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STEEL

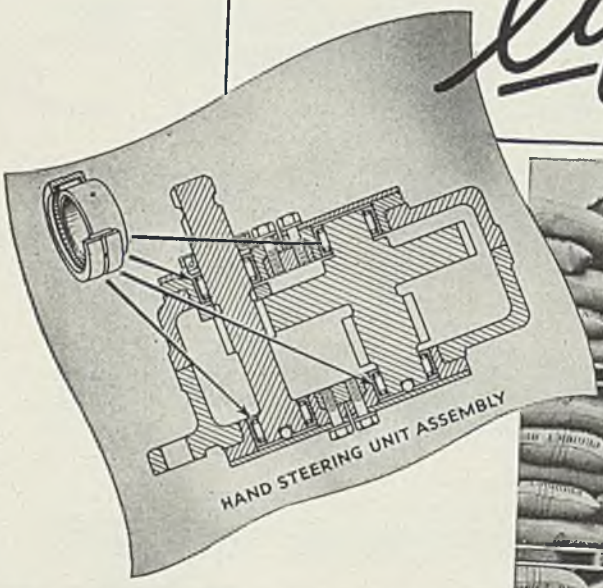
ESTABLISHED 1882

Contents

Volume 106—No. 10 **March 4, 1940**

PRODUCTION • PROCESSING • DISTRIBUTION • USE

A *lift* WHERE YOU WANT IT



BANTAM QUILL BEARINGS SMOOTH THE WAY FOR TRADE AUTOMATIC MARK INDUSTRIAL LIFT TRUCKS

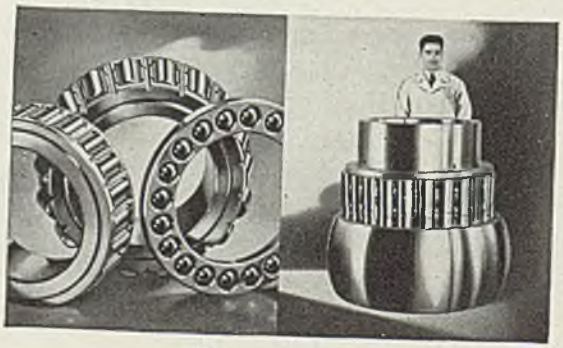
Faster, more economical load handling is the demand of the day—so Automatic Transportation Company puts Bantam Quill Bearings on its lift trucks—on sprockets for power-saving lifting—on steering units for effortless control. Automatic's engineers can give their customers these advantages at little cost—for Bantam's Quill Bearing is inexpensive to buy, easy to install.

This is just one of the many applications for which the Quill Bearing is ideally suited. Low friction loss, high load capacity, space and cost limited—if these are your bearing requirements, Bantam's Quill Bearing is your solution. Its sturdy construction is your assurance of dependability — *every* part is designed for long life and heavy duty.

Investigate these advantages of the Quill Bearing. For full details on construction, sizes, and ratings, write for Bulletin H-104. For Needle Bearings for lighter service, write our affiliate, The Torrington Company, Torrington, Conn., and ask for Circular 21-H.

BANTAM BEARINGS CORPORATION • SOUTH BEND, INDIANA

(*Right below*) **CUSTOM-MADE BEARINGS** for the *unusual* application are a major part of Bantam's service to industry. A typical instance of Bantam's engineering is this lift bridge bearing, 47" O. D., 26" I. D., 20" long. Bantam has designed and built some of the largest bearings ever made—and will take on *your* toughest problem, too.



(*Far left*) **TAPERED ROLLER, STRAIGHT ROLLER, AND BALL BEARINGS**—Bantam makes them all. With its comprehensive line, Bantam can meet your needs for any type of bearing.

ENGINEERING COUNSEL from Bantam is unbiased, because Bantam makes all types of bearings. Bantam's recommendations are based on comprehensive experience—and are determined solely by *your* needs. For advice on your bearing problem, TURN TO BANTAM.

BANTAM BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

As the Editor Views The News

■ SHRINKAGE in steelmaking is more gradual. Last week's rate (p. 27) was 65½ per cent, down 2 points. Production a year ago was 56 per cent and was nearing the end of a moderate first quarter expansion. Operations now have relinquished practically all the late-1939 upturn. The decline in finished steel buying (p. 87) appears to have been definitely checked, but start of a general revival has yet to appear. Favorable market developments include a sharp upturn in shape and reinforcing bar orders, more activity in railroad equipment, further reduction in consumers' inventories and a steadier tone in scrap. Steel prices are expected to be reaffirmed for second quarter. Automobile production continues relatively heavy.

• • •

Billion For Planes

Construction will start immediately (p. 24) on the West coast plant for the production of pig iron in electric furnaces. Initial plans call for two 50-ton furnaces, with two 200-ton units to be installed later. . . . British and French governments have decided (p. 33) to place their billion-dollar aircraft order in this country. . . . Open-hearth and electric furnace capacities of the steel industry as of Dec. 31, 1939, were at new high levels, but discarding of bessemer units reduced total steelmaking capacity slightly. . . . Labor troubles (p. 27) again made headlines at Pittsburgh last week.

• • •

May Change Labor Act

New plant for rolling stainless steel was formally opened last week (p. 25) by Republic Steel Corp. at Massillon, O. . . . Total net income of 103 iron and steel consumers in 1939 (p. 38) was 180 per cent larger than in 1938. . . . Canada's heavy industries (p. 39) continue to benefit from war material orders, but peace-time business also is gaining. . . .National "Modern Pioneer" awards were made last week (p. 21) to 19 outstanding inventors and research scientists, climaxing a series of such presentations throughout the country. . . . Important changes in structure and administration (p. 30) of the national labor relations act are in prospect. . . . Pig iron production (p. 26) averaged 101,648 gross tons daily in February, off 12 per cent from January but comparing with 73,578 tons a year ago.

• • •

Betters Creep Resistance

Important research recently (p. 44) indicates that creep resistance of alloy steel bolting materials for service at temperatures above 850 degrees Fahr. is improved markedly by employing a normalizing treatment instead of oil quenching and drawing. . . . A new structural system which affords simplicity and great strength (p. 50) clamps sheets under tension in steel frames to eliminate the necessity of cross bracing. . . . In an eastern plant, hack saw blade production has been improved by adoption of a new tooth cutting method and installation of a continuous, controlled atmosphere hardening furnace (p. 54). . . . Modern physics may throw light (p. 58) on why actual tensile strengths of metals always are lower than strengths calculated theoretically.

• • •

New Testing Machine

A specially-designed testing machine (p. 62), demonstrated last week and said to be the most powerful of its kind, is expected to extend the study of aluminum products for applications into new fields. . . . Recently installed at a Canadian dock terminal on the St. Lawrence river is a new boat loading conveyor capable of transferring coal to lake carriers at a rate of 800 to 1000 tons per hour (p. 60). . . . Life of lead-lined steel tanks is extended by improved tank construction which affords smooth, unstrained joints on exterior (p. 69). . . . Electrodeposition is now being employed to produce one-piece screens of nickel, copper or other metals (p. 64). Commercial sizes are 25 to 400 mesh.

E C Kreutzberg

Un acier entièrement nouveau !..

"LED

L'ACIER

à très grande vitess

L'INLAND S
des annees de recher
permettant l'incorporati

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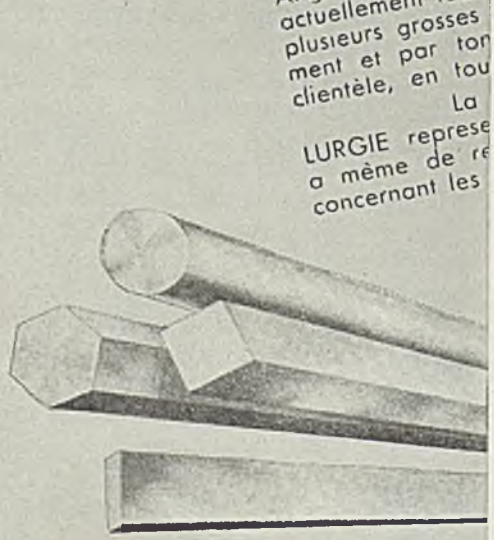


FRENCH INDUSTRY ADOPTS LEDLOY

New Inland lead-bearing, open hearth steel

Factories in France are humming today at top speed to feed the guns—to win the war. That is why thi advertisement appears in a leading French industria paper. French factories, and English factories too, ar finding what many American manufacturers have alread learned—Inland Ledloy bars and plates help spee production. Work goes, in the words of the French man, *á trés grande vitesse.*

This remarkable new Inland development—a lead bearing, free-cutting steel—greatly increases production while retaining all the desirable qualities of good oper hearth steel. Ledloy is made in all open hearth carbon steel analyses. Cutting speeds are increased 30 to 60% —tool life, 50 to 200%. Actual savings, available for increased profits, are often as high as $50.00 or more per ton of steel machined.

