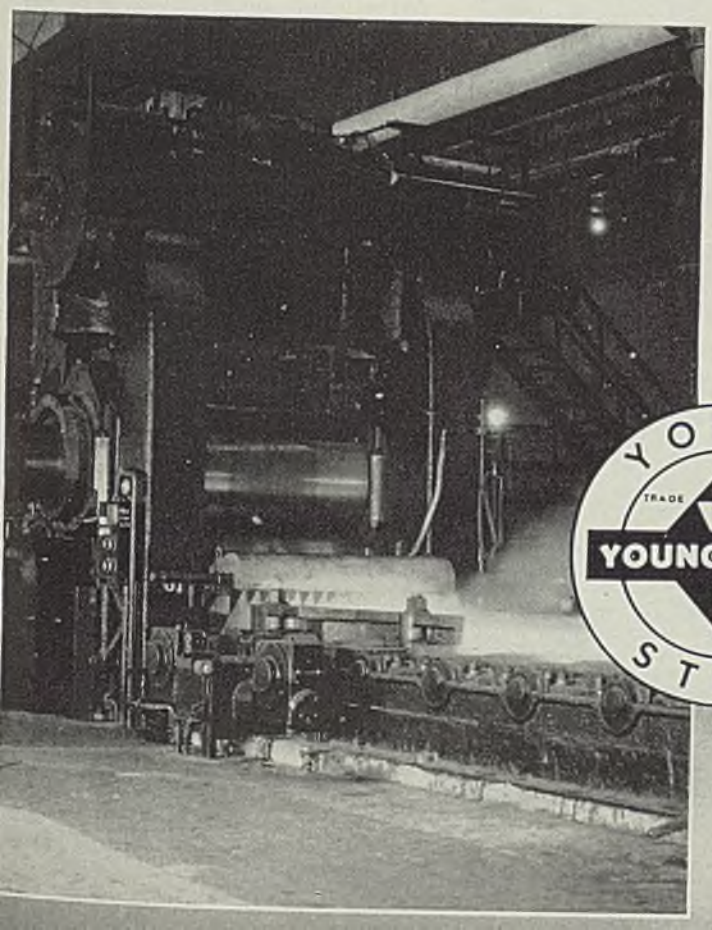
At a plant in the East the practice of taking photographs of all steel going to the blooming mill is followed, with the result that all observers have been taken off of the mill. Photographs also are taken after four passes through the blooming mill to disclose any burning or cracking of the surface.

An operator in the Chicago district cited a plant which has pit

(*Please turn to Page 78*)



THE Bulldog trademark of the International Motor Truck Company has long stood as a symbol of the staunch stamina of their widely-known line of Mack Trucks and Buses. Yoloy makes an important contribution to the toughness and durability of Mack construction and has been used for body framing and chassis on jobs such as this United Traction Company bus for the City of Albany.



Yoloy is a high tensile, low alloy steel developed by Youngstown. Compared to regular materials Yoloy will reduce weight 25% to 40% for equal strength, has a corrosion resistance 4 to 6 times greater. In addition Yoloy has excellent welding properties, forms well, yet has a high impact resistance.

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General Offices - YOUNGSTOWN, OHIO

Welding on a Conveyor

Output per operator increased when torch welding operations are placed on continuous conveyor; leaks reduced in assembly of 116 joints with 3000 pounds per square inch test pressure

■ AT THE Servel Electrolux plant, automatic gas refrigerators have been built since 1927. During this time, a system of production has been developed designed primarily to make the strongest and safest refrigerating units possible at highest speed and lowest cost consistent with the high quality requirements of this work.

A problem commonly encountered by all manufacturers is that of floor space. An example of how space is saved in this plant is seen in manufacture of the cabinet shelf. This shelf is of one-piece construction for strength, better sealing and to eliminate gaskets.

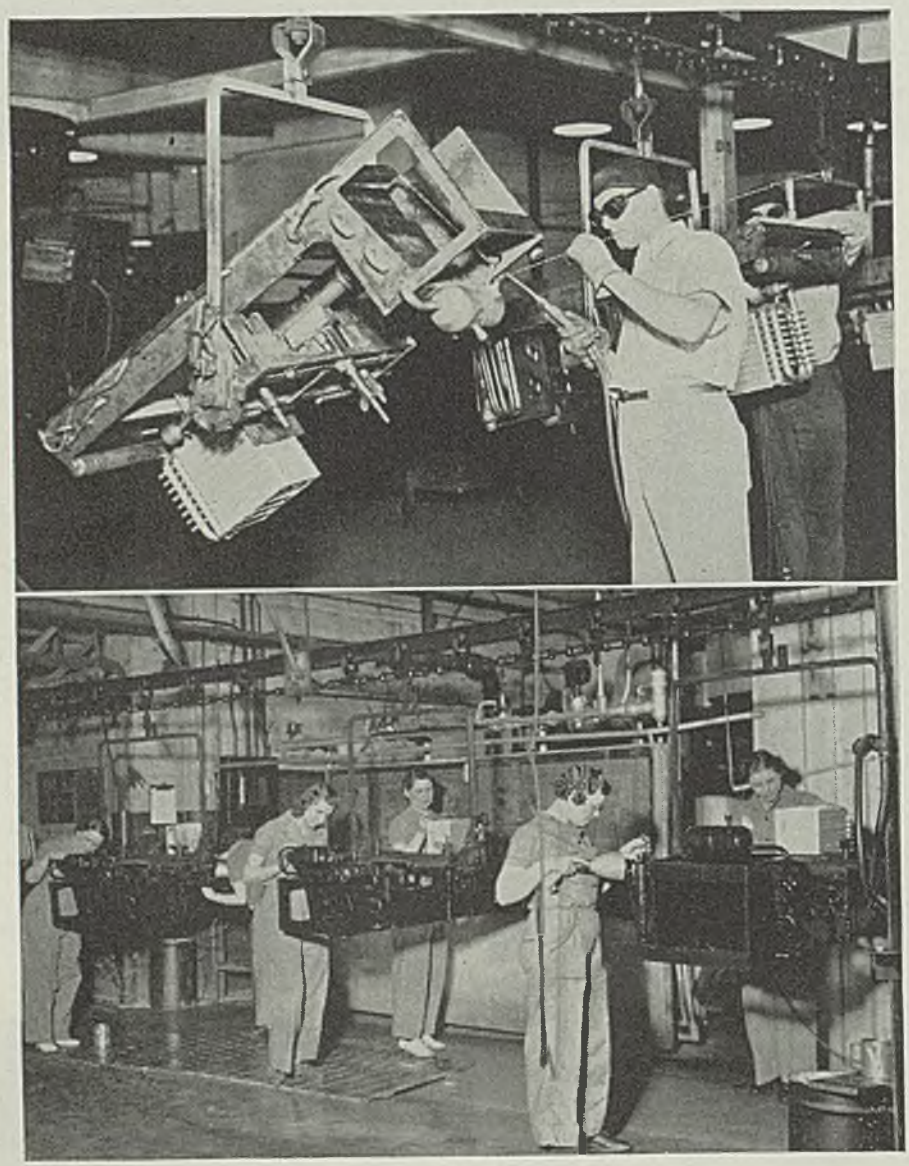
In its manufacture, first a large sheet of steel is blanked, pierced and flange formed. During blanking, a development is formed in the corner so after the shell is folded over the fixture, four small slots will be left in the corner approximately 3 inches long. These corners then are welded on a water-cooled fixture using an oxyacetylene torch. Following this operation, the joint is finished to a smooth surface. Fixtures on which this work is done are quite small. The whole setup for welding the corners on a 1000-per-day basis requires a space only about 8 x 10 feet.

Each Electrolux refrigerating unit consists essentially of seven parts known as generator, liquid heat exchanger, absorber, condenser, rectifier, gas heat exchanger, evaporator.

First of these major unit assemblies consists of the absorber, heat exchanger and evaporator of the chilling unit. This is a mass of tubing ranging from 2¼ to 5/16-inch

By R. G. RODGERS
Works Manager
And
WALTER R. CAMPBELL
Superintendent, Electrolux Division
Servel Inc.
Evansville, Ind.

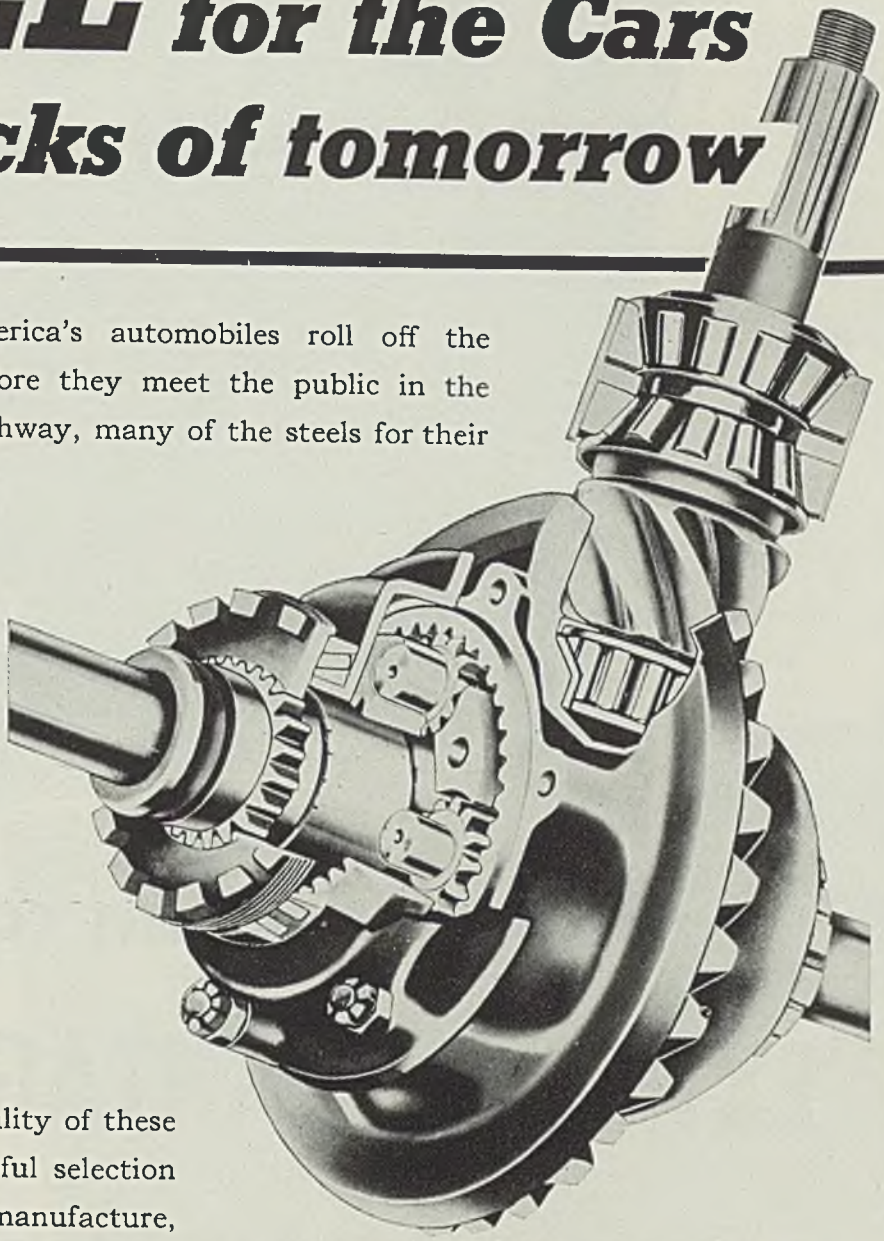
Abstract from paper presented at fortieth annual convention of International Acetylene association, Milwaukee.



Upper, oxyacetylene welding of final unit assembly as it moves on conveyor after it has been tackwelded in a jig to position parts accurately

Lower, leak testing assembled units using a soap solution while on a chain conveyor line

STEEL for the Cars and Trucks of tomorrow



LONG BEFORE America's automobiles roll off the assembly line, long before they meet the public in the showroom or on the highway, many of the steels for their crankshafts, axles, camshafts, connecting rods, and gears are in production at Wisconsin Steel. Here the mill and the factory work together with one aim: the *right* steel for the *specified* job.

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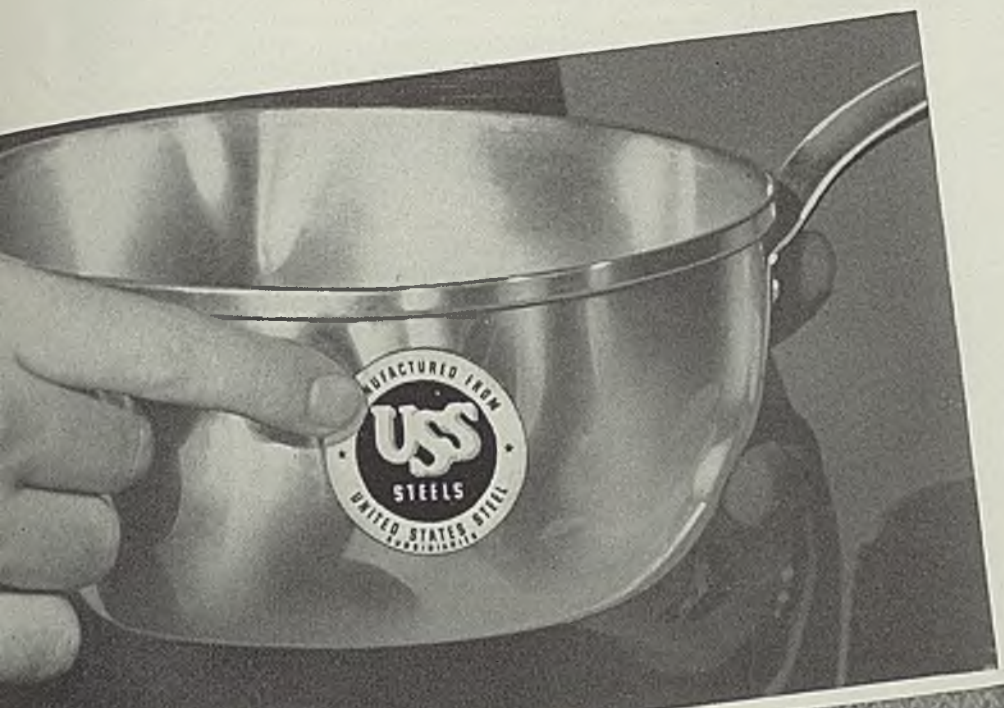
Retailers, recognizing the influence of the wide national advertising for United States Steels, seize upon this label as an aid to selling, make it a primary point in their demonstration of product merit. Many are employing the seal in their own product advertising. It is a happy contribution towards meeting the increasing demand of consumers that manufacturers give more facts about their products.

Any qualified manufacturer using U·S·S Steels may employ this symbol without one cent of cost. Hundreds are doing so. In 1939 over 6,000,000 household, farm and office articles carrying this label were shown in retail stores and sold to the public. Evidence of successful merchandising results mounts daily.

Write for full particulars and information concerning the sixty classifications of products now benefiting from this remarkable promotion. Perhaps your products, too, could benefit.



SPECIAL SEALS FOR SPECIAL STEELS

The U·S·S trade-mark shown on this page is employed for the general line of steels. Other trade-marks are available for STAINLESS, COR-TEN, MAN-TEN, VITRENAMEL, PREMIER SPRING WIRE, FENCE, etc. Many manufacturers have even incorporated the U·S·S mark into their own label. Special cooperation assured to meet your own product's requirements.

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COLUMBIA STEEL COMPANY, *San Francisco*
CYCLONE FENCE COMPANY, *Waukegan, Ill.*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

Scully Steel Products Company, Chicago, *Warehouse Distributors*
United States Steel Export Company, New York

in diameter, from 12 to 17 gage, and in various forms. All these connections are welded together. Absorber shell 4¼ inches in diameter is welded from two pieces of cold-drawn shell in an automatic oxy-acetylene welding machine with continuous wire feed. Pressure chamber is a 2½-inch diameter tube with caps welded on each end by an automatic machine using two blowpipes to weld both caps simultaneously. Continuous wire feed is used, the operator merely loading and unloading the machine.

These units must withstand a bursting pressure of 3000 pounds per square inch. This excessive strength is not needed for normal operation of the unit but is required to make the high-pressure leak test a safe operation. Some 116 individual welds are required.

Output Increased

Frequent expansions of manufacturing facilities have been made since this refrigerator was first placed on the market. It was soon necessary to increase output to an extent where manufacturing on a continuous conveyor was justified. So far as is known, welding at that time never had been used for the fabrication of metal parts moving on a conveyor. Nevertheless, after consultation with various engineers it was decided the plan was quite feasible so the entire manufacturing process was co-ordinated to the new scheme and a conveyor was placed in operation. All of this was completed with but little disturbance to manufacturing schedule, particularly since the changeover was made during the slack period of the yearly production cycle.

Benefits resulting from adoption of a conveyor system for production have amply repaid expense of changeover and investment in new equipment. Lost motion in handling and stacking the various sub-assemblies and completed units has been eliminated almost entirely. Welding efficiency has been increased rather than decreased as was first expected.

Also, there has been an important decline in the percentage of leaks, even though the welding is done while the work is moving. It has been found that movement of the conveyor is not detrimental to quality work. However, operation of the conveyor must be smooth and without any irregular motion.

Most gratifying, however, has been the 50 per cent increase in production made possible by this changeover to conveyor system. This increased output involves only a 20 per cent increase in number of operators.

Welding department is laid out with sub-assembly benches and fixtures for tacking the parts together at right angles to the main conveyor line. Conveyor travels along the line of production at a rate of about 7 feet per minute, 458 feet per hour for maximum production. At every 6 feet along the conveyor chain is a special swivel hanger for holding the work. Consequently one unit about every 46 seconds or 78 units per hour can be turned out when desired. The time needed to execute a weld varies according to its length, position and other factors but operators make from 60 to 100 joints per hour in general welding.

After assembly by tack welding, the first part of the unit is placed on the conveyor. This is the evaporator and gas heat exchanger assembly. A sufficient number of operators are assigned to welding on this part so each operator can finish his weld easily in the allotted time. All this work is done by oxyacetylene torches. Welding tips are specified for each weld. This with constant oxygen pressure and low constant acetylene pressure assures the foreman that the welder always uses the correct size flame.

This assembly rides to a point along the line where several major sub-assembly tacking fixtures are located. Here each unit is removed from the conveyor for tack welding into a sub-assembly and then the enlarged unit placed back on the line. Finish welding is divided among the various operators and completed as before.

Sub-assembly lines for condenser side rail and rectifier assembly, for generator and liquid heat exchanger assembly and for absorber assembly operate in a similar manner to make these sub-assemblies.

All these sub-assembly lines feed into the main conveyor line where final assembly fixtures are located. Here the sub-assemblies are taken off for tacking in specially designed jigs and fixtures. After tack welding they are replaced on the conveyor and finish welding completed while moving on the conveyor.

Following this, each unit is tested for leaks and repaired while on the conveyor line. Extensive tests

(*Please turn to Page* 88)

Iron, Steel Engineers Discuss Crane Bridge Drive Problems

■ THIRTEEN phases of the problem presented by crane bridge drives were discussed in papers presented by as many authors before the Pittsburgh district section, Association of Iron and Steel Engineers, at Hotel William Penn April 25.

The session took form of a symposium, each author taking a separate part of the general subject. F. W. Cramer, Carnegie-Illinois Steel Corp., acted as chairman. Reason behind the meeting was the study which has been carried on since January, 1938, on bridge design and the various factors covering crane specifications. Original specifications, set up in 1929, have proved obsolete in many particulars and the subject has been studied by committees over the past two years, with this session one of the results.

Relation of crane speeds to production needs was discussed by R. J. Harry, Alliance Machine Co., Alliance, O. He outlined various demand factors which affect design of the units, stressing need for careful study of requirements before specifying speed and travel needs.

The various types of cranes now commonly used were shown diagrammatically by H. W. Ball, Morgan Engineering Co., Alliance, O. Number of wheels and necessary weight to provide adequate friction for braking purposes were stressed. Proper rate of acceleration for any given application was outlined by W. C. Heinle, Cleveland Crane & Engineering Co., Wickliffe, O. He indicated the acceleration needs, for most efficient and economical operation, should be based on average requirements rather than peak load conditions.

Discusses Friction in Cranes

Factor of friction, how it is controlled and how its effects are calculated in building cranes to certain specifications was shown by C. Brongersma, Shaw Box Crane & Hoist Co., Muskegon, Mich. Bearings were covered by E. C. Rice, Whiting Corp., Harvey, Ill. The three principal types—sleeve, roller and pin—were described and defects and advantages of each were outlined.

Problems connected with quick and effective stopping of cranes were laid out by R. J. Wadd, Harnischfeger Corp., Milwaukee. The speaker held that for almost any application an effective stop would be large enough to halt a crane against a force equal to 50 per cent of full collision force with heavy load. Fac-

(*Please turn to Page* 77)

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BETWEEN HEATS WITH Shorty

■ Say fellers:

Last part of April there were over 52,000,000 tons of steel and plenty of pig iron on the seventeenth floor of the William Penn hotel in Pittsburgh and the floor didn't even buckle. You see, them open he'rth and blast furnace fellers held their annual meetin' there and maybe you think the air wasn't full of graphite—"kish", as the boys call it.

There was a lotta things hangin' and they weren't all blast furnaces, if you get what I mean. Skips were runnin' up and down tryin' to keep the furnace full but time and agin she'd get off the rod and they'd catch 'er agin after chargin' 'bout 5 rounds. The pumps were workin' O. K. and they didn't have any trouble keepin the stock in the throat moist. Tryin' to reduce flue dust losses, I guess. They lowered the big bell every round and then started chargin' agin. Boys, the fillin' system was clickin' like a dandy.

Shapin' Up Time Is Bad

Some of the open-he'rth boys had a tough time on the night turn meetin' specifications. Many started chargin' 'round 6 p.m. and they found it kinda tough shapin' up. Had to make many additions to get proper fluidity. But they got 'er all right. 'Bout the time they came to the refinin' period 'round midnight there were some variations in the physical condition and they had to make some more additions to get specific control 'bout 2 a.m. Time from tap to tap was—oh, I'd say she ranged from 8 p.m. to 'bout 4 a.m., though some took an hour or so longer. No trouble gettin' 'er in the ladle either. Guess you'll agree with me the boys made some fast heats, huh?

When I got home Mrs. Shorty found some cards in my pocket with a lot of numbers on them—802, 1003, 1009 and 1066—and she sez, "Playin' flinch agin, huh?", and I sez, "Not 'xactly. They're what you call heat numbers in steelmakin' language."

"Yeah?" she says, and then quick as a wink, "I always knew them steelmakin' boys could pour".

"Sure can, honey", I sez. "Guess you got somethin' there, all right."

* * *

Fellers were sorta disappointed at the dinner when they 'nounced that Henry Roemer, the big boss at Pittsburgh Steel Co., couldn't be at the meetin' 'cause of bein' under the weather. Sent one of his boys—feller by the name of Garret Conners, once from Valley mill district, Youngstown, O.—to pinch hit for 'im, and he did a good job, you betcha.

Advice Worth Heedin'

Wanta tell you open-he'rth boys somethin', and you who are makin' pigs and piglets—if you haven't got Henry Roemer on your speakin' list you jus' haven't a friend in the steelmakin' business, that's all.

He can speak your language. And if you jus' got a common bucket of water and a dipper out in the mill, he'll stoop for the handle, take a gulp, spit 'er out and then gulp the rest of 'er down jus' like you and me do. Makes no difference to him.

What I'm tryin' to say is that Henry used to carry a dinner bucket, same as us guys. He started at a little hand-filled stack in the Mahoning Valley when he was 14. Knows what you're talkin' 'bout when you got your tongue sayin' monkey, bustle pipe, snort valve and peep hole. He knows what a glassy slag means and when the ol' bosh lights up like a Christmas tree, he understands. You don't need to 'xplain 'em.

When he was 21 they pinned the mill superintendent's badge on his coat lapel and when he reached 30 they 'xchanged the super's badge for a button stamped with the 'nitial "G. M." And that's not all. Before he passed the 35 mark, he had arrived. Jus' couldn't go any higher for he was the head of his company.

Now you'll find him at work seated in a leather upholstered high-back swivel chair at the head of a table in the Grant buildin' in Pittsburgh.

His shoes may have a higher polish, his trousers may have a sharper crease and his shirt may be freer from grease stains than when he was on his way up, but he's the same Henry we fellers knew out in the sheet mill when he was boss.

Front office hasn't made him any different. He can sit down on the old bench—the one we all carved our 'nitials in, remember? He can put his arm 'round your shoulder and rest his hands on your sweaty shirt, cross his legs and ask 'bout how the Mrs. and kids are gettin' along up at the house. Or when you're eatin' out of your dinner pail, you can split your piece of pie in two, hand him a piece and he'll take it. And before he finishes it he'll be tellin' you what a fine cook that's packin' your bucket. You're sorta sorry to leave him when it's time to finish off the breakdowns.

No, fellers, the leather upholstered chair at the head of the directors' table up in the Grant Buildin' hasn't changed Henry and if you've never felt the clasp of the hand that knows how to 'nipulate the tongs, nor heard the familiar greetin', "How are ya, son?" then you've jus' never made a cast of iron nor a heat of steel that's any good.

Well, anyway, fellers, they all liked his speech and I could tell by the way those calloused hands were makin' a clappin' sound.

* * *

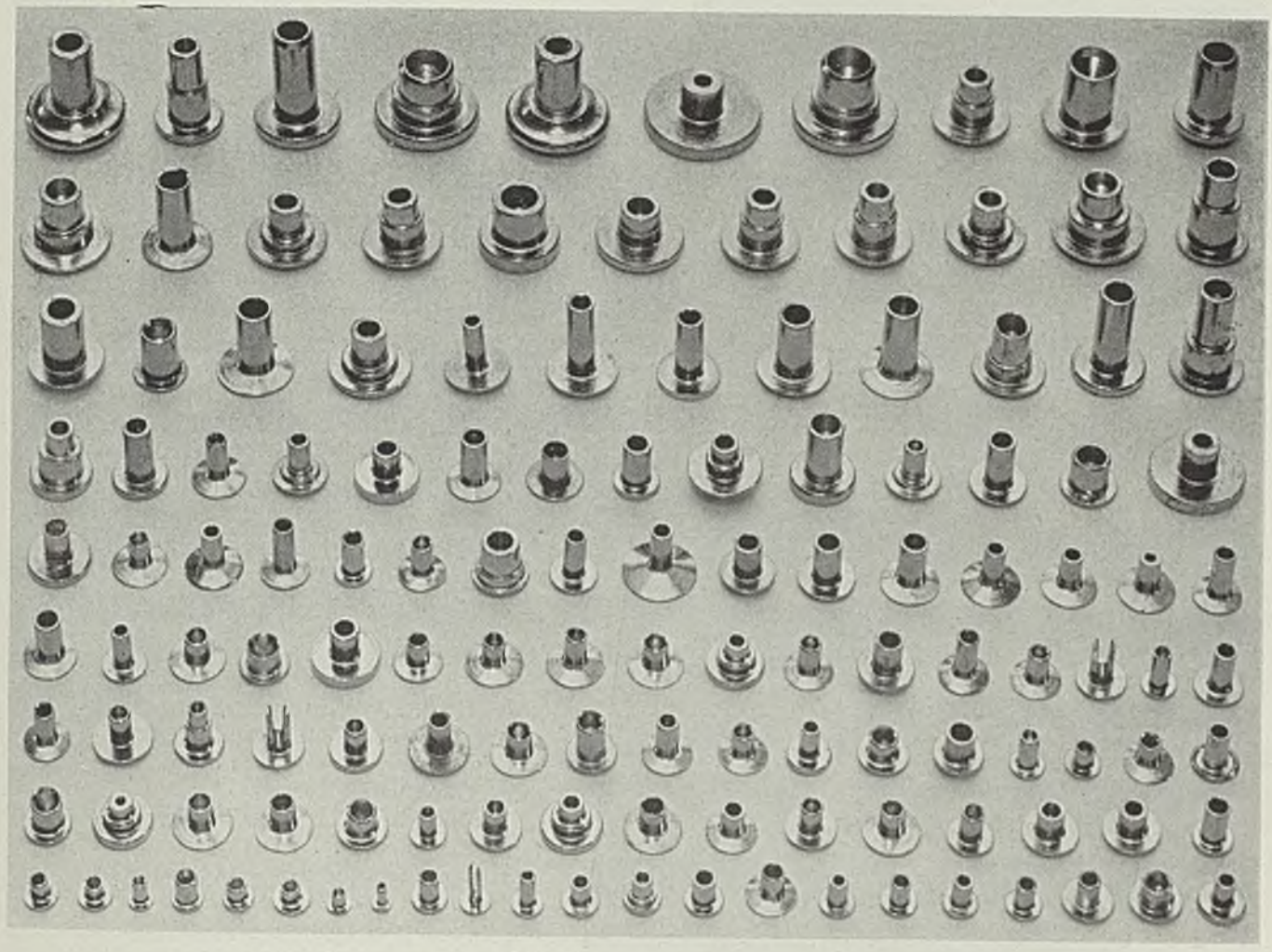
One "buck" apiece and six buses pulled up at the gate of the Edgar Thomson works of the Carnegie-Illinois Steel Corp. at Braddock, Pa. The boys piled out and plenty of guides, white tape and red arrows showed 'em where to go. Here's what they saw and heard.

Men washin' up at the change of turns . . . whistles blowin' . . . rolls dronin' . . . cranes rumblin' overhead . . . hot saws spittin' sparks like Fourth of July stuff . . . flames sneakin' out heatin' furnace doors and lickin' the side walls . . . men sweepin' up scale between narrow-gage tracks . . . rollin' mill guides and spare rolls piled as high as the ceilin' . . . water sprayin' over the rolls . . . heated steel runnin' through roll passes like snakes . . . all I can say is those ingineers 'round 1887 must've known how to make some good blue prints 'cause the mills that came from their finger tips at Braddock weren't messin' with steel. They sure were layin' tonnage down on the hot beds all right.

Fact of matter is, fellers, I got some tonnage goin' through the bloomer at my own plant, so gotta go. I'll be seein' you.

"Shorty" Long

Tubular RIVETS



The advantages of Townsend Tubular Rivets are numerous and varied. They are made to extremely close tolerances, are consistently uniform, are attractive in appearance and provide ample strength for practically all riveting requirements.

Speed of application is assured by Townsend Tubular Rivets. The consistent uniformity and extremely close tolerances permit the successful operation of automatic machine riveting with its resulting economies and the attractive appearance of these rivets are a guarantee against unsightly finishes—a necessary consideration under today's marketing requirements.

Already in wide use in the automotive and aviation fields, in the manufacture of all types of products for domestic use, in the heating and air conditioning industries and by jewelers, luggage and toy makers, Townsend Tubular Rivets are daily finding new uses in new and varied industries.

Although Townsend Tubular Rivets are carried in stock sizes, the bulk of those produced are made to specifications especially suited to each customer's requirements. Services of our Engineering Department are free and available to all. Write for further information.

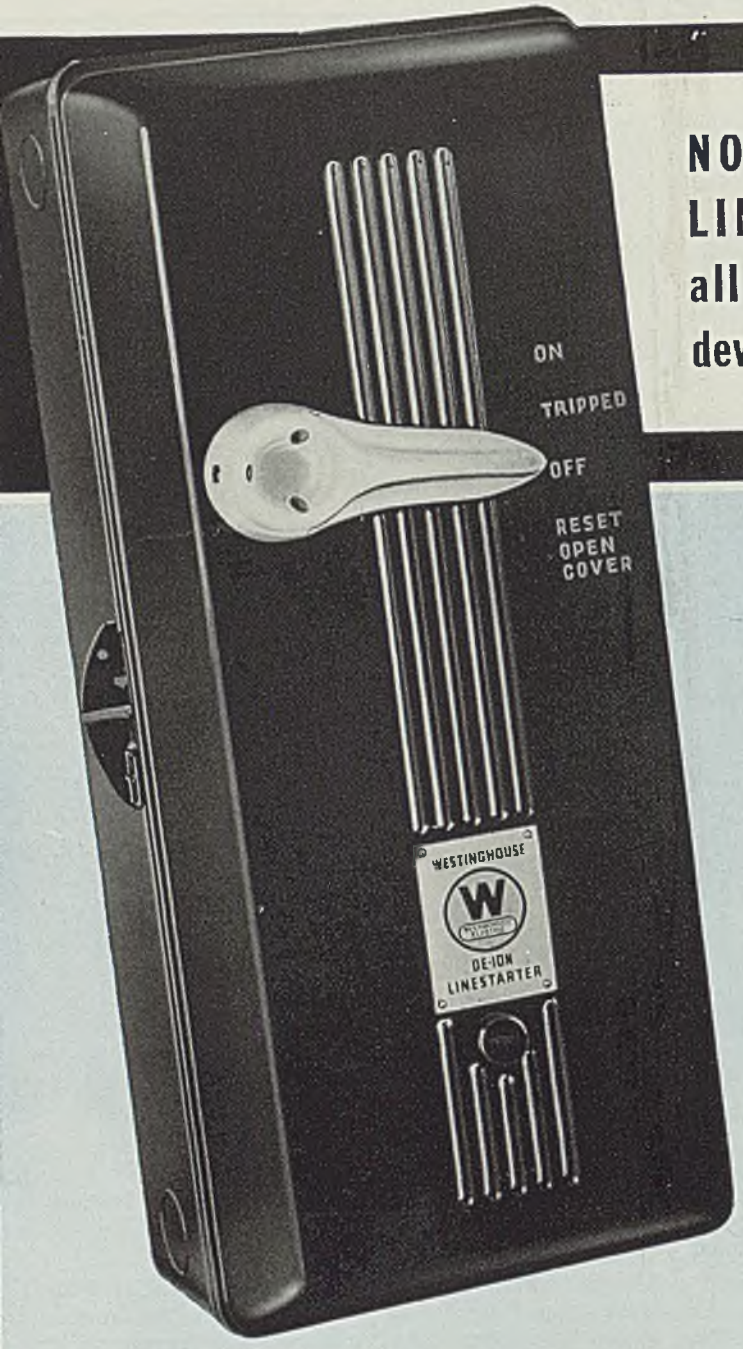
TOWNSEND COMPANY

NEW BRIGHTON SINCE 1816 (*Pittsburgh District*) PENNSYLVANIA

The Largest Rivet and the Oldest Wire Manufacturers in the World

SOLID AND TUBULAR RIVETS — SPECIAL WIRE NAILS — HEADED METAL PRODUCTS — AND WIRE SPECIALTIES — IN ALL METALS

INSTALLATION TIME CUT 6



WESTINGHOUSE "DE-ION" COMBINATION LINESTARTER—with new and improved safety interlocking handle. Insures maximum operator safety.