You should be familiar with the possibilities of this important new machining steel. We suggest that you call or write for Inland Ledloy Bulletin No. 50.

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

INLAND STEEL CO.

Dr. Charles Franklin Kettering

President, General Motors Research Corp., Dayton, O. and Detroit—"Invented and perfected the self-starter for automobiles and Delco lighting system for farms . . . improved diesel engines for trains and ships"

John B. Tytus

Vice president, American Rolling Mill Co., Middletown, O.—"Developed revolutionary process for continuous rolling wide strip steel . . . hand labor replaced by mechanical methods, with increase in employment due to greater use"

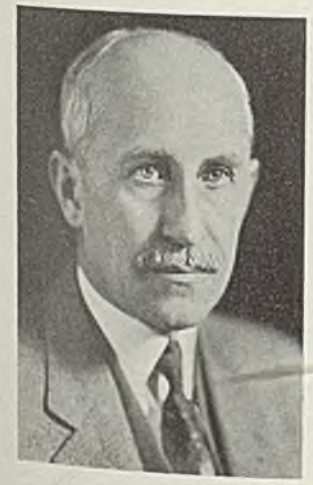
Henry Ford

Founder, Ford Motor Co., Dearborn, Mich.—"Largely responsible for the present-day automobile and for the efficiency of industrial production which has transformed luxuries for the few into common necessities for the many"

Industry Honors NATION'S BUILDERS

■ CLIMAXING a nationwide program to honor this country's outstanding inventors and research scientists was the bestowal of 19 silver plaques, national "Modern Pioneer" awards, at a dinner sponsored by the National Association of Manufacturers at the Waldorf Astoria, New York, Feb. 27. The dinner, last of a series of 14 held in industrial communities throughout the nation commemorating the 150th anniversary of the United States patent system, was attended by more than 1500 persons.

In addition to the national awards, more than 100 inventors and research workers



Orville Wright

Dayton, O.—"With his late brother, Wilbur . . . made first power-driven, heavier-than-air machine to make a successful flight through the air . . . has continued his contributions to the development of the aviation industry"

Dr. William David Coolidge

Director, research laboratory, General Electric Co., Schenectady, N. Y.—"Invention of method of producing ductile tungsten permitted use . . . for increasing efficiency of incandescent lamps . . . significantly advanced X-ray art"

Dr. Frederick Gardner Cottrell

Chemist, Washington—"Versatile inventor in many fields, he is best known for his invention of equipment and development of methods embodied in the universally used Cottrell process of electrical precipitation"

Dr. Irving Langmuir

Associate director, research laboratories, General Electric Co., Schenectady, N. Y. —"Brilliant alike as chemist, physicist, engineer and inventor . . . he has saved millions of dollars to electric light users, has created bases for very large new industrial activities"

Dr. Vladimir Kosma Zworykin

Research engineer, RCA Mfg. Co., Camden, N. J.—"Made notable contributions to development of photo-electric cells of high sensitivity, to transmission of pictures by radio, to progress toward television . . . Invented the iconoscope—the electric eye"

Dr. William Meriam Burton

Pasadena, Calif. ex-president, Standard Oil Co. of Indiana—"Largely responsible for invention and development of first commercial cracking process . . . made possible quantity and quality of gasoline demanded by our modern motor cars"

from the New York district were presented scrolls. Previously nearly 500 other men had received similar scrolls at district banquets.

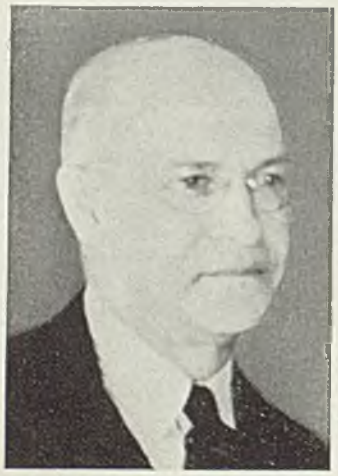
Recurrent theme throughout the program was that inventions and science have made possible America's high living standards and that new frontiers—industrial, not geographical—remain to be exploited and, given a chance, should bring new goods, new services and new employment opportunities. Refuted was the contention that new inventions and new machines have lessened employment.

Speaking at the New York dinner, H. W. Prentis Jr., president, National Association of Manufacturers, and of Armstrong Cork Co., Lancaster, Pa., characterized as "defeatism" the attitude that machinery and inventions destroy jobs.

Mr. Prentis took issue with the recent statement by President Roosevelt that we in this country "face the task of finding jobs faster than inventions can take them away."

"Surely it is defeatism for the President of the greatest nation in the world to suggest . . . . 'the efficiency of our industrial processes has created a surplus of labor.'" Mr. Prentis declared the ultimate purpose of the whole business and industrial organization is to supply the needs and wants of the population, adding there is no limit to the amount of business that may be done because there is no visible limit to human needs.

"Did the President count our encouragement of invention and business enterprise



Charles Frederick Wallace

Vice president, Wallace & Tiernan Co. Inc., Belleville, N. J.—"Numerous devices . . . making possible application of liquid chlorine in the treatment of water and in the disposal of wastes . . . added to public health"

Dr. Leo Hendrik Baekeland

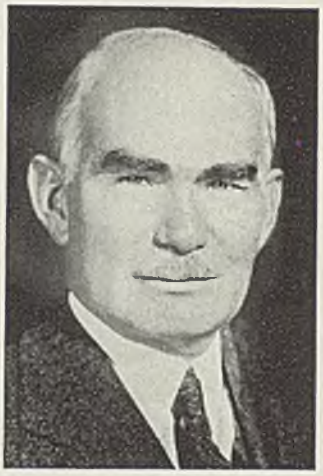
Founder and retired president, Bakelite Corp., New York—"Inventor of Bakelite, he was primarily responsible for the present plastic industry." Also invented light-sensitized Velox photographic paper, aided in developing electrolytic cell

Dr. George Oliver Curme Jr.

Vice president, Carbide & Carbon Chemicals Corp., New York—"Research and discoveries have developed so many new products . . . as to have created an entire new industry for the production of industrial solvents"

Edwin Herbert Land

President, Polaroid Corp., Boston—"By creating polaroid . . . made possible increased comfort of eyes in the glare of reflected sunlight, increased safety of motorists at night, a new process for three-dimensional pictures, many scientific applications"



Dr. Lee de Forest

President, several De Forest companies, Hollywood, Calif.—Through his radio tube "we telephone over half the world, speech is broadcast over the whole world, the movies talk, television has come, cosmic rays tell their story and atomic energies are revealed"

John Van Nostrand Dorr

President, Dorr Co. Inc., New York—"By his inventions metallurgical and industrial chemical processes have been improved in every civilized country, waters of many large cities have been purified and made sanitary, sewage effluents rendered harmless"

during the period of our greatest technological advance, 1870 to 1930, among the 'ways that have failed' that he mentions? It was during that period, while the population of our country nearly trebled, that the number of gainfully employed persons nearly quadrupled and the volume of production increased about elevenfold. Did invention take away jobs faster than other jobs could be found in those years? Obviously not." Moreover, the speaker pointed out, employment today is more nearly normal in the most highly mechanized industries—those in which there has been the greatest technological advance.

Manufacturing employment has risen in spite of many obstacles to virtually the 1929 level. In the building industry, where handicraft largely has persisted and per capita production has not increased, employment is at least one-third below the 1929 level.

Dr. Karl T. Compton, president, Massachusetts Institute of Technology, and chairman of the committee on awards, declared that pioneering has shifted from a geographical to an industrial basis, and upheld the American patent system as a major factor in America's progress. Robert L. Lund, chairman, national modern pioneers committee, and executive vice president, Lambert Pharmacal Co., St. Louis, expressed a similar sentiment.

Charles F. Kettering, vice president, General Motors (*Please turn to Page 76*)

Dr. Edwin Howard Armstrong

Professor of electrical engineering, Columbia university, New York—"One of the leaders in accomplishing the miracle of radio communication." Inventor of the superheterodyne receiving circuit and many other radio developments

Dr. Harry Steenbock

Professor of biochemistry, University of Wisconsin, Madison, Wis.—"Directed the energy of the ultra-violet lamp upon milks, foods and certain sterols, and found a way to provide vitamin D in great abundance"

Willis Haviland Carrier

Chairman, Carrier Corp., Syracuse, N. Y. —"Research in heat transmission, psychometry, refrigeration and aerodynamics, and his invention of equipment . . . primarily responsible for modern development of air conditioning"

Sierra Iron Co. Plans Immediate Start on Electric Pig Iron Plant

SEATTLE

■ SIERRA Iron Co. which recently signed a 20-year power contract with the Bonneville project, will start construction of a plant immediately, according to D. H. Botchford, president. Initial plans call for two 50-ton furnaces for reduction of iron ore electrically. Later the company will install two 200-ton furnaces. They will be of the pit type, especially designed to use low-grade coal for reduction, and are said to be adapted to local conditions.

Bids will be asked soon for the construction of a building, 40 x 120 feet, of steel and corrugated iron, to house the first electric furnace.

Mr. Botchford also is president of the Rich Mfg. Co., with plants in Los Angeles and Portland, Oreg. The Rich company manufactures soil pipe, hydrants, valves and fittings and will take all of the initial output of the new Sierra Iron Co. plant. Mr. Botchford was vice president and general manager of the Columbia Steel Co. before that plant was purchased by the United States Steel Corp.

Associated with him in the Sierra Iron Co. is Albert E. Greene, Medina, Wash., who developed the Greene electric furnace. Mr. Greene has conducted experimental work on an electric furnace method for smelting iron or manganese ores for many years. The furnaces to be installed are a "tilting type, three-phase, multiple electrode with closed top through which the electrodes are suspended into the bath."

Coal Is Reducing Agent

The method to be used is described: "Coal is used as the reducing agent. The furnace is equipped with an auxiliary rotary drying kiln into which the ground ore, coal and flux is fed, dried and discharged directly through a closed feed lead into one end of the electric furnace. Tapping of the slag and charge is at the opposite end. Coal may be of the abundant sub-bituminous or noncoking bituminous rank and may consist of the fines which are obtainable at low cost.

"Reduction takes place at the feed end of the furnace, with metal and slag flowing to the tapping end. Gases pass out of the furnace, counter-current to flow of ore, preheating and partially pre-reducing the ore as it drops from the kiln onto the furnace hearth. Heat evolved by the burning of the coal and coal gases supplies a good share of the heat required to maintain the furnace temperature, the remainder supplied by the electric arc. In this way the power consumption is kept relatively low."

The plant is said to be the first in America designed to produce pig iron by this method.

Iron ore will be purchased from D. Earle Stewart, mining engineer, formerly associated with Ford, Bacon & Davis, New York. Mr. Stewart has acquired ore properties near Scappoose, Oreg. Shipments will be made by rail and by water on the Columbia river. Ore mining will be an open pit operation.

When under full operation, Sierra Iron Co. is scheduled to use 1000 tons a day. The ore is claimed to be "a usable ore equal to most ores used in the United States and Europe and better than a great many."

Mining at Scappoose is scheduled to start April 15. Some magnesite ore will be shipped from Shasta county, Calif., and other reserves as needed.

Sierra Iron's plant will be constructed two miles east of the site where the Aluminum Co. of America soon will erect a large metal producing plant. Sierra Iron has leased for 30 years a 23-acre site from the Port of Vancouver.

The company's power contract with the Bonneville project runs for 20 years, calls for delivery of 1500 kilowatts by June 1, 3000 kilowatts by Dec. 1 and 6000 kilowatts by June 1, 1941.

Initial cost of the proposed plant will be $120,000. Plans call for a total investment of $600,000 within two years. When completed, plant will have a daily capacity of 500 tons and will use 30,000 kilowatts of power.

Current Events In Chicago . . .

By J. F. POWELL, Chicago Editor, STEEL

■ TWO changes in railroad handling of less-than-carload freight, announced last week, are expected to benefit the small shipper, help rail carriers recover from truck lines some of the less-than-carload traffic.

One of the changes involves restoration by New York Central of pickup and delivery service on less-than-carload lots of freight, a service which the road has not provided for a year and a half. Railroad started the service late in 1936 but discontinued it in the later part of 1938 because revenues did not come up to expectations.

Illinois Central railroad will begin experiments March 19 on a new freight-handling system involving quicker distribution and a saving in rates to distributors shipping carloads to distribution points where, at present, it is necessary to pay for numerous less-than-carload freight classifications in getting the broken-up shipments to their destinations.

Under new system, carloads must be broken-up and distribution begun within 48 hours of receipt at distributing point. Shipments going to other destinations from the distributing point then will be covered by a single, fourth-class rate classification, lowest of the less-than-carload rates available. The areas only of Memphis, Tenn., and Meridian and Jackson, Miss., will be involved in the first try-out of the plan.

♦

Chicago association of commerce has sent 4000 leaflets to out-of-town companies pointing out the advantages of establishing branch plants in this territory. The association seeks to enlarge the number of industries in Chicago by showing how the average manufacturer here has fared better than competitors in a majority of other industrial areas in the country. Figures bearing on the metalworking industry also reveal the Chicago area accounts for 18.3 per cent of the country's blast furnace production, 16.2 per cent of rolling mill products, 27 per cent of railroad car building, 11.5 per cent of machinery, 12 per cent of electrical wares, and 8 per cent of all manufactured goods, while representing only 3.8 per cent of the country's population.

♦

Santa Fe railroad last week received seven new streamlined passenger cars from the shops of Pullman-Standard Car Mfg. Co., Chicago. The new cars, built of high-tensile steel with exteriors of stainless, will go into service on de luxe streamlined trains of the Santa Fe system. They comprised two combination baggage-chair cars and a baggage-dormitory car, a buffet diner, dining car, club-lounge car, and chair-observation car.

Republic Expands, Centralizes Stainless Steel Making Facilities

■ REPUBLIC Steel Corp. last June started construction of a new plant at Massillon, O, for making stainless steel in coils and cut lengths in various finishes. In January the mills started operation; six weeks later, production of 1200 tons a month was reached.

Now 1500 to 2000 tons a month could be shipped if it could be made, so rapidly is the demand for this grade of high-quality steel increasing. Already plans have been made by the automotive industry to double the quantity used in cars this year over that used in 1939 models.

Formal opening last Tuesday of Republic's new stainless finishing plant utilizing five acres of floor space under roof, was attended by approximately 40 magazine and newspaper editors and representatives. Following day families and friends of employes viewed the various operations.

Stainless steel cold rolled at this plant is made in the company's electric steelmaking department at Canton, O. This division, originally consisting of six electric furnaces, recently was enlarged by the installation of a 25-ton unit transferred from the company's Buffalo plant and a new 50-ton unit.

Republic now has concentrated all stainless steel producing and finishing operations at Canton and Massillon, O., with the exception of the hot rolling of slabs into coils. This is done at Warren, O.

A portion of the five-acre building was rebuilt to accommodate three annealing and electro-pickling lines which were transferred from the company's Warren, O., division, and a new 34, 28 and 20-inch, 4-high reversing mill and a 2-high, 34-inch skin pass stand. Original equipment for cold rolling stainless includes a 2-stand tandem, 4-high 20-inch mill, a 4-high 20-inch mill and a 12 and 18-inch 2-high skin pass mill.

With this equipment, Republic now produces coils of cold-rolled stainless strip from ¼-inch to 23⅛ inches. In the polishing department sheets 68 inches wide by 24 feet long can be polished on either or both sides in all trade finishes.

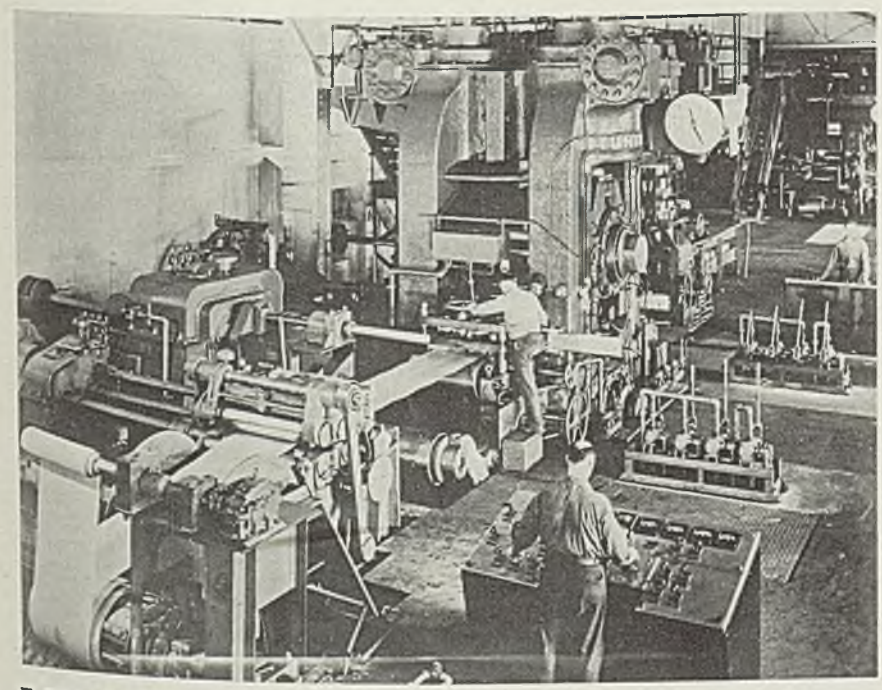
Estimate 1940 Utilities' Program at $600,000,000

■ Private utilities, according to United States commerce department's estimates, will install 2,000,000 kilowatt additional power generating facilities this year. Indicated cost is $600,000,000.