NOFUZE COMBINATION LINESTARTER provides all needed motor circuit devices in ONE compact unit

1. **Magnetic motor starter.** (Push button operated).
2. **Manual disconnect switch.**
3. **Motor overload protection.**
4. **Fuseless circuit protection.**

Here's your answer to motor circuit protection . . . all in one streamlined package. You save all around . . . on installation time . . . on space . . . on conduit . . . on wiring cost.

Bi-Metal in the Nofuze Breaker protects the circuit . . . Bi-Metal in the starter protects the motor. You save on maintenance costs because there is nothing to renew or replace. Outage time is reduced because workers restore service without waiting for maintenance men. Trouble-free operation is assured because Bi-Metal is tamper-proof.

And at no additional cost to you, "De-ion" Arc Quenchers are supplied on both breaker and starters. "De-ion" Arc Quenchers confine, divide and extinguish arcs instantly . . . preventing burning of contacts and prolonging contact life.

W WESTINGHOUSE ELECTRIC **Westinghouse**

WEEKS 16% OF SPACE SAVED

Crown Cork and Seal Co. Saves 30% of Installation Time-Cost With Combination Linestarters . . .

Note compactness of Combination Linestarters—how they can be arranged to occupy a minimum of wall space. Yet, doors can be opened wide. Space inside is ample for wiring.

The space and cost saving advantages of Westinghouse Combination Linestarters were conclusively proved in this recent installation at the Crown Cork and Seal Company, Baltimore, Maryland.

Westinghouse engineers recommended that 95 combination units be installed instead of separate linestarters and circuit breakers. By following their recommendation 268 man hours of installation time was saved and space requirements were reduced from 240 sq. feet to 200 sq. feet of wall space.

First cost of the Nofuze Combination Linestarters was practically the same as for separate linestarters and circuit breakers.

Savings as large as these . . . 30% in installation time-cost and 16% in space . . . are worth-while in any plant. You can make them in yours, by letting Westinghouse engineers help you apply modern Westinghouse Combination Linestarters to your control problems. Consult us freely, we are at your service on any electrical problem, large or small.

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.

J-21051

Motors and Control

Residual Tin in Steel

Test data show strip steel with high or low tin content rolls normally. If percentage of tin falls in intermediate range, product becomes extremely hard and breaks easily

By PAUL J. McKIMM
Cleveland

PART I

■ INFLUENCE of tin in steel as a residual or "tramp" constituent on the physical properties or more specifically on the performance of deep drawing sheet steel, has been the basis of much argumentation dating from early production of automobile body sheets.

During the period of 1915 to 1925 operators and metallurgists often mentioned that it was not possible to obtain an extra deep drawing sheet with a metal containing in excess of 0.015 per cent of tin. Other groups granted that the tin constituent could reach as high as 0.025 per cent tin before deleterious effects were encountered.

The controversial aspects of the tin issue interested the writer particularly when serving as consultant for producing sheet steel which would meet the performance specification of the automotive trade. In each instance and without exception, however, the failures were attributed to residual (tramp) alloys generally and to tin specifically.

The seriousness of alloy contamination is evident for two reasons: first, a great deal of money has been wasted by the industry, and second, both the causes and the tremendous waste of money still exist and this in view of definite evidence which warrants that these elements are innocuous within certain practical limits and that these limits are far greater than is generally assumed.

Before citing how far-reaching the cost of steel production has been affected by these features, it may be of interest to present a few instances where changes were made solely for the purpose of reducing the alloy contamination affecting drawing quality.

In 1928 and 1929 one plant, to avoid the use of manganiferous ores, burdened its blast furnace with virgin ores and approximately 15 to 17 per cent of open-hearth slag which yielded from 1.75 to 2.25 per cent manganese in the metal. Later the slag was eliminated from the burden because it was held that residual alloys were carried into the iron. This feature increased the cost per ton of iron.

Other plants utilizing both open-hearth slag and "cheapeners" such as borings, turnings, bushelings, etc. eliminated these for the same reason at an extensive increase in iron cost. Many other plants for this same reason not only increase their iron cost over and above normal current cost, but used every means at their disposal for selecting scrap, even going so far as to hand pick it and thereby increase the open-hearth basic material cost. Many plants that should be following a high-iron charge, such as 60 to 65 per cent for economical reasons, are sacrificing cost by using a low iron charge in the range of 40 to 50 per cent.

Quality Is Essential

The most economical practice, in the opinion of the author, when dealing with alloy contamination and specifically tin, is to produce a quality that will amply meet established specifications of the trade. There are two modes of attack: that of iron and that of steel. A study of the figures later presented on high tin bearing materials that have done their jobs successfully yields little information concerning how high a single element or how high a combination of contaminating elements can be allowed to go before becoming detrimental in the ultimate use of subject material.

As far as can be determined, no information on the effects of tin upon the physical properties of low-carbon drawing steels, has been published with the exception of the following items in the literature:

J. N. Witely and A. Braithwaite, prepared a paper in 1922 on "Some Obser-

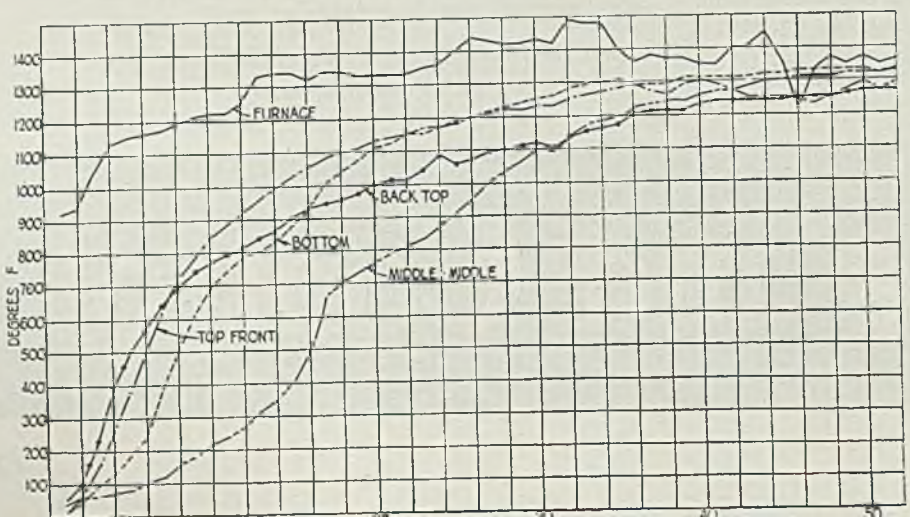


Fig. 1—Annealing temperatures to which the bands were subjected for 52 hours

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This newly-developed equipment g improves crane operation by prote operators from *excessive heat, fume metallic dust.*

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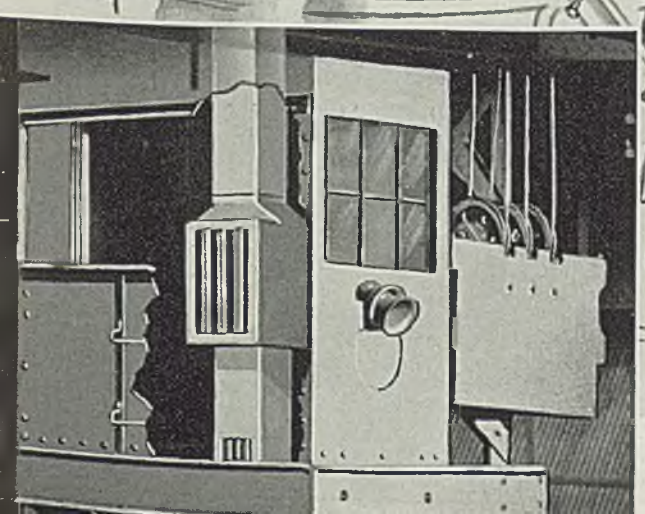
A Small Investment i Lintern-Aire Conditio Repays Many Times O

This remarkable unit actually lower incoming air as much as 20° F by me ical means when conditions require— lowest, practical effective temperatu Keeps operator enveloped in an a phere of *clean*, rapidly circulating, air.

For existing as well as new cranes—t cabs or stationary cabs. No lost ti installing. Send for recommendati discover its many economies and be



vations on the Effect of Small Quantities of Tin in Steel," which was published by the British Iron and Steel Institute; No. 1, Vol. 107, 1923. Their results, based upon experiments made with medium carbon steels, indicate that the presence of tin in small quantities had a harmful effect upon the ductility and that steel rails containing more than 0.06 per cent tin were unsafe. They also noted that the harmful effects of tin increased in direct ratio to the carbon content.

The British Iron and Steel Institute, No. 2, Vol. 128, 1933, contains an article, "The Effect of Tin as an Impurity in Mild Steel," by J. H. Andrews and J. B. Pelle, following experiments made upon mild steels containing 0.05 to 0.63 per cent tin. The results of this investigation suggested that small amounts of tin affected the shock-resisting properties of mild-carbon steels but not to any considerable extent when present in amounts less than 0.20 per cent tin. They also found that heat treatment minimizes the adverse effects of tin upon the impact strength.

Proceedings of the Twentieth Open-Hearth Conference of the iron and steel division of the American Institute of Mining and Metallurgical Engineers, Birmingham, Ala., April 7 to 9, 1937. "Basic Open-Hearth Pig Iron," page 48; and "Manufacture of Low-Carbon Steel by the Basic Open-Hearth Process," page 88; both by the author.

Modern Practice Considered

In the following experimental data all that pertains to sheets produced from sheet bar on hand mills and treated by normalizing and box annealing, has been deleted and only material processed by the continuous cold strip method and box annealed is offered due to the rapid spread of the new system of processing. Further tests are offered in the sequence of their development.

Test No. 1: Light-gage tin mill enameling stock produced at a plant purchasing the hot bands; hence, little information existant of history previous to cold reduction.

Ladle Analysis

Element	Per cent
Carbon	0.07
Manganese	0.30
Phosphorus	0.007
Sulphur	0.026
Copper	0.12
Tin	0.052

This steel was of the rimming type and processed from the ingot into slabs and hot rolled into bands. The hot bands, cold reduced to 0.012-gage x 11 1/16 x 88½, were used ultimately for miscellaneous enameled kitchen utensils. No segregation tests at this time were made.

Annealing was conducted in three different boxes with other similar material having 0.022, 0.016, 0.014 and 0.012 per cent of tin respectively. Each box contained eight lifts, two of which were tops corresponding to the top of the ingot. These were placed one on the top of the box and one on the bottom for the sake of uniformity in testing. Figs. 1, 2 and 3 show graphically the annealing temperatures and time. Test results follow:

Box position	Rockwell 15T End	Rockwell 15T Center	Olsen End	Olsen Center	Location in ingot
Top	70	70.5	330	330	Bottom
Top	72	71	343	331	Bottom
Bottom	69.5	70	339	340	Top
Bottom	70	70	340	340	Top
Top	72	73	340	340	Top
Top	72	74	340	342	Top
Bottom	70	70	335	337	Bottom
Bottom	71	72	345	348	Bottom

The data show the tests are uniform regardless of their corresponding location in the ingot or the position in the box. The test and the high tin material were exactly in line with those obtained on the lower tin content material. The inspection standard for Rockwell 15T scale was under 75.

The second test was that of 0.20-gage (0.0375-inch) 18 x 105.

Ladle Analysis

Element	Per cent
Carbon	0.08
Manganese	0.32
Phosphorus	0.009
Sulphur	0.025
Copper	0.18
Tin	0.078

This steel was rimmed in 24 x 60-inch molds, reduced by hot rolling into 0.090 to 0.100-gage bands, pickled and cold-reduced to 0.0375-gage and cut to length. The sheets were charged into the annealing furnace without any other treatment such as wash-pickle, etc. The weight per box was 105,000 pounds. Four thermocouples were placed in the charge: one was located at the top front, another at top back which are the highest temperature areas of the charge and for the greatest time duration. Another couple was placed at the bottom and the fourth couple was at the middle middle or the lowest temperature area and for the least time duration. The control and temperature equipment was modern and automatic. Four slabs were obtained from each ingot and the product from the one top slab of each were kept separate throughout processing in order to determine the effects of general segregation on the physical properties. The annealing temperatures reached approximately 1300 degrees Fahr. on the hot wires and 1280 degrees Fahr. on the cold wire or middle middle. Physical data are shown in table above.

Hrs. above 1240° Fahr.	Rockwell	Olsen	Elastic, lbs./sq. in.	Ultimate, lbs./sq. in.	Elongation 2"	Elongation 4"	Elongation 8"
18	44/47	422	30,110	47,435	51.0	40.0	32.5
12	45/45	418	26,305	46,950	53.0	40.0	31.0
19	43/44	419	25,630	46,370	53.0	41.5	32.8

These results correspond with those obtained on similar material containing extremely small amount of tin contamination. The tests also show excellent physical properties possessing uniformity; practically no wide variation of values exists between the uppermost portion of the usable ingot and that of the balance.

At this time several heats were charged using a larger amount of detinned scrap in the open-hearth charge in order to obtain a higher tin analysis. These heats contained 0.047, 0.057 and 0.078 per cent tin, respectively. All material was processed as described and their analysis

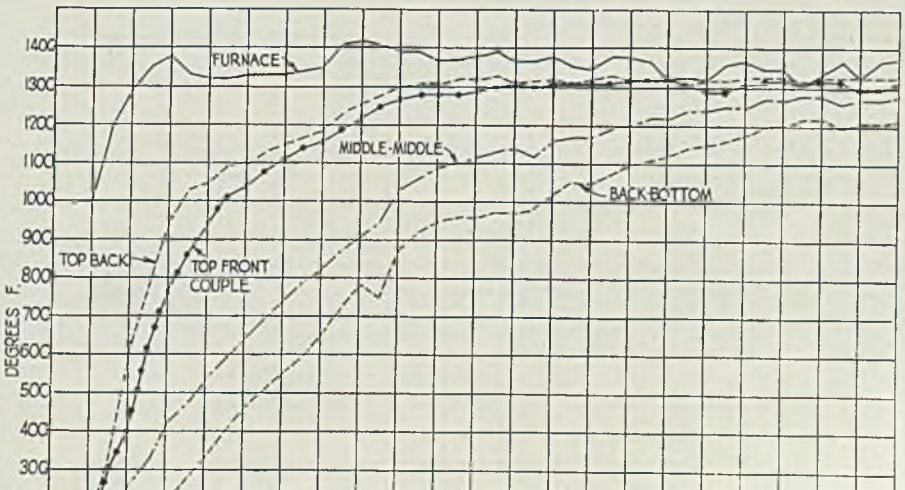


Fig. 2—Annealing temperatures to which black plate was subjected for 44¾ hours

ANALYSIS

Element	Group 0.047% Tin	0.057% Tin	0.078% Tin
Carbon	0.09	0.07	0.08
Manganese	0.34	0.29	0.36
Phosphorus	0.008	0.011	0.008
Sulphur	0.025	0.027	0.027
Copper	0.14	0.11	0.12
Tin	0.047	0.057	0.078

CROP TESTS*

Top middle carbon	0.09	0.06	0.07
Top edge carbon	0.06	0.04	0.04
Top middle sulphur	0.041	0.055	0.046

and test results will be summarized herewith.

The 0.047 per cent tin group was sheets of 0.037-gage, 59¾ inches wide and 131⅜ inches long. Forty-eight tests were taken and showed Rockwell hardness, B scale, of 40 to 47 where only six tests were over 45 and only three at 40. Olsen values (not lubricated), 0.418 to 0.430; Elastic limit, 27,035 to 35,600 p.s.i.; ultimate, 43,170 to 52,052 p.s.i.; elongation, per cent in 2 inches, 50.5 to 56.5 per cent, in 4 inches, 39.0 to 45.0 per cent and in 8 inches, 30.0 to 34.7 per cent.

The 0.057 per cent tin group was sheets of 0.0375-gage, 49½ inches wide and 60 inches long. The physical values of this group were somewhat better than those of the previous group although the Rockwell was as high as 48 in several instances.

Higher Temperature Used

The 0.078 per cent tin group was composed of sheets of 0.0375-gage 48-inches wide and 115¾ inches long. In view of the high tin content and to insure the most suitable test the annealing temperature was increased approximately 20 degrees and the soaking period about 2 hours. The results obtained were Rockwell, B scale, 39 to 44; Olsen values were 0.417 to 0.428; elongation in 2 inches, 60.0 per cent, in 4 inches, 46.0 and in 8 inches, 32.5 per cent. A check sample of this group was taken by folding a cross section of the sheet upon itself and drilling through the several surface and core areas. The check analysis showed carbon 0.04, manganese 0.31, phosphorus 0.008, sulphur 0.029, copper 0.13 and tin 0.110. Incidentally, this material was used for quarter panels. Another feature was that the samples when tested for age-hardening showed an increase of about 3 points in Rockwell hardness in approximately three days; no further increases were noted during a 4-month period.

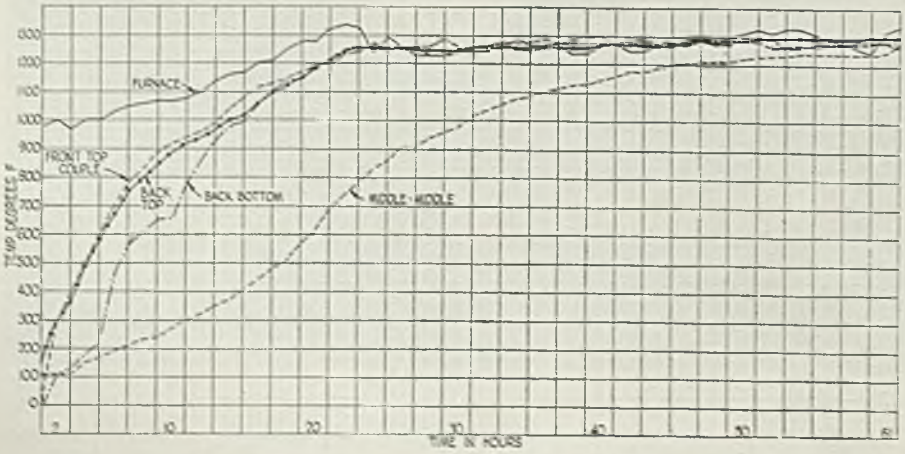
*With the analysis we add crop analysis which is qualified thus: After years of extensive testing for segregation by analyzing split ingots and establishing crop test by cutting a cross section of the slab located at the bottom, middle and top of the ingot it was definitely determined the greatest segregation existed between core and edge at the top of ingot. That is, immediately below the discard section the core would contain the highest concentration of segregation while the edge the lowest of these elements. All along the ingot wall the analysis would be the same and if any lower point did exist it would be at the top edge, therefore these crop analysis conform to this section.

Tin Content Varied

In order to become acquainted with some of the characteristics of high concentrations of tin contamination in steel, the scrap, especially bushings containing tin, was charged in small quantities into the blast furnace and yielded iron containing from 0.020 to as high as 0.037 per cent tin. Utilizing this higher tin content iron, a heat of steel was produced anticipating an addition of virgin tin to several of the ingots; to one ingot, 80 pounds were added and to another 40 pounds. It was assumed that the first ingot would contain from 0.25 to 0.30 per cent tin and the second about 0.15 per cent.

These two ingots were heated and rolled into slabs, four slabs being obtained per ingot. A crop from the top of each ingot was taken and analyzed at the edge and center or core area. The edge in both instances analyzed 0.09 per cent tin whereas the core of the ingot having the greatest addition of tin analyzed 0.85 per cent. The slabs were reheated and rolled into hot strip. Slabs containing the higher and lower percentages of tin processed with normal appearance while those of intermediate tin range developed a peculiar color, and appeared to be extremely hard although no noticeable difference showed on the mill or motor load. The coils then were pickled, tandem cold rolled, annealed and skinned passed. In the cold reduction another peculiarity was evidenced coinciding with that occurring in hot rolling i.e. the low and high tin ranges rolled as a normal product while material of some intermediate tin range was extremely hard; in fact, the material squeeled excessively during reduction and broke from the band edge into the strip from 4 to 8 inches. Other than these two instances the processing was perfectly normal.

Fig. 3—Annealing temperatures to which black plate was subjected for 61 hours



Sheets Analyzed for Tin

After annealing the steel at temperatures reaching 1340 degrees Fahr. at the hot points and 1300 degrees Fahr. at the low range and over 1240 degrees Fahr. at the low point for 34 hours, the physical results in all tin ranges were below 45 Rockwell, B scale, before skin or tempering cold passing. At this stage every sheet was analyzed for tin according to standard practice, that is, by folding a strip upon itself, drilling through the several surfaces and analyzing each for tin. The tin content varied from 0.09 up to 0.37 per cent. The ladle analysis for elements other than tin follows:

Element	Per cent
Carbon	0.08
Manganese	0.31
Phosphorus	0.008
Sulphur	0.029
Copper	0.14
Chromium	0.05
Nickel	0.07
Molybdenum	0.02
Vanadium	trace

Before skin passing all material had a Rockwell value of 45, B scale; cold reduction was approximately 0.005-inch. The ultimate Rockwell was under 48, B scale, excepting an intermediate tin range where the skin pass increased the Rockwell value up to 68. Not having a sufficient number of tests at each point of tin analysis it could not be determined where this critical range existed but it appeared to be somewhere between the points of 0.19 and 0.27 per cent tin. Other physical properties conformed to that shown by the Rockwell test and indicated the critical intermediate range while those above or below were in line with the test of other extra deep drawing material.

(To be continued)

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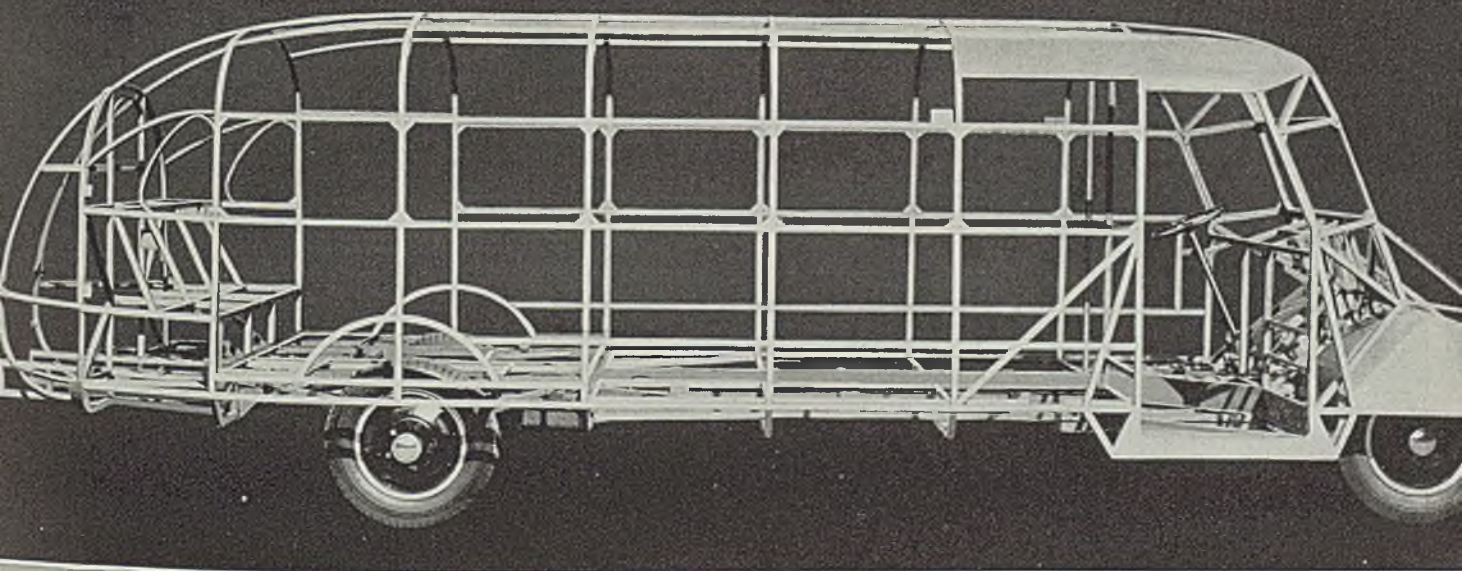
It will be to your advantage today—and to your profit tomorrow—to have complete information on Republic ELECTRUNITE – the modern electric resistance welded tubing. Its consistent uniformity in diameter, wall thickness, concentricity and strength . . . its fine, smooth surface finish . . . and its easy workability . . . speak for themselves to those who use and fabricate tubing.

Let us send you the complete story and a copy of the Handbook of Welded Steel Tubing. Let our engineers assist you in selecting the most efficient and economical tube from the many analyses, shapes, sizes and gauges available. Write—Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio — *world's largest manufacturer of steel and ferrous alloy electric resistance welded tubing.*



REPUBLIC

ELECTRUNITE

Steel Aircraft

High fatigue strength of stainless admirably fits it for aircraft. Effective use demands thick-metal structural design be discarded, new shapes and forms created for thin material

By E. J. W. RAGSDALE
Edward G. Budd Mfg. Co
Philadelphia

■ A LIMITING factor in aircraft production in World War I was spruce.

When aircraft outgrew wooden construction, duralumin seemed a metallurgical miracle. With one-third the weight, it had the same strength as ordinary steel. Accordingly, one could build in dural to the same strength and at one-third the weight of ordinary steel construction.

High-tensile steels were known but had had little structural application. True, the British experimented with them. Riveting proved a problem, as also did corrosion.

Stainless steel first entered the picture in 1931, when the Budd company built an amphibian plane patterned largely after a wood-built Savoia-Marchetti. It was a success in every department and demonstrated that high-tensile steel had a definite place in aircraft construction. Unfortunately, perhaps, the company did not follow through after its first effort. Railway equipment then seemed a more promising field and stainless steel is firmly established there today. Only in the past two years has the company resumed its interest in aviation. It has found use of stainless steel is favored by the increased size of ships and the fact that cost of maintenance now assumes importance over obsolescence.

In the meantime, dural construction has had a wonderful development in both laboratory and shop. It has been perfected to the point where the metal is used to excellent advantage. Any initial work in stainless, therefore, must compete with dural in its present highly developed state and not as it was used ten years ago. Research in stainless so far indicates that this can be done. Yet we have not more than begun to find out how to use stainless steel to best advantage.

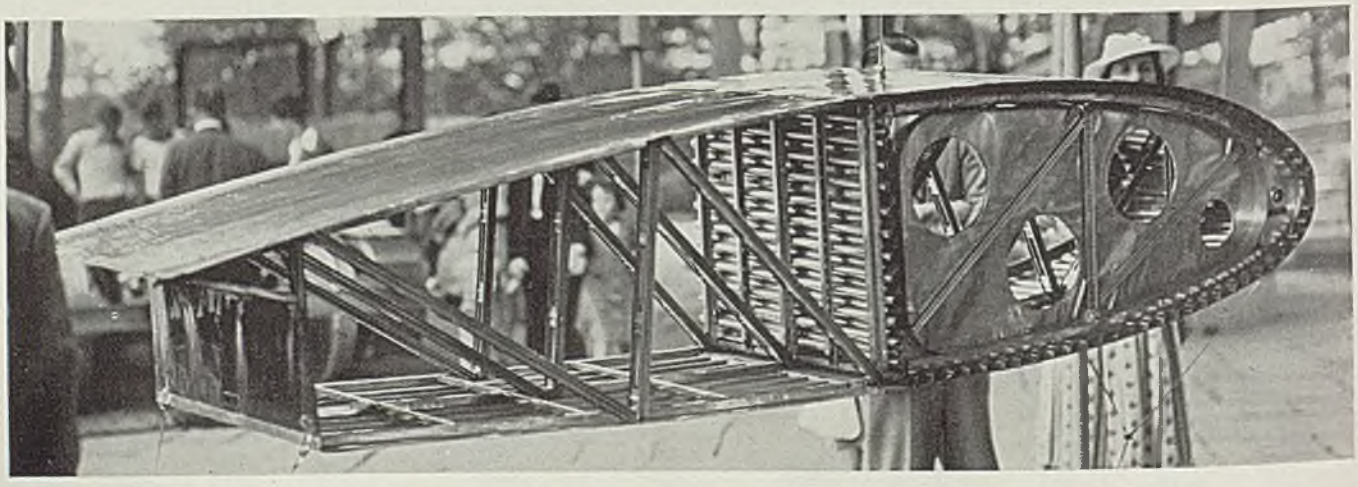
Most structural properties of dural and high-tensile stainless steel balance out against weight. While stainless is three times as strong in ultimate tensile, in yield and in modulus of elasticity, it also is three times as heavy. Actual weight ratio of stainless to anodic treated dural is 2.85 to 1.

Steel Much Stronger

From a design point of view, the one great advantage of the lighter alloys is their bulk. This makes for stability of simple structural shapes and of panel plates. In other words, the metal has appreciably smaller tendency to twist or buckle under load. Stability ratio of aluminum to steel is 9:1. This would seem to be a serious handicap to steel design.

Actually it *is* a handicap but one which can be overcome. As an instance, a thin steel sheet with a corrugated backing makes a panel which can be ten times more stable than a single plate of light alloy of the same weight. Similarly, columns and other structural members can be rendered stable by use of closed or stabilized open sections.

The outstanding advantage of 18-8 is that it can be welded readily and



Wing section designed for a transport plane, shows how thin stainless steel can be used effectively by proper design of sections. Material here is 0.004 to 0.016-inch thick

PLAY BALL! is in the Headlines

"They laughed when I stepped up to the mound to inaugurate the '40 season. They didn't know that I pitch a 24-hour-a-day, 365-day-a-year game in bigger lots than this, the world over—that in my league I'm tops because *my control is perfect*.

"When the man behind the mask signals for a *fast one,* I can pour it *right down the groove*. When he calls for *curves,* I have thousands of volt-amp. curves to give him his heart's desire. I can burn 'em across the plate, skim along the edge or nip the corners. My delivery is smooth in all styles—south-paw, down-hand or overhead because my arc is *stabilized*.

"This *perfect control* is the result of the New '*Shield-Arc*' (or '*Shield-Arc Jr.*') with its Job Selector and Stabilized Current Control. They give me fine, accurate control of both slope of volt-amp. curve (ARC BEHAVIOR) and amperage (ARC INTENSITY). No other welding team has this winning combination. Try us.

"Yours for a bigger welding gate and more satisfied fans for your products or services,

"FLEETWELD ROD"

World's Most Famous Welding Pitcher,
Owned, Controlled, and For Sale by
THE LINCOLN ELECTRIC COMPANY,
Cleveland, Ohio.

Largest Manufacturers of Arc Welding Equipment in the World.

A HIT!

Users of the New 200-amp. "*Shield-Arc Jr.*" report that this $243 welder covers the entire welding front. This all-purpose d. c. outfit enables you to do *more* welding and to do it *faster* and *easier*. Can be used on any thickness of plate. Welds all common metals and alloys—all types and sizes of work. Current range 40 to 250 amps. Accurate arc control with Job Selector. Big overload capacity. Get details today!

Call the nearest Lincoln office or mail the coupon for details.

LINCOLN "*SHIELD-ARC*" WELDERS

The *head line* for profits on the welding front

THE LINCOLN ELECTRIC CO., Dept. Y-20, Cleveland, O.

Send free bulletin on New motor-driven "*Shield-Arc Jr.*"

Name _____ Position _____

Company _____

Address _____

City _____ State _____

cheaply by the Shotweld system. Resulting weld has exactly the properties desired. The weld metal has a shear strength of from 75,000 to 90,000 pounds per square inch and an elongation of 65 per cent. It is strong and tough.

A standard shop test is to twist the weld through 90 degrees. It should not rupture much before this. Furthermore, metal next to the weld is not impaired.

Stainless 18-8 is the only known structural metal which actually can be toughened and improved by a welding operation.

The Shotweld system makes possible single lap joints having an efficiency of 92 per cent. In rivet practice, regardless of the metal, an efficiency of 70 per cent is high. What this means in structural assembly should be obvious.

Stainless Resists Impact

Aside from structural worth, stainless has several other qualities which recommended themselves to aircraft construction.

It is corrosion resistant.