Based on comments from within the industry, expenditures for 1940 are approximately $150,000,000 greater than last year. New construction, according to the report, probably will be principally financed through sale of securities and not "so largely out of earnings as has been the case in recent years."

Department's statistics indicate power generation, which reached a record high at year's end, totaled 123,000,000,000 kilowatt hours in 1939. Of this amount the record total of 107,000,000,000, represented sales to ultimate consumers.

Residential sales were estimated at nearly one-fifth the total. Farm consumers took more than 3,000,000,000 kilowatt hours, more than double 1932 sales.



■ Cold rolling coils of stainless steel on the new 34-inch reversing mill in Republic Steel Corp.'s improved and expanded stainless steel finishing plant which formally was opened at Massillon, O., last week. Steel is so carefully protected that paper is rolled into the coils (lower left)

Steel Employment Down Slightly in January

■ Average number of steel employes in January was 556,000, against 563,000 in December and 451,000 in January last year. Total payrolls were $82,827,000, against $84,537,000 in December, and $59,348,000 in January, 1939.

The 496,000 wage-earning employes averaged 83.5 cents per hour, against 85 cents in December, and 82.6 in January, 1939. Wage earners averaged 37.1 hours a week, against 36.9 in December, and 32 in January last year.

Canada's December Steel Imports Total $18,876,000

■ Canada's iron and steel imports last December totaled $18,876,000, an increase of $7,555,000 over $11,321,000 for corresponding 1938 period.

Imports from United States increased from $10,024,000 to $16,913,000. Machinery formed largest single item, totaling $3,474,000 against $2,022,000 for December, 1938.

Central Tube Liquidates Pipe, Conduit Business

■ Central Tube Co., Pittsburgh, steel pipe and conduit manufacturer, last week announced its decision to liquidate business. Disposition of plant and inventory has been arranged.

Company's pipe stock accounts will be serviced by Spang Chalfant Inc., Pittsburgh, effective Feb. 26. Latter will make available to former Central Tube Co. customers a complete line of buttweld, lapweld and seamless tubular products.

Output of an additional patented process continuous weld mill, now practically completed, will increase Spang Chalfant's service facilities.

February Pig Iron Down 12.3 Per Cent as 19 More Stacks Go Out

■ NINETEEN more blast furnaces were taken out of production during February and, as a consequence, United States production of coke pig iron suffered a sharp setback. This was the third consecutive month that the production rate has dropped and second in which the furnace total has declined. On the last day of February, 158 stacks were active, as compared with 177 Jan. 31, and 191 Dec. 31.

According to reports from the country's 233 potential blast furnaces, with operators making estimates for the last two or three days of the month, average daily production in February was at the rate of 101,648 gross tons per day. This was a loss 14,267 tons per day, or 12.3 per cent, from the January rate of 115,915 tons per day. The rate was the smallest since last September, with 95,802 tons daily, and compares with 73,578 tons per day in February, 1939.

AVERAGE DAILY PRODUCTION

Gross Tons

	1940	1939	1938	1937
Jan.	115,915	70,175	46,608	103,863
Feb.	101,648	73,578	46,655	107,857
March	.....	77.201	47.426	111.951
April	.....	68,511	46,267	113,354
May	.....	55,404	40,675	114,360
June	.....	70,647	35,358	103,843
July	.....	76,001	39,131	112,947
Aug.	.....	85,823	48,242	116,676
Sept.	.....	95,802	56,103	113,932
Oct.	.....	117,012	66,694	93,259
Nov.	.....	124,003	76,222	66,901
Dec.	.....	121,535	71,378	48,499
Ave.	109,019	86,375	51,752	100,573

MONTHLY IRON PRODUCTION

Gross Tons

	1940	1939	1938
Jan.	3,593,354	2,175,423	1,444,862
Feb.	2,947,795	2,060,183	1,306,333
Tot. 2 mo.	6,541,149	4,235,606	2,751,195
March	.....	2,393,255	1,470,211
April	.....	2,055,326	1,388,008
May	.....	1,717,522	1,260,937
June	.....	2,119,422	1,060,747
July	.....	2,356,036	1,213,076
Aug.	.....	2,660,513	1,495,514
Sept.	.....	2,874,054	1,683,097
Oct.	.....	3,627,384	2,067,499
Nov.	.....	3,720,100	2,286,661
Dec.	.....	3,767,605	2,212,718
Total	.....	31,526,823	18,889,663

Total production for February was 2,947,795 gross tons. Against the 3,593,354 tons made in January, this was a decrease of 645,559 tons, or 18.0 per cent. However, part of this loss is due to the fact that February was a 2-day shorter month. The February output was the smallest since last September with 2,874,054 tons, and compares with 2,060,183 tons in February, a year ago.

Output for the two months of 1940 has aggregated 6,541,149 gross tons, and is a gain of 2,305,543 tons, or some 54.5 per cent over the 4,235,606 tons made in the first two months of 1939. Output for the corresponding period of 1938 was 2,751,195 tons.

Relating production to capacity, operations in February averaged 73.0 per cent, against 87.1 in January, 88.5 in December and 90.3 in November. In February, 1939, the rate was 51.0 per cent.

During February, 6 blast furnaces resumed and 25 were blown out or banked. All of the stacks resuming were of nonmerchant or steelworks classification; of this group, 21 stacks were made inactive. No merchant furnaces resumed and 4 were taken out. The 158 active furnaces was the lowest number operating since last August with 138. In February, 1939, active units totaled 121. In two months, 33 blast furnaces have been blown out or banked.

Furnaces resuming operation in February were: In Indiana: Gary No. 9, Carnegie-Illinois Steel Corp. In Ohio: Lorain No. 2, National Tube Co.; Mingo No. 4, Carnegie-Illinois Steel Corp. In Pennsylvania: Cambria "J" and Steelton A, Bethlehem Steel Co. In West Virginia: Riverside, Wheeling Steel Corp.

Stacks blown out were: In Illinois: South Works Old No. 2 and South Works New No. 9, Carnegie-Illinois Steel Corp. In Indiana: Gary Nos. 1, 2, 3 and 6, Carnegie-Illinois Steel Corp.; Madeline No. 3, Inland Steel Co. In Massachusetts: Everett, Mystic Iron Works. In Minnesota: Zenith, Interlake Iron Corp. In Ohio: Anna, Struthers Iron & Steel Co.; Martins Ferry, Wheeling Steel Corp.; Brier Hill No. 2, Youngstown Sheet & Tube Co.; Lorain No. 3, National Tube Co.; Massillon, Republic Steel Corp.; Ohio Nos. 2 and 4, Carnegie-Illinois Steel Corp. In Pennsylvania: Midland No. 3, Pittsburgh Crucible Steel Co.; Shenango No. 1, Shenango Furnace Co.; Bethlehem "B." Bethlehem Steel Co.; Eliza No. 4, Jones & Laughlin Steel Corp.; One Monessen, Pittsburgh Steel Co.; Carrie Nos. 1 and 3, Clairton No. 2 and Duquesne No. 5, Carnegie-Illinois Steel Corp.

FEBRUARY IRON PRODUCTION

	No. in blast; last day of Feb.	Jan.	—Total Tonnages— Merchant	Non-Merchant
Alabama	17	17	83,158*	148,898
Illinois	10	12	49,901	188,040
New York	10	10	58,141	125,404
Ohio	31	36	74,417	487,601
Penna.	57	64	106,505*	882,933*
Colorado	3	3		
Indiana	12	16	3,274*	542,807
Maryland	6	6		
Virginia	1	1		
Kentucky	1	1		
Mass.	0	1		
Michigan	5	5		
Minnesota	1	2	6,470	190,246
Missouri	0	0		
Tenn.	0	0		
Utah	1	1		
West Va.	3	2		
Total	158	177	381,866*	2,565,929*

*Includes ferromanganese and spiegeleisen.

Urge Certified Ratings For Propeller Fans

■ Good volume of business in the ventilating industry this year is indicated by reports from all parts of the country, according to Propeller Fan Manufacturers' association, Detroit. Gratifying progress, reports the association, is being made in its nation-wide campaign advocating certified ratings for propeller fans. Ultimate consumer would then be certain as to capacity of any fan installed or specified.

Key note of the association's annual meeting held recently was that purchaser should insist on certified ratings, and that air delivery on any fan equipment purchased be in accordance with standard test code for centrifugal and axial fans.

A. R. Stephan, DeBothezat Ventilating Equipment Co., New York, was elected president of the association; M. W. Bauer, Aerovent Fan Co., Piqua, O., vice president; and V. C. Shetler, secretary-treasurer.