It has the highest known resistance to impact of any structural metal and it does not lose this quality even at 100 degrees Fahr. below zero.

As phenomenal as is its corrosion resistance, the heat resistance of 18-8 stainless is even more remarkable. At a temperature when light alloys melt entirely, stainless steel has the strength of mild steel at room temperature. For this reason stainless already has found extensive application for fire walls and exhaust manifolds.

However, one property of 18-8 stainless which has rarely been appreciated is its extreme resistance of fatigue. The fatigue or endurance limit of a metal is that stress in pounds per square inch below which the metal repeatedly can be loaded without causing failure. For cold-rolled 18-8, it is 79,000 pounds per square inch; for dural, it varies from 10,000 to 15,000 pounds per square inch.

Allows Higher Payloads

The figure of 79,000 pounds per square inch as an endurance limit is not impressive alone. It becomes more so, however, when it is stated as being two-thirds of the yield point. Endurance limit of dural is less than one-third its yield strength.

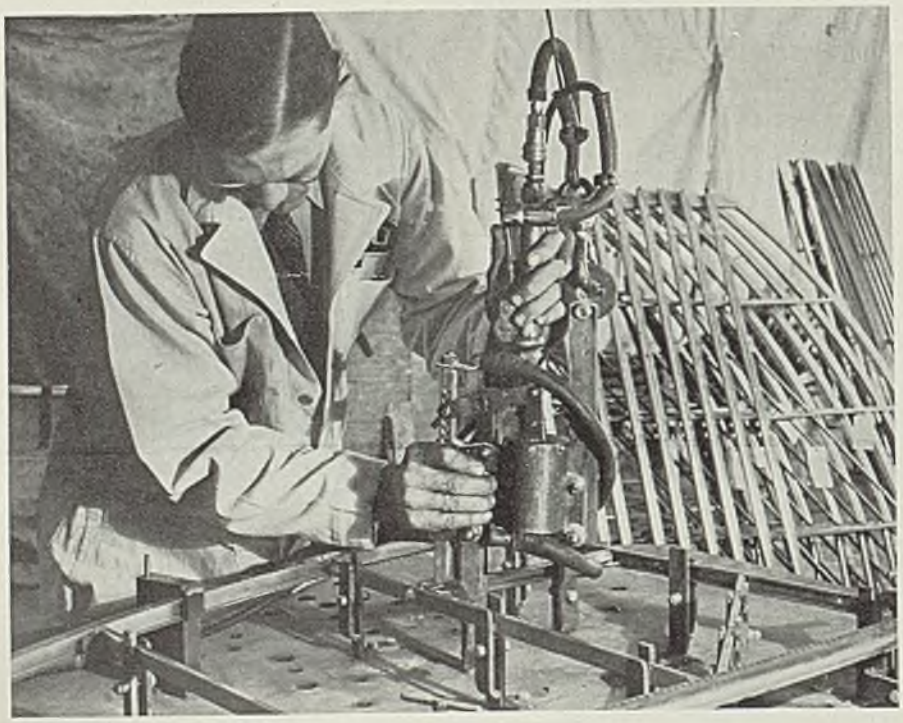
Fatigue limits are of interest chiefly in connection with fatigue exposure. Fatigue exposure, in turn, is a function of overloading.

To appreciate the importance of fatigue strength, consider transport airplanes built to an ultimate factor of five. In quiet, normal flight, the metal is stressed to a factor of one under steady static stresses. No flight, however, is ever made without exceeding this factor. In fact, a factor of two often is exceeded due to added dynamic loads. Every time this happens, light alloys are stressed beyond their endurance limitation. Every time such limit is invaded, by just so much is the fatigue resistance reduced.

It takes, however, a factor of almost four to reach into the endur-

(*Please turn to Page* 81)

Welding jig and gun used in assembly of a rudder for a small sport plane. Material is 0.012 to 0.020-inch thick



Simplified Practice on Eaves Trough Revised

■ Copies of the first revision of Simplified Practice Recommendation R29, eaves trough, conductor pipe and fittings and ridge rolls, are now available, according to the division of simplified practice, national bureau of standards, Washington. This recommendation, which establishes a simplified schedule of sizes for eaves trough, etc., and fixes a minimum gage weight for metals used in their manufacture, first became effective in 1925. It was reaffirmed without change annually from 1925 through 1932, and again in 1935 and 1937.

The current revision further reduces sizes of eaves trough by the elimination of the 3½ and 8-inch sizes, adds a 1½-inch diameter plain round conductor pipe, and enlarges the scope of the recommendation to include sizes and styles of box and roof gutters and plain ridge rolls. The revision, according to the committee, effects an elimination of about 200 items in eaves trough, ridge rolls, and their accessories, and materially reduces the variety of box and roof gutters.

Sound Arc Welds Made On First Attempts

■ A striking demonstration of the reliability of modern arc welding occurred as a feature of a 5-day course in welding design and practice held at Pittsburgh recently under auspices of the Lincoln Electric Co., 12818 Coit road, Cleveland.

Five of those attending the course —an assistant manager of a fabricating plant, a chief engineer of a construction company, a designing engineer, a shop foreman and a plant superintendent—were invited to make three welds each. When tested, all the welds showed a tensile strength in excess of 50,000 pounds per square inch. They were the first welds these men had ever made.

Statistics of Metals

■ *Metal Statistics*, cloth, 692 pages, 4 x 6 inches; published by *American Metal Market*, New York; supplied by STEEL, Cleveland, for $2.

The thirty-third annual edition, this volume has been enlarged and refined, presenting a wealth of information on ferrous and nonferrous metals and miscellaneous economic subjects.

Additions include statistics on consumption of scrap and pig iron in steelmaking, exports of galvanized sheets, apparent consumption of tin plate, domestic production of hot-rolled alloy steel. Several new nonferrous tables have been added.

MR. A. is a parts manufacturer. He is bedeviled with production problems. His costs are running up to where they are eating big holes in his profit. Like anyone else, he's interested in profits.

MR. B. makes electrical appliances. Ask him what his troubles are and he'll tell you that another manufacturer is getting the business. He can't get "Box Office" appeal into his product.

MR. C. says that his new designs would sweep the market clean . . . if he could only produce them. He has a fabricating problem that really has him bothered.

MR. D. makes specialties so do a lot of other manufacturers make specialties. H problem is getting prices to where he can compet make a fair profit.

4 MANUFACTURERS 4 PROBLEMS

1 Simple Answe

HERE are four pretty stiff questions. Yet the one answer to all of them is American Quality Cold Rolled Strip Steel. This product answers Mr. A's problem because it fabricates easily, at high speeds and at low cost.

Mr. B., who is looking for "Box Office," will find that American Quality Cold Rolled Strip Steel has a smooth, eye-appealing finish that will give his product a front row seat in dealers' displays. As for Mr. C.—our Cold Rolled Strip Steel is available in a complete range of widths, edges, tempers and finishes, which answers his problem. And the fact that this product is a comparatively inexpensive raw material, along with its other advantages, should take care of Mr. D.

Whether you make complete products or parts, our engineers and metallurgists can be of help to you. Call American Steel & Wire Company—today!

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UNITE
STATE

More Sensitive Control

New automatic combustion control for chain grate, stoker-fired boilers is unusually sensitive to load variations. It compensates for the changes in heat value, and the moisture in the fuel

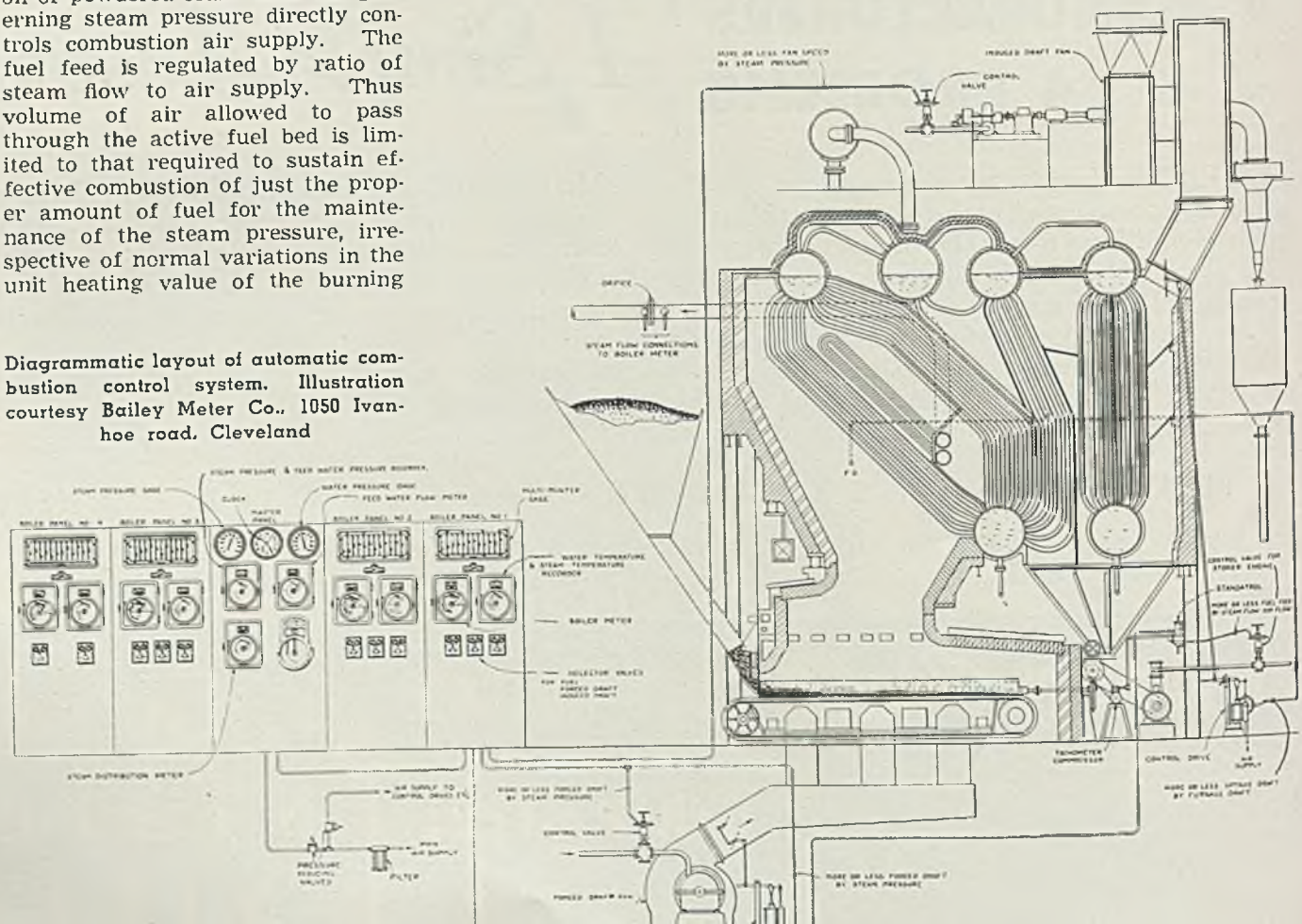
By REGINALD TRAUTSCHOLD
Engineering Consultant
Caldwell, N. J.

■ MARKED advance in automatic combustion control is exemplified by regulatory methods now employed for four 500-horsepower, chain grate, stokered fired boilers at a prominent steel mill in New York state. The system is so sensitive that usual variations in heating value and moisture content of coal, and even normal wear of stoker equipment, are effectively compensated in the control.

Boilers burning coal in solid form are inherently somewhat more responsive to changes in volume of air supplied for combustion than are steam generators operated on gas, oil or powdered coal. Here the governing steam pressure directly controls combustion air supply. The fuel feed is regulated by ratio of steam flow to air supply. Thus volume of air allowed to pass through the active fuel bed is limited to that required to sustain effective combustion of just the proper amount of fuel for the maintenance of the steam pressure, irrespective of normal variations in the unit heating value of the burning coal, its moisture content or changes in steam demand.

Operating mechanism of the master pressure controller is connected to main steam header and serves the entire battery of boilers. It consists essentially of a pressure element attached to a pilot valve actuated by a supply of compressed air under constant pressure. See diagram below. Any change in steam demand pressure repositions the setting of this pilot valve, automatically effecting a proportional increase or decrease in the air pressure in the outlet line leading from the pressure controller to the diaphragm control valve of the turbine-driven induced-draft fan.

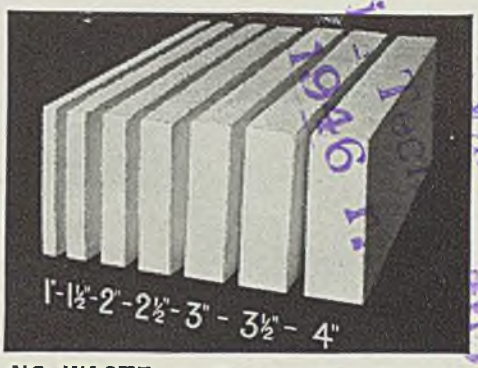
This loading pressure regulates the steam supply to the fan turbine, admitting more or less steam for the adjustment of the fan speed, hence changing the induced draft according to existing demands for steam. At the same time, speed of forced draft fan is lowered or raised to secure the best and most economical fuel combustion attainable for



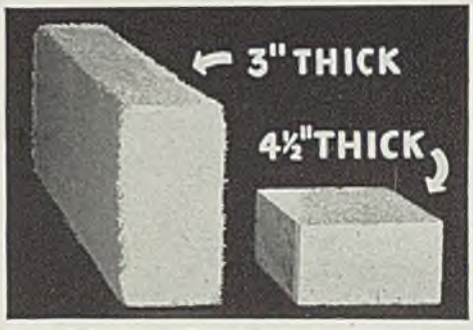
Diagrammatic layout of automatic combustion control system. Illustration courtesy Bailey Meter Co., 1050 Ivanhoe road, Cleveland

WHAT OTHER INSULATION GIVES YOU *ALL* THESE ADVANTAGES?

Standard throughout the steel and metal-working industries, J-M Superex has proved itself the most efficient, economical insulation for all types of high-temperature equipment... Check these money-saving features



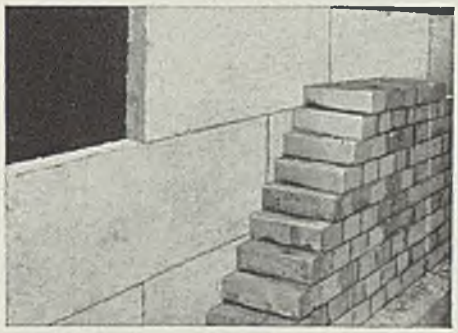
NO WASTE... You can buy the exact thickness you need when you use Johns-Manville Superex. This modern material is available in the wide range of thicknesses shown above . . . and in any intermediate thickness you might want.



HIGH INSULATING EFFICIENCY... J-M Superex has an exceptionally low thermal conductivity, even at high temperatures. It is frequently possible to use 3 inches of this durable, efficient insulation in place of 4½ inches of other materials.

LOW INSTALLATION COSTS... Superex is supplied in large lightweight blocks that are easy to handle and install. As much as 3 sq. ft. can be applied in one unit. Think what this means in time and labor savings!

SAFETY AT HIGH TEMPERATURES . . . Made of asbestos and diatomaceous silica, Superex has unusually high heat resistance. Thousands of installations in service up to 1900° F. prove its dependability and long life.



LESS HEAT LEAKAGE... Joint losses are a potential source of costly fuel waste. The large-size units in which Superex is supplied reduce the number of joints needed . . . keep such leakage at the absolute minimum.

WHEREVER a block insulation is needed, you can't go wrong with J-M Superex. For over 15 years, it has been proving its superior efficiency and dependability for high-temperature service. You'll find Superex ideal for insulating slab-heating, annealing and all types of controlled-atmosphere furnaces, hot-blast stoves, open-hearth regenerators, soaking pits, producer-gas mains, etc. For details, ask for brochure IN-55A. Johns-Manville, 22 E. 40th St., N. Y. C.

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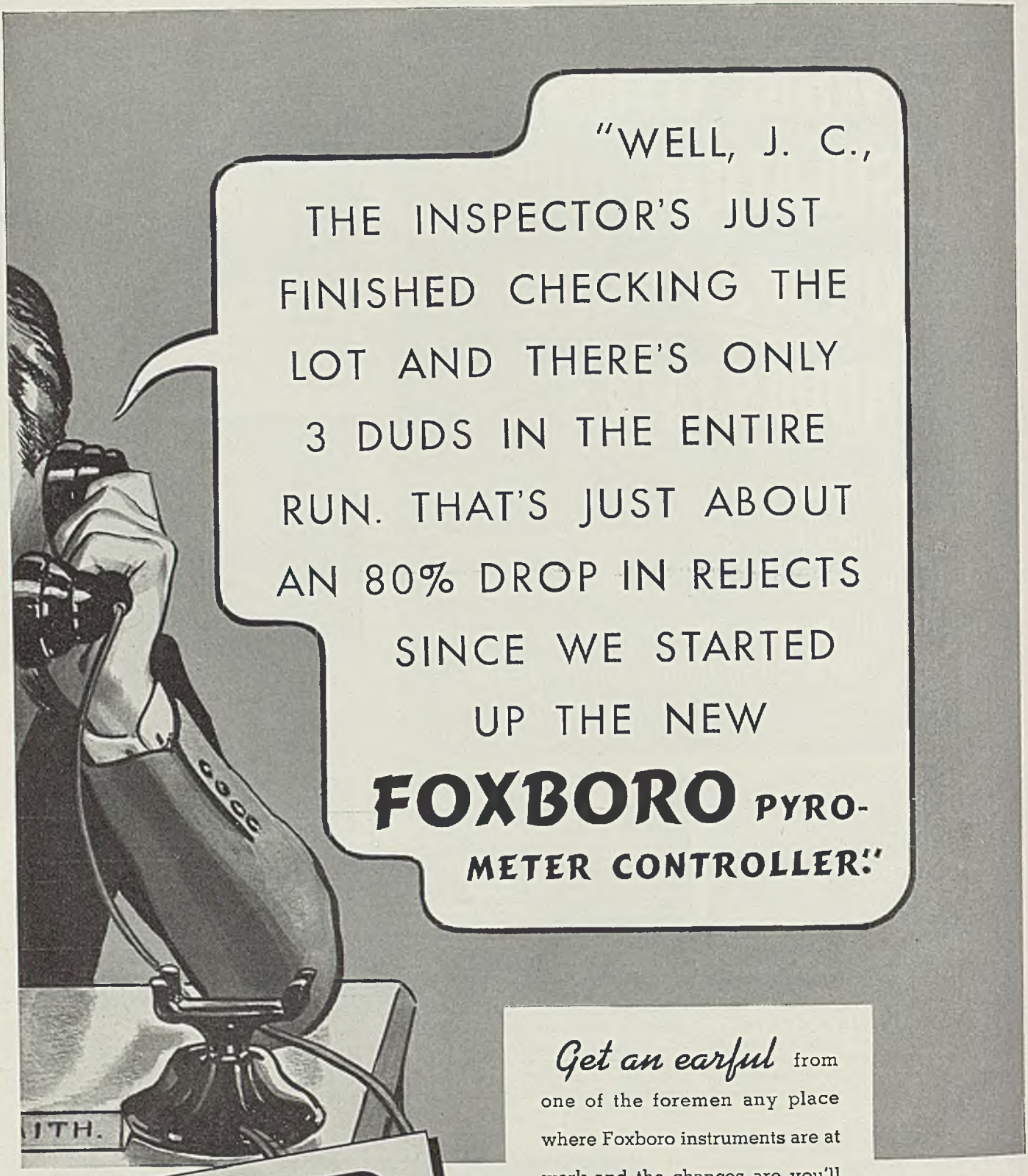
INDUSTRIAL INSULATIONS

For every temperature... for every service condition

SUPEREX...85% MAGNESIA...JM-20 BRICK...SIL-O-CEL C-22 BRICK ...SIL-O-CEL NATURAL BRICK...J-M NO. 500 CEMENT... SIL-O-CEL C-3 CONCRETE...MARINITE



Get an earful from one of the foremen any place where Foxboro instruments are at work and the chances are you'll hear something that adds up to the same thing: *Because Foxboro has the edge in practical performance, Foxboro gets the vote of the men in the plant.*

THE FOXBORO CO., 118 NEPONSET AVE., FOXBORO, MASS., U.S.A. • BRANCHES IN 25 PRINCIPAL CITIES

generation of the required steam.

Simultaneously fuel feed is regulated by a pilot valve operated from *both* the steam-flow and the air-flow mechanisms of boiler meters with which each of the four steam generators is provided. These key instruments record steam flow and air flow to each of the boiler units on a common, slowly rotating chart. They are calibrated so the most satisfactory combustion conditions pertain when, and only when, the graphs traced by the steam-flow and air-flow recording pens exactly coincide.

With the pens posting superimposed graphs, the pilot valve is definitely positioned and a definite loading pressure is transmitted to the diaphragm control valve that regulates the steam to the stoker feed turbine. A sensitive balance of the stoker speed (fuel supply) to the volume of air furnished for combustion, as governed by the demand for steam, thus is secured.

Valve Modifies Air Pressure

Should the air-flow record tend to go outside the steam-flow record, thus indicating more air than needed to obtain best boiler efficiency, setting of pilot valve shifts automatically and modifies the air loading pressure on the diaphragm control valve that regulates the amount of steam fed to the forced-draft turbine fan, re-establishing the balance.

On the other hand, should the steam-flow graph tend to pass the air-flow record, indicating a deficiency of air for the existing fuel feed, the pilot valve automatically opens the port controlling the loading pressure on the diaphragm valve that governs the steam pressure on the turbine-driven stoker—restoring the proper balance between the fuel and air by suitable stoker speed adjustment.

Since it is the heat release of the burning fuel that governs the boiler pressure and the steam output for which the speed of the stoker is adjusted, balancing fuel and air supplies by stoker speed adjustment likewise is governed by the heat release of the burning fuel. Consequently, ordinary variations in heating value and moisture content of the coal exert no material influence upon the sensitiveness with which the air and fuel balancing is effected. Neither does progressive wear of stoker equipment exert any effect.

Thus each boiler unit carries its own proportional share of the battery load. Wide operating flexibility is provided by selector valves at the four individual boiler control panels by which control of fuel feed, forced draft or induced draft can be transferred from automatic to manual regulation by simply turning a knob.

Control knobs of these selector valves also may be adjusted so any boiler unit may carry more or less than its share of the battery load, thus providing ready means of cutting out individual boilers or of operating the units at whatever capacity rating the working situation may demand. The return of any boiler or of any phase of combustion control to automatic regulation likewise is done by a knob adjustment.

Important economies have been produced by the system. While they cannot be resolved to dollar and cent values without full knowledge of local expenses and accurate check-ups on plant requirements, nevertheless they are of a decidedly high order. Fuel consumption has been cut since the boilers are operated automatically and constantly at best overall efficiencies for the existing loads. No wasteful or time-consuming "hunting" for correct fuel-air balance occurs.

Increased boiler battery capacity is secured by virtue of the sensitiveness in control exercised over load distribution to the individual boilers under all degrees of steam demand. Punishment and abuse of boilers consequently can be avoided, effectively minimizing boiler and furnace maintenance.

Boiler operation conforms automatically to steam demands, incidental as well as serious waste of fuel and time are curtailed and investments in steam generating and fuel burning equipment are capitalized upon to greatest advantage. Economical operation of boilers for long sustained periods is made possible with boiler outages and maintenance held constantly under close control.

The system can be adapted to a wide range of boiler setups.

Iron, Steel Engineers

(*Concluded from Page* 58)

tors surrounding the choice of the correct motor for any given application were outlined by G. A. Caldwell, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Outlining data required in determining choice, he stated any competent engineer, whether experienced in crane operation or not, could specify a motor which would do the best possible job so long as he has the required data.

Relation of gear ratio to motor selection and control was covered by J. A. Jackson, General Electric Co., Schenectady, N. Y. J. R. Lewis, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., discussed advantages and drawbacks of both series wound and compound motors for crane bridge travel.

Accelerating resistor values, number of accelerating points and number of master points required for best service was the subject of a paper by P. B. Harwood, Cutler-Hammer Inc., Milwaukee. R. I. Puette, Clark Controller Co., Cleveland, talked on maximum and average torque requirements for crane bridge braking.

Discussion of plugging and dynamic braking, outlining resistor values for some types and apprications was given by H. L. Wilcox, Electric Controller & Mfg. Co., Cleveland. J. C. Cox, Wagner Electric Co., St. Louis, described progress made in mechanical brakes for crane bridge travel, particularly hydraulically actuated mechanisms. Because of the length of the program, there was little discussion.

Bulletin Offered on Die Casting Designing

■ Under the title of "Designing for Die Casting", New Jersey Zinc Co., 160 Front street, New York, has compiled 35 pages of notes to serve as an aid to design engineers in availing themselves of the advantages offered by zinc alloy castings.

The bulletin is well illustrated, the illustrations supplementing the discussion of each subject. Some of the subjects mentioned are: Blind holes, bosses, cored holes, draft allowances, fillets and shadow marks. The publication is available to anyone interested upon receipt of a request on a company letterhead.

Material Repairs Concrete Instantly

■ A new, fast drying, premixed material, Speed-Patch, for repairing holes in concrete floors is announced by Rock-Tred Co. Inc., 629 West Washington boulevard, Chicago. It permits repair of concrete floors and outside drives and walks in three minutes or less. Material is of soft, lumpy consistency that dries and hardens upon being tramped into place.

Establish Award

(*Concluded from Page 52*)

capacity for less than 4 hours yet some grades of steel are going into the pits which require 5 hours heating. All of us, he pointed out, should be considering whether we have the right pits and pit capacity to handle delicate steels being made today. We set up a cycle of heats, he stated, for ingots that should be getting in the pits for 5 hours instead of for a shorter period. Our superiors started with the old Bessemers and the ingots were not in the pits longer than 40 minutes. Today in quality steels the ingots require from 3½ to 4 hours in the pits. The important thing to consider in heating ingots is that we are annealing steel, 70 per cent of which requires special attention.

Mill Scale

A small open-hearth shop in the Chicago district was able to increase its take of hot metal from 42 to 50 per cent charge without flushing by the use of roll scale. At a large shop they were able to increase their hot metal charge from 45 to 60 per cent by the use of a combination of hard ore and mill scale using a 50 to 50 per cent mix. A typical charge included scrap, 125,000 pounds; scale, 30,700 pounds; ore, 34,000 pounds; and hot metal, 245,200 pounds. The object behind the combination of scale and ore, as pointed out, is to reduce the silicon content. As a result of this practice production of the furnaces was increased approximately one ton per hour.

Blast Furnacemen Deal With Raw Materials

■ WITH some 58 billion kilowatt hours per year capacity in present waterpower plants and those already authorized by the federal government, it is evident that large power consumers are needed to utilize this output, according to Charles Hart, president, Delaware River Steel Co., Chester, Pa. He pointed out that the government had recommended establishment of an electric ore smelting plant at Portland, Ore. However, Birmingham district appears most suitable from ore, limestone and cost power standpoint.

Power rate for continuous smelting in Sweden is around 3.5 mills per kilowatt hour. This compares with a figure of 1.75 mills specified in recent contracts between the United States government and Sierra Iron Co. Average cost of generating power by Tennessee valley authority system is said to be 1.51 mills per kilowatt hour. With above power rates it is thought possible to operate electric smelting furnaces at a profit, provided adequate sales outlets are available.

Most such Swedish furnaces employ Soderberg type electrodes, a continuous electrode made on the job by placing a self-baking electrode material in a steel shell, subsequent sections of the shell being welded on as electrode is fed into the furnace. In subsequent discussion, A. H. Fosdick, superintendent blast furnaces, Bethlehem Steel Corp., Bethlehem, Pa., pointed out that electrode consumption of 20 pounds per ton given by Mr. Hart was low. Average consumption that might be needed was estimated at from 40 to 70 pounds per ton.

Comparing costs, pig iron made in a blast furnace was estimated to cost $15 per ton while that made in electric furnace approximately $25 per ton. This was at a power cost of 1.75 mills per kilowatt hour. On basis of 1000-ton blast furnace and 50-ton electric furnace, 20 electric furnaces would be needed to equal the output of one blast furnace. These would cost at least twice as much as the blast furnace as far as the original investment was concerned.

One authority, however, says unless current can be had at 1 mill per kilowatt hour, electric furnace smelting is not feasible in this country.

Left to right: A. H. Fosdick, superintendent blast furnaces, Bethlehem Steel Corp., Bethlehem, Pa.; B. M. Stubblefield, superintendent blast furnaces and coke ovens, Youngstown Sheet & Tube Co., Youngstown, O.—co-chairmen of the Wednesday morning session of the Blast Furnace and Raw Materials Committee; Charles Hart, president, Delaware River Steel Co., Chester, Pa., who spoke on "The Production of Pig Iron in the Electric Blast Furnace"

Ore Blending System

A new system for blending ores was described by John F. Meissner, Robins Conveying Belt Co., Chicago. This system, recently installed in an English plant at Scunthorpe obtains remarkable uniformity of chemical and mechanical mixtures. It blends particle sizes as well as chemical constituents. Proper blending of ore at this location is extremely important as in a 27-foot face of open pit quarry here, iron content varies from 15 to 35 per cent. Also silicon and limestone contents vary widely. However, by use of this blending method, variations in limestone and silica are kept within 1 per cent. In fact, it is estimated that coke consumption has been cut about 10 per cent by the more uniform material obtained from blending. With recently installed furnaces and with crushing, grading and better practice generally, it now is possible to obtain 600 tons per day output per furnace compared with 322 previously. Coke consumption is around 2100 pounds per ton of pig as compared with 2760 to 3000 pounds previously. Flue dust has been cut from 380 to 56 pounds per ton of pig.

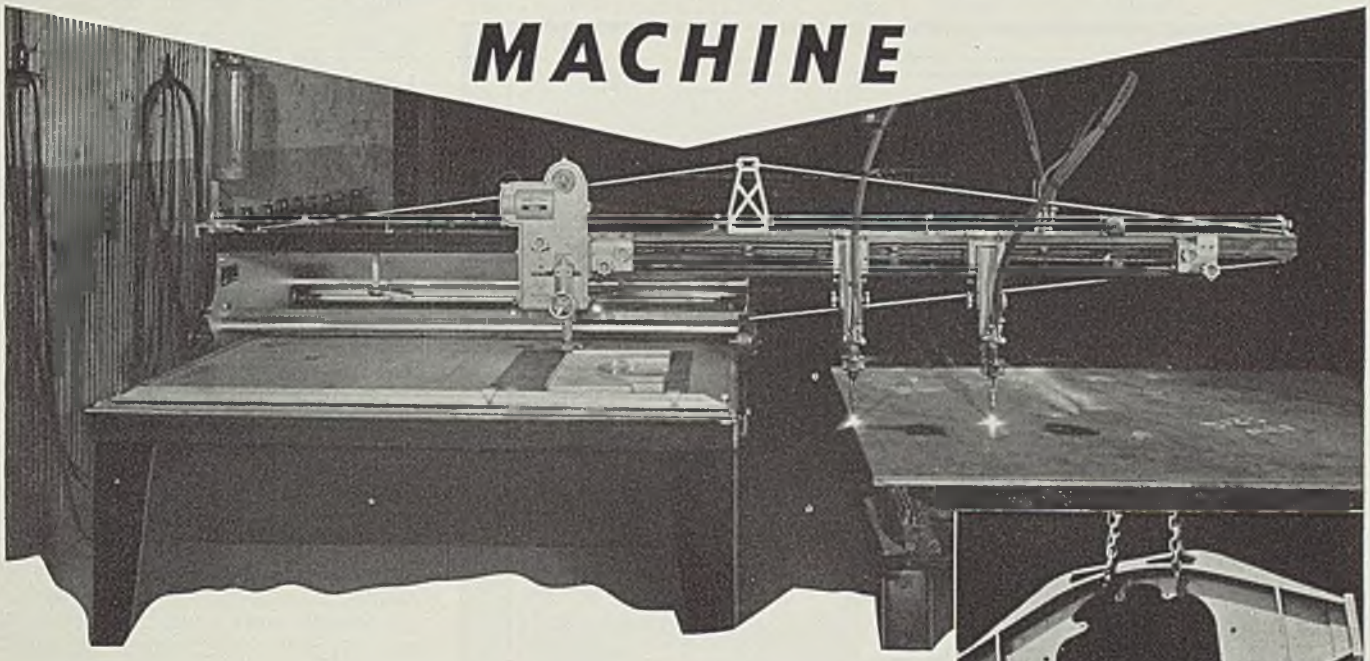
Credit for a good portion of the improved results is due to the blending system. Raw ore from the open pit mines is distributed in thin layers horizontally and later reclaimed by taking off vertical slices from the beds, thus obtaining the uniformity desired. Beds are in parallel rectangles, enough ore being bedded down one day to take care of the following day's requirements. Tri-

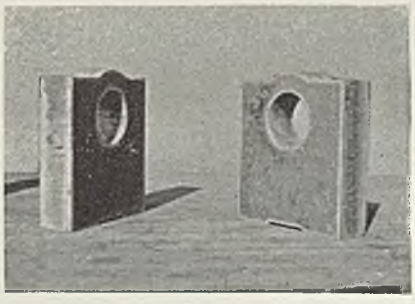
INCREASE YOUR PROFITS

IMPROVE YOUR PRODUCTS

STEP UP YOUR PRODUCTION

NATIONAL SHAPE CUTTING MACHINE





THE National Shape Cutting Machine brings you advantages so advanced as to make obsolete other methods and equipment for the cutting of tailored steel shapes.

The National Shape Cutting Machine is more than a cutting tool — it is a flame shaping machine capable of cutting an infinite variety of shapes from steel plate, slabs, billets or forgings. It makes more profitable the manufacture of parts, bases, floor plates and all types of pieces that can be fabricated more satisfactorily from such stock materials as bars, plates, sheet and angles. National Shape Cutting Machines are fast and they cut with such precision and cleanness that machining is seldom necessary. They permit the use of lighter weight, stronger and cheaper materials with a definite improvement in quality and appearance in the finished product. Through the elimination of expensive patterns, production costs are lowered and perfect duplicates are possible.

The pictures illustrate the versatility of the National Shape Cutting Machine. Note the clean cuts, the absence of machining, the trueness of line and shape.

Any industry, large or small, which manufactures ferrous metal products needs the advantages that only National Shape Cutting Machines can give it.

There is a model to fit your requirements.

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PLANTS AND WAREHOUSES IN PRINCIPAL CITIES

angular cross section of each pile is approximately 60 feet wide at base and 22 feet high at apex with about 25 gross tons of ore per lineal foot of pile. In depositing the ore, an automatic conveyor with tripper mechanism sprinkles about 175 pounds of ore per foot of travel as it passes automatically back and forth the length of the pile. A pile of approximately 22 feet high requires about 400 passes of the tripper distributing bridge.

In speaking of iron ore concentration and the Lake Erie price, E. W. Davis, director mines experiment station, of Minneapolis, pointed to the need of greater contact between the ore people and the blast furnace men. He said the blast furnace operator should contact the ore man much more than at present if most efficient utilization of ore supplies was to be made. About 20 per cent of the ores coming down are in concentrated form, and trend is to use up higher grade ores. Proper concentration is important, stated Mr. Davis.

Discussing use of sinter in blast furnaces, Joseph H. Slater, superintendent blast furnaces and coke ovens, Corrigan-McKinney plant, Republic Steel Corp., Cleveland, said that use of sinter is not a cure-all, good coke being most important.

To check amount of sinter and its value, two identical blast furnaces were loaded similarly except first unit used 35 per cent sinter and the second used regular ore mixture. Result was that over the test period first furnace produced 17,360 tons against 15,080 for the second furnace and coke consumption was 1835 pounds coke per ton for first furnace against 2027 pounds for the second. Flue dust averaged 42 pounds less for the first furnace also. Although this was a fairly definite indication of the value of sinter, another test was made by switching the burdens on the same two furnaces. In this test, 36 per cent of the burden in the second furnace was sinter, and the second furnace showed a production of 18,925 tons against 15,083 for the first furnace and a coke rate of 1730 pounds against 2050 pounds for the first furnace. In addition the furnace with sinter operated much better. As result of these favorable tests, up to 1000 pounds of sinter is being prepared and used daily.

Sinter Discussed

As to amount of sinter that it pays to use, Mr. Slater was of the belief that not more than 50 per cent could be employed economically. While results improved up to 100 per cent sinter, the additional cost may not warrant. Mr. Slater said if confronted with choice of using 100 per cent sinter in one out of five furnaces or using 20 per cent in each of the five furnaces, he would much prefer to use the latter.

In the following discussion, one user stated that 40 per cent sinter was about the right burden. It was brought out that 50 per cent sinter is not limit as benefits increase up to 100 per cent if it is possible to get proper balance between silica and other elements. Of course the added cost factor is something else. Fine ore and flue dust makes a better sinter than flue dust alone, according to general opinion. This is especially true when carbon in the flue dust is high. It was brought out that type of ore being sintered is extremely important on amount of sinter that it is practical to use.

Foreign blast furnace practice was described by William A. Haven, vice president, Arthur G. McKee & Co., Cleveland. He covered German, Russian, British and other foreign designs, capacities and practice. Included was a table showing world production of pig iron with United States at the head of the list with 37,130,000 gross tons output. German output at 18,800,000, French at 14,040,000, British at 11,950,000, Japanese at 2,760,000. These figures were for 1937.

Steel Aircraft

(*Concluded from Page 72*)

ance limit of stainless steel. Sufficient added dynamic loads to give this factor result only during severe maneuvers such as would not be normal for a ship so lightly stressed. Certainly there would not be sufficient repetition ever to threaten the fatigue resistance of stainless steel.

With such important inherent advantages, the research required for practical application of stainless steel to aircraft construction is more then justified. This work is going on steadily and methodically. The first real problem is for the designer to divorce his thoughts from thick-metal structures and to create shapes and forms adapted to thin material. The next is to realize all of the possibilities offered by production welding.

Already certain aircraft parts are conceded to stainless steel. Gradually these will be increased and the day is actually not far distant when complete aircraft will be built of it. Already experimental designs have been built. Economics of production and maintenance will force the issue.

♦

Alloying of Tin to Any Metal Now Possible

■ By means of the Colaweld Mormetal process, developed by Colonial Alloys Co., Colonial Philadelphia building, Philadelphia, zinc, cadmium, tin, bismuth, lead or their alloys may be fusion bonded to most any metal, ferrous or nonferrous.

Application of process requires only two operations, applying of Mormetal by spray or brush and the application of heat. Bonding strength of Mormetal is due to a combination action of adhesion and fusion alloying with the surface of the base metal. It is resistant to corrosion, abrasion or erosion, and the low heat required during application does not tend to burn, twist or anneal the metal on which it is applied.

World Aircraft Lore in Comprehensive Volume

■ *Aerosphere*, 1939, cloth, 1420 pages, 8½ x 11¼ inches; 2055 illustrations; published by Aircraft Publications, 370 Lexington avenue, New York; supplied by STEEL, Cleveland, for $15, plus shipping charges.

This volume was prepared by Glenn D. Angle, consulting engineer and technical editor of *Aero Digest*. With a wide background, he is in a position to compile such a monumental work. Formerly he was professor of mechanical engineering at Lawrence Institute of Technology and from 1918 to 1924 was engineer in charge of aircraft engine design for the United States army air service.

The first section is devoted to world aircraft engines, 844 pages, covering aircraft engines of all time, alphabetically arranged. The second section, 202 pages, is concerned with modern aircraft, including all known current types throughout the world. Third section, 63 pages, is devoted to statistics, covers all available facts of this nature compiled from many sources. The fourth section, 274 pages, is a world-wide aircraft directory, alphabetically arranged by countries. It offers a list of firms and individuals, with names of officers and executives, branch offices and their products. It also lists each firm under the articles it is known to produce. This makes the volume a trade directory, arranged for easy reference.

Illustrations include 1524 engine photographs and cross-sections, 379 photographs of planes and 152 miscellaneous photographs, illustrations and decorative pieces.

The directory section lists 2059 American firms and 4528 foreign firms in 33 countries.

Photoelectric Controls

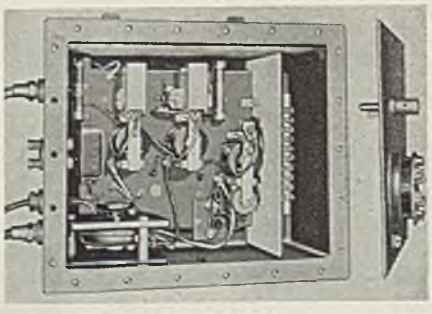
■ United Cinephone Corp., Long Island City, N. Y., has introduced model 60 photoelectric controls housed in compact 9 x 6½ x 4¼-inch

enclosures. Telephone type relays are provided, permitting a maximum noninductive load of 3 amperes alternating current at operation speeds up to 10 per second. Photocell is separately housed, making it possible to mount the control five feet from the electric eye. Control is priced at $24.

Motor Starter

■ Ohio Brass Co., Mansfield, O., announces ADG explosion-proof automatic direct-current motor starter for conveyor, fan, pump and compressor work in gaseous mine atmospheres.

The device controls and protects direct-current motors from 2 to 50 horsepower operating at voltages of 250 and 600. Pushbutton or remote float switch control arrangements are available. Overload and short circuit protection are provided by a line contactor fitted with a thermal element adjustable for a wide range of timed overloads. Case is of heavy, steel plate, welded and tested for airtightness. Ground joint between case and cover provides flame-proof seal. Cable outlets and pushbutton stations are watertight and flameproof. Handhole for replacing fuses and making adjustments in the field is provided in the cover.

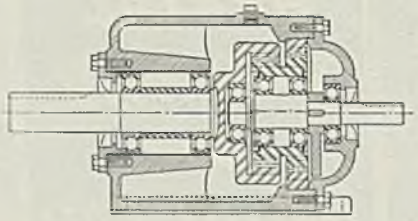


Speed Reducer

■ Brad Foote Gear Works, Cicero, Ill., has developed a speed reducer which develops high ratio speed reductions without use of large gears or drives.

The various speed reductions are developed by a compact Gyro reducer. A double spur and internal gear, ball bearing mounted on drive shaft eccentric, meshes with a stationary internal gear. In mesh with the secondary gear is either a spur or internal gear which is solid and concentric with the output shaft.

The eccentric drives initial spur around pitch line of stationary internal gear. Since initial spur and secondary gear are solid, speed of latter is controlled by ratio between initial spur and stationary gear. To

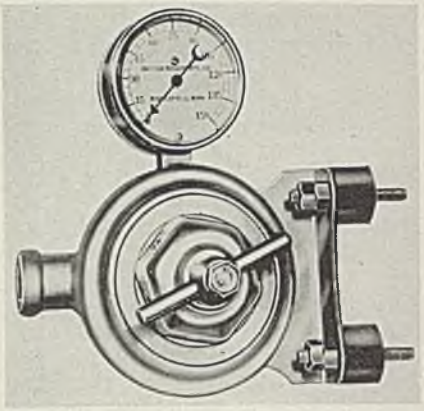


obtain large ratios, a small difference in number of teeth between spur gear and internal gear is used.

The efficiencies of this design range between 79 and 90 per cent with reduction ratios from 20:1 to 7500:1.

Pressure Gage

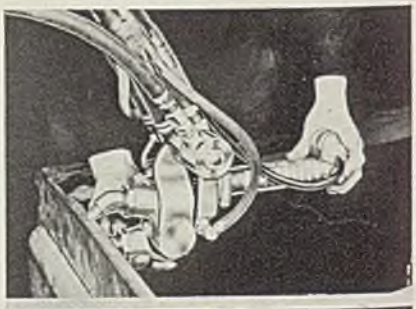
■ Dayton Rogers Mfg. Co., 2830 Thirteenth avenue, Minneapolis, has placed on the market a combination pressure gage and self-contained reducing regulator valve for receiving a varying or high air pressure at the inlet side and delivering a constant reduced pressure automatically at the outlet side. A safety release valve in the body of the regulator releases any excessive pressure. Built-in filter on the inlet side is of the replaceable cartridge type, and can be removed without the use of tools or dismantling regulator. Three extra seats are furnished in a compartment on the adjusting screw. Each regulator

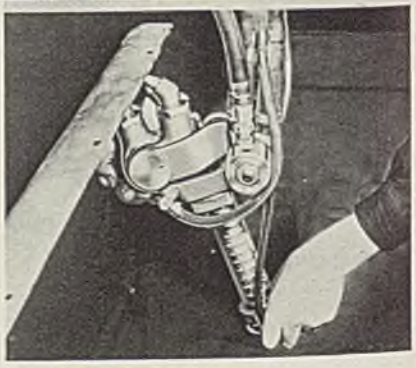


and gage is equipped with a mounting bracket and vibration dampeners.

Hydraulic Welding Cable Clamp

■ Progressive Welder Co., 737 Piquette avenue, Detroit, has developed a hydraulic welding-cable clamp which increases gun handling speed and reduces operator fatigue. It is designed so cable and gun are locked hydraulically while pressure is on for a weld, and unlocking it the moment pressure is released, permitting gun to be swiveled to a different position. Device operates directly from hydraulic pressure system and consists of a small pressure chamber, plunger of which actuates a hollow bolt. This bolt is inserted



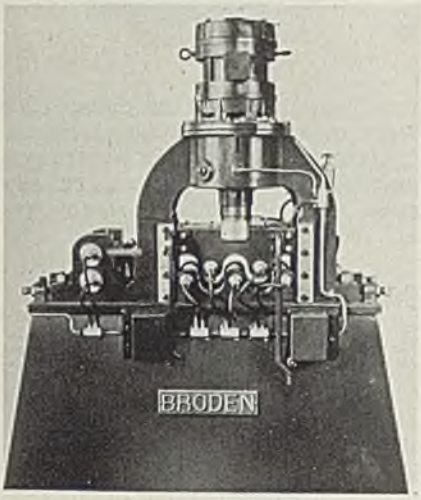


through both cable and gun terminals. When control button is

pressed for the weld, hydraulic pressure actuates plunger in pressure chamber of cable clamp at the same time bringing the electrodes together on the work. Clamp is at present available in five sizes, each has three pressure connections.

Scale Breaker

■ Broden Construction Co., 11730 Harvard avenue, Cleveland, has developed a 5-roll scalebreaker for breaking or cracking scale on hot



rolled strip in coil form prior to pickling operation. Its capacity is 3/16-inch maximum thickness and 8 inches maximum width strip with strip passing through rolls at 200 to 600 feet per minute. Horizontal guide rolls on entry end permits wiping of the strip. A pair of vertical side guide rollers guides the strip sideways. Its three bottom breaker rolls and two top rolls are stationary. Top rolls are raised or lowered by a screwdown mechanism, motor being operated with high and low limit switches. Rolls are 2½ inches diameter and are mounted on needle bearings. They can be removed easily for grinding by removing screws holding the keeper plates. Leather aprons at entry and exit, as well as a top cover, prevent scale from flying about.

Electric Hand Saw

■ Skilsaw Inc., 3313 Elston avenue, Chicago, announces an improved model 127 portable electric hand saw which is claimed to have a 12-inch blade and cut to a depth of 4⅜ inches. It is used for cutting timber, many types of building tile and for continuous cutting of copper sheets up to ⅝-inch thick, lead sheets up to 2 inches thick and many types of heavy gage corrugated metals. Blade has a speed of 2400 revolutions per minute and is protected by an automatic spring-

operated telescoping guard that rotates on ball bearings. Saw is 22 inches long, its frame being of special die-cast aluminum alloy. Blower arrangement built into upper guard keeps line of cut free of sawdust.

Capacity Booster Valve

■ Regulator division, Square D Co., 6060 Rivard street, Detroit, announces class 9160 capacity booster valve for water, steam and other fluids. It provides smooth modulation, positive shut-off and eliminates surging and liquid hammer. Valve body is of forged brass. Bronze screen is provided for filtering fluid and it may be removed easily for cleaning. Operation depends upon

pressure difference or drop across valve.

Either the pilot or by-pass circuit, when open, serves to reduce pressure below piston to a value less than inlet pressures. The greater pressure on the inlet side then acts upon piston to move it to open position. When pilot circuit is closed, piston will close by spring action.

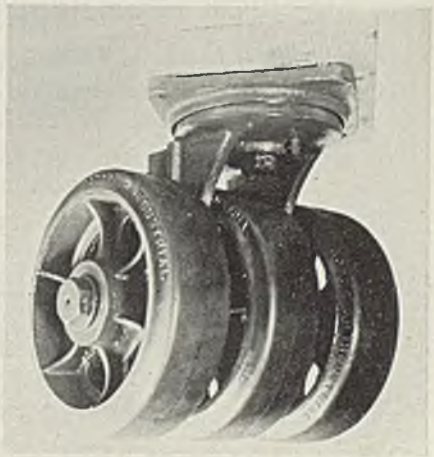
Swing Joint

■ Chiksan Tool Co., Brea, Calif., announces a high temperature swing joint for operation at working pressures to 500 pounds at temperatures up to 700 degrees Fahr. Pressure is transmitted through double rows of hardened steel balls in flame-hardened races. Packing chamber is machined to close tolerances and chromium-plated and polished. The packing set is a specially designed combination of asbestos and brass rings and is held in place by the tension of an alloy wire spring. Packing is not affected by chemicals. Joint is made in six different styles for full 360-degree rotation in one, two or three planes.

Style illustrated is No. 60 for applications where rotation in two planes is required.

Tri-Wheeled Casters

■ Service Caster & Truck Co., Albion, Mich., announces a set of four tri-wheeled rubber-tired casters, each with capacity of 4000 pounds. It is known as 1212 MSTT, measures 15 inches overall and has a 9 x 9-inch top-plate with bolt-hole 7½ inches apart. Both top-plate and yoke legs are of ½-inch cast steel. A double bearing is incorporated in the swivel. Half-inch balls absorb the vertical load. Lateral or thrust load is taken by a heavy-duty Timken bearing. Wheels measure 12 x 14 inches. Axle is cold-rolled steel, 1¼-inch diameter



by 16⅜ inches in length—termi-

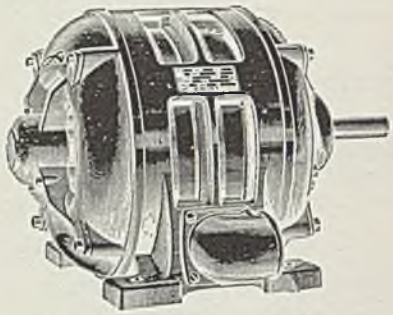
hexagonal nut and ¼ x 2½-inch cotter. Hollow center and flush-type Zerk fitting at one end permits lubrication of center wheel.

Hard Facing Electrodes

■ Lincoln Electric Co., 12818 Coit road, Cleveland, announces two new hard facing electrodes, Faceweld Nos. 1 and 12, which are cast abrasion-resisting alloys used for hard-facing by the metallic arc process. Former is a general purpose electrode and is softer and tougher of the Facewelds. It has good abrasion resistance and high resistance to impact. It is used for surfacing such parts as digger teeth, scarifiers, grader blades, cement plant machinery, etc., by arc welding. Latter is applied by arc welding and is somewhat harder than Faceweld 1. Its resistance to impact is good but not quite as high as Faceweld 1. Applications include screw conveyors, conveyor sleeves, plows, gyratory crushers, power shovel and dragline bucket parts.

Electric Motor

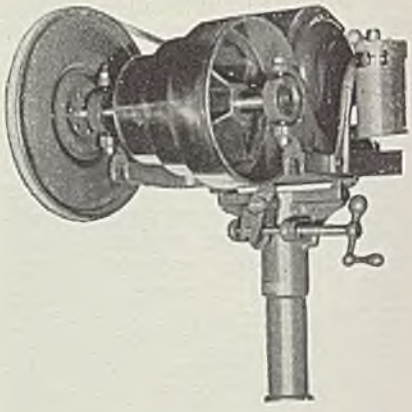
■ Louis Allis Co., 133 Stewart avenue, Milwaukee, announces a Lo-Amp electric motor for use on refrigerating and air conditioning units and similar installations. Motor has low locked rotor current and



can be supplied with either high starting or normal starting torque. It does not have any centrifugal switches, relays, brushes or slip rings and does not require any special control to operate.

Motor Drives

■ Quality Hardware & Machine Co., 5831 North Ravenswood avenue, Chicago, announces new line of individual motor drives which includes 15 models for lathes, shapers, milling machines and turret lathes. Each drive is applicable to any belt-driven machine. It is a complete self-contained unit, including motor mounting. V-belts are used for the motor drive to the countershaft, the



final drive being by standard flat belt. Crank and screw control that actuates cam working directly against base of motor and drive shaft mounting, provides wide range of adjustments. Drive control is hand operated. Unit can be equipped for electrical controllers.

Spraying Hood

■ Jackson Electrode Holder Co., 15122 Mack street, Detroit, has introduced a spraying hood to protect workmen engaged in paint spraying operations. Hood is of tailored, black, rubberized fabric,

with comfortable headgear equipped with extra wide sweatband. Air supply from plant air line is conducted through flexible hose attached to operator's belt, to a light metal tube conforming to but not touching his brow. Twenty-four vents allow fresh air to issue in a cascade over operator's face and out through clear opening in front of his eyes. This air flow sweeps fumes and dust away from him. Opening is cut in a black fiber unit which is removed easily from the hood and replaced by a similar unit having a standard 6½ x 9¾-inch clear Plastacele window.

Flock Gun

Paasche Airbrush Co., 1909 Diversey parkway, Chicago, has developed an improved FF-¾-inch flock gun for rapid application of

flock when supplied from a flock pressure tank or mechanical feed hopper. Gun has aluminum alloy pistol grip handle with trigger. This delivers a wide continuous stream of flock. Slight pull on trigger releases blast of clean air for blowing off excess flock. Gun is light and has ¼-inch standard pipe thread air inlet, and ⅞-inch 27-thread material inlet. It can be equipped with specially designed nozzles for unusual applications.

Small Socket Wrenches

Blackhawk Mfg. Co., West Allis, Wis., announces a line of miniature open-end boxtype and small socket wrenches called Nuggies. They are of Hexite steel and packaged in a compact lightweight Durez plastic box. Sockets range from 3/16 to 7/16-inch. The miniature half and half's have 7/32 to 7/16-inch openings. Set includes a hinged offset, handle bar, insulated grip handle, and extension bar.

Solenoid Valve

General Electric Co., Schenectady, N. Y., announces an inexpensive solenoid valve adapted to requirements of heating and air conditioning industry as well as to general applications in the control of air, oil, water and gas. It may be used as water control for humidifiers, laundry and dishwasher equipment, oil shutoff for oil burner service, pilot-gas control for gas burners, air control for compressed-air devices or for evaporative cooling equipment. Since it is designed to be incorporated into an assembly that has its own enclosure, no coil cover, conduit plate, etc., have been provided.

Glow Tube Meter

Weltronic Corp., 2832 East Grand boulevard, Detroit, has placed on the market a glow tube meter which takes measurements of welding current and of voltages of such short duration as 1 cycle on a 60-cycle circuit. Instrument also can be used with continuous current flow and voltages. It measures current from 50 amperes to 50,000 amperes and voltages from 0.5 volts to 550 volts on a 60-cycle circuit. Calibrated by an oscillograph and by a high-vacuum tube voltmeter, it can be used with circuits of other than 60-cycle by using a corrective factor. Assembly comprises a special air core transformer, a small potential transformer, a calibrated rheostat and a small neon glow lamp. In taking readings the hinged window is closed

over an electrode arm or cable. Tabulation chart indicates value of current for each dial setting.

Fluorescent Lamp

■ Lamp division, Westinghouse Electric & Mfg. Co., Bloomfield, N. J., announces a 58-inch RF fluorescent lamp producing white light for industrial lighting. It may be operated on either 105-125 or 210-250-volt 60-cycle alternating current in special equipment which provides direct current through use of a rectifying device.

All of the lamps are entirely interchangeable in single and twin fixture units available for their use. Light output is about the same as at 4250 lumens.

Flock Spray Gun

■ Electric Sprayit Co., Sheboygan, Wis., has placed on the market model FL flock gun. It features comfortable revolver grip with controls at the back of the gun providing full range of adjustments, including changing from round to fan spray without adjusting the nozzle. It also permits handling with ease any grade or quality of flock, as well as glow beads or other types of powders. Feature of gun is an oil and moisture filter in the handle. This eliminates possibility of dampening flock.

Convertible Shovel

■ Link-Belt Speeder Corp., subsidiary Link-Belt Co., 301 West Pershing road, Chicago, announces a new ½-yard convertible shovel-dragline-crane, model LS-60. It includes advancements such as self-aligning roller bearings on drum shafts, reverse shaft and main power shaft, safety-type rapid boom hoist for crane duty, double fully-enclosed traction brakes controlled from the cab, a 56-inch machine-finished roller path turntable with roller bearing hook rollers, interchangeable clutches on the drum, swing, retract and the boom hoist parts.

Either a gasoline or diesel of 60 horsepower can be supplied and either lug driven track shoes or "Caterpillar" crawlers are available.

The machine may be quickly converted from one attachment to another without mechanical alteration.

Insulated Cables

■ Okonite Co., Passaic, N. J., has placed on the market improved Okonite-Okoprene cables incorporating the same insulation but better protected because of an air-tight, lightproof material or sheath made of neoprene.

This sheath provides a protective layer of supplementary insulation in which the regular insulation is permanently sealed. This now enables the cable to resist moisture, oils, chemicals, heat, sunlight and flame.

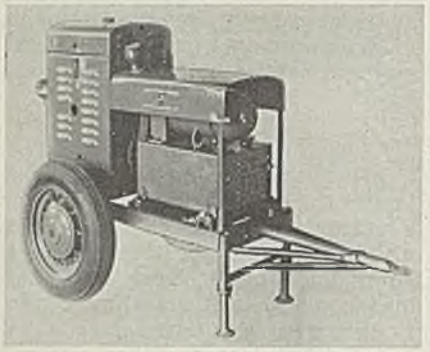
In addition, cable is tough, smooth, stable and flexible. Smooth covering and small outside diameter makes it very easy to pull into ducts.

Cables are furnished in single conductor form for voltages up to 5000 volts. For phase identification they can be furnished in 3 or 4

colors. They may be used by utility companies and industrial plants such as steelmills, machinery and tool plants.

Engine Driven Welder

■ Comet Products Co., Chappaqua, N. Y., has developed an engine-driven arc welder for mass production welding on a 24-hour basis. Its



heavy-duty construction allows use of relatively large size electrodes at high average amperages without danger of burning out. Simple control of both current and voltage permits operator to select quickly the best possible combination to meet varying conditions. Light in weight, the welder is offered in four sizes. The 150 and 200 ampere units are powered by 4-cylinder, air-cooled engines and 300 ampere welders by water-cooled 6-cylinder engines.

Telephone Mask

■ Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, has introduced

a telephone mask which permits two-way conversation between a mask wearer and the fresh air base located at some distance, or between two widely separate mask wearers.

All of the power used is derived from the voice itself. Set, consisting of transmitter and receiver, is built into facepiece of mask. For the fresh-air end, either a hand set or chest type transmitter and headset are used. Mask operates by voice fluctuations in the magnetic circuit. These generate a small electric current and are later reconverted to reproduce the spoken voice.

When used in industrial service a workman wearing the mask protected against gases and fumes, is free to move about and has both hands free.

Capacitors

■ Aerovox Corp., New Bedford, Mass., announces capacitors for fluorescent lamp power-factor correction. These may be included in the fixtures as initial built-in equipment, or may be added subsequently. Capacitors are of the oil-filled paper type. Their flat metal covering is hermetically sealed and have insulated wire terminals at one end. They are available in three types, taking care of requirements of the twelve standard types of fluorescent lamps in general use.

Welding on a Conveyor

(*Concluded from Page* 58)

are necessary as it is of utmost importance to maintain perfection joints. First is a pressure rupture test at 1000 pounds air pressure. This test determines if any weak or split tubes are in the unit. After this the unit is charged with 850 pounds air pressure and tested for leaks using a liquid soap solution which is brushed or poured on, coating the welds with a thin film of soap. Leaks show up as bubbles or white foam and are marked with a wax crayon.

After air is released, the weld is repaired by rewelding about half of the joint and adding more filler rod. About three out of nearly 200 joints are found on each unit in this first test. After repair the unit is charged with air, tested and repaired again if necessary, sometimes as many as five successive repairs may be required.

After unit leaves the welding department it is painted and the paint baked on. Charged with air, the unit is tested again while warm and the joints expanded. Here leaks are extremely small and must be examined quite closely. Some of these show up with foam no larger than a pinhead only after several minutes of watching.

Before the refrigerants are charged in, however, all parts of the unit from which it is desirable to prevent heat loss during operation are enclosed by a steel casing and packed with mineral wool insulation. Next, unit is evacuated and charged with required amounts of aqua ammonia, water and hydrogen gas while moving on the conveyor.

Tested for Several Hours

After this operation, the unit leaves the conveyor and is placed on a stationary test rack where it is given a calorimetric test of several hours duration to check refrigerating capacity. All units are capacity tested in this manner in a hot room at 100 degrees Fahr.

After unit is in operation, it is again tested for leaks using moistened paper previously treated with a chemical which turns the white paper a reddish pink color wherever ammonia seeps through, no matter how small the leak. Wrapped around each of the welds, this paper detects leaks so small that they cannot be detected with the high-pressure air and soap solution.

Any units which fail to make the load capacity test, due to having a plugged or partially plugged weld in the system, are discharged. The solution is washed out, the welded joint cut out and replaced. It has been possible, however, to cut down the unit rejects from bad welds at this point to less than ½ of 1 per cent.

As a further check against the production calorimetric test, a control laboratory picks at random a certain percentage of units from the test line and gives them an extremely sensitive calorimetric test. The control laboratory also assists the manufacturing and inspection departments in finding the defects causing a particular unit or batch of units to be rejected on the calorimetric or hot room test.

After final test, units are placed on another conveyor for final assembly where they are equipped with all gas controls and are given a final touch up. After a general inspection, units are placed on an overhead conveyor carrying them to the cabinet department where they are removed and installed in cabinets on another conveyor line.

Practically all production welding and testing thus is done on conveyors. This has been found a most important factor in permitting increased production in this plant.

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 COPPE*

Hard Chromium Plating Repairs Worn Tools

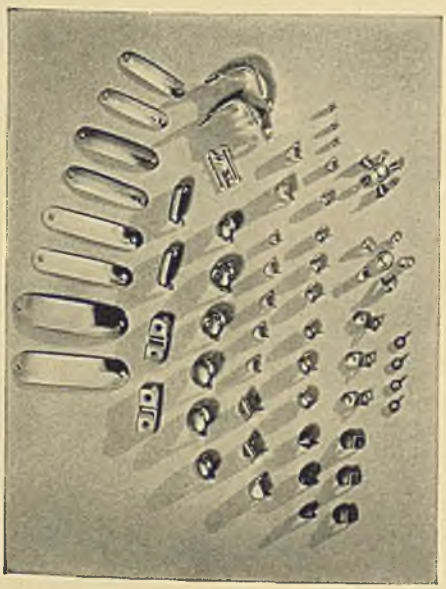
Dies, punches, drills, gauges, and other tools which have become worn in service can be restored to usefulness by building up their surfaces with a plating of hard chromium, it has been discovered. The hard chromium surface can be built up to thicknesses as great as 0.008 inch, which is sufficient in most cases to compensate for wear and to reproduce the original dimensions of the tool.

A striking feature is that tools saved from the scrap heap by hard chromium often are actually superior to the original tools. The amount of friction is reduced by the presence of chromium, and consequently less heat is generated and the cutting is smoother. The hardness of the chromium may be even greater than that of the original steel. New tools plated with one or two thousandths of chromium are superior in wear resistance to plain steel. Files have longer life when chromium-plated.

Bridgeport will gladly give further information on this method of salvaging tools.

Copper Alloys Readily Stamped in Many Shapes

The ease with which the copper alloys can be formed into a wide variety of shapes is illustrated by this assortment of stampings made by Penn Rivet Corporation from phosphor bronze and brass. The readiness with



which the copper alloys can be formed by all of the major fabricating processes is an outstanding advantage in production economy. Hot forging, cold heading, drawing, machin-

Simple Precautions Prevent Season Cracking of Bra

Understanding of Causes of Intercrystalline Cracks is First Step in Eliminating Failu

Season cracking of yellow brass, which results in the development of fine irregular cracks or actual breaks in articles fabricated by drawing, stamping, spinning, or cold heading, may easily be prevented once the underlying factors are understood.

Four Factors Involved

The combination of causes which brings about season cracking of yellow brass includes four factors:

1. High tensile stresses existing within the metal as a result of cold working operations, or external tensile stresses such as occur in tightly screwed bolts.
2. The presence of ammonia even in traces so slight that it cannot be detected by sense of smell.
3. Moisture.
4. The element of time.

If any one of these factors is removed, the likelihood of season cracking is greatly reduced. If two of the factors are eliminated, the danger of season cracking is entirely eliminated.

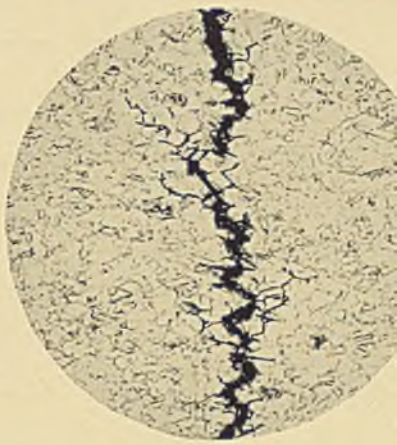
Typical Instance of Season Cracking

The importance of these factors in causing season cracking is clearly indicated by a case recently brought to the attention of the Bridgeport laboratories. Failure had occurred in a number of yellow brass shells which had been stored in a damp basement while in the hard drawn condition and with the drawing lubricant still on. When these shells were removed from storage after a period of several months, many of them badly cracked and had to be scrapped.

A study of these shells indicated the ence of all four factors leading to sc cracking. Tiny cracks had developed in beaded sections where highest tensile str had existed. The cups had been formed left hard, and had received no annea treatment to relieve the stresses (*inte stresses*). Chemical tests showed the ence of *ammonia* on the cracked piece. hard shells had been stored in a damp c (*moisture*) for a period of several mo (*time*).

Steps in Prevention

An understanding of the mechanism this type of failure indicates the precaut necessary to prevent it. For example, stresses produced by cold working ca removed by a relief anneal before sto The shells can be stored in a dry place, from ammonia or ammonia-producing



Micrograph illustrates structure of metal in th cinity of a crack, showing the intercrystalline ration. Mag. 75X. Etched with NH_4OH, plus H

stances. Finally, if the shells are given finishing operation immediately after dr ing, there will not be time for season cr ing to occur.