RATE OF FURNACE OPERATION

(Relation of Production to Capacity)

	1940[1]	1939[1]	1938[2]	1937[3]
Jan.	87.1	51.0	33.6	76.6
Feb.	73.0	53.5	33.6	79.5
March	..	56.1	34.2	82.5
April	....	49.8	33.4	83.7
May	....	40.2	29.4	84.3
June	....	51.4	25.5	76.6
July	....	55.0	28.2	82.9
Aug.	....	62.4	34.8	85.7
Sept.	....	69.7	40.5	83.7
Oct.	....	85.2	48.0	68.4
Nov.	....	90.3	55.0	49.3
Dec.	....	88.5	51.4	35.6

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

PRODUCTION . . .

Steel Production Rate Drops 1.5 Points to 65.5 Per Cent of Capacity

■ STEELWORKS operations last week declined 1½ points to 65½ per cent. Two districts showed small increases, five lost a few points each and five were unchanged. A year ago the rate was 56 per cent; two years ago it was 29.5 per cent.

Youngstown, O.—Sustained at 40 per cent, with 38 open hearths and two bessemers active. Republic Steel Corp. resumed bessemer production after being down for repairs but Youngstown Sheet & Tube Co. suspended its bessemer. This week probably will show an increase of 1 or 2 points as Sheet & Tube resumes bessemer output, Pittsburgh Coke & Iron Co. has banked its merchant furnace.

Birmingham, Ala.—Holds at 90 per cent with 21 open hearths in service. Removal of one furnace this week will carry the rate down to 84 per cent.

Pittsburgh—Steady at 63 per cent with the same rate indicated for this week.

Wheeling, W. Va.—Continues at 94 per cent.

New England—Loss of 7 points to 56 per cent.

Detroit—Gain of 2 points to 94 per cent as Great Lakes Steel Corp. lighted its only idle open hearth.

Chicago—For sixth consecutive week production has slipped, going down 4½ points to 59 per cent. Four producers reduced production, two others operating above rated capacity.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Mar. 2	Change	Same week 1939	Same week 1938
Pittsburgh ...	63	None	50	27
Chicago	59	— 4.5	56.5	26.5
Eastern Pa...	65	— 3	37	30
Youngstown .	40	None	47	29
Wheeling	94	None	71	38
Cleveland	71	+ 3	51	28
Buffalo	58	— 9	32.5	21
Birmingham .	90	None	83	58
New England	56	— 7	60	15
Cincinnati ...	57	— 2	55	10
St. Louis	63.5	None	55	28
Detroit	94	+ 2	76	35
Average ...	65.5	— 1.5	56	29.5

Central eastern seaboard—Reduction of 3 points to 65 per cent.

Buffalo—Receded 9 points to 58 per cent as the principal producer withdrew four open hearths.

St. Louis—Unchanged for the second week at 63.5 per cent.

Cleveland—Increased 3 points to 71 per cent, second consecutive upturn and highest rate in month.

Cincinnati—Down 2 points to 57 per cent on further curtailment in backlogs.

What's New at Pittsburgh . . .

By R. L. HARTFORD, Pittsburgh Editor, STEEL

■ LABOR troubles again made headlines here last week. Trouble broke out at several points, with more promised this week. Most serious was a brief but bitter dues collection campaign which closed the plant of McKeesport Tin Plate Co., in Port Vue, near McKeesport.

Picketing started early Tuesday morning. Since there are few members with dues paid in the plant, SWOC leaders called on members of the United Mine workers from the district to aid, and set up a solid line to prevent entrance to the plant. Pickets also closed a bridge and a nearby street to all traffic. Office and administrative employes were allowed to enter, but workmen were barred unless paid-up membership cards were shown.

There were so few of these that the plant was unable to operate, and management announced late Tuesday all operations had been suspended. Neither McKeesport police nor Allegheny county law enforcement officials made any effort to open the public road to traffic, and while there was considerable ill feeling, no violence was reported.

Pickets later were taken away, and the union announced the campaign was "a big success." However, the company continued to view the incident as a breach of contract and would not reopen the plant. The entire matter is obviously another step in the new campaign toward the closed shop and checkoff, since union leaders after recalling pickets stated the incident was a routine procedure, which would occur monthly hereafter, and which could be easily eliminated by institution of the checkoff.

Other labor news follows: Monaca, Pa., workers at United States Sanitary Mfg. Co. voted to strike when their contract expired last week. SWOC officials demanded an increase of 20 per cent in minimum pay rates, vacations with pay and the closed shop. Late last week union negotiators reported little headway made in conferences with plant officials, would not admit how many of the workers had actually voted in the strike vote.

Management of Titan Metal Mfg. Co., Bellefontaine, Pa., announced it has asked national labor relations board to reconsider its order demanding reinstatement of 146 strikers, since this action would result in insolvency and force out all 600 of the company's workmen.

♦

Curtiss-Wright Corp. will begin immediately on work for a new addition to its propeller plant here. Plant, recently acquired from Pittsburgh Screw & Bolt Co., is located on Neville Island. Structural steel has been awarded to Pittsburgh-Des Moines Steel Co., and general contractors have been named. Edwin L. Wiegand Co. has also announced an addition to its plant here, to be used principally as storage space but also to provide room for expansion when necessary.

MEN of INDUSTRY

■ H. A. FELDBUSH, heretofore general manager, Carbondale division, Worthington Pump & Machinery Corp., Harrison, N. J., has been appointed a vice president. He will make his headquarters at Holyoke, Mass., where he will have charge of operations of the Holyoke works in the manufacture of air and refrigerating equipment. He will continue as an active member of the Carbondale operating committee.

♦

E. K. Anderson, associated with Cutler-Hammer Inc., Milwaukee, a number of years, has been appointed manager of the company's branch office at Dallas, Tex. This office serves Arkansas, Texas, Oklahoma and southern part of New Mexico, and is under direct supervision of G. E. Booth, district manager, located at St. Louis.

♦

E. P. Connell has been elected treasurer, and M. A. Carpenter, secretary, Falk Corp., Milwaukee.

♦

James Dana Hutchinson Jr. has been elected treasurer, E. D. Clapp Mfg. Co., Auburn, N. Y.

♦

Robert W. Lea, vice president in charge of finance, Johns-Manville Corp., New York, has been elected a director.

♦

Warren R. Eaton has been elected vice president and production manager, Bliss & Laughlin Inc., Harvey, Ill.

♦

H. C. Grossman, manufacturing supply salesman, Vonnegut Hardware Co., Indianapolis, has joined National Twist Drill & Tool Co., Detroit, as sales engineer.

♦

Arthur E. Schobeck was re-elected president and general manager, Jamestown Malleable Iron Corp., Jamestown, N. Y., at the annual meeting of the corporation Feb. 26.

♦

Fred L. Fox has been appointed district manager of sales at Chicago for Superior Steel Corp., Pittsburgh, with offices at 2013 Peoples Gas building.

♦

Warren J. Belcher and Richard L. Mullaney have been promoted to vice president and assistant general manager, respectively, Whitney Chain & Mfg. Co., Hartford, Conn. Mr. Belcher will be in charge of engineering. He has been associated with three generations of the Whitney family in manufacturing. Mr. Mullaney joined the Whitney company in 1938. He formerly was with Stout All Metal Airplane Co., Dearborn, Mich.; Hutto Engineering Co., Detroit; Curtiss Wright Flying Service, and Worthington Pump & Machinery Corp., Harrison, N. J.

E. K. Anderson

♦

J. C. Merwin has been elected treasurer, Chain Belt Co., Milwaukee, in addition to the office of vice president, which he now holds. Mr. Merwin joined Chain Belt in 1917. Prior to his election in 1924 as vice president in charge of the conveyor division, Mr. Merwin was works manager. L. B. McKnight, associated with the company since 1926 when he became secretary and sales manager of the Stearns Conveyor Co., Cleveland, a subsidiary of Chain Belt, has been appointed assistant to the vice president. In 1933 Mr. McKnight was appointed sales manager of the company's conveyor division in which capacity he continues.

Harold S. Falk

Who has been elected president, Falk Corp., Milwaukee, as noted in STEEL, Feb. 26, page 20. A graduate of the University of Wisconsin, college of engineering, Mr. Falk joined Falk Corp. in 1906 and from that time to 1920 was employed in various departments. He then became vice president and works manager, which positions he held until his election to the presidency

♦

Edward S. Perot, executive vice president, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., has been elected president. Prior to joining Crocker-Wheeler early in 1939, Mr. Perot was with National Conduit & Cable Co. nine years, serving two years as vice president. For three years he was president, Dictograph Products Co., and six years president of Southern Dairies Inc. Other officers elected are: Wallace K. Brown and Ben D. Christian, vice presidents; Edward C. Jones, secretary, and Kenneth S. Murray, assistant treasurer.

♦

Frank M. Robbins, president, Ross-Meehan Foundries, Chattanooga, Tenn., and retiring president, Steel Founders Society of America, has been awarded the Frederick A. Lorenz Memorial medal for 1940 for "outstanding contribution to the welfare of the industry during his term of office. Presentation was made at the annual meeting of the society in Chicago, Feb. 14-15.