Two methods are recommended for rel ing cold working stresses: (a) annealin temperatures in excess of 400° C. (752° which results in softening of the metal; a true relief anneal at temperatures of ab 300° C. (572° F.), where stresses are relie with no appreciable softening of the m

COPPER ALLOY BULLETIN

ALLOYS OF COPPER

This is the eleventh of a series of articles on the properties and applications of the copper alloys, and concludes the subject of 70-30 Brass.

70-30 BRASS

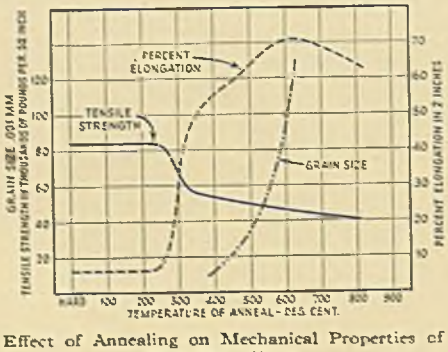
The physical properties of 70-30 Brass (Cartridge Brass) are as follows:

Specific Gravity	8.53
Density, lbs./cu. in.	.308
Electrical Resistance ohms/circ. mil ft. at 20°C	37.71
Electrical Conductivity I. A. C. S.	27.5
Thermal Conductivity at 20°C cal./sq. cm./cm./sec./°C	0.290
% copper	31.0
Temperature Coefficient of Linear Expansion/°F	0.0000103
Tensile Strength, lbs./sq. in.	
Annealed Sheet	45,000-51,000
Hard Sheet	71,000-81,000
Elongation in 2 in.	
Annealed Sheet	35-70%
Hard Sheet	2-10%

EFFECT OF DRAWING & ANNEALING

The effect of drawing and annealing on the properties of 70-30 Brass is shown in curves below. If the drawing curves of 70-30 Brass are compared with previously published values for the higher copper content alloys, the generally higher values of tensile strength are apparent. The annealing characteristic curves for 70-30 Brass are not directly comparable with previously published curves for the higher copper alloys, which were based on rod and wire. The high elongation values on the Cartridge Brass curve are characteristic of alloys containing about 70% copper.

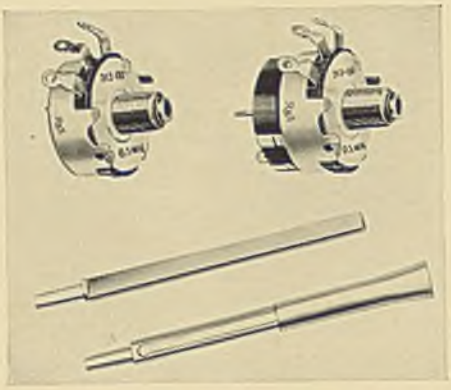
Fabricators desiring information on Cartridge Brass or any other copper alloy in specific uses are invited to discuss their problems with Bridgeport.



Effect of Annealing on Mechanical Properties of 70-30 Brass Sheet.

Brass Shafts Cut Cost

International Resistance Company selects brass for use in all the shafts of the thousands of controls which it manufactures for radio sets and electronic equipment. Although the

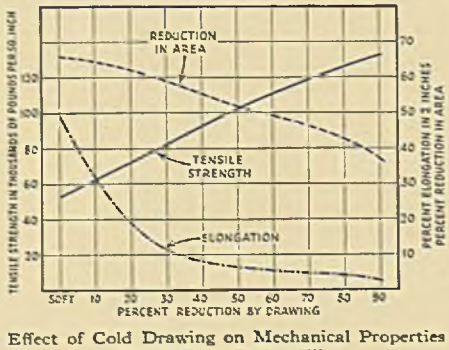


initial cost of brass is actually higher than steel, savings in machining costs and the elimination of plating or other finishing operations make it less expensive, as well as more satisfactory, in the long run.

This application is typical of many instances in which total product costs may be lowered by using brass, because fabrication economies serve to offset the higher initial cost of materials.

Memos on Brass—No. 9

The non-rusting properties of brass make it an ideal material for the manufacture of parts that must have long life. Where corrosive conditions are severe, other copper alloys, such as Duronze*, can be successfully used.



Effect of Cold Drawing on Mechanical Properties of 70-30 Brass Rod or Wire.

NEW DEVELOPMENTS

Special-purpose chucks are said to provide a convenient means of holding small parts, especially of irregular section, for machining operations. Chucks are made by setting a plug representing the part to be held in a shell and pouring in a low-melting alloy. **(No. 30)**

A new scratch brush is said to incorporate a number of special features. It has a one-piece metal hub that is described as indestructible. Permanently tight tufts are assured by the use of drawing wires of high tensile strength. **(No. 31)**

A height and depth gage is said to allow easy readings in hard-to-reach places. Gage is reported to be so designed that a three-point contact is maintained whether it is used for measuring inside parallel surfaces or as a height or depth gage. **(No. 32)**

Numbering pliers of the single-wheel type are said to provide a handy means of impressing a letter or number on tubes, rings, bars and other parts of brass and other materials. **(No. 33)**

A milling machine is said to be suitable for production use on brass and copper, as well as for pattern shop work. It is provided with a tiltable 18 by 48-inch table, and has a range of 8 spindle speeds between 600 and 7,200 RPM, according to the manufacturer. **(No. 34)**

A press guard is arranged to surround the sides and front of a tool in position on the press, it is said. It is reported that operation of the actuating pedal permits engagement o the clutch only if the operator's hands and other obstructions are out of the way. **(No. 35)**

An addition agent for sulphuric or hydrochloric acid pickling baths is said to act as a wetting agent, reducing surface tension and decreasing the amount of drag-out. **(No. 36)**

A tool holder is reported to be supplied with a set of 8 high-speed steel cutters to machine radii between 5/16 and 3/4 inch. Application is said to be in lathe, shaper, or planer. **(No. 37)**

A solderless connector for electric wires is said to consist of a formed pocket, washer, and screw. Formed piece is said to be self-centering, so that a wire need not be wound around the screw or its strand separated. **(No. 38)**

A new filter for plating baths is said to be easy to disassemble and clean. Filter sheets are reported to be composed of fibrous material molded in disc form. They are available in several different standards of density or porosity, permitting any degree of filtration, it is claimed. **(No. 39)**

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.

Steelmaking Recovers; Demand Gains Slightly

Mills seek releases against sheet and strip orders. Lower prices withdrawn. Export sales active. Scrap stronger

MARKET I
TABLOID

Demand

Sustained or heavier for r products.

Prices

Generally steady. Sheets strip at former levels.

Production

Up 2 points to 63½ per c

■ STEEL ingot production last week broke out of its recent sidewise trend with a 2-point gain to 63½ per cent. This is the first recovery of consequence so far this year and restores steelmaking to the early-March level.

Heavier bookings of sheets and strip at price concessions which were withdrawn May 1 account to a large extent for improvement in operations.

Producers have established June 30 as the final date for shipment of low-price orders but will have difficulty meeting this deadline unless buyers co-operate by accepting a portion of the tonnage this month. Many users prefer to delay releases until the end of the quarter, since the material is not required immediately. In order to prevent congestion of rolling schedules in late June, mills now are pressing for specifications.

With buyers well covered, sheet and strip bookings have slumped. Business in other products is steady or slightly heavier. Seasonal influences are reflected in buying of some commodities, including tin plate, pipe and wire. Export markets remain active, inquiries holding at the good pace of recent weeks, although orders have not varied materially. Semifinished grades continue outstanding in sales abroad.

Pig iron production declined slightly in April. Daily average output was 104,638 net tons, compared with 105,502 tons in March and 76,732 tons a year ago. Total production the first four months this year was 13,738,636 tons, against 9,726,290 tons in the 1939 period, an increase of 41.2 per cent.

With a few exceptions, steel prices are fairly steady. Products affected by the recent open reduction of $4 a ton are back to former levels, although a test of these figures awaits absorption of business now on mill books. Galvanized sheets, although not openly reduced, also shared in recent price concessions. However, producers have taken steps to withdraw cuts on this grade as well. An advance of $1 a ton in Pacific coast prices on all steel products results from higher ocean freight rates which became effective May 1.

Strength is more apparent in iron and steel scrap markets, with prices higher in most leading districts. Grades other than the principal steelworks items have experienced the largest upturn, but the price composite for the latter is 8 cents higher at $16.08.

Construction work requiring structural shapes or concrete reinforcing bars continues fairly plentiful, but steel tonnages involved are restricted. Improvement in private building so far this year has been more pronounced in number of projects than in amount of steel required, and the decline in public work has been a retarding factor.

Automobile production has slipped further from its recent spring peak, last week's output of 99,305 units being a decrease of 2100. Parts manufacturers are slowing down in anticipation of early-summer model changes by some car builders, and a gradual decline in assemblies appears probable the next few months. Last week's production was almost 40 per cent larger than a year ago.

Railroad equipment buying is light. Fair activity continues in releases against previous orders for track material and steel products for equipment building, but the immediate outlook for freight car purchases is unfavorable, based on the amount of business pending.

Tin plate production is up 2 points to 65 per cent, accompanied by heavier releases and prospects for further seasonal gains in demand the next few weeks. Export business continues active.

Opening of navigation on the Great Lakes last month saw April shipments of 464,669 tons of Lake Superior iron ore to lower ports. This compares with 56,798 tons a year ago, when start of the lake movement was delayed later than usual.

Shipbuilding continues a relatively large outlet for heavy steel products. Heading pending business are two large liners, requiring about 30,000 tons of steel, on which the maritime commission takes bids this week.

Principal increases in steelmaking last week were in the larger districts. Gains included 3 points to 58 per cent at Pittsburgh, 2½ points to 59½ at Chicago, 5 points to 50 at Youngstown, 14 points to 94 at Wheeling and 10½ points to 53 at Cincinnati. Losses were 4 points to 53 in New England and 2 points to 70 at Detroit. Unchanged were eastern Pennsylvania at 57, Buffalo at 44, Cleveland at 70, Birmingham at 83 and St. Louis at 42½.

COMPOSITE MARKET AVERAGES

	May 4	Apr. 27	Apr. 20	One Month Ago Apr., 1940	Three Months Ago Feb., 1940	One Year Ago May, 1939	Five Years Ago May, 1939
Iron and Steel	$37.17	$36.57	$36.56	$36.69	$37.21	$35.80	$32.35
Finished Steel	56.60	55.50	55.50	55.90	56.50	56.00	54.00
Steelworks Scrap..	16.08	16.00	15.96	16.00	16.98	14.05	10.27

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

	May 4, 1940	April 1940	Feb. 1940	May 1939
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.20c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.52
Iron bars, Chicago	2.25	2.25	2.30	2.10
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.00	2.10	2.05
Sheets, cold-rolled, Pittsburgh	3.05	2.95	3.05	3.10
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	1.95	2.10	2.03
Sheets, cold-rolled, Gary	3.05	2.90	3.05	3.08
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	2.00	1.92

Pig Iron

	May 4, 1940	April 1940	Feb. 1940	May 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	85.33

Scrap

Heavy melt. steel, Pitts.	$16.25	$16.45	$17.75	$14.55
Heavy melt. steel No. 2, E. Pa.	15.50	15.50	16.30	12.75
Heavy melting steel, Chicago	15.25	15.20	15.75	12.75
Rails for rolling, Chicago	19.25	18.65	18.25	17.25
Railroad steel specialties, Chicago	19.00	18.05	18.50	14.75

Coke

Connellsville, furnace, ovens	$4.75	$ 4.75	$ 4.75	$ 3.75
Connellsville, foundry, ovens	5.75	5.75	5.75	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 ports	2.65c

Cold Rolled

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

Galvanized No. 24

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

Black Plate, No. 29 and Lighter

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

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.55c

Enameling Sheets

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

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 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 ports	2.65c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	4.00c

Structural Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast ports	2.70c

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 ports	2.80c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.05c
Chicago or Gary	2.05c
Detroit, delivered	2.15c
Cleveland	2.05c

Buffalo	2.05c
Birmingham	2.05c
Gulf ports	2.40c
Pacific Coast ports	2.70c

Iron

Chicago	2.25c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

New Billet Bars, Base

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	1.70-1.90c
Gulf ports	2.05-2.25c
Pacific Coast ports	2.10-2.30c

Rail Steel Bars, Base

Pittsburgh, Gary Chicago, Buffalo, Cleveland, Birm.	1.70-1.90c
Gulf ports	2.05-2.25c
Pacific Coast ports	2.10-2.30c

The above represent average going prices. Last quotations announced by producers were 2.15c, mill base, for billet bars and 2.00c for rail steel.

Wire Products

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

Standard and cement coated wire nails	$2.55
(Per pound)	
Polished fence staples	2.55c
Annealed fence wire	3.05c
Galv. fence wire	3.40c
Woven wire fencing (base C. L. column)	67
Single loop bale tie, (base C.L. column)	56
Galv. barbed wire, 80-rod spools, base column	70
Twisted barbless wire, column	70

To Manufacturing Trade

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

Bright bess., basic wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c
Worcester, Mass., $2 higher on bright basic and spring wire.	

Cut Nails

Carload, Pittsburgh, keg..$3.85

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Dellvered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.70c
Detroit, dellvered	2.80c

Alloy S.A.E.	Diff.	Alloy S.A.E.	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 ports	2.75c
Cooperage hoop, Young., Pitts.; Chicago, Birm.	2.20c

Cold strip, 0.25 carbon and under. Pittsburgh Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

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

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

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

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

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

Cents per pound

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

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

Bolts and Nuts

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

Carriage and Machine

½ x 6 and smaller	68.5 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

Semifinished hex.	U.S.S.	S.A.E.
½-inch and less.	67	70
⅝-1-inch	64	65
1⅛-1½-inch	62	62
1⅝ and larger	60	..

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	2.95c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural	3.40c
½-inch and under	65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75	off

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld. 1 point less on butt weld. Chicago delivery 2½ and 1⅛ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
⅛	63½	54
¼	66½	58
⅜—3	68½	60½

Iron

¼	30	13
⅜—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	63¼
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 47/64-in. incl.	2.15

Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.50.

Skelp

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

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$4.35- 4.60
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	7.00c

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, $4c, 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 118.50
Less 200 lb. lots 118.00
Do., carlots del. Pitts. 105.33

Spiegeleisen, 19-21% dom.
Palmerton, Pa., spot 82.00
Do., 26-28% 89.50

Ferrosilicon, 50% freight allowed, c.l. 69.30
Do., ton lot 82.00
Do., 75 per cent 126.00
Do., ton lots 142.00
Spot, $5 a ton higher.

Silicomanganese, c.l., 2% per cent carbon 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $12.30 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.90-2.00

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. bbl., c.l., 17-18% Rockdale, Tenn., basis 18%, $5 unitage, $8.50; electric furn., per ton, c.l., 23-25% f.o.b. Mt. Pleasant, Tenn., 24% $5 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, 65% 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. tl., 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, 55 to 60% molybdenum, lb. molyb. cont. f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, tl., 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% tl., 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 ¼c 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 $1.00c
Do., spot $1.00c

98% chrome, contract $3.00c
Do., spot $3.00c

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 $87.50
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., 200-lb. kegs, lb. $2.50
Do., 100-200 lb. lots 2.75
Do., under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 45-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-In. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: S A E 2300	Cold Drawn Bars: S A E 3100
Boston	3.98	3.86	4.86	3.85	3.85	5.66	3.51	4.48	4.66	3.26	4.13	8.63	7.23
New York Met.)	3.84	3.76	3.76	3.76	3.75	5.56	3.38	4.40	4.50	3.31	4.09	8.59	7.19
Philadelphia	3.85	3.75	4.25	3.55	3.55	5.25	3.35	4.05	4.75	3.31	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	3.62	3.62	3.62	3.40	5.25	3.05	4.30	4.45	3.22	3.75	8.15	6.75
Pittsburgh	3.35	3.40	3.40	3.40	3.40	5.00	3.15	....	4.75	....	3.65	8.15	6.75
Cleveland	3.25	3.30	3.30	3.40	3.58	5.18	3.15	4.05	4.72	3.20	3.75	8.15	6.75
Detroit	3.43	3.23	3.48	3.60	3.65	5.27	3.23	4.30	4.84	3.20	3.80	8.45	7.05
Omaha	3.90	3.80	3.80	3.95	3.95	5.55	3.45	....	5.00	....	4.42	....	....
Cincinnati	3.60	3.47	3.47	3.65	3.68	5.28	3.22	4.00	4.67	3.45	4.00	8.50	7.10
Chicago	3.50	3.40	3.40	3.55	3.55	5.15	3.05	4.10	4.60	3.30	3.75	8.15	6.75
Twin Cities	3.75	3.65	3.65	3.80	3.80	5.40	3.30	4.35	5.00	3.63	4.34	8.84	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.18	4.23	4.73	3.54	3.88	8.38	6.98
St. Louis	3.62	3.52	3.52	3.47	3.47	5.07	3.18	4.12	4.87	3.41	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	....	....
Indianapolis	3.60	3.55	3.55	3.70	3.70	5.30	3.25	....	4.76	....	3.97	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.68	3.75	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.34	4.34	4.33	4.33	5.93	3.99	....	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	3.85	5.20	3.40	3.50	5.75	3.70	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	4.40	6.25	4.00	4.00	6.40	4.10	6.30	5.25	....	6.60	10.65	9.80
San Francisco	3.50	4.00	6.00	3.35	3.35	5.60	3.40	6.40	5.15	....	6.80	10.65	9.80

	S A E Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	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	7.20	5.75	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; 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, any quantity in New York, 150-1499 pounds in Cleveland, 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, Indianapolis, Milwaukee, Omaha, 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, May 2

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports	Quoted in £ 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.	$21.00	6 0 0	$33.23	3 18 0
Basic bessemer	.....	.....	.....	.....
Hematite, Phos. .03-.05	21.88	6 5 0	.....	.....
Billets	.....	.....	$31.95	3 15 0
Wire rods, No. 5 gage	.....	.....	61.77	7 5 0
Standard rails	$36.75	10 10 0	$48.99	5 15 0
Merchant bars	2.10c	13 9 0	2.76c	7 5 0
Structural shapes	1.89c	12 2 6	2.83c	7 9 0
Plates, ¼ in. or 5 mm.	2.05c	13 2 6	3.44c	9 1 0
Sheets, black, 24 gage or 0.5 mm	2.65c	17 0 0	2.98c	7 17 0°
Sheets, gal., 24 ga., corr.	3.17c	20 6 3	4.10c	10 16 0
Bands and strips	.....	.....	2.76c	7 5 0
Plain wire, base	.....	.....	3.15c	8 6 3
Galvanized wire, base	.....	.....	3.75c	9 17 6
Wire nails, base	.....	.....	3.56c	9 7 6
Tin plate, box 108 lbs.	$ 5.60	1 12 0	.....	.....

British ferromanganese $100.00 delivered Atlantic seaboard duty paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich §§Mar
Fdy. pig iron, Si. 2.5.	$19.42	5 11 0(a)	$15.60	788	$32.02	950	$25.33	63
Basic bess. pig iron	18.29	5 4 6(a)	.....	.....	30.33	900	27.94	(b)69.50
Furnace coke	5.54	1 11 8	4.46	225	11.12	330	7.64	19
Billets	32.81	9 7 6	23.03	1,163	42.97	1,275	38.79	96.50
Standard rails	1.74c	11 3 0	1.43c	1,588	2.06c	1,375	2.38c	132
Merchant bars	2.18c	14 0 0††	1.31c	1,454	2.06c	1,375	1.98c	110
Structural shapes	1.93c	12 8 0††	1.27c	1,414	2.06c	1,375	1.93c	107
Plates, †¼-in. or 5 mm.	1.95c	12 10 6††	1.66c	1,848	2.42c	1,610	2.29c	127
Sheets, black	2.73c	17 10 0§	1.97c	2,193‡	2.85c	1,900‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.25c	20 16 3	3.23c	3,588	4.80c	3,200	6.66c	370
Plain wire	3.04c	19 10 0	2.11c	2,340	3.00c	2,000	3.11c	173
Bands and strips	2.30c	14 15 0††	1.47c	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.	15.00
Bos. dock No. 1 exp.	15.00
New Eng. del. No. 1	14.00
Buffalo, No. 1	16.50-17.00
Buffalo, No. 2	14.50-15.00
Chicago, No. 1	15.00-15.50
Chicago, auto, no alloy	14.00-14.50
Cincinnati dealers	12.75-13.25
Cleveland, No. 1	15.50-16.00
Cleveland, No. 2	14.50-15.00
Detroit, No. 1	†13.25-13.75
Detroit, No. 2	†12.25-12.75
Eastern Pa., No. 1	16.50-17.00
Eastern Pa., No. 2	15.50
Federal, Ill. No. 2	12.50-13.00
Granite City, R. R. No. 1	†13.50-14.00
Granite City, No. 2	12.50-13.00
Los Ang., No. 1, net	11.50-12.00
Los Ang., No. 2, net	10.50-11.00
N. Y. dock No. 1 exp.	13.75
Pitts., No. 1 (R. R.)	17.50-18.00
Pittsburgh, No. 1	16.00-16.50
Pittsburgh, No. 2	15.00-15.50
St. Louis, No. 1	†13.50-14.00
St. Louis, No. 2	†12.25-12.75
San Fran., No. 1, net	11.50-12.00
San Fran., No. 2, net	10.50-11.00
Seattle, No. 1	14.50-15.50
Toronto, dlrs., No. 1	11.00
Valleys, No. 1	17.00-17.50

COMPRESSED SHEETS

Buffalo, new	15.00-15.50
Chicago, factory	15.00-15.50
Chicago, dealers	13.50-14.00
Cincinnati, dealers	12.25-12.75
Cleveland	15.00-15.50
Detroit	†14.00-14.50
E. Pa., new mat.	16.50-17.00
E. Pa., old mat.	14.00-14.50
Los Angeles, net	9.00- 9.50
Pittsburgh	16.00-16.50
St. Louis	†10.00-10.50
San Francisco, net	9.00- 9.50
Valleys	16.50-17.00

BUNDLED SHEETS

Buffalo, No. 1	14.50-15.00
Buffalo, No. 2	13.00-13.50
Cleveland	13.50-14.00
Pittsburgh	15.00-15.50
St. Louis	†9.00- 9.50
Toronto, dealers	9.75

SHEET CLIPPINGS, LOOSE

Chicago	11.50-12.00
Cincinnati, dealers	8.25- 8.75
Detroit	†10.50-11.00
St. Louis	†8.00- 8.50
Toronto, dealers	9.00

BUSHELING

Birmingham, No. 1.	13.00
Buffalo, No. 1	14.00-14.50
Chicago, No. 1	14.00-14.50
Cincin., No. 1, deal.	9.25- 9.75
Cincin., No. 2 deal.	3.25- 3.75
Cleveland, No. 2	9.50-10.00
Detroit, No. 1, new	†13.25-13.75
Valleys, new, No. 1	15.75-16.25
Toronto, dealers	5.50- 6.00

MACHINE TURNINGS (Long)

Birmingham	5.00
Buffalo	10.00-10.50
Chicago	9.50-10.00
Cincinnati, dealers	5.25- 5.75
Cleveland, no alloy	9.00- 9.50
Detroit	†7.50- 8.00
Eastern Pa.	9.00- 9.50
Los Angeles	4.00- 5.00
New York	†6.50- 7.00
Pittsburgh	10.50-11.00
St. Louis	†6.50- 7.00
San Francisco	5.00
Toronto, dealers	7.00- 7.25
Valleys	10.00-10.50

SHOVELING TURNINGS

Buffalo	12.00-12.50
Cleveland	9.50-10.00
Chicago	10.50-11.00
Chicago, spcl, anal.	12.50-13.00
Detroit	†8.00- 8.50
Pitts., alloy-free	12.50-13.00

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	†4.00- 4.50
Buffalo	9.50-10.00
Cincinnati, dealers	4.00- 4.50
Cleveland	9.50-10.00
Eastern Pa.	9.00- 9.50
Detroit	†7.75- 8.25
New York	†5.25- 5.75
Pittsburgh	9.50-10.00
Toronto, dealers	6.75

AXLE TURNINGS

Buffalo	15.50-16.00
Boston district	†8.00- 8.50
Chicago, elec. fur.	16.50-17.00
East. Pa. elec. fur.	16.00-16.50
St. Louis	†9.25- 9.75
Toronto	6.00- 6.50

CAST IRON BORINGS

Birmingham	7.50
Boston dist. chem.	†8.25- 8.50
Buffalo	9.50-10.00
Chicago	9.50-10.00
Cincinnati, dealers	4.00- 4.50
Cleveland	9.50-10.00
Detroit	†7.75- 8.25
E. Pa., chemical	14.50-15.00
New York	†7.00
St. Louis	†5.00- 5.50
Toronto, dealers	6.75

RAILROAD SPECIALTIES

Chicago	18.75-19.25

ANGLE BARS—STEEL

Chicago	19.50-20.00
St. Louis	†14.75-15.25

SPRINGS

Buffalo	19.50-20.00
Chicago, coil	19.00-19.50
Chicago, leaf	17.50-18.00
Eastern Pa.	20.00-20.50
Pittsburgh	21.50-22.00
St. Louis	†16.25-16.75

STEEL RAILS, SHORT

Birmingham	16.50
Buffalo	21.50-22.00
Chicago (3 ft.)	19.50-20.00
Chicago (2 ft.)	20.00-20.50
Cincinnati, dealers	18.25-18.75
Detroit	†19.50-20.00
Pitts., 3 ft. and less	21.50-22.00
St. Louis, 2 ft.& less	†18.00-18.50

STEEL RAILS, SCRAP

Birmingham	16.00
Boston district	†14.50-15.00
Buffalo	18.00-18.50
Chicago	16.50-17.00
Cleveland	19.00-19.50
Pittsburgh	18.50-19.00
St. Louis	†15.00-15.50
Seattle	18.00-18.50

PIPE AND FLUES

Chicago, net	11.50-12.00
Cincinnati, dealers	10.00-10.50

RAILROAD GRATE BARS

Buffalo	13.00-13.50
Chicago, net	11.00-11.50
Cincinnati, dealers	8.25- 8.75
Eastern Pa.	15.00-15.50
New York	†10.50-11.00
St. Louis	9.50-10.00

RAILROAD WROUGHT

Birmingham	14.00
Boston district	†9.50-10.00
Eastern Pa., No. 1	18.00-18.50
St. Louis, No. 1	10.00-10.50
St. Louis, No. 2	12.50-13.00

FORGE FLASHINGS

Boston district	†10.00-10.25
Buffalo	14.00-14.50
Cleveland	15.00-15.50
Detroit	†13.00-13.50
Pittsburgh	15.00-15.50

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	18.50-19.00

LOW PHOSPHORUS

Cleveland, crops	22.50-23.00
Eastern Pa. crops	21.00-21.50
Pitts., billet, bloom, slab crops	22.00-22.50

LOW PHOS. PUNCHINGS

Buffalo	19.50-20.00
Chicago	18.50-19.00
Cleveland	18.50-19.00
Eastern Pa.	21.00-21.50
Pittsburgh	20.50-21.00
Seattle	18.00
Detroit	†14.25-14.75

RAILS FOR ROLLING

5 feet and over

Birmingham	16.50
Boston	†15.75-16.00
Chicago	19.00-19.50
New York	15.50-16.00
Eastern Pa.	20.00-20.50
St. Louis	†17.50-18.00

STEEL CAR AXLES

Birmingham	18.00
Boston district	†16.00-16.50
Chicago, net	21.50-22.00
Eastern Pa.	22.00
St. Louis	†18.50-19.00

LOCOMOTIVE TIRES

Chicago (cut)	18.50-19.00
St. Louis, No. 1	14.75-15.25

SHAFTING

Boston district	†17.00-17.50
New York	†18.00-18.50
Eastern Pa.	22.50-23.00
St. Louis, 1¼-3¾"	†16.50-17.00

CAR WHEELS

Birmingham, iron	13.00
Boston dist., iron	†13.00-13.25
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	20.00-20.50
Pittsburgh, iron	19.00-19.50
Pittsburgh, steel	21.50-22.00
St. Louis, iron	14.50-15.00
St. Louis, steel	†15.50-16.00

NO. 1 CAST SCRAP

Birmingham	15.50
Boston, No. 1 mach.	†15.00-15.50
N. Eng. del. No. 2	14.00-14.50
N. Eng. del. textile	16.00-17.00
Buffalo, cupola	17.50-18.00
Buffalo, mach.	18.50-19.00
Chicago, agri. net	13.50-14.00
Chicago, auto net	16.00-16.50
Chicago, railroad net	14.50-15.00
Chicago, mach. net	15.50-16.00
Cincin., mach. deal.	16.25-16.75
Cleveland, mach.	20.50-21.00
Detroit, cupola, net	†15.50-16.00
Eastern Pa., cupola	20.00-20.50
E. Pa., No. 2 yard	16.50
E. Pa., yard fdry.	16.50-17.00
Los Angeles	16.50-17.00
Pittsburgh, cupola	17.50-18.00
San Francisco	14.50-15.00
Seattle	12.00-14.00
St. Louis, breakable	†14.00-14.50
St. Louis, agri. mach.	15.75-16.25
St. L., No. 1 mach.	†16.25-16.75
Toronto, No. 1 mach., net dealers	18.00-18.50

HEAVY CAST

Boston dist. break.	†12.75-13.25
New England, del.	14.50-15.00
Buffalo, break	15.00-15.50
Cleveland, break, net	15.50-16.00
Detroit, auto net	†16.00-16.50
Detroit, break	†13.00-13.50
Eastern Pa.	18.50
Los Ang., auto, net	13.00-14.00
New York break	†14.00
Pittsburgh, break	15.00-15.50

STOVE PLATE

Birmingham	10.00
Boston district	†10.50-11.00
Buffalo	14.50-15.00
Chicago, net	10.50-11.00
Cincinnati, dealers	8.50- 9.00
Detroit, net	†9.50-10.00
Eastern Pa.	15.00-15.50
New York fdry.	10.75-11.25
St. Louis	10.50-11.00
Toronto dealers, net	12.00-12.50

MALLEABLE

New England, del.	21.00
Buffalo	19.00-19.50
Chicago, R. R.	19.50-20.00
Cincin., agri., deal.	13.50-14.00
Cleveland, rail	21.00-21.50
Eastern Pa., R.R.	20.50-21.50
Pittsburgh, rail	21.50-22.00
St. Louis, R. R.	†16.00-16.50

Ores

Lake Superior Iron Ore

Gross ton, 51½ %

Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract.	9.00-10.00

Foreign Ore
(Prices nominal)

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe, 6-10% Mn.	15.00
North African low phos.	16.00
Spanish No. African basic, 50 to 60%	16.00
Chinese wolframite, short ton unit, duty paid	$23.50-24.00
Scheelite, imp.	$25.00
Chrome ore, Indian, 48% gross ton, cif.	$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%	49.00-50.00
Indian, 49-50%	
Brazilian, 48-52%	46.00-48.00
Cuban, 50-51%, duty free	61.20

Molybdenum

Sulphide conc., per lb., Mo. cont., mines	$0.75

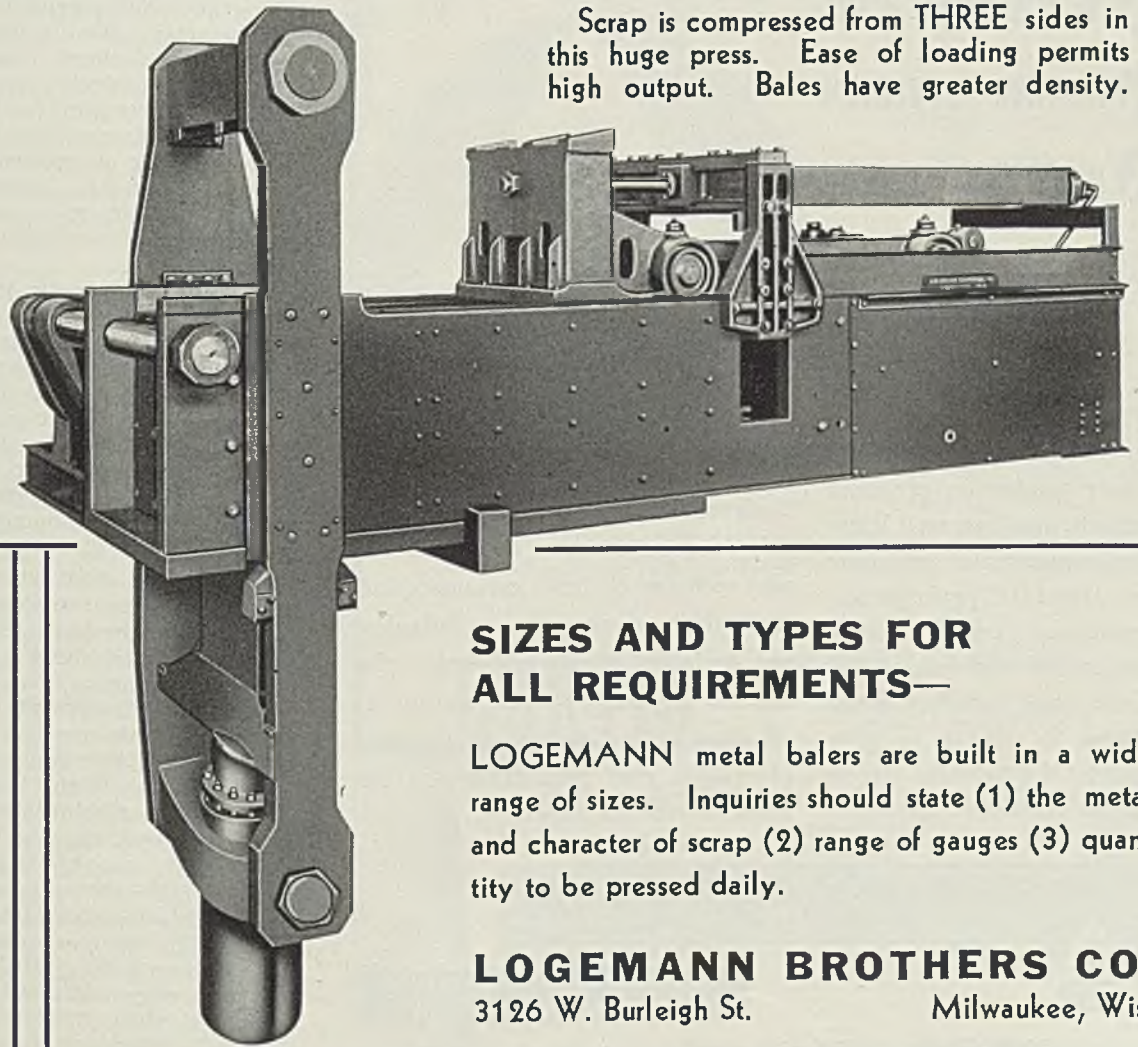
SHEET SCRAP?

Bale it in a LOGEMANN SCRAP PRESS

"Hydraulic-compressed" scrap pressed in LOGEMANN metal balers, commands the best price at all times. It can be more conveniently stored and more economically handled.

It can be readily held for favorable markets. It practically eliminates corrosion, saves much heat in remelting. It easily loads cars to capacity.

Scrap is compressed from THREE sides in this huge press. Ease of loading permits high output. Bales have greater density.



SIZES AND TYPES FOR ALL REQUIREMENTS—

LOGEMANN metal balers are built in a wide range of sizes. Inquiries should state (1) the metal and character of scrap (2) range of gauges (3) quantity to be pressed daily.

LOGEMANN BROTHERS CO.
3126 W. Burleigh St. Milwaukee, Wis.

Sheets, Strip

Sheet & Strip Prices, Pages 92, 93

Cleveland—Sheet and strip producers have accumulated fairly large backlogs but may meet difficulty in clearing books of low-price tonnage by June 30. Many buyers prefer to postpone receipt of this material until June, and mills are pressing for earlier releases in order to prevent a jam in schedules near the end of next month. Buying has slumped with the elimination of the $4 cut on domestic business, although export demand continues fairly active.

Belated price weakness in galvanized sheets became more pronounced just before former quotations on other grades were restored, and concessions of $4 a ton or more carried over past May 1. Official recognition was not accorded the lower levels and some efforts are being made to reinstate the 3.50c market.

Pittsburgh—Sheet and strip production has leveled off, with higher schedules seen likely to result from recent buying at temporarily reduced prices. Sheet mill operations recently have been at about 50 per cent, with galvanized output at 46 per cent. Buying has slumped with restoration, May 1, of prices prevailing before the $4 cut last month, but mill backlogs are fairly heavy.

Chicago—The rise in buying of low-priced sheets and strip has subsided with the return on May 1 to previous quotations, $4 a ton higher. Second quarter producing capacity of some mills is well booked. Irregularity still is noted in galvanized sheet prices.

Boston—Bookings of narrow cold strip in April were the best of the year, stimulated by price concessions, with former quotations now restored. Covering at lower prices was general and well spread as to consumers. Most producers feel the volume booked is largely at the expense of future business. Re-rolling operations will gradually mount this month with June schedules likely to be still more active to enable shipments of low-priced material by the last of that month.

New York—Sheet fabrication is expanding slowly, reflecting mainly the larger requirements of the building industry. New contracts, however, have declined since May 1, when sheet producers rescinded concessions. Buying during the concession period was not excessively large, as buyers, for one reason, still had fair sized stocks. However, they appear generally to be well covered for the remainder of this quarter and probably beyond.

Cold strip buying is meager, following moderate covering at recent lower prices. Such flurry was not of large proportions, although well distributed as to consumers, with apparently little speculative buying. Considerable tonnage taken during the last half of April to be shipped by June 30 is at the expense of future buying, in the opinion of most sellers.

Philadelphia—Following the recent flurry which accompanied the rescinding of the $4 price cut May 1, sheet buying has been quiet. Buying was not heavy, but users generally are well covered for the remainder of this quarter. Specifications are disappointing to producers for this season of the year, but volume is at least being sustained.

Buffalo—Mills have accumulated considerable backlog of low-price tonnage, but with delivery of a portion of this business deferred until later in the quarter, production so far has been influenced little. Higher prices were instituted May 1 on sheet and strip grades affected by the April reduction.

Cincinnati — Higher operations

among sheet mills are indicated as a result of recent forward coverage at reduced prices. Previous quotations now are being applied. Automotive interests were not active in buying lately, requirements prior to the summer model changes being moderate.

Birmingham, Ala.—Due to adverse weather, sheets have not shown the anticipated increase in bookings, but hold steady. Strip is moving in reasonably good volume.

Toronto, Ont.—While sheet booking continues steady, no large contracts were reported last week. Electric equipment makers furnish a large part of current demand, and warehouses also are in the market. Mills are booked almost solid to the end of July, and are making contract deliveries but have no sheets for spot delivery. Many consumers are taking delivery from warehouses or ordering in the United States.

Plates

Plate Prices, Page 92

Chicago—Although orders to mills decreased slightly last week, fabricators indicate a considerable volume of work now is pending and feel a sufficient amount of this will materialize to assure good operations for some weeks to come. Inquiries are headed by 600 tons from bureau of reclamation, Friant, Calif., for anchorage and pier plates.

Boston—Miscellaneous plate buying is slightly more active, with small-lot specifications still prominent. Fabricators show little inclination to order much beyond early requirements. Several water tank projects are in prospect, but such needs are well below those of recent years. Structural, boiler and railroad shop demand continues meager. Watertown, Mass., arsenal has bids on approximately 500 individual plates of various sizes, widths and finishes. Some price shading developed during the recent weakness in other flat rolled products, but not much beyond frequent indirect concessions.

New York—Although the market is slightly more active because of a firmer trend in prices, demand, apart from shipbuilding specifications, is of a miscellaneous character. Building operations, disappointing to date, are expected to improve. Lack of government spending is reflected in a lighter volume of tank work than noted a year ago, while tank fabricators report few public works of this kind are pending. Lack of important railroad buying also has slackened demand.

Philadelphia—Plate business is

spotty, with volume slightly better and with prices firmer as a result of the rescinding of the $4 concessions in sheets and strip. In fact, plate prices withstood the shock of these concessions very well, it now appears, although buying was adversely effected for a while. Tank and boiler work is fair; railroad demand poor.

Seattle—Moore Dry Dock Co., Oakland, Calif., has the award for caisson gates at Puget Sound navy yard, welded construction specified, involving about 600 tons of plates and 400 tons of structurals. Quartermaster, Fort Mason, Calif., opened bids April 29 for a steel gas-storage tank for the Fairbanks, Alaska, air base. Everett, Wash., has called bids May 8 for a 25,000-gallon 75-foot water tower, alternate wood.

Birmingham, Ala.—Plate production remains consistently high. Considerable tonnage is coming from tank manufacturers and shipbuilders, with some railroad requirements.

San Francisco—Some improvement in demand for plates is noted and two large projects were placed with Moore Dry Dock Co., Oakland, Calif., 1400 tons for caisson gates for Pearl Harbor, T. H., and Bremerton, Wash., navy yards and 500 tons for a second wind tunnel at Moffett Field, Calif. Awards totaled 2200 tons and brought the aggregate to date to 23,760 tons, compared with 16,330 tons for the same period a year ago.

Toronto, Ont.—Plate demand is well sustained, with shipbuilders taking large tonnages, mostly from the United States. Orders and inquiries for plates are appearing from builders that recently closed contracts for small patrol boats. Boiler and tank builders also are in the market and there is growing demand from this source.

Plate Contracts Placed

1400 tons, Caisson gates, Pearl Harbor and Bremerton, Wash., to Moore Dry Dock Co., Oakland, Calif.

500 tons, wind tunnel, Moffett Field, Calif., to Moore Dry Dock Co., Oakland, Calif.

113 tons, water tank, Coeur d'Alene, Idaho, County Club, to unstated interest.

Plate Contracts Pending

4200 tons, 50 and 59-inch welded steel or reinforced concrete pipe, metropolitan water district, Los Angeles, specification 328; bids May 14.

1100 tons, steel penstocks, Parker Power dam, California-Arizona; Chicago Bridge & Iron Co., Chicago, low $184,500, schedule two, pro. 898, bid April 15 to bureau of reclamation, Denver.

600 tons, anchorage and pier plates, for dam, Friant, Calif.; bids to bureau of reclamation.

575 tons, welded plate steel outlet pipes Friant dam, Central Valley project, California, Western Pipe & Steel Co. of California, low $78,895 f.o.b. Los Angeles; bids April 25, pro. 903, bureau of reclamation, Denver.

375 tons, including 1230 feet, 42-inch steel pipe, 1050 feet, 48-inch, and 1590 feet, 51-inch, alternates on riveted or electric welded fabrication, for installation on route 6, section 9, Passaic county, New Jersey; bids May 17 to E. Donald Sterner, state highway commissioner, Trenton, N. J.

130 tons, liner plates, Clearwater dam, Piedmont, Mo.; United Construction Co., Winona, Minn., low on general contract.

Unstated tonnage, steel barges, Panama, United States Steel Export Co., Washington, low on four, $201,156, and three, $156,348; bids April 24, schedule 4008.

Tin Plate

Tin Plate Prices, Page 92

Pittsburgh—Tin plate operations continue to gain as releases move upward. Nearing the canning season, increased activity and moves to increase inventories in line with expected demand have boosted the order tonnage and sent the operating rate up two points to 65 per cent of

capacity. Sellers expect the rate to continue a steady upward pull over the balance of the second quarter. Export business is steady, with volume good and prices strong. Miscellaneous demand and general line can volume are on a fair level.

Pipe

Pipe Prices, Page 93

Pittsburgh — Pipe business is slightly heavier, topped by a small increase in demand for oil country goods and boiler tubes. Standard pipe is somewhat more active but still relatively dull, with resale prices irregular. Railroad demand is good.

Cleveland — Pipe demand is expanding, with prospects encouraging. Shipments of standard pipe to consigned stocks are heavier than 30 days ago, reflecting better requirements in building construction. Movement of oil country goods is fair, though improvement has been less noticeable than in standard material. Export business has shown moderate gains the past few weeks.

Boston—Demand for seamless and alloy tubing from the aircraft industry is active. The Springfield, Mass., armory has estimates on 25,000 feet of seamless. Production of bicycles has held well, although buying for frames is tapering. Merchant steel pipe business is spotty in small lots, with resale prices unsettled in some centers. Lagging construction has also slowed down wrought iron pipe. Cast pipe buying continues much smaller than usual. Volume placed so far this season has been disappointing, although orders, including blanket awards, are more numerous.

New York—Except for a large tonnage of cement-lined cast pipe for yard stocks, New York city, expected out for bids this week, inquiry is light with export volume active. Rahway, N. J., closes May 14 on 220 tons and bids go in May 6 with the department of water supply, gas and electricity, New York, on a line in the Fifth Avenue-Central Park district, taking mostly steel pipe. Steel pipe inquiry also includes close to 375 tons of large diameters for installation in Passaic county, New Jersey, bids May 17. Cast pipe prices are inclined to be firmer.

Birmingham, Ala.—Pipe production is steady by virtue of small and scattered orders. Improvement, anticipated a few weeks ago, has been slow.

Seattle—Inquiry is slow, following sizable contracts awarded first quar-

ter. Ellensburg, Wash has called bids May 6 for a small tonnage of 6-inch cast iron and 4 and 6-inch galvanized and black steel pipe.

Steel Pipe Placed

Unstated tonnage, 100 lengths 24-inch, steel shore pipe and 50 lengths, 20-inch, United States engineer, Wilmington, Dela., to Gary Steel Products Corp., Norfolk, Va.; bids April 18, pro. 118.

Cast Pipe Placed

520 tons, 6, 8 and 12-inch, metropolitan district commission, Hartford, Conn., to Florence Pipe Foundry & Machine Co., Florence, N. J.

336 tons, 8 to 20-inch, Glendale, Calif.; 294 tons to National Cast Iron Pipe Co., Birmingham, Ala., and 42 tons 16 and 20-inch, to United States Pipe & Foundry Co., Burlington, N. J.

100 tons, 6 to 10-inch, cement-lined, Mt. Vernon, N. Y., to Donaldson Iron Works, Emaus, Pa.

Cast Pipe Pending

1020 tons, 6 and 8-in., Class 150, Los Angeles; American Cast Iron Pipe Co., Birmingham, Ala., low on 829 tons and National Cast Iron Pipe Co., Birmingham, Ala., low on 191 tons.

458 tons, 6 to 12-in., Santa Rosa, Calif.; bids May 7.

325 tons, 4 and 6-inch, Spokane, Wash., to Pacific States Cast Iron Pipe Co., Provo, Utah.

220 tons, 12 and 16-inch, Rahway, N. J.; bids May 14.

128 tons, 6-in., Whittier, Calif.; bids May 6.

120 tons, 8-inch cement lined, Panama, schedule 4022, bids May 7.

Bars

Bar Prices, Page 92

Chicago—Carbon and alloy bar sales generally show little change, though one large interest continues to report improvement in alloy demand. Automotive and agricultural machinery needs lead. Farm implement requirements have subsided slightly but show indications of continuing well into third quarter. Tractor production is prominent.

Boston—Demand is slightly improved and some alloy grades border on the active as a result of orders from government shops, small forgers, machine builders and miscellaneous consumers. High speed tool steel also is moving briskly although in small lots. Mill deliveries on special alloys and heat-treated grades have been reduced slightly, with a good portion of tonnage moving through secondary distributors. Stocks on hand are not large, and some mills are pressed for delivery.

New York—Bar demand is tending upward slightly. Releases are coming principally from machine tool builders and manufacturers of airplane equipment. Substantial volume from government shops continues, and slightly improved business is noted from bolt and nut makers. Carbon bar deliveries are two to four weeks.

Shell steel inquiry for the Allies is expanding rapidly, although buying to date has been confined largely to the order placed recently with the American Car & Foundry Co., New York, at an estimated total of about $10,000,000 involving about 30,000 tons. While the principals in the transaction refuse to comment, it is reliably understood the order will be handled at the Buffalo plant of the American Car & Foundry Co., which has recently been reopened after a suspension of considerable time. Large inquiries for machine tool equipment for facilitating production of this contract are before the trade.

Philadelphia — Bar specifications are coming principally from small forgers, although miscellaneous volume is holding well. Of the ma-

jor heavy products bars continue relatively most active. Carbon bar sellers, however, now have only normal backlog, the heavy booking of a few months ago having been worked off.

Birmingham, Ala. — Bars have shown some inclination upward, and production is on an even basis. Merchant bars are particularly steady, a good tonnage going to producers of agricultural implements.

Toronto, Ont.—Merchant bar sales are holding well, with most current orders for small lots. Mills are booked to the end of this quarter, and some producers are prepared to give short term delivery on new orders. Warehouse operators are buying freely to keep sufficient stocks to meet expected increased demand later in the year.

Buffalo—Production rose slightly last week, with most of the gain in large-diameter material. Demand for alloy bars is expected to increase as aircraft builders get into full production on war orders.

Wire

Wire Prices, Page 93

Pittsburgh—Merchant wire items are moving fairly well, stimulated by price concessions as well as seasonal conditions. Manufacturers' wire items are now moving well, running ahead of the previous week, while April finished up ahead of March.

Boston—Wire demand is well diversified and buying has improved slightly. Incoming orders are generally for prompt delivery, and some consumers are more inclined to anticipate, but export inquiry is heavy.

New York—Export demand for wire and rods is notably heavy, not only from South America but from nations until recently depending on Europe for supplies. For South America 1000 tons of special fencing has been booked. Domestic demand is gradually improving, notably for needs indirectly connected with armaments.

Birmingham, Ala.—All specifications in wire products continue in excellent demand. Inventories are generally light and most of the product is finding its way directly into consumer hands.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 93

New York—With prices generally firmer, sellers believe the downward trend in production the past four months has about run its course and that May will bring a leveling off if

not an upturn. May tonnage is expected to be bolstered by improved building and shipyard specifications. Automotive requirements likely will be sustained a little longer, although railroad demand lacks promise. Current operations are between 40 and 45 per cent, down several points from first of the year. Action on third quarter quotations is not expected immediately.

Rails, Cars

Track Material Prices, Page 93

Railroad buying is at a minimum, only a few scattered sales being made and practically no inquiry in market. Newfoundland railway is asking bids on 50 flat cars from builders in the United States. Two small lots of rails have been placed by government agencies for public work.

Locomotives Placed

Chicago, Rock Island & Pacific, one 1000-horsepower diesel-electric switch engine, to American Locomotive Co., New York.

Des Moines Union Railway, Des Moines, Iowa, three 660-horsepower diesel switchers, to American Locomotive Co., New York.

Rail Orders Placed

MacDill Field, quartermaster, Tampa, Fla., 615 tons with accessories to Tennessee Coal, Iron & Railroad Co., Birmingham, bids April 19, pro. 6899-47.

Rail Orders Pending

United States army, Fort Lewis, Wash., 172 tons, also fastenings; bids May 7 to Capt. E. P. Antonovitch, constructing quartermaster, Fort Lewis.

Car Orders Pending

Newfoundland Railway, fifty 30-ton flat cars; contemplated.

Shapes

Structural Shape Prices, Page 92

Chicago—Projects pending are heavier, but fabricators' operations are unchanged and orders to mills declined moderately last week. Large inquiries are few. These include 400 tons for upper guide wall extensions on Mississippi river dams between St. Louis and St. Paul and 400 tons for repairs and reinforcing of elevated lines, Chicago Rapid Transit Co.

Boston—Structural inquiry fluctuates, lately being slightly heavier. A 700-ton addition to a Hartford, Conn., insurance building is among the larger jobs. Massachusetts closes May 21 on a truss and stringer bridge, Hoosic river, North Adams, taking several hundred tons, the largest span inquiry in several months. Lack of bridge and public work so far this year accounts for the lag in this district, while private construction compares well and is slightly ahead of last year. Awards are light.

Philadelphia—Award of 900 tons by John McShain, this city, to Bethlehem Steel Co., Bethlehem, Pa., features the structural market. Of this total 700 tons are for the naval medical center, Bethesda, Md., and 200 tons for the Longfellow store in Washington. Belmont Iron Works, Eddystone, Pa., booked 120 tons for a laboratory in Newark, Del., through the Shepard Construction Co., Wilmington, Del. Buying otherwise has been light although a few fair-sized tonnages are being figured.

Seattle—New business is developing slowly. Interest centers in the Washington state Kettle river bridge, bids at Olympia, May 7, involving 1632 tons. About 500 tons

is involved in bulkhead coaster gates, Coulee dam, Steacy-Schmidt Mfg. Co., New York, low to Denver, $190,000.

San Francisco—A fair volume of structural business was reported placed, totaling 2200 tons. This brought the year's aggregate to 61,863 tons, compared with 47,808 tons for the same period last year. Pending business is heavy and calls for more than 19,000 tons.

Toronto, Ont.—New construction work continues on an expanding scale calling for larger tonnages of shapes. Approximately 2000 tons is pending for viaduct at Smith Ann and Wellington streets for Canadian National Railways. Various construction projects for which Foundation Co. of Canada Ltd., Montreal, has general contract, will involve upwards of 10,000 tons.

Shape Contracts Placed

6000 tons, Dorchester street station of Canadian National Railways, Montreal, to Dominion Bridge Co., Lachine, Que.

2000 tons, superstructure, bridge, East Chester creek, New York, Harris Structural Steel Co., New York, through National Excavation Co., New York.

1770 tons, piling, Cuyahoga river straightening, Cleveland, to Carnegie-Illinois Steel Corp., Pittsburgh; Great Lakes Dredge & Dock Co., Cleveland, contractor.

1100 tons, 180 galvanized steel transmission towers, Columbia-Nashville line, Tennessee Valley Authority, Knoxville, to American Bridge Co., Pittsburgh; bids April 12.

700 tons, naval medical center, Bethesda, Md., through John McShain, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.; 1650 tons of reinforcing steel also placed with that company.

700 tons, addition to building for Connecticut Mutual Insurance Co., Hartford, Conn., to Harris Structural Steel Co., New York, through Robert Glenn Co., New York.

650 tons, viaduct, Harrisburg, Pa., for state, to Bethlehem Steel Co., Bethlehem, Pa.

550 tons, bridge reconstruction, Delaware, Lackawanna & Western railroad across route 6, section 13, Mountain Lakes, N. J., to Bethlehem Steel Co., Bethlehem, Pa., through Eldora Construction Co., Newark, N. J.

500 tons, state bridge PSC-6600, Rochester, N. Y., to American Bridge Co., Pittsburgh.

500 tons, bridge 1369, Peru, Ind., for New York, Chicago & St. Louis railroad, to Bethlehem Steel Co., Bethlehem, Pa.

500 tons, addition to Howard Smith Paper Mills, Cornwall, Ont., to Dominion Bridge Co., Lachine, Que.

500 tons, plant addition for Continental Can Co. of Canada Ltd., at New Toronto, Ont., to Runnymede Iron & Steel Co. Ltd., 3382 Dundas street West, Toronto, Ont.

330 tons, addition to plant, for Warner & Swasey Co., Cleveland, to Paterson-Leitch Co., Cleveland.

330 tons, mill buildings, for General Fireproofing Co., Youngstown, O., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, addition to department store, for The Diamond Inc., Charleston, W. Va., to Ingalls Iron Works, Birmingham, Ala.

265 tons, grade crossing, West Forty-ninth street, Cleveland, for Cuyahoga county, Ohio, to Fort Pitt Bridge Works, Pittsburgh.

256 tons, state highway bridge, Meridian, Tex., to Bethlehem Steel Co., Bethlehem, Pa.

253 tons, state highway bridge, Raton, N. M., to Des Moines Steel Co., Des Moines, Iowa.

250 tons, factory building, for Ranger Engineering Corp., Farmingdale, N. Y., to Belmont Iron Works, Philadelphia.

250 tons, alterations to building, for City

Shape Awards Compared

	Tons
Week ended May 4	13,409
Week ended April 27	11,204
Week ended April 20	10,014
This week, 1939	9,315
Weekly average, year, 1940	16,651
Weekly average, 1939	22,411
Weekly average, March	19,759
Total to date, 1939	404,582
Total to date, 1940	299,725

Includes awards in United States of 100 tons or more.

Bank Farmers Trust Co., New York, to Dreier Structural Steel Co., New York.

240 tons, building, Dow Chemical Co., Freeport, Tex., to Consolidated Steel Corp., Los Angeles.

200 tons, extension to melting building 121, for Aluminum Co. of America, Massena, N. Y., to Lackawanna Steel Construction Corp., Buffalo.

200 tons, Longfellow store, Washington, through John McShain, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.; 900 tons of reinforcing steel also placed with that company.

185 tons, state bridge FAS-223, Wellman, Iowa, to Clinton Bridge Works, Clinton, Iowa.

180 tons, bridge, Sleepy Eye, Minn., to Illinois Steel Bridge Co., Jacksonville, Ill.

180 tons, bridge 1347, Bunker Hill, Ind., for New York, Chicago & St. Louis railroad, to American Bridge Co., Pittsburgh.

175 tons, bridge FAGM-438-B(1), Pulaski county, Arkansas, to Virginia Bridge Co., Roanoke, Va.

165 tons, store building, S. H. Kress & Co., Augusta, Ga., to Kline Ornamental Iron Co., Atlanta, Ga.

165 tons, form trusses for drydock No. 2, navy yard, Mare Island, Calif., to Bethlehem Steel Co., San Francisco.

160 tons, paper plant addition, Camas, Wash., and structure at Sitka, Alaska, navy air base, to Isaacson Iron Works, Seattle.

150 tons, store building, S. H. Kress & Co., Dallas, Tex., to Mosher Steel Co., Dallas, Tex.

150 tons, dormitories, Grove City college, Grove City, Pa., to Pittsburgh Bridge & Iron Co., Pittsburgh.

120 tons, state bridges, Flemington, W. Va., to Riverside Steel Co., Wheeling, W. Va.

120 tons, laboratory, Newark, Del., through Shepard Construction Co., Wilmington, Del., to Belmont Iron Works, Eddystone, Pa.

115 tons, parochial high school, Charleston, W. Va., to Ingalls Iron Works, Birmingham, Ala.

100 tons, radio towers, naval air station, Jacksonville, Fla., to Aetna Steel Construction Co., Jacksonville.

100 tons, J. Forstmann library building, Passaic, N. J., to Selbach-Meyer Co., Union City, N. J.

Shape Contracts Pending

2511 tons, Panama Canal, schedule 4032, bids May 13; also includes 68 tons plates, and 24 tons bolts and washers.

2500 tons, amusement pavilion, Los Angeles; bids opened.

2500 tons, hangar, LaGuardia Field, New York; bids in.

2000 tons, armory, Washington; bids May 22.

1300 tons, air base hangar, Fairbanks, Alaska, for United States government.

1300 tons, Loose-Wiles Biscuit Co. plant, Oakland, Calif.; Dinwiddie Construction Co., Crocker Bldg., San Francisco, low on general contract.

1200 tons, medical center buildings, bureau of yards and docks, navy department, Washington; John McShain Co., Philadelphia, low, bids April 23.

800 tons, high school, Halifax, N. S., for school board.

750 tons, addition, post office, Spokane, Wash.; James Leck Co., Minneapolis, low on general contract at $527,850.

750 tons, office and factory building, for City Machine & Tool Co., Toledo, O.

700 tons, public school No. 99, New York; bids in.

627 tons, including 362 tons bearing piles and 165 tons sheet piling, La Brea dam, Orange county, Calif.; bids May 20.

575 tons, building, for Hydraulic Press Mfg. Co., Mt. Gilead, O.

550 tons, medium security prison, Huttonsville, W. Va., for board of control.

520 tons, four highway bridges, state of Oklahoma; bids June 4.

500 tons, high school, Chester, Pa.; bids May 9.

500 tons, coaster gates Coulee dam; Steacy-Schmidt Mfg. Co., New York, low to Denver.

475 tons, state bridge FAP-285-B (3), Denver.

450 tons, extensions to warehouses, for Owens-Illinois Glass Co., Streator, Ill.

450 tons, tunnel supports, Continental Divide tunnel, station 618.39 to 698.39; general contract to S. S. Magoffin, Englewood, Colo. at $471,123.

400 tons, Bowery Bay sewage project, New York; Lane Engineering Co., New York, low.

400 tons, upper guide wall extensions, Mississippi river dams, bids to United

States district engineer, Rock Island, Ill., May 8.

400 tons, reinforcing and repairs of south side trestles, Chicago Rapid Transit Co., Chicago.

360 tons, state bridge, Erie county, Pennsylvania; bids to state highway department, Harrisburg, Pa., May 10.

350 tons, bascule bridge, Ocean City, Md., Tidewater Construction Co., Norfolk, Va., low on general contract; 2600 tons of bars also required.

330 tons, store building, for Thalimer Bros. Inc., Richmond, Va.

300 tons, factory at Brownsburg, Que., for Defense Industries Ltd., 625 Dorchester street, Montreal.

300 tons, Lamokin housing project, Philadelphia district; bids May 6.

295 tons, railroad underpass, Mountain Lakes, N. J.

270 tons, including 90 tons H columns, two bridges in San Mateo county, Calif., for state; bids May 8.

250 tons, viaduct, Clarks, Nebr., for state.

250 tons, steel truss and stringer bridge over Hoosac river, North Adams, Mass.; bids May 21.

225 tons, dormitory, Connecticut state college, Storrs, Conn.

218 tons, galvanized structural steel transmission towers, Columbia-Nashville line, Tennessee valley authority, Knoxville; bids May 20.

200 tons, air base power house, Fairbanks, Alaska, for United States government.

200 tons, factory building, for Jones & Lamson Machine Co., Springfield, Vt.

200 tons, miscellaneous material, bureau of reclamation, canal, Antioch, Calif.

200 tons, Gravois avenue underpass, Missouri Pacific railroad, St. Louis; G. L. Tarlton Contractor Inc., St. Louis, low on general contract.

185 tons, five pump houses, sewage plant, United States army engineers, Kingston, Pa., Sodoni Construction Co., Wilkes-Barre, Pa., low; 350 tons of bars also required.

180 tons, state bridge FAGS-85-C, Milwaukee.

176 tons, including bearing and sheet piling, East Fullerton Creek dam, Orange county, California; Chas. U. Heuser, 816 Allen avenue, Glendale, Calif., low on general contract at $234,000.

170 tons, state bridge 5337, Faribault, Minn.

160 tons, Clearwater dam, Piedmont, Mo.; United Construction Co., Winona, Minn., low on general contract.

160 tons, office building, for New York State Electric & Gas Co., Elmira, N. Y.

140 tons, state bridge, Lawrence county, Ohio.

140 tons, high school addition, New Brunswick, N. J.

130 tons, state bridge, Wilbur Cross parkway, Willington, Conn.

125 tons, building addition, New York Telephone Co., Troy, N. Y.

125 tons, overpass, Pittsfield, Pa., for state.

120 tons, state bridge FAP-137-B (1), Rexford, Mont.

120 tons, state bridge 639, Chippewa, Wis.

120 tons, bridge 228, Falls, Md., for Western Maryland railroad.

Unstated, eleven bearing assemblies, Coulee dam; American Bridge Co. and Consolidated Steel Corp., Los Angeles, low.

Unstated, automatic radial gates for Vallecito dam, Pine river project, Idaho; Willamette Iron & Steel Corp., Portland, low to Denver.

Unstated, Entiat, Wash., hatchery and garage for reclamation bureau; West Coast Construction Co., Seattle, low.

Unstated, 130-foot steel span, Tobacco river, Montana; W. P. Roscue, Billings, general contractor.

Tonnage unstated, 175,950 square feet steel sheet piling, improvements to locks and dams 11, 16, 18, 20 and 21, upper Mississippi river; bids at Rock Island, Ill., May 8.

Reinforcing

Reinforcing Bar Prices, Page 93

Pittsburgh—Despite a fairly active market, prices disclose no firmness. Quotations average about 1.70c, ranging up to 1.90c. Rail steel bars on the whole are weaker than billet material. Export prices are holding to the published level. Inquiries are plentiful for both public and private work.

Chicago — Pending business is steady. Inquiries include no large

projects, but small jobs are numerous. Awards include 445 tons for a Northwestern university building and 150 tons for a Marion, Ind., bridge.

Boston—Housing projects account for several hundred tons, but reinforcing steel buying is confined mostly to small lots. Bridge and highway needs are light. Little tonnage involved in the defense program, including extensions to the navy yard at Boston, is yet to be placed in this district, although a few jobs remain, including two warehouses at the air base, Chicopee, Mass. Prices continue depressed. Part of close to 1000 tons of sheet piling for dike and other engineering projects under supervision of the United States engineer, Providence, has been placed.

New York—Reinforcing steel inquiry is heavier and pending tonnage is the largest of the year. Until recently highway mesh has lagged, but close to 2000 tons for New York state and Connecticut are now active. In addition to the East river housing project, New York, 1680 tons, two similar jobs are up for Elizabeth and Jersey City, N. J. Concrete bar prices continue to sag.

Philadelphia—Reinforcing bars for two projects, totaling 2550 tons, have been placed through John McShain, this city, with Bethlehem Steel Co., Bethlehem, Pa. One project involves 1650 tons for the naval medical center at Bethesda, Md., and the other 900 tons for the Longfellow store in Washington. Outstanding among pending jobs is the bascule bridge in Ocean City, Md., requiring 2600 tons of reinforcing steel.

Seattle—Rolling mill schedules are adjusted to the decreased call for products, no large tonnages of reinforcing being in the market. Small orders of 20 to 50 tons are fairly numerous but outstanding propects are lacking. Bethlehem Steel, San Franciso, is reported to have been awarded 1518 tons for reclamation jobs in Washington state, the Seattle plant probably to provide the tonnage. Business pending is less than 1000 tons, including army and navy projects and state highway work in Oregon and Washington.

San Francisco — Reinforcing bar awards were the largest for any week this year, 9159 tons, bringing the total to date to 52,271 tons as compared with 68,793 tons for the corresponding period in 1939. Numerous small projects were placed involving lots ranging from 15 to 65 and 75 tons. Pending business exceeds 18,000 tons.

Toronto, Ont.—Reinforcing steel is in good demand, with orders pending totaling around 3000 tons, and prospective business covering early summer running a further 10,000 tons. Some 700 tons will be required for new terminal station to be erected at Burlington, Ont., for Hydro Electric Commission of Ontario, University avenue, Toronto, and orders are pending for 400 tons for substation at Ottawa, Ont., for Ottawa Electric Co.