♦

W. S. Arthur has been placed in charge of the new office opened by Cooper-Bessemer Corp., Mt. Vernon, O., in the Arcade building, St. Louis. He will manage sales engineering activities in Missouri, southern Illinois, northeastern Arkansas and Mississippi as far south as Greenville. Since 1936 Mr. Arthur had been head of Superior Engine Co.'s Chicago offices.

♦

Wade R. Weaver, the past two years chief inspector, Cleveland works, Republic Steel Corp., has been named superintendent of the 40-inch, 21-inch and 18-inch open-hearth mills at Youngstown, O. Following graduation from Yale university, Mr. Weaver joined the former Corrigan-McKinney Steel Co., successively working in the open-hearth department, rolling mill and as assistant chief metallurgist.

♦

George A. Smith, assistant plant manager, Meriden, Conn., factory, New Departure division, General Mo-

tors Corp., has been appointed assistant general manager, Hydra-Matic Transmission division of General Motors at Detroit. He joined New Departure in 1920 as foreman of machining inspection and advanced through various positions until his appointment last year as assistant plant manager.

♦

W. L. Kennicott has been appointed representative in southern California for McKenna Metals Co., Latrobe, Pa., with headquarters at 4905 South Santa Fe avenue, Los Angeles. He succeeds the late G. B. Ferguson. Mr. Kennicott is a specialist in the application of carbide tools in turning, boring, facing, milling, shaping and other machining operations.

♦

Harold L. Dublin, in charge of sales of sheets and strip in the Cleveland sales offices of Jones & Laughlin Steel Corp. since October, 1936, resigned March 1. Previously Mr. Dublin had been Cleveland sales manager for Follansbee Bros. Co. for two years, having been associated with the Follansbee company 24 years.

♦

Arch Davis has been promoted to executive secretary, International Business Machines Corp., New York. He will assist Thomas J. Watson, president, and other officers of the corporation in matters dealing with all phases of the company's operations. Heretofore advertising manager, he will continue to supervise activities of that department. Eugene F. Hartley, formerly executive secretary, has been promoted to position of economist.

♦

Clyde Hause, sales engineer, Gorham Tool Co., Detroit, has been elected chairman, Detroit chapter, American Society of Tool Engineers, succeeding C. W. Thiede, chief tool engineer, Chrysler Jefferson avenue plant. B. L. Diamond, sales engineer, Consolidated Machine Tool Corp., Detroit, has been elected vice chairman, and Clyde Mooney, tool engineer, Pioneer Engineering Co., secretary.

♦

Norton Co., Worcester, Mass., announces the following changes in its sales organization on the Pacific coast: P. S. Wiswell, who has been looking after interests of both Norton and its Behr-Manning division, will henceforth devote all his time to the sale of Behr-Manning products. Warren H. Turner, field engineer in the Detroit area, will take over the southern California territory, including Arizona and New Mexico, with headquarters in Los Angeles. E. G. Petherick, formerly grinding wheel specialist for C. W. Marwedel, Norton distributor in San Francisco, has joined Norton and

W. L. Kennicott

will take over the northern California district, including Nevada and Utah. A. M. Pitts, with headquarters in Seattle, will continue as representative in Washington, Oregon, Idaho, Montana and western Wyoming.

♦

Lewis A. Dibble has been reelected president, Eastern Malleable Iron Co., Naugatuck, Conn. John Walker was elected vice president; Charles E. Brust, formerly secretary and treasurer, was named secretary and managing director of the Eberhard division in Cleveland. He succeeds Arthur L. Wheeler, who has retired from the board. Emil Mannweiler was made treasurer and also remains assistant to the president. F. Leslie Howard, assistant treasurer, has become assistant secretary, while George E. Bean was reelected managing director, Wilmington, Del., plant, and T. Rice Davis remains in his similar position at the Naugatuck Iron Works. James L. Linsley continues as director in charge of sales research.

Died:

■ M. STEWART DRAVO, 56, manager, Pittsburgh branch office, Crucible Steel Co. of America, New York, in Pittsburgh, Feb. 20. Mr. Dravo was long associated with Crucible, having joined the organization in 1909 after graduating from Trinity college, Hartford, Conn.

♦

Frederick C. Reiter, buyer for the Van Camp Hardware & Iron Co., Indianapolis, recently in that city.

♦

Robert Farnsworth, 38, vice president, Curtiss-Wright Corp., New York, Feb. 17, in that city.

♦

William Henry Wright, 61, vice president, Semet-Solvay Engineering Corp., New York, Feb. 24 at his home in Mountain Lakes, N. J. He had been with Semet-Solvay since 1930. Mr. Wright was a member, American Iron and Steel institute and American Society of Mechanical Engineers.

♦

Arthur C. Tobin, 61, Chicago manager for General Fireproofing Co., Feb. 17 in that city. From 1913 to 1914 he was sales manager for the company at Youngstown, O.

♦

Frank Melahn, 67, Feb. 19 at his home in East Dundee, Ill. He had been associated with the Illinois Bolt & Iron Co., Carpentersville, Ill., 42 years.

♦

August F. Blaess, 69, retired chief engineer, Illinois Central railroad, Chicago, Feb. 19 in Gulfport, Miss., where he had resided since retirement in May, 1938.

♦

Frederick W. Morgan, 72, who supervised the rolling of steel in many plants throughout the country, Feb. 25 at his home in Rocky River, O. He retired in 1929 after 46 years in the steel business.

♦

Walter U. Rickard, 70, president, Rim Stoker Co., Feb. 15 at his home in Wilkes-Barre, Pa. Prior to becoming president of Rim Stoker he was associated with Vulcan Iron Works, Wilkes-Barre, 47 years.

♦

Hollingsworth Morris, 72, retired machinery manufacturer, at his home in Villanova, Pa., Feb. 25. From 1907 to 1912 he was president, Morris Engineering Co., Philadelphia, and from then until his retirement in 1931, head of the Cresson-Morris Co., Philadelphia.

♦

Joseph A. Halls, 70, in Daytona Beach, Fla., recently. He began his career with William Tod Co., successively becoming superintendent, United Engineering & Foundry Co., Pittsburgh, and superintendent, metal lath department, General Fireproofing Co. Later he joined Truscon Steel Co., Youngstown, O.

♦

Fred J. Carr, for many years a manufacturing executive at Richmond, Ind., at his home recently. In 1889 he joined the old Hoosier Drill Co. of which he became manager in 1903. When the works became part of International Harvester Co. he was purchasing agent until his retirement.

♦

George Harris, 94, in Niles, O., Feb. 24. He was the son of James Harris who went to Niles in 1846, later built the Brown-Bonnell mills at Youngstown, the Harris-Blackford mill at Niles and other mills at St. Louis and Covington, Ky. Mr. Harris obtained his first job in his father's mill at Niles, and later was superintendent of the American Tin Plate mill at Sharon, Pa., devoting 40 years to rolling mill work.

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ OPPOSITION to proposed trade agreements act extension for a three-year period from June 12 was expressed last week before senate finance committee by Senator O'Mahoney, Wyoming, chairman, temporary national economic committee.

Senator O'Mahoney stated he intends to propose amendment to resolution, already passed by the house, providing no duties contained in any agreement take effect until "the congress by law has specifically approved such an agreement and the duties and other import restrictions so specified to carry out such agreement."

He said two issues are involved in the proposal to renew executive authority to negotiate reciprocal trade agreements. First is desirability of international agreements with respect to trade; second, extent to which congress shall delegate to the executive power to fix custom duties. He declared it is not generally recognized the trade agreements act has called upon congress to abandon its "constitutional legislative power in an utterly unprecedented manner."

Senator O'Mahoney told finance committee members: "If you are to insist upon the passage of this measure . . . at least let it provide that those who actually fix the rates shall be confirmed by the senate." Supporters of this legislation have contended there are precedents for it, but Senator O'Mahoney denied this.

Plan Restrictive Amendments

Many other witnesses appeared last week before the finance committee, both for and against the bill. Among these were Secretary of State Hull and Secretary of Agriculture Wallace, who favor the bill.

House, by a vote of 216 to 168, passed the simple resolution providing for extension. Efforts were made in the house to amend the resolution, but all were defeated.

Senate opponents of extension have practically conceded the upper house will pass the resolution. They contend, however, they will make a vigorous effort to pass restrictive amendments. One principal suggested amendment would make it necessary for senate to pass on each proposed trade agreement after it had been negotiated but before it became operative.

Another proposal is for a congressional yardstick providing limits on tariff reductions while a third would eliminate the most-favored-nation theory of the existing reciprocal trade program.

It is expected the finance committee will report measure back to senate by end of this week. Senator Barkley, majority leader, last week said he had full confidence the resolution will pass senate in the form in which it passed the house and that no more than a week would be necessary for debate on the bill.