St. Louis—Bids will be opened at Rock Island, Ill., May 8 for improve-

Concrete Bars Compared

	Tons
Week ended May 4	7,859
Week ended April 27	1,725
Week ended April 20	10,576
This week, 1939	9,900
Weekly average, year, 1940	8,070
Weekly average, 1939	9,197
Weekly average, March	7,469
Total to date, 1939	190,812
Total to date, 1940	145,262

Includes awards in United States of 100 tons or more.

ments to locks and dams Nos. 11, 16, 18, 20 and 21 in the upper Mississippi river, which will require 1250 tons of reinforcing bars and 175,950 square feet of steel sheet piling.

Reinforcing Steel Awards

2625 tons, bureau of reclamation, invitation 33,444-A, Coram, Calif., to Columbia Steel Co., San Francisco.

1650 tons, naval medical center, Bethesda, Md., through John McShain, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.; 700 tons of shapes also placed with that company.

900 tons, McCullough Homes housing project, Baltimore, to Bethlehem Steel Co., through Woodcrest Construction Co. and Rosoff Bros., joint contractors, New York.

900 tons, Longfellow store, Washington, through John McShain, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.; 200 tons of shapes also placed with that company.

670 tons, graving dock, navy yard, Mare Island, Calif., to Bethlehem Steel Co., San Francisco.

445 tons, foundation, technical school building, Northwestern university, Evanston, Ill., to Joseph T. Ryerson & Son Inc., Chicago.

250 tons, Manchester avenue bridge, Kansas City, Mo., to Sheffield Steel Corp., Kansas City, Mo.

190 tons, technical building, Moffett Field, Calif., to San Jose Iron & Steel Co., San Jose, Calif.

180 tons, Ohio highway department, project No. 26, Brown and Clermont counties, to Truscon Steel Co., Youngstown, O.

180 tons, Hubbard Ice & Fuel Co. building, Cedar Rapids, Iowa, to Laclede Steel Co., St. Louis.

149 tons, water system, Kailua, T. H., to Bethlehem Steel Co., San Francisco.

120 tons, Pennsylvania highway project, McMurray, Pa., to Jones & Laughlin Steel Corp., Pittsburgh, through Electric Welding Co.

100 tons, sewage treatment plant, Hammond, Ind., to Inland Steel Co., Chicago.

100 tons, United States embassy building, Havana, Cuba, to Youngstown Sheet & Tube Co., Youngstown, O.

Reinforcing Steel Pending

2600 tons, bascule bridge, Ocean City, Md.; Tidewater Construction Co., Norfolk, Va., low on general contract; 350 tons of shapes also required.

2036 tons, reinforced concrete or welded steel pipe, metropolitan water district, Los Angeles; bids May 14.

1680 tons, East river housing project, New York; George F. Driscoll Co., Brooklyn, low.

1450 tons, including mesh, state highway projects, New York state, bids May 1 and 15.

1250 tons, improvements to locks and dams 11, 16, 18, 20 and 21, upper Mississippi river; bids at Rock Island, Ill., May 8.

1000 tons, housing projects, Jersey City and Elizabeth, N. J.; bids May 16 and 22, respectively.

900 tons, La Brea dam, Orange county, California; bids June 6.

750 tons, Clearwater dam, Piedmont, Mo.; United Construction Co., Winona, Minn., low on general contract.

500 tons, flood control project, unit 4, Johnstown, Pa.; bids May 16.

485 tons, highway mesh, Fairfield, Stratford and Trumbull, Conn.; bids in; approximately 110 tons also included in state highway projects closing May 13, Hartford.

434 tons, Gravois avenue underpass, Missouri Pacific railroad, St. Louis; G. L. Tarlton Contractor Inc., St. Louis, low on general contract.

362 tons, East Fullerton creek dam, Orange county, California; Chas. U. Heiser, 816 Allen avenue, Glendale, Calif., low on general contract at $234,900.

350 tons, tuberculosis sanitarium, Greenville Springs, La.; Norman Construction Co., Lake Charles, La., low on general contract.

350 tons, five pump houses, sewage plant, United States army engineers, Kingston, Pa.; Sodoni Construction Co., Wilkesbarre, Pa., low on general contract; 185 tons of shapes also required.

300 tons, Delaware, Lackawanna & Western railroad bridge, Mountain Lake, N. J.

225 tons, state highway projects, Rhode Island; bids May 15.

220 tons, Loose-Wiles Biscuit Co. plant, Oakland, Calif.; Dinwiddie Construction Co., Crocker Bldg., San Francisco; low on general contract.

180 tons, weather bureau building

Behind the Scenes with STEEL

■ A new-found reader of STEEL is E. D. Lucas Jr., of Indian Run Farm, Exton, Pa. Mr. Lucas not only reads STEEL (and likes it), he wields a wicked poetic pen as witnessed by this week's contribution:

STEEL SYMPHONY

By Ted Lucas

Big-bellied shovels with derricks on high
Scooping iron mouthfuls, ten yards a try.
Red ore pouring in the hold of a freighter,
Grab buckets dipping in a hematite crater.
Skip hoist travels up the side of the stack
Dumping ore and limestone and coke, powder black.
Blast furnace glows and belches and roars—
Out of the tap-hole molten iron pours.
Hot metal mixers, shaped like whales,
Pulled across the yard on rolled steel rails.
Then in the open hearth, molten iron and scrap
Boil in a basin hot as Satan's lap.
"Knock out the fire clay, tap the heat!"
Shovel in aluminum to make her complete—
While hot sparks fly out in mad celebration,
Observers make pyrometric calculation:
Temperature, twenty-nine ninety-four . . .
Rivers of slag in the thimbles pour,
Thimbles for giants with Vulcan's hands,
Thimbles supported on I-beam stands . . .
Pick up the ladle with a hundred-ton crane,
Fill up the ingot molds, set 'er down again.
Ingots lined up like soldiers in a row,
Off to the soaking pits, ingots all aglow—
Squeeze the hot ingots between rolls of steel,
Roll sheets and bars for an automobile,
Roll giant girders for the Golden Gate bridge,
Draw out wires for the fence on the ridge.
Coat steel with tin to make cans for sardines,
Talcum powder, tennis balls, pork 'n beans.
Coat steel with zinc to roof the barn's gables
And galvanized rope for a trawler's cables.
Roll stainless steel for the diner on rails,
Alloys for the plane that carries the mails . . .
Whine of miner's dragline scoop
Ore cars grumbling in a group
Furnace loosing iron stream
Bessemer's blow, a Dante's dream—
Tapping heats in giant ladles
Rumbling cranes on girdered cradles
Sound of roll and shear and wheel—
That's the symphony of steel!

Golden Gate Expo, No. 2

■ Mail from San Francisco these days sports a catchy slogan, *Fair in '40.*

Is It Raining, Please?

■ Latest trick by Michigan Bell Telephone in Detroit is a 24-hour weather reporting service similar to the correct time they'll give you most places for a nickel. Just dial WEather 1212 and a sweet young thing soothes you with "fair and warmer".

Trick Names

■ At the Midwest Safety council exhibit in Chicago last week Great Stuff Products Co. passed out samples of "John D. Jr.", a powdered hand soap. Also exhibiting was the Daylight Germ-Killing Illumination Co. We don't get it!

Sit Tight

■ Last week's puzzle of the new service that STEEL will soon announce is still unsolved.

Stickler

■ This one is by Carl D. Thompson: Two men start toward each other along a perfectly straight road. A reaches the point from which B started 11 minutes after B left and B reaches A's starting point 15 minutes after A left. They immediately start back and meet exactly half way between the starting points at precisely 4:00 P. M. *When did each man leave?*

■ Read STEEL—and PROFIT!

SHRDLU

Washington.

180 tons, two bridges, San Mateo county, Calif., for state; bids May 8.

170 tons, highway project SP-94-233, Owen county, Kentucky; bids May 8.

166 tons, highway project FAGM-158-F, Montgomery county, Kentucky; bids May 8.

150 tons, Southern State Parkway, SP-40-2, Suffolk county, New York.

135 tons, four highway bridges, state of Oklahoma; bids June 4.

135 tons, floor protection wall, Mississippi river, Golconda, Ill.; bids May 28.

110 tons, public opening, Rutland, Vt.; Truscon Steel Co., Youngstown, O., low.

100 tons plus, 210-foot concrete bridge and abutment work in Washington and Wasco counties, Oregon; bids in to Oregon highway commission.

Pig Iron

Pig Iron Prices, Page 94

Pittsburgh—Demand is steady, but with sales light. There has been some action toward firmer prices, but it is doubted this will be successful. Foundry activity is fair but not promising. Although blast furnace operations continue steady, total April production here was off from March.

Chicago—Sales show a slight further improvement. Most buying is for quarterly needs. Volume still is not great. April tonnage shipped was slightly less than in March. May shipments may show a measure of improvement. By-product foundry coke shipments showed no variation in April from March tonnage, though, because April had one less business day, daily average was better.

Boston—With the bulk of new buying in small spot lots for prompt delivery, shipments against old commitments are inclined upward. Foundry melt holds, with casting requirements for machine tools well maintained and outstanding. Supplies of foreign iron stored in this district have dwindled to a low point. Larger consumers with substantial stocks continue to draw on inventories, with hints they might purchase at lower prices. The recent indirect inquiry for more than 1500 tons is now believed to have been a feeler in this direction. However, prices are firm.

New York — Domestic specifications show little change on the average, although soil pipe makers are more active. Export inquiry continues heavy, particularly from Mediterranean countries. Inquiries from South America are fairly active.

Philadelphia—Pig iron sellers see little early change in rate of specifications, which in April were about on a parity with March business

which, in turn, was substantially ahead of February.

Buffalo—April shipments were off slightly from March, but orders lately have increased moderately. Output holds at 64 per cent, with little merchant iron being added to stocks. Foundry operations continue irregular. Plants working on munition orders are maintaining a five-day week.

Cincinnati—Pig iron shipments are off slightly, although the melt is sustained. Foundries producing machine tool castings have reduced backlogs, with evidence of an accumulation of castings in hands of some manufacturers. Pig iron sales are slow, being confined to spot lots. By-product foundry coke prices are being extended through May at $10.50, delivered Cincinnati.

St. Louis—Shipments of pig iron in April were about the same as in March. While sales continue light and are confined to spot cars, there has been an increase in inquiries following announcement of restoration of the cut of $4 a ton in sheets and strip.

Birmingham, Ala.—Pig iron production is back to 100 per cent, Sloss-Sheffield Steel & Iron Co. having relighted its city furnace and activity being under way Wednesday at Republic's recently completed rebuilding job at Thomas. Prospects are considered good for continued steady production.

Toronto, Ont.—While larger melters are marking time and sales are mostly in small lots, blast furnace representatives state that prospects for future business are bright. Inventories are reduced and as war business increases, demand for merchant pig iron will keep pace. Inquiries are appearing and some future contracts are being closed.

Scrap

Scrap Prices, Page 96

Pittsburgh—Added strength in all classifications was indicated last week, with railroad specialties and low phos material making another advance and stronger brokers' prices appearing on No. 1 steel and other open hearth grades and blast furnace material. Quotations have not changed on No. 1 and 2 heavy melting steel in the absence of sales to mills in any volume at prices outside current quotations.

Cleveland—Quotations on several grades have moved up 50 cents to $1 per ton, although steelmaking grades have remained steady. Low phosphorus scrap for electric furnace use leads in the advance.

Chicago—The market is stronger, with most grades definitely higher. Dealer-broker trading in No. 1 heavy melting steel has been at $16 or higher, although the last mill sale brought $15.50. Strength in railroad specialties and cast grades is outstanding.

Boston—Following the loading of a 6000-ton cargo, another boat is in to take on several thousand tons of iron and steel scrap. Shipping facilities continue uncertain. Brokers are covering export orders at unchanged prices. Domestic demand for both Pennsylvania and New England shipment is somewhat heavier, reflected in slightly higher prices on several grades. Some No. 1 machinery has moved to Canada by rail. Stove plate has brought better than $12, delivered New England, while No. 1 machinery and textile cast are slightly firmer. For barge shipment to eastern Pennsylvania, alloy-free turnings, bushelling and auto blocks are higher.

New York—Domestic buying of iron and steel scrap continues slow, with shipments to eastern consumers mostly against contracts, most steelmaking grades in this district moving from northern New Jersey,

with $14 generally paid for No. 1 heavy melting. Prices for most part are unchanged, with heavy breakable cast slightly firmer. Uncertainty of ships hampers exports.

Philadelphia—While prices are unchanged and little important buying is noted, the Eastern Pennsylvania scrap market is fairly strong. Supplies are coming out rather slowly, attributed principally to the cleaning up of many stocks last fall, when No. 1 steel in this district got up to $22 to $22.50, delivered, and upon some occasions even higher. No. 1 melting steel is $16.50 to $17, but it appears little could be done under $17 on a sizable tonnage. Heavy cast is strong because of the light accumulation in dealers' yards.

Buffalo—Despite heavy shipments from upper lake ports, the local iron and steel scrap market displays stronger price tendencies, with a small sale of No. 1 heavy melting steel reported within a range of $16.50 to $17 a ton, an advance of 50 cents. Within the past two weeks five boatloads of scrap, aggregating approximately 25,000 tons, have arrived here from Duluth and Detroit areas. One consumer received this entire amount and reports three more boatloads, averaging 5000 tons, are scheduled to arrive soon.

Cincinnati — Dealers have advanced prices 50 cents on all grades. Sentiment is improved, accompanied by a moderate increase in consumer interest. Heavy melting steel is in best demand. The Ohio river is returning to normal stage after the recent flood, permitting resumption of scrap movement by barge.

St. Louis—Scrap prices are unchanged from a week ago. Mills are temporarily out of the market, and no buying of consequence is in immediate prospect. Recent railroad lists included 4825 tons for the Baltimore & Ohio and 888 tons for the Alton.

Birmingham, Ala.—Scrap shows no indication of activity. Prices are nominal, but movement of most grades is in moderate lots only.

Seattle — Export houses report they could increase business with Japan were space available. Tidewater stocks are heavy and dealers are disinclined to make further purchases. Rolling mills are out of the market, buying only occasionally from out of town connections, recent purchases by mills having been made in small lots at $10, gross ton, for mixed scrap.

Toronto, Ont.—Considerable interest, with new activity and firm prices feature iron and steel scrap market. Demand for cast scrap and stove plate are special features and melters are taking all offerings. No. 1 cast scrap has practically dis-

appeared and melters demanding this material have been turning to United States sources recently. Imports of scrap are gaining steadily. Local dealers also report strong demand for steel scrap.

San Francisco—Apparently scrap prices on the Pacific coast have reached the bottom and currently are firm. Supply is not large and steel producers continue to buy only to replace consumption. While some inquiries for shipment to Japan have been reported no new business has been booked. Prices are unchanged.

Warehouse

Warehouse Prices, Page 95

Pittsburgh—New lists were issued last week by leading interest here, affecting bolts and nuts, which were reduced in line with going prices; flat-rolled steel, which was reduced $4 per ton on most grades, with stretcher leveled cold-rolled sheets off $6 and long ternes off $8.

Chicago — Sales continue at the moderately improved rate of late April. Last month's business was on a par with March, with the May outlook relatively good.

New York—Warehouses are maintaining recently lowered prices on sheets and strip. While there may be an advance later on cold strip and cold flat wire, the remainder of the quotations are expected to hold until July 1 or longer.

Philadelphia — Jobbing demand has started the new month at about the April rate, which was possibly a shade higher than in March. Prices generally are steady. Despite rescinding of concessions by mills May 1, leading jobbers believe there will be no further change in their quotations until at least third quarter.

Buffalo—While sales are steady, May is expected to better the April volume. Although no further price adjustments have been made, indications are sellers will follow move of mills and rescind recent reductions in sheets and strip.

Cincinnati—Jobbers have reduced prices on sheets, strip and long ternes, in grades affected by recent mill action, and so far have not announced policies in reflection of the restoration of former mill prices.

Semifinished Steel

Semifinished Prices, Page 93

Pittsburgh—Releases against sheet bar specifications have moved up, with the nonintegrated mills boosting production and preparing to move out low priced tonnage. Skelp and wire rod tonnage has been only

fair, although export demand has moved up and is still increasing. This is true of all semifinished products, particularly wire rods and billets.

Steel in Europe

Foreign Steel Prices, Page 95

London — (*By Cable*) — Freight rate increase in Great Britain seriously affects costs and may cause a further price increase. Closing of the Scandinavian markets has diverted steel deliveries from Belgium and Luxemburg to Great Britain. This is a welcome addition to supplies. British works are fully booked, some to the end of the year.

Belgium reports its producers are out of the market for bars, plates and structurals. Luxemburg producers have booked substantial orders from Holland. Prices on the Continent are hardening.

Iron Ore

Iron Ore Prices, Page 96

Cleveland — Reflecting earlier opening than a year ago of the Great Lakes navigation season, April shipments of Lake Superior iron ore were far ahead of the like 1939 month. Total movement was 464,669 gross tons, against only 56,798 tons in April last year. Shipments from various upper lake ports follow:

Port	April, 1940	April, 1939
Escanaba	60,378	29,758
Marquette	100,710	12,503
Ashland	38,456	.....
Superior	230,584	14,537
Two Harbors	34,541	.....
	464,669	56,798

Ferroalloys

Ferroalloy Prices, Page 94

New York—Export inquiry is livelier, with fair tonnages moving abroad. Ferromanganese shipments for domestic account are expected to hold through greater part of May near the level of March and April. While books for third quarter have been opened on major steel products, ferroalloy sellers contemplate no early action, as the usual procedure is to open books about the middle of the month preceding the new quarter.

Coke Oven By-Products

Coke By-Product Prices, Page 93

New York—Naphthalene, flakes and balls, in barrel-lots to jobbers, has advanced ¼-cent a pound, east-

ern plants, to 7.00c, with demand for household requirements brisk. The advance became effective May 1. Phenol buying is fair to good by industrial consumers, demand from the plastics trade having tapered slightly. Consumption of distillates is steady and current production is being absorbed readily.

Equipment

New York—Machine tool orders are well maintained, although hampered by extended deliveries on most metalworking lines. A heavy list of machinery continues to be held up by aircraft engine builders pending decision on the type of power plant to be used in the new government planes, which will also be available to the allies. Commissions from abroad are not currently placing business, but shipments are now being made against first orders placed by allied representatives.

Nonferrous Metals

New York—Last week's developments in the Mediterranean district caused apprehension in nonferrous metal circles as to the probable effect on markets here. Copper prices eased and demand for all metals was generally light.

Copper—The implied British threat of halting shipments of commodities, including copper, to Italy and Balkan countries resulted in a decline in both export and resale copper prices here. It was pointed out that a blockade of that area probably would be followed by offerings of large tonnages of copper at ruinous price concessions. Custom smelters lowered their prices for casting copper to 10.87½c, f.o.b. refinery, electrolytic copper to 11.12½c, Connecticut, and their bids for copper and brass scrap to the basis of 9.50c for No. 1 heavy copper. The minimum price quoted by leading mine producers continued at 11.50c. Export copper closed lower at 11.10c, f.a.s. New York.

Lead—Sales increased slightly on Friday but total turnover for the week was only moderate. Prices held at 4.95c, East St. Louis, and 5.10c, New York.

Zinc—Trading remained inactive with prices steady at 5.75c, East St. Louis, for prime western. Consumption held steady, as gaged by the galvanized sheet output rate of 46 per cent of capacity.

Tin—Feature of the week's developments was the purchase of 2104 tons of grade "A" pig tin by the procurement division of the treasury department. This tin will be delivered during the next six

months. The open market was generally quiet with Straits spot fluctuating within the narrow range of 47.12½c to 47.55c. Withdrawal of British merchant ships from the Mediterranean will increase substantially the distance from the East to European ports.

Antimony—Only routine business was booked at the unchanged price level of 14.00c, New York, for American spot. Chinese spot held nominally unchanged at 16.50c, duty paid New York.

Nonferrous Metal Prices

April	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
27	*11.25	11.50	11.00	47.50	47.12½	5.10	4.95	5.75	19.00	14.00	35.00
29	*11.25	11.50	11.00	47.55	47.12½	5.10	4.95	5.75	19.00	14.00	35.00
30	*11.25	11.50	11.00	47.12½	46.75	5.10	4.95	5.75	19.00	14.00	35.00
May											
1	*11.25	11.50	10.87½	47.25	46.75	5.10	4.95	5.75	19.00	14.00	35.00
2	*11.25	11.50	10.87½	47.50	47.12½	5.10	4.95	5.75	19.00	14.00	35.00
3	*11.12½	11.50	10.87½	47.37½	46.87½	5.10	4.95	5.75	19.00	14.00	35.00

*Based on sales by custom smelters; mine producers unchanged at 11.50c.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 11.50c Conn. copper

Sheets	
Yellow brass (high)	18.31
Copper, hot rolled	20.12
Lead, cut to jobbers	8.25
Zinc, 100 lb. base	11.00
Tubes	
High yellow brass	21.06
Seamless copper	20.62
Rods	
High yellow brass	14.26
Copper, hot rolled	16.62
Anodes	
Copper, untrimmed	17.37
Wire	
Yellow brass (high)	18.56

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass	
New York	6.87½-7.12½
Cleveland	8.00-8.25
Chicago	7.25-7.50
St. Louis	7.75-8.25
Heavy Copper and Wire	
New York, No. 1	8.50-8.75
Cleveland, No. 1	9.00-9.25
Chicago, No. 1	8.75-9.00
St. Louis	8.75-9.25
Composition Brass Turnings	
New York	6.50-6.75
Light Copper	
New York	6.50-6.75
Cleveland	7.00-7.25
Chicago	6.75-7.00
St. Louis	6.75-7.00
Light Brass	
Cleveland	4.00-4.25
Chicago	4.50-4.75
St. Louis	4.50-4.75
Lead	
New York	4.50-4.75
Cleveland	3.90-4.15
Chicago	3.90-4.10
St. Louis	4.00-4.25
Zinc	
New York	3.00-3.25
Cleveland	2.75-3.00
St. Louis	3.25-3.50
Aluminum	
Misc., cast, Cleveland	7.25
Borings, Cleveland	5.00
Clips, soft, Cleveland	14.25
Misc. cast, St. Louis	7.75-8.00

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads	11.75
Standard No. 12 aluminum	13.75-14.00

■ March domestic sales of household electric refrigerators amounted to 277,379 units compared to 234,044 units in March, 1939, according to 15 companies reporting to National Electrical Manufacturers' association, New York. March world sales were 291,999 units compared to 251,895 units of March, 1939.

Construction and Enterprise

Ohio

AMHERST, O.—Board of public affairs, C. A. Cooper, mayor, Sam Wragg, clerk, is taking bids to May 17 for a municipal light and power plant to cost about $145,000. It includes brick and concrete building 40 x 87 feet, boiler room 35 feet high, engine room 25 feet high, with equipment, including boilers, stokers, generators boiler feed pumps, feed water heater, coal and ash handling equipment, switchboard, piping and valves. Floyd G. Browne, Marion, O., is engineer.

CLEVELAND—Steel Storage File Co., W. F. Regenhardt, president, 2216 West Sixty-Third street, will build a 1-story plant 90 x 110 feet, costing about $40,000.

CLEVELAND — Gillmore-Carmichael-Olson Co., 4966 Woodland avenue, has been awarded general contract for $150,000 addition to observatory for Case School of Applied Science, Cleveland.

CLEVELAND — Reliable Steel Plate Co., Emanuel Margulis, manager, 2330 East Seventy-ninth street, will build an addition, 1-story, 50 x 50 feet.

CLEVELAND—Cleveland Screw Products Co., 3062 East Ninety-third street, is negotiating for property adjoining its plant, on which to build an addition, 1-story 56 x 80 feet, equipped with sprinkler.

CLEVELAND—National Box & Can Co., 4147 Broadway, J. L. Berkey, president, is building two 1-story additions, 30 x 30 and 31 x 47 feet. Dean W. Rankin, 1836 Euclid avenue is contractor.

COLUMBUS, O.—Zero Locker Co., recently incorporated, is having plans prepared by T. W. Brooks, architect, 329 East Broad street, for a plant costing about $20,000 at Grove City, O., as cold-storage locker service building. Company is capitalized at $30,000. R. W. Haines of Haines Electric Co., is president.

DOVER, O.—Central Plastics Mfg. Co. is being organized by Michael Zifer and Herbert Mason, the former engaged in plastics production for several years. Capital of $20,000 being raised locally to equip plant.

MANSFIELD, O. — Mansfield Metal Vault Co., Elmer Hedeen, president and manager, is undertaking a remodeling program, with an addition of 13,000 square feet of floor space. Present building will be remodeled to accommodate boiler plant, heating plant and show rooms.

MARSHALLVILLE, O.—Marshallville Equipment Co. plans a refrigerated locker plant to house 450 lockers of about 5½ cubic feet each for frozen food storage, construction to start this summer.

RITTMAN, O.—Ohio Salt Co., H. S. Squibbs, superintendent, is building a boilerhouse and will install a 4000-horsepower boiler, duplicating the installation made a year ago. Riley Stoker Corp., Worcester, Mass., is contractor for the boiler and accessories.

TOLEDO, O.—City Auto Stamping Co., Amos Lint, president, is having plans prepared by Albert Kahn, Detroit, for a 1-story plant addition with 80,000 square feet floor space, for its die division. Completion date is about Sept. 1.

WELLINGTON, O.—Contract has been awarded General Electric Co., Schenectady, N. Y., for 1000-kilowatt turbogenerator and to Ingersoll Rand Co., Cleveland, for condensers, for local electric light and power plant.

YOUNGSTOWN, O.—General Fireproofing Co. has let contract to Gillmore-Carmichael-Olson Co., Cleveland, for $200,000 addition to house a press department and heavy storage. Includes installation of 10-ton overhead crane and two 2-ton cranes, electrically operated.

New York

BUFFALO, N. Y.—Spencer Lens Co. has given a contract to Gillmore-Carmichael-Olson Co., Cleveland, for an additional unit to its plant completed last fall, to house specialized work in optical and scientific instrument field.

DANSVILLE, N. Y.—Genessee Aviation Corp., Dansville-Mt. Morris highway, will build an airplane plant costing about $40,000.

DUNKIRK, N. Y.—Allegheny Ludlum Steel Corp. has awarded contract to Gillmore-Carmichael-Olson Co., Cleveland, for addition to fine wire mill, 180 x 280 feet, sawtooth roof, costing about $90,000.

JAMESTOWN, N. Y.—Rane Tool Co. Inc., 17 Ross street, is building a 1-story addition costing $40,000. Warren Construction Co., 335 State street, is contractor.

Connecticut

BRIDGEPORT, CONN.—Moon Special Tool Co., R. F. Moon, manager, 358 John street, will build a 2-story steel and concrete tool manufacturing plant at 740 Union avenue, to cost about $40,000.

C. E. Bohn is architect, care owner.

Massachusetts

CHARLTON, MASS.—Town has plans for additions to fire protection, including standpipe, reservoir, pumping station and pipe line. W. F. McCracken is chairman of the special committee in charge. Address Town Hall. H. E. Bailey, 177 State street, Boston, is engineer.

Vermont

SPRINGFIELD, VT.—Bryant Chucking Grinder Co. has let contract for second addition within a six-months period, for 14,000 square feet floor space, to The Austin Co., Cleveland. Machine shop will provide three 30-foot bays equipped for crane operation, cost about $40,000.

Michigan

DETROIT—Vincent Steel Process Co., 2434 Bellevue avenue, is adding 2000 square feet to its heat-treating building. Two new heat-treating furnaces are being installed, one a continuous type with 36-inch belt for normalizing and quenching, the other a special furnace for heat-treating bars up to 20 feet in length. Plant will have capacity for 125 tons per day.

Pennsylvania

PITTSBURGH—Gibson Electric Co., manufacturer of electrical contacts for circuit opening and closing devices, has bought a plant at 8344 Frankstown avenue, containing 15,000 square feet floor space. Equipment will be installed to allow company to do entire manufacturing and increase production.

Illinois

CHICAGO—American Manganese Steel Co., Chicago Heights, will build a warehouse and shipping room at its welding rod division, to cost about $10,000.

CHICAGO—Garden City Plating & Mfg. Co., 1430 South Talman avenue, is having plans prepared by Himelblau & Spitz, 220 South State street, for a 2-story addition to cost about $40,000.

CHICAGO — Rheem Mfg. Co., 3425 South Kedzie avenue, is building a 1-story addition to its steel barrel factory at cost of about $70,000. Westcott Engineering Co., 205 West Wacker drive, is engineer.

CHICAGO—Protex Metal Weatherstrip Co., 2308 West Sixty-Ninth street, is building a 1-story plant at 4508 South Western avenue, at cost of about $40,000.

CHICAGO — Julius Frank Machine Works Inc., 618 West Elm street, has been incorporated with 200 shares $50 par, to manufacture machinery. Selder · Selder, 10 South LaSalle street, are representatives.

EAST MOLINE, ILL.—International Harvester Co. has given contract to Tunnicliff Construction Co., 105 Fillmore street, Davenport, Iowa, for a 1-story factory 393 x 770 feet, costing about $1,000,000, equipped with conveyors, machine tools and other machinery.

GALVA, ILL.—Company being formed by Fred C. Heiden and L. A. Hagney, East Peoria, Ill., and Thomas Spencer, Fairfield, Iowa, to operate idle foundry of Hire Foundry Co., now owned by Farm Tools Inc. Considerable new foundry equipment will be installed. Company is reported to have two-year contract for castings for Peoria manufacturer.

KEITHSBURG, ILL.—Staats Mfg. Co., manufacturer of a new type hydraulic clutch, is completing new plant and will install equipment for production of its clutch. Franklin E. Staats, Rock Island, Ill., heads company.

WYOMING, ILL.—Aldrich Co., L. I. Aldrich, president, manufacturer of oil burners, is building an addition 110 x 240 feet, to increase production 50 per cent. Company recently removed from Peoria to obtain larger quarters.

Indiana

EAST CHICAGO, IND.—United States Gypsum Co., 300 West Adams street, Chicago, is building a 1-story addition 50 x 200 feet, to cost about $40,000.

SOUTH BEND, IND. — Oriental Wrought Iron Works, J. J. Kohen, president, has occupied former plant of South Bend Watch Co., 1720 East Mishawaka avenue.

WEST TERRE HAUTE, IND.—Central Indiana Power Co., F. C. Cour, purchasing agent, Traction building, Indianapolis, will build a 1-story hydroelectric powerhouse addition, 104 x 145 feet. Sargent & Lundy Inc., 140 South Dearborn street, Chicago, are consulting engineers.

District of Columbia

WASHINGTON—Bureau of supplies and accounts, Navy department, asks bids as follows: May 14, schedule 1488, motor-driven metal-cutting hack saw, for San Diego, Calif.; May 10, schedule 1501, motor-driven metal nibbling machine, for Philadelphia; schedule 1423,

two motor-driven radial drills, for Puget Sound, Wash.; schedule 1428, motor-driven high-speed shaper, for Mare Island, Calif.; schedule 1436, motor-driven vertical hydraulic press, for Boston; schedule 1438, motor-driven bench type universal milling machine, for Mare Island, Calif.; May 7, schedule 1484, motor-driven 42-inch vertical turret lathe and thread-cutting attachment, for Coco Solo, C. Z.; schedule 1489, 20 chain hoists for Philadelphia; May 14, schedule 1487, motor-driven wood and metal cutting band saw, for San Diego, Calif.; schedule 1505, motor-driven 14 x 72-inch universal grinder, for Mare Island, Calif.; May 10, schedule 1503, motor-driven abrasive belt type polishing unit and complete equipment, for Alexandria, Va.

West Virginia

CLARKSBURG, W. VA.—National Carbon Co. has awarded contract to Gillmore-Carmichael-Olson Co., for new shipping unit, the second addition this year erected by this firm.

MILTON, W. VA.—Appalachian Power Co., Huntington division, Huntington, W. Va., has started construction of $75,000 outdoor substation and will follow by construction of $100,000 substation at Huntington, at Eighth street and Eighth avenue, including transformers, automatic reclosing circuit breakers and similar equipment in the plant here.

Georgia

SAVANNAH, GA.—Cyclone Fence Co., Waukegan, Ill., subsidiary American Steel & Wire Co., is negotiating for purchase of Savannah Wire Cloth mills, a division of Port Wentworth Corp., Port Wentworth, Ga.

Missouri

ST. LOUIS—Laclede Light & Power Co., 1017 Olive street, has let contract to Woermann Construction Co., 3800 West Pine boulevard, for addition and alterations at its plant at 1725 North Wharf.

ST. LOUIS—Southern Equipment Co. has let contract to L. O. Stocker Co., 1103 Arcade building, for a manufacturing plant for production of stainless steel equipment at Thirty-eighth and Walsh streets, 2-story, 125 x 145 feet.

ST. LOUIS, MO.—Guy A. Thompson, trustee for St. Louis, Brownsville & Mexico Railroad Co., St. Louis, has been authorized by federal court to acquire the 26-mile Port Isabel & Rio Grande Valley railroad, in Texas.

Wisconsin

MELLEN, WIS.—Penokee Veneer Co. has given contract to Frank Tomlinson & Son, Ashland, Wis., for foundations for several additions, including a dryer building 30 x 113 feet, lathe room 26 x 130 feet and boilerhouse 19 x 44 feet.

MILWAUKEE—Electric Power Co., 231 West Michigan street, will let contract soon for a 1-story brick and steel power plant 98 x 120 feet, to cost about $225,000. F. Luber, care owner, is architect.