LOWER WALSH-HEALEY BASE PROPOSAL IS STUDIED

H. S. Evans, executive vice president, Central Iron and Steel Co., Harrisburg, Pa., appearing last week before a subcommittee of the house said if the Walsh-Healey act was reduced from $10,000 to $2000 per contract it might put 25,000 men out of work in his industry.

Mr. Evans was discussing proposed amendment to Walsh-Healey public contracts act which provides establishment of minimum wages on government contracts of $10,000 or more. An amendment has passed senate applying the act to contracts of $4000 or more. Representative Healey, Massachusetts, has proposed it be applied to contracts of only $2000 or more.

Lee Pressman, Committee of Industrial Organizations counsel, told the committee a lower minimum was needed to prevent splitting up of large contracts, a practice he said was sometimes done to avoid the law.

Secretary of Navy Edison pointed out navy's construction program might be "very seriously affected" if the Walsh-Healey public contracts act should be applied to naval contracts of less than $10,000.

Informed charges had been made in congress the navy had let contracts of $9999 to evade the law, Edison said he would order such practices, if any, stopped.

SMITH COMMITTEE REPORT ADVISES LABOR ACT CHANGES

Preliminary report of the special Smith house committee, investigating national labor relations board activities, is said to recommend important changes in the labor act itself and a thorough revision of administrative policy. In its present form report is claimed to call for amendments to:

Open way for replacement of present board members.

Strip the board of its power to act as judge, jury and prosecutor by providing an administrator to consider complaints under the act.

Give employers caught in labor strife right to petition for election to determine employe representatives.

Grant a broader court review of decisions.

Strengthen rules of evidence.

Relieve employers of necessity of treating with aliens in bargaining with employes.

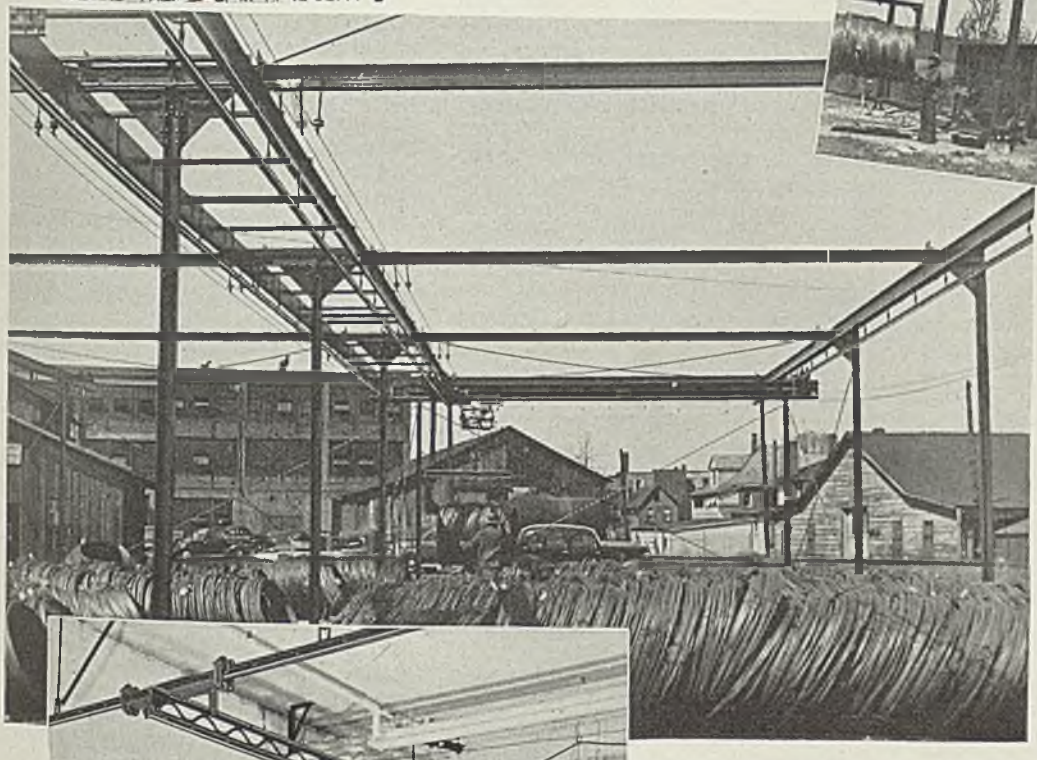
Clarify freedom of speech issue involved in present law.

Provide warring unions cannot petition for an election unless they can agree an election should be held to determine employe representation for collective bargaining purposes.

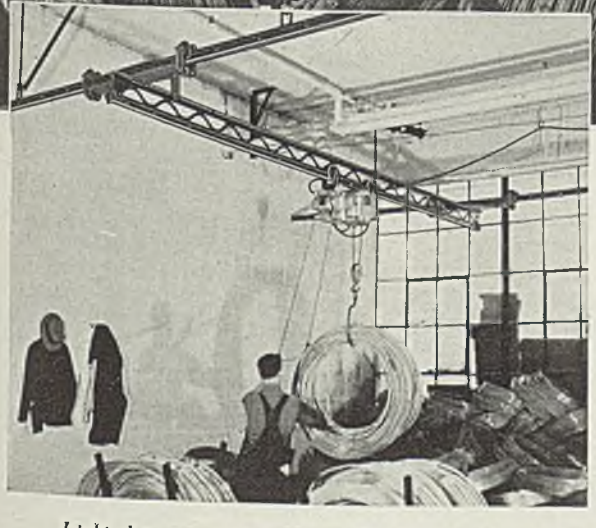
Recently Representative Smith,

"Saves 32c per ton!" in handling cost - - -

Two men unload car of rod in 1½ hours with crane and electric hoist.



Cranes provide 6000 sq. ft. of low-cost storage area served by electric hoists.



Light duty crane reduces inside storage area. Hoist conveys coils to punches and cold-headers.

Unloading and storing coiled rod from box cars formerly cost 40c per ton and required 5500 sq. ft. of warehouse space.

Now, raw coils are unloaded from gondolas, stored outside and handled through pickling to punches and cold-headers at 8c per ton.

A Clear Saving of 32c per Ton Made Possible by Overhead Handling

Innovations, such as a turntable for transferring coils between hoists, develop in conference with American MonoRail engineers.

Their wide experience in nearly every industry often reveals profit producing possibilities where least expected. Consultation is offered without obligation.

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Virginia, chairman of the committee, asked Attorney General Jackson to apprise the committee whether labor board members had violated a law forbidding use of federal appropriations for lobbying.

Mr. Jackson has notified Chairman Smith the department of justice makes legal rulings only at request of department heads and the President. In his reply the attorney general said:

"Almost from the beginning of the government, my predecessors have, with great unanimity, taken the position that statutes prescribing duties of the attorney general do not authorize him to render opinions to congress or to its committees or members.

"These statutes have not been substantially changed since 1789. As early as 1818, Attorney General Wirt, and as late as Oct. 4, 1939, Attorney General Murphy each ruled that under the statutes attorneys general are not authorized to give official opinions on questions of law except upon call of the President or the head of an executive department to enable him to decide a question pending in his own department for action. . . ."

DEPARTMENT OF COMMERCE APPOINTS ADVISORY MEMBERS

James W. Hook, Geometric Tool Co., New Haven, Conn., has been appointed to the business advisory council, department of commerce. Other new members: Cornelius F. Kelley, Anaconda Copper Co., Anaconda, Mont.; W. S. Newell, Bath Iron Works, Bath, Me.; and Clarence Avildsen, United Drill & Tool Corp., Chicago. Several other industrialists were also appointed.

Nathan T. Bartlett, formerly with temporary national economic committee, has been appointed secretary, following resignation of E. Willard Jensen.

ASKS TIME TO MODIFY WAGE-HOUR REGULATIONS

Col. Philip B. Fleming, wage-hour law administrator, has prevailed on congress to give him opportunity to modify existing regulations before any action is taken on pending wage-hour amendments.

Representative Cox, Georgia, leader of the house bloc seeking changes, revealed that Colonel Fleming plans conferences soon with industrial leaders to discuss proposed changes in his interpretations of the exemptions in the act.

"If Colonel Fleming were given a free hand I think he would make a good job of administering a bad law," Mr. Cox said. "But I don't believe he will be permitted to exercise any freedom."

A rule now is pending on Speaker Bankhead's desk providing for consideration of three bills for changes in the law which may be called up at any time by any member of the house rules committee. Mr. Cox, as a rules committeeman, is entitled to act at any time the house is momentarily clear of business.

JANUARY EXPORT FIGURES SHOW FURTHER INCREASES

Substantial increases in United States export trade in last four months of 1939 over corresponding period of the preceding year were followed in January by an even more marked rise, according to department of commerce. January exports from United States were nearly three-fourths greater in value than in the same month last year, when export trade was at a low level, and also slightly above the relatively high figure for last December.