Minnesota

KEEWATIN, MINN.—Bond issue of $32,000 has been approved at special election, to finance sewage disposal plant. John Rebrovich is village clerk.

MINNEAPOLIS—Wabash Screen Door Co., Martin H. Otto, president, has given contract to August Cederstrand Co., 966 Central avenue, for a 1-story plant addition and warehouse 49 x 270 feet.

MINNEAPOLIS—Union Welding & Machine Co., 2300 Central avenue N. E., has been incorporated to deal in welding equipment by D. W. Markley, J. J. Gibson and Louis Markley.

Texas

DALLAS, TEX.—Hoke Smith Inc. has been incorporated with $10,000 capital to deal in steel and iron, by Hoke Smith and Vernon S. Smith.

HOUSTON, TEX.—Engineers & Fabricators Inc. has been incorporated with $50,000 capital to deal in steel and iron fabrications, by Edward E. Dillman and C. S. Birch.

South Dakota

LEAD, S. DAK.—Rotary Gravity Stamp Mill Co. has been incorporated to manufacture milling and mining machinery, by George W. Morthland, T. D. Murrin and associates.

Iowa

BURLINGTON, IOWA — Steel Craft Corp. C. A. Kelley, president, has given contract to Carl A. Nelson, for a 2-story factory 50 x 150 feet and will install conveyor system, presses, welding machine and ovens.

DUNCOMBE, IOWA — Village, J. W. Brown, clerk, is taking bids to May 17 for power plant switchboard and complete electric distribution system, including meters.

FORT MADISON, IOWA—City, L. F.

Albers, clerk, is having a survey made for construction of a municipal waterworks system.

MARSHALLTOWN, IOWA — Fisher Governor Co. has given contract to Ben Cole & Son, Ames, Iowa, for a 2-story factory addition 120 x 180 feet, to cost about $75,000. R. H. Vandercook, Marshalltown, is architect.

OELWEIN, IOWA—Voters have defeated proposition to issue $650,000 in bonds for construction of municipal light and power plant.

WATERLOO, IOWA—Iowa Gas Engine Co., J. L. Briden, manager, plans construction of 1-story factory at 207 Center street.

WATERLOO, IOWA—Waterloo Valve Spring Compressor Co., Nicholas Sulentic, president, has awarded contract to A. E. Mutton for construction of 1-story factory addition, 60 x 100 feet.

Montana

MISSOULA, MONT.—Findell Lumber Co., E. A. Findell, president, is making plans for rebuilding of its burned sawmill and power plant.

MISSOULA, MONT.—Missoula county, W. J. Babington, county clerk, is taking bids to May 11 for diesel power unit of 80 horsepower or more.

SHELBY, MONT. — Pacific National Oils Inc. subsidiary of Petroleum Refining Co., Beverly Hills, Calif., is building oil refinery near Shelby with initial capacity of 500 barrels per day. James M. Pope, Shelby, is superintendent.

Idaho

NAMPA, IDAHO—Special election will be held May 7 to pass on $98,000 bond issue to finance proposed municipal disposal plant costing $165,000.

POCATELLO, IDAHO—Idaho Refining Co. is building a $50,000 asphalt plant. Gilbert D. Mayle is general manager.

California

LOS ANGELES—Johnson Machine & Tool Works, 5925 Sunset boulevard, has been formed by W. J. Johnson, same address.

LOS ANGELES—Federal Aircraft Corp. has been formed with $500,000 capital to engage in manufacture of airplane accessories. Guthrie & Darling, Pacific Mutual building, are representatives.

LOS ANGELES — National Aircraft Equipment Co. has been organized with $25,000 capital. Roland Kinney, 2525 East Forty-ninth street, Los Angeles, is representative.

VENTURA, CALIF. — Brown Aircraft Corp., Laurence W. Brown, president, will build plant here for manufacture of high - speed military training planes. Company is said to have advance orders for first year's production.

Washington

ABERDEEN, WASH.—V. A. Nyman, formerly general manager of Aberdeen Plywood Co., whose plant was burned recently, is interested in a new corporation, Aberdeen Plywood Co., which will build a $500,000 factory, planned for operation in September.

VANCOUVER, WASH.—Great Western Malting Co., William Einzig, manager, plans construction of storage building addition to its plant. E. F. Carter, Vancouver, B. C., is architect.

Canada

PORT ALBERNI, B. C. — Bloedel, Stewart & Welsh Ltd., 510 Hastings street, Vancouver, B. C., has retained Howard Simmons, Chicago, as engineer to build pulp plant here at cost of $3,500,000.

AMHERST, N. S.—Canadian Car & Foundry Co., Montreal, plans enlargement of its aircraft plant. L. E. Petro, general manager, has received assurance of contract for three plane wings and assembly of three machines per week, from department of munitions and supply, Ottawa.

CORNWALL, ONT. — Howard Smith Paper Mills Ltd., 407 McGill street, Montreal, has awarded general contract for a wharf addition to Foundation Co. of Canada Ltd., to cost $140,000.

OTTAWA, ONT.—Ottawa Electric Co., W. H. Munro, general manager, will build 4000-kilowatt substation on Nelson street, costing $125,000.

ST. CATHARINES, ONT. — McKinnon Industries Ltd., manufacturer of automobile parts, has let contract for plant addition to Newman Bros., 127 St. Paul street.

TORONTO, ONT.—Canadian Kodak Co. Ltd., Eglington avenue, has bought 16-acre site and will build addition to cost $75,000.

TORONTO, ONT. — Hydro Electric Power Commission of Ottawa, 620 University avenue, will build 220,000-volt transmission line from Quebec border to new terminal at Burlington, Ont., 270 miles. New steel towers for 170 miles will be required.

BROWNSBURG, QUE.—Defense Industries Ltd., 625 Dorchester street, Montreal, will build a metalworking plant here at cost of $100,000.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

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American Foundry Equipment Co., 549 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

ABRASIVE CLOTH
Abrasive Products Co., So. Braintree, Mass.

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Abrasive Co., Taconey & Fraley Sts., Philadelphia, Pa.
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ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
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Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.

ACETYLENE
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
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Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

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American Chemical Paint Co., Dept. 310, Ambler, Pa.
Ampco Metal, Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

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AIR CONDITIONING EQUIPMENT
Lintern Corp., The, 7960 Lorain Ave., Cleveland, O.
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AIRLESS BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., 549 So. Byrkit St., Mishawaka Ind.
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ANNEALING BOXES—See BOXES (Annealing)

ANNEALING COVERS
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

ARCHES AND WALLS
Standard Arch Co., Frostburg, Md.

ARCHES (Suspended)
Standard Arch Co., Frostburg, Md.

AXLES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

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Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
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BALLS (Special Alloy Metals)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel)
(*Also Stainless)
*Strom Steel Ball Co., 1850 So. 54th Ave., Cicero, Ill.

BANDS—See HOOPS AND BANDS

BANDS (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
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Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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BARGES (Steel)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Maryland Dry Dock Co., Baltimore, Md.
Treadwell Construction Co., Midland, Pa.

BARRELS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

BARS (Alloy)
Ampco Metal, Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 4A, 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.

BARS (Brass, Bronze or Copper)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BARS (Concrete Reinforcing)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Iron)—See IRON (Bar)

BARS (Steel)
(*Also Stainless)
*Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
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.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BASKETS (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

BATTERIES (Storage)
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.
Graybar Electric Co., 420 Lexington Ave., New York City.

BATTERY CHARGING APPARATUS
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

BEAMS, CHANNELS, ANGLES, ETC.
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BEARINGS (Ball)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BEARINGS (Brass, Bronze)
Amp[illegible] Metal, Inc., Dept. S-423, 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.
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.

BEARINGS (Journal)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
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 (Needle)
Torrington Co., The, Torrington, Conn.

BEARINGS (Non-Metallic)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.

BEARINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

BEARINGS (Quill)
Bantam Bearings Corp., South Bend, Ind.

BEARINGS (Radial)
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.
Link-Belt Co., 519 No. Holmes Ave., Indianapolis, Ind.
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.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roll Neck)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller)
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.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
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 (Rolling Mill)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
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 (Thrust)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Company, 519 No. Holmes Ave., Indianapolis, Ind.
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 (Chain and Link)
Baldwin-Duckworth Div., 326 Plainfield St., Springfield, Mass.
Jeffrey Mfg. Co., 889-99 No. Fourth St., Columbus, O.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
United States Rubber Co., 1230 Sixth Ave., 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.

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., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
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.
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 CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co., 500 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

BLAST FURNACE CLEANING (Gas)
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

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
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., 600 Mercer St., Harmony, Pa.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

BLUE PRINTING MACHINES
Pease, C. F., Co., The, 2601 W. Irving Park Blvd., Chicago, Ill.

BLUE PRINTING SUPPLIES and EQUIPMENT
Pease, C. F., Co., The, 2601 W. Irving Park Blvd., Chicago ,Ill.

BOILER HEADS
Bethlehem Steel Co., Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Oil Well Supply Co., Dallas, Texas.
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)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
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 (Track—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9373, Scranton, Pa.

BORING MACHINES (Precision)
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
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 SHOES
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.

BRAKE LININGS
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Press)
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

BRICK (Ladle)
Globe Brick Co., The, East Liverpool, 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, Refractories Div., 85 Liberty St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., Sharon, Pa.

BROACHING CUTTERS
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Co., Oakley Sta., Cincinnati, O.
Kilbourn Ave., Chicago, Ill.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 So.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Broslus, 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., 94- 150th St., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
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)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty 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. S-429, 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 (Jig)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

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.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Shawinigan Products Corp., Empire State Bldg., New York City.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Dump)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT
Pangborn Corp., Hagerstown, Md.,

CASTINGS (Acid Resisting)
American Brake Shoe & Fdry. Co., 230 Park Ave., New York City.
Ampco Metal, Inc., Dept. S-429, 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.
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, Refractories Div., 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Electro-Alloys Co., The, Elyria, O.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O., Springfield, 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. S-429, 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.
Otis Steel Co., The, Cleveland, O.
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 Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Canton Pattern & Mfg. Co., The, Andrews Pl. S.W., Canton, O.
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)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Electro-Alloys Co., The, Elyria, O.
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)
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.

WHERE-TO-BUY

CASTINGS (Steel)—Con. (*Also Stainless)
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., Springfield, O.
Oil Well Supply Co., Dallas, Texas.
Otis Steel Co., The, Cleveland, O.
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.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Wear Resisting)
American Brake Shoe & Fdry. Co., 230 Park Ave., New York City.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. S-429, 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 (High Temperature Hydraulic)
Atlas Lumnite Cement Co., Dept. S1, Chrysler Bldg., New York City.

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., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Jeffrey Mfg. Co., 889-99 No. Fourth St., Columbus, O.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 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 (Power Transmission)
Jeffrey Mfg. Co., 889-99 No. Fourth St., Columbus, O.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

CHAIN (Roller)
Baldwin Duckworth Div., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont 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., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 So. Belmont Ave., Indianapolis, Ind.

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)
Broslus, 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.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CLAMPS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANER (Floor-Oil Absorbent)
Sta-Brite Mfg. Co., 3914 So. Wabash Ave., Chicago, Ill.

CLEANING EQUIPMENT (Metal)
Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.

CLEANING SPECIALTIES
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sta-Brite Mfg. Co., 3914 So. Wabash Ave., Chicago, Ill.

CLIPS (Packaging)
Consumer's Steel Products, 6454 E. McNichols Rd., Detroit, Mich.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Twin Disc Clutch Co., 1379 Racine Ave., Racine, Wis.

CLUTCHES (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 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.

COAL OR COKE—(Con.)
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.

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.
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 (Heat Resistant)
Atlas Lumnite Cement Co., Dept. S1, Chrysler Bldg., New York City.

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.
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.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
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.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (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.

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.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 114 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., 114 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 114 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.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 114 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., Dept. 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9373, Scranton, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 412 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

COUPLERS
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Baldwin-Duckworth Div., 326 Plainfield St., Springfield, Mass.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
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.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., The 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
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.
Northern Engineering Works, 2609 Atwater St., Detroit, 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.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
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 So. 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.
Northern Engineering Works, 2609 Atwater St., Detroit, 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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
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 So. 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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
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.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon, O.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)
Barker-Colman Co., 209 Loomis St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
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
Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.
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.
Amsco Metal Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.,
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

WHERE-TO-BUY

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)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRAFTING ROOM EQUIPMENT
Pease, C. F., Co., The, 2601 W. Irving Park Blvd., Chicago, Ill.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

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., 220 S. Belmont Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine 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
Pangborn Corp., Hagerstown, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DRYERS (Rotary)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.

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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
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.

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.

FANS (Crane Cab)
Graybar Electric Co., 420 Lexington Ave., New York City.
Truflo Fan Co., 600 Mercer St., Harmony, Pa.

FANS (Exhaust Ventilating)
Graybar Electric Co., 420 Lexington Ave., New York City.
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Truflo Fan Co., 600 Mercer St., Harmony, Pa.

FANS (Portable)
Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Truflo Fan Co., 600 Mercer St., Harmony, Pa.

FANS (Temperature)
Garden City Fan Co., 332 S. Michigan Ave., Chicago, Ill.

FANS (Wall)
Graybar Electric Co., 420 Lexington Ave., New York City.
Truflo Fan Co., 600 Mercer St., 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.

FILING CABINETS (Blueprint, Drawing and Tracing)
Pease, C. F., Co., The, 2601 W. Irving Park Blvd., Chicago, Ill.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction 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.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Dept. 310, Ambler, Pa.

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, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass Co., 230 Park Ave., New York City.

FORGINGS (Drop) (*Also Stainless)
American Forge Div. of The American Brake Shoe & Fdry Co., 2621 So. Hoyne Ave., Chicago, Ill.
*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.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.,
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Upset)
American Forge Div. of The American Brake Shoe & Fdry. Co., 2621 So. Hoyne Ave., Chicago, Ill.
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)
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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, 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)
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 (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, 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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
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.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, 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.
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.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Harter Corp., The, Sturgis, Mich.

GAGE BLOCKS
Dearborn Gage Co., 22037 Beech St., Dearborn, Mich.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.
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.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Fanner Mfg. Co., The, Cleveland, O.
John Finn Metal Works, San Francisco, Calif.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Hubbard & Co., Oakland, Calif.
Independent Galvanizing Co., Newark, N. J.
International Derrick & Equipment Co., Columbus, O.
Joslyn Co. of California, Los Angeles, Calif.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Lewis Bolt & Nut Co., Minneapolis, Minn.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
San Francisco Galvanizing Works, San Francisco, Calif.
Sanitary Tinning Co., The, Cleveland, O.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

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.

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.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GASKETS (Asbestos, Metal or Rubber)
Garlock Packing Co., The, S 3-40, 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. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
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.
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.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., 25th St., Pittsburgh, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Fairbanks, Morse & Co., Dept. 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.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-20.
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)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.

GRINDING COMPOUNDS
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING DISCS
Abrasive Products Co., So. Braintree, Mass.

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.
Norton Company, Worcester, Mass.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Brown & Sharpe Mfg. Co., Providence, R. I.
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 (Tool and Cutter)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
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 (Segmental)
Abrasive Company, Tacony & Fraley Sts., Philadelphia, Pa.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HAMMERS (Chipping, Riveting, Calking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Steam)
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The Alliance, O.

HANGERS
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.

HEATERS (Air)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty 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.

HELMETS (Blast Cleaning)
Pangborn Corp., Hagerstown, Md.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc.,
Bridgeport, Conn.

HOBBING MACHINES
Barber-Colman Co.,
209 Loomis St., Rockford, Ill.

HOBS
Barber-Colman Co.,
209 Loomis St., Rockford, Ill.
Brown & Sharpe Mfg. Co.,
Providence, R. I.

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.
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.
Northern Engineering Works,
2609 Atwater St., Detroit, 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.
Northern Engineering Works,
2609 Atwater St., Detroit, 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.
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.
Northern Engineering Works,
2609 Atwater St., Detroit, Mich.

HOOKS (Chain)
American Chain & Cable Co., Inc.,
Bridgeport, Conn.

HOOPS AND BANDS
American Steel & Wire Co.,
Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Columbia Steel Co.,
San Francisco, Calif.
Laclede Steel Co., Arcade Bldg.,
St. Louis, Mo.
Ryerson, Jos. T., & Son, Inc.,
16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The,
New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg.,
Birmingham, Ala.
Youngstown Sheet & Tube Co., The,
Youngstown, O.

HOSE (Rubber)
Lowman-Shields Rubber Co.,
209 First Ave., Pittsburgh, Pa.
United States Rubber Co.,
1230 Sixth Ave., New York City.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Allis-Chalmers Mfg. Co.,
Milwaukee, Wis.
Baldwin Southwark Div., Baldwin Locomotive Works,
Philadelphia, Pa.
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)

HYDRAULIC UNITS
Barnes, W. F. & John, Co.,
201 So. Water St., Rockford, Ill.
Chambersburg Engineering Co.,
Chambersburg, Pa.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

INDICATORS (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.

INDICATORS (Blast Furnace Stock Line)
Broslus, 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.,
Dept. 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.
Graybar Electric Co., 420 Lexington Ave., New York City.
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 CONCRETE
Atlas Lumnite Cement Co., Dept. S1, Chrysler Bldg., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp.,
Ajax Park, Trenton, N. J.
Armstrong Cork Co.,
985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The,
Refractories Div., 85 Liberty St.,
New York City.

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 or Woodruff)
Moltrup Steel Products Co.,
Beaver Falls, Pa.

KNIVES
American Shear Knife Co.,
3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co.,
2086 W. 110th St., Cleveland, O.

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.

LAMPS (Industrial)
General Electric Co., Dept. S-E,
Nela Park, Cleveland, O.
Hygrade Sylvania Corp.,
Salem, Mass.

LAPPING MACHINES
Cincinnati Milling Machine Co.,
Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co.,
5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

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
Jones & Lamson Machine Co.,
Springfield, Vt.
LeBlond, R. K., Machine Tool Co.,
Dept. J-11, 2694 Madison Rd.,
Cincinnati, O.
Monarch Machine Tool Co.,
Sidney, O.
South Bend Lathe Works, 856 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Automatic)
Brown & Sharpe Mfg. Co.,
Providence, R. I.
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)
Brown & Sharpe Mfg. Co.
Providence, R. I.
Bullard Company, The,
Bridgeport, Conn.
Jones & Lamson Machine Co.,
Springfield, Vt.
Warner & Swasey Co.,
5701 Carnegie Ave., Cleveland, O.

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)

LIFTERS (Rubber, Vacuum)
Lowman-Shields Rubber Co.,
209 First Ave., Pittsburgh, Pa.

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Dept. S-E,
Nela Park, Cleveland, O.
Graybar Electric Co., 420 Lexington Ave., New York City.
Hygrade Sylvania Corp.,
Salem, Mass.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Atlas Car & Mfg Co., The,
1140 Ivanhoe Rd., Cleveland, O.
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., 3813 Gulf Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave.,
New York City.
Penola, Inc., 34th & Smallman Sts.,
Pittsburgh, Pa.
Pure Oil Co., The,
35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc.,
50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc.,
26 Broadway, New York City.
Sun Oil Co.,
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.

WHERE-TO-BUY

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.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Barnes, W. F. & John, Co., 201 So. Water St., Rockford, Ill.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Buss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Broslus, 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.
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., 5600 St. Jean, Detroit, Mich.
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.
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)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
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.

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)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Dept. 310, Ambler, 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 CUTTERS
Barber Colman Co., 209 Loomis St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

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., 5600 St. Jean, Detroit, Mich.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-20.
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.
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.

NAILS—Con.
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.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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 (Blasting)
Pangborn Corporation, Hagerstown, Md.

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 (Machine Screw)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.

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)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 191-200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

OILS (CUTTING)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3813 Gulf Bldg., Pittsburgh, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
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.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

PACKING (Asbestos or Rubber)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1230 Sixth Ave., New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Dept. 310, Ambler, Pa.

PAINT (Industrial)
Carey, Philip Co., The, Dept. 71, Lockland, Cincinnati, O.

PAINT (Marking)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Dept. 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.

PARTS (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

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., Dept. 310, Ambler, Pa.
Parkin, Wm. M., Co., The, 1905 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING CRATES
Youngstown Welding & Engineering Co., The, Youngstown, O.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.
Youngstown Welding & Engineering Co., The, Youngstown, O.

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
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.
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 (Roller Bearing)
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.
222 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass Co., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
American Rolling Mill Co., The, 1510 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.
Wheeling Steel Corp., Wheeling, W. Va.
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
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 58th 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
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works 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.
*American Rolling Mill Co., The, 1510 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.
Otis Steel Co., The, Cleveland, O.
*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., 412 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.

POTS (Case Hardening)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

POTS (Melting)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York, N. Y.
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.

PREHEATERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
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., 56 Avenue A, 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., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg, 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., 56 Avenue A, 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., 56 Avenue A, Newark, N. J.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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.
Brown & Sharpe Mfg. Co., Providence, R. I.
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 (Fuel Injection)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PUMPS (Hydraulic)
Aldrich Pump Co., The, Allentown, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St. Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
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)
Brown & Sharpe Mfg. Co., Providence, R. I.
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., 944 150th St., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
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., 209 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.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORY CONCRETE
Atlas Lumnite Cement Co., Dept. S1, Chrysler Bldg., New York City.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Globe Brick Co., The, East Liverpool, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
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.
Norton Company, Worcester, Mass.

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)
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.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The Nicetown, Philadelphia, Pa.

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
Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

RIVETS (*Also Stainless)
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, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass Co., 230 Park Ave., New York City.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.

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 and Straightening)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

ROLLS (Rubber Covered)
Lowman-Shields Rubber Co., 209 First Ave., Pittsburgh, Pa.

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., Springfield, 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., Springfield, O.
Otis Steel Co., The, Cleveland, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machine)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 1510 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.
New Jersey Zinc Co., 160 Front St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Lowman-Shields Rubber Co., 209 First Ave., Pittsburgh, Pa.
United States Rubber Co., 1230 Sixth Ave., New York City.

RUST PREVENTIVES
Alrose Chemical Co., Mill St., Cranston, R. I.
American Chemical Paint Co., Dept. 310, Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.
Koppers Co., Tar & Chemical Div., 1100 Koppers Bldg., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Dept. 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.
Linlern Corp., The, 7960 Lorain Ave., 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 (Band—Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hack)
Armstrong-Blum Mfg. Co., 5737 Bloomingdale Ave., Chicago, Ill.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Brown & Sharpe Mfg. Co., Providence, R. I.
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 (Monorail)
American MonoRail Co., The, 13102 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 9373, 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.

WHERE-TO-BUY

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., 194-200 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.

SCREWS (Cold Headed)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
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., 194-200 Varick St., New York City.
Townsend Co., New Brighton, Pa.

SCREWS (Hardened Self-Tapping)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Machine)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
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., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)
Shakeproof Lock Washer Co., 2525 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., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thread-Cutting)
Shakeproof Lock Washer Co., 2525 N. Keelor Ave., Chicago, Ill.

SCREWS (Thumb)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
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. 4A, 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-SPECIAL (Brass or Copper)
Revere Copper & Brass Co., 230 Park Ave., New York City.

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., 944 150th St., Hammond, Ind.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
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.

SHEARS—Con.
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.
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 So. 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.
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.
Otis Steel Co., The, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-429, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass Co., 230 Park Ave., New York City.

SHEETS (Corrugated)
American Rolling Mill Co., The, 1510 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.
American Rolling Mill Co., The, 1510 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.
Otis Steel Co., The, Cleveland, O.
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)
American Rolling Mill Co., The, 1510 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, 1510 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.
American Rolling Mill Co., The, 1510 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.
Otis Steel Co., The, Cleveland, O.
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)
American Rolling Mill Co., The, 1510 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)
American Rolling Mill Co., The, 1510 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.
Otis Steel Co., The, Cleveland, O.
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.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT
Graybar Electric Co., 420 Lexington Ave., New York City.

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)
Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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., 2045 W. Hunting Park Ave., Philadelphia, Pa.
New Departure Div., General Motors Corp., Bristol, Conn.

SPELTER (Zinc)
St. Joseph Lead Co., 250 Park Ave., New York City.

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.

WHERE-TO-BUY

SPIKES (Screw)—Con.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLES (Grinding)
Bryant Chucking Grinder Co., Springfield, Vt.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

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., 412 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., 412 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., 2525 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.
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. 4A, 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 (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.
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. 4A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Otis Steel Co., The, 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.

STEEL (Corrosion Resisting)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 1510 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
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)

Crucible Steel Company of America, 405 Lexington Ave.,
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (Drill)

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., 627-629 Sixth Ave., 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)

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, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
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.
Otis Steel Co., The, Cleveland, O.
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)

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. 4A, 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, 1510 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., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Otis Steel Co., The, Cleveland, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., 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.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
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.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT

Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
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, Refractories Div., 85 Liberty St., New York City.
Canton Pattern & Mfg. Co., The, Andrews Pl. S. W., Canton, O.

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.

SWITCHES (Electric)—Con.

General Electric Co., Schenectady, N. Y.
General Electric Co., Dept. S-E, 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

Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)

National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
United States Rubber Co., 1230 Sixth Ave., New York City.

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)

Dietzel Lead Burning Co., Coraopolis, Pa.
United States Rubber Co., 1230 Sixth Ave., 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 MACHINERY (Materials)

Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

TERMINALS (Locking)

Shakeproof Lock Washer Co., 2525 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 So. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)

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.)

Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
Ex-Cell-O Corp., 1228 Oakman Blvd., 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)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)

Air Reduction Sales Co., 60 E. 42nd St, New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

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.

TRANSMISSIONS—VARIABLE SPEED

Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

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.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
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, 2169 W. 25th St., 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, 2169 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O
Baker-Raulang Co., The, 2169 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
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)

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)

Bridgeport Brass Co., Bridgeport, Conn.

TUBES (High Carbon)

Steel & Tubes Division, Republic Steel Corp., Cleveland, O.

TUBING (Alloy Steel) (*Also Stainless)

*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.
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 (Seamless Steel)

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBING (Square, Rectangular)

Steel & Tubes Division, Republic Steel Corp., Cleveland, O.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

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 (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., 412 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., 2525 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., 2525 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.
Hobart Bros., Dept. ST-440, Troy, O.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-20.
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-20.
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.
Hobart Bros., Dept. ST-440, Troy, O.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-20.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
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.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
American Agile Corp., 5806 Hough Ave., Cleveland, O.
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-20.
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 Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Champion Rivet Co., The, Harvard Ave. at E. 108th St. Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Dept. ST-440, Troy, O.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-20.
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.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
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)
*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.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE (High Carbon)—Con.
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.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
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.
Graybar Electric Co., 420 Lexington Ave., New York City.

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.
Fifth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 412 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., 412 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
New Jersey Zinc Co., 160 Front St., New York City.
St. Joseph Lead Co., 250 Park Ave., New York City.

ZINC ALLOYS
New Jersey Zinc Co., 160 Front St., New York City.
St. Joseph Lead Co., 250 Park Ave., New York City.

ZINC (Rolled Sheets, Strips, Coils)
New Jersey Zinc Co., 160 Front St., New York City.
St. Joseph Lead Co., 250 Park Ave., New York City.

ZIRCONIUM METAL AND ALLOYS
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CLASSIFIED

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Experienced in coarse and fine wire, ferrous and nonferrous, hot galvanizing, tinning and heat treating. Metallurgical background. Address Box 204, STEEL, Penton Bldg., Cleveland.

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MANUFACTURERS AGENT, UPPER NEW York State, having established trade with manufacturers and jobbers, desires additional lines for production or resale. Experienced in steel, mechanical and electrical products; tools. Interested only in lines which can show volume results through intelligent handling and thorough coverage. Address Box 203, STEEL, Penton Bldg., Cleveland.

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OPPORTUNITIES
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are of equal interest to distributors and manufacturers—use an ad on this page next week to let manufacturers know you are interested in taking on new lines.

Bids Wanted

Federal Works Agency, Public Buildings Administration, Washington, D. C., April 20, 1940.—Sealed proposals in duplicate will be publicly opened in this office at 1 P. M., Standard Time, May 23, 1940, for construction of the U. S. P. O., Miamisburg, Ohio. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request and when considered in the interests of the Government, will be furnished, in the discretion of the Commissioner, to builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Commissioner of Public Buildings, Federal Works Agency.

Castings

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THE WEST STEEL CASTING CO., Cleveland. Fully equipped for any production problem. Two 1½ ton Elec. Furnaces. Makers of high grade light steel castings, also alloy castings subject to wear or high heat.

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NORTH WALES MACHINE CO., INC., North Wales. Grey Iron, Nickel, Chrome, Molybdenum Alloys, Semi-steel. Superior quality machine and hand molded sand blast and tumbled.

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Bids Wanted

Federal Works Agency, Public Buildings Administration, Washington, D. C., April 18, 1940.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Standard Time, May 21, 1940, for construction of the U. S. P. O. at Mount Hope, W. Va. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished, in the discretion of the Commissioner, to builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Commissioner of Public Buildings, Federal Works Agency.

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.

A New and Inexpensive Fafnir Ball Bearing Pillow Block

QUICK FACTS: Manufacturers of Equipment in Which Dependability and Low-Cost Friction-Freedom Are Essential Are Ordering These Units by Thousands . . . The All-Rubber Molded Housing Not Only Permits a Less Expensive Transmission Unit but Insulates Against Noise-Transmission as Well.

Manufacturers of light-duty equipment (domestic heating, ventilating and air conditioning, for instance), have welcomed the inexpensive Fafnir Rubber Pillow Block for its combination of low-cost operation, friction-freedom and dependability as well as noise-insulation.

Cuts Friction – Slashes Starting Torque

The Fafnir Rubber Pillow Block likewise effects a big reduction in service difficulties on the equipment in which it is installed. Tests show its starting torque after one minute's idleness to be only 1/20th that of a plain bearing. Running torque has been measured at as much as 60% less! Thus wear on motors and belts is cut 'way down, and a substantial power saving is made possible.

Simplifies Assembly – No Shaft Shoulders or Sleeves Needed

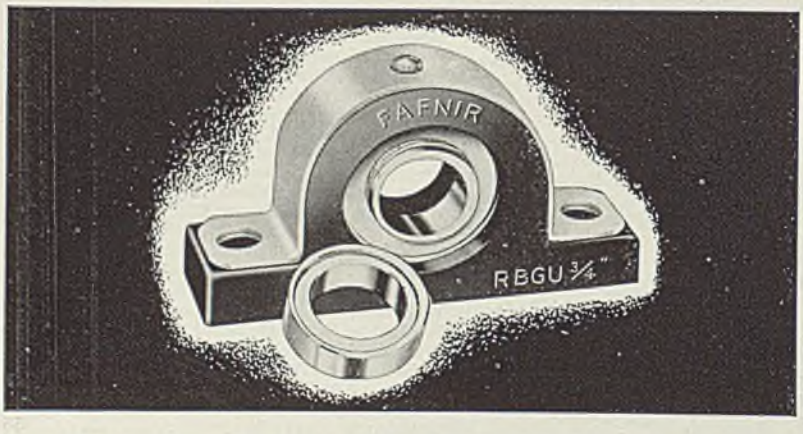
The unit embodies a Fafnir Single Row Ball Bearing (able to absorb both radial *and thrust* loads), with the exclusive Self-Locking Collar feature for simple finger-twist application to straight shafts. This bearing is pressed into a *full-size* housing of high-grade, long-life molded rubber; its bolt holes reinforced with steel shells. One unit of each pair has a wire spring in the base for grounding of any electrical charges set up. The bearing is fully sealed and prelubricated with sufficient grease to last for years, eliminating need for relubrication in average light-duty service.

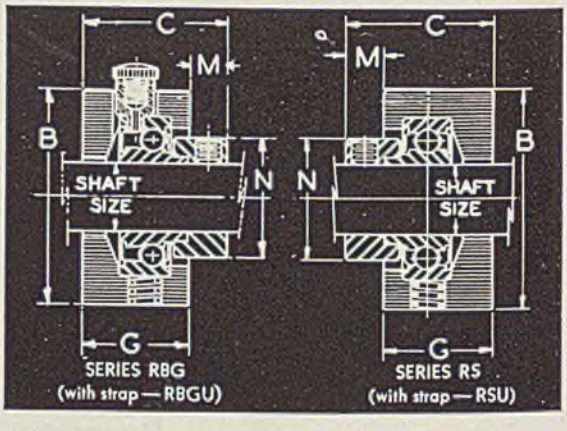
Buyer's Test Proves Long Life

Before specifying the Fafnir Rubber Pillow Block, one large user conducted his own test of this unit, but discontinued the test after the unit had provided 4500 hours' service with no failures, and no addition of lubricant (equivalent to five years' normal service). Needless to say it is now standard equipment with him. And in our own laboratory 15,000 hours of continuous operation have been successfully chalked up!

Made in Wide Range

RBGU Series, illustrated, shows how additional features can be incorporated where desired – cadmium-plated steel strap for reinforcement in heavier service than normal, and grease fitting for relubrication where unusual conditions so require. Series RS, standard for many applications, dispenses with both strap and grease fitting. Made in sizes to fit shaft diameters from ½" to 1 7/16". Two cartridge types also are available. Folder RB gives complete details and specifications. Write for your copy today. The Fafnir Bearing Company, New Britain, Connecticut.





FAFNIR *Ball Bearings*

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