Commerce department's January figures show general imports were more than one-third larger in value than in January, 1938, although slightly below the December level. Value of both import and export trade increased after the middle of 1939, but greater gain occurred in exports, with a resulting marked increase in export balance. In both December and January value of exports exceeded imports by more than $120,000,000.

STUDY U. S. DEPENDENCE ON FOREIGN TIN SUPPLIES

House rules committee has given right of way to a resolution by which committee on foreign affairs is to investigate extent to which United States is dependent on foreign nations for its tin supply. The rules committee has submitted to the house a privileged resolution which means that it can be brought up at almost any time and there is every indication that it will be passed during the present session of congress. Reolution:

"The committee on foreign affairs of the house of representatives or a subcommittee thereof, is hereby authorized and directed to review and bring up to date its previous report on tin; to make such further investigation as it may deem appropriate with regard to the present dangerous dependency of the United States upon foreign nations for a supply of tin as a material vital to its commercial and military needs, including (a) world control of tin prices and production by foreign countries; (b) possible substitutes for and resources of tin which may be developed within the United States and its territorial possessions; (c) all other questions in relation thereto that would aid congress in any necessary legislation.

"The said committee, or any subcommittee thereof, is hereby authorized to sit and act at such times and places within the United States, whether or not the house is sitting, has recessed, or has adjourned, to hold such hearings, to require the attendance of such witnesses and the production of such books, papers and documents, by subpoena or otherwise, and to take such testimony as it deems necessary. Subpoenas shall be issued under the signature of the chairman or any member designated by him and shall be served by any person designated by him. The chairman of the committee or any member thereof may administer oaths to witnesses. Every person who, having been summoned shall willfully default, or who, having appeared, refuses to answer any question pertinent to the investigation heretofore authorized shall be held to the penalties provided by section 102, revised statutes of United States."

CONGRESS REFUSES TO ALLOW SALARIES FOR ADVISORS

Commerce department officials are annoyed by congress' refusal to appropriate $160,000 for salaries of so-called business experts in the office of the secretary.

A number of men who were formerly connected with various business interests were appointed special advisors to Secretary Hopkins recently, but Capitol Hill believes these additional members were unnecessary.

GOVERNMENT IRON, STEEL PURCHASES TOTAL $1,135,309

During week ended Feb. 17, government purchased $1,135,309.66 worth of iron and steel products under the Walsh-Healey act as follows: Doehler Die Casting Co., Pottstown, Pa., $24,150; International Nickel Co. Inc., New York, $45,200; Babcock & Wilcox Tube Co., Beaver Falls, Pa., $10,542.

Cory & Joslin Inc., San Francisco, $53,628; Summerill Tubing Co., Bridgeport, Pa., $23,709.17; Warren Foundry & Pipe Corp., New York, $13,118.71; American Bridge Co., Denver, Colo., $34,911; Jones & Laughlin Steel Corp., Pittsburgh, $45,586.71.

Apollo Steel Co., Apollo, Pa., $26,347.08; Lacy Mfg. Co., Los Angeles, $10,887; Dravo Corp., Pittsburgh, $574,800; Lehigh Structural Steel Co., Allentown, Pa., $64,137; Arthur J. O'Leary & Son Co., Chicago, $26,000; May Hardware Co., Washington, $20,963.44.

Nicholson File Co., Providence, R. I., $38,755.41; Delta File Works of Carver File Co., Philadelphia, $22,829.04; Rochester Ropes Inc., Jamaica, N. Y., $18,690.70; and Hadley Special Tool Co. Inc., Boston, $81,054.40.

AVIATION

ALLIED GOVERNMENTS PLACE BILLION-DOLLAR ORDER

■ BRITISH and French governments last week decided to place a billion-dollar order for 8000 planes and 13,000 engines with United States planemakers, bulk of the business going to Glenn L. Martin Co., Baltimore; Douglas Aircraft Co., Santa Monica, Calif.; Curtiss-Wright Corp., New York; Brewster Aeronautical Corp., Long Island City, N. Y.; Bell Aircraft Corp., Buffalo; Lockheed Aircraft Corp., Burbank, Calif.; Consolidated Aircraft Corp., San Diego, Calif.; United Aircraft Corp., Hartford, Conn.

Contracts and specifications will be issued on completion of technical surveys made by Secretary of Treasury Morgenthau. Preparations have been made to obtain volume production and deliveries in last quarter of this year, although shipments will extend well into 1941. Substantial volume of subcontracting is probable.

Mr. Morgenthau said costs of planes to foreign buyers are in line with domestic prices. Tax policies, he said, are neither impeding plant expansions nor boosting prices. British and French governments have more than sufficient dollar exchange for financing, he declared.

Glenn L. Martin Co., Baltimore, reports that while it may consider subcontracts to metalworking companies not regularly engaged in aircraft work, such action will depend on factors not yet determined. North American Aviation Inc., Inglewood, Calif., states although backlog is $51,000,000, production is on schedule and subcontracts are improbable.

Ryan Aeronautical Co., San Diego, Calif., has contracts amounting to $300,000 with Douglas and Lockheed for exhaust systems. Company recently introduced a "flying motorcycle" plane with a short takeoff distance and a takeoff angle said to be around 60 degrees. It is equipped with Fowler-type flaps. On landing, plane can come to a full stop within 10 feet.

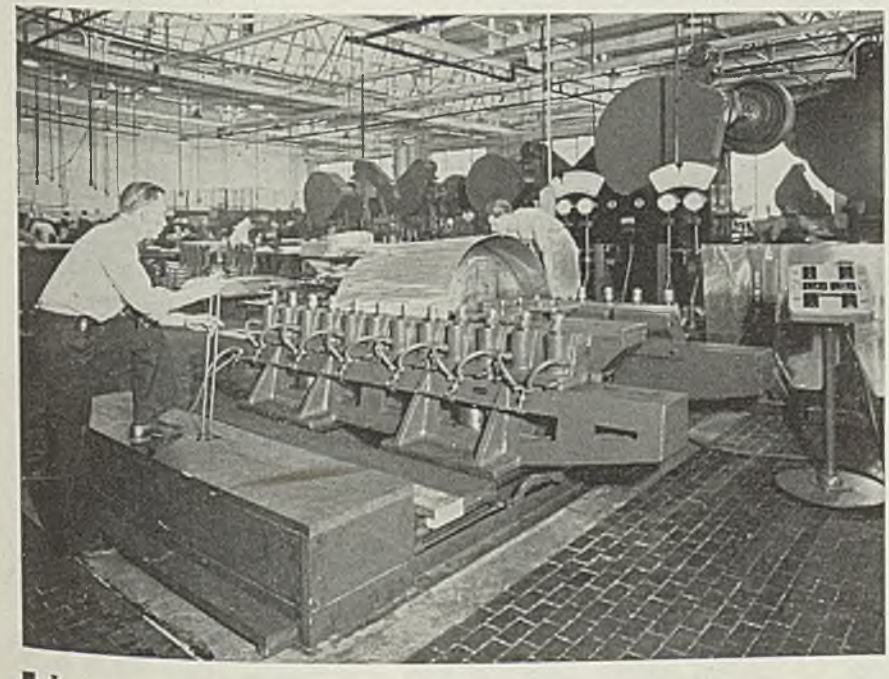
A $20,000,000 order for improved two-engine attack bombers was placed with Douglas Aircraft Co. by British air ministry. Douglas contracts on hand and immediately pending are over $100,000,000.

New Metal-Stretching Press

What is claimed to be the first metal-stretching press built in United States is in operation at Middle River plant of Glenn L. Martin Co. Built by Engineering & Research Corp., Riverdale, Md., press is used to form large parts such as skins and cowlings formerly shaped by power hammer and hand tools. Machine, illustrated on this page, consists of platen powered by two hydraulic cylinders placed between two rows of independently-operated jaws. Cylinders raise and lower platen vertically, or operate in tandem for angular position of platen. Form blocks, made to exact contour since there is no spring-back, are wood covered by 0.040-inch deep-drawn body steel and are placed on platen. Metal to be stretched is placed over block and clamped in both rows of jaws. Platen and form then rise into sheet. When sheet is stretched into all contours of the form it is released. Thickness of material is reduced only 5 to 7 per cent and operation takes but a few minutes.

To better living conditions of its employes, Glenn L. Martin Co. is sponsoring a housing project, "Stansbury Manor," 12 miles east of Baltimore. First unit accommodates 184 families. Ultimate plans call for 2000 homes.

Records filed with civil aeronautics authority show five out of 14 airlines reporting so far operated at a loss in December. Net income, before taxes, rose to $251,142 from $90,541 in November and $76,556 in December, 1938. Largest loss was $127,369 of United Air Lines Transport Corp. Air travel for January decreased 14.7 per cent from December but was 60.9 per cent above January, 1939.



■ A new way to form skins and cowling for aircraft at Glenn L. Martin Co., Baltimore, is to stretch the metal sheets over steel-covered forms of exact contour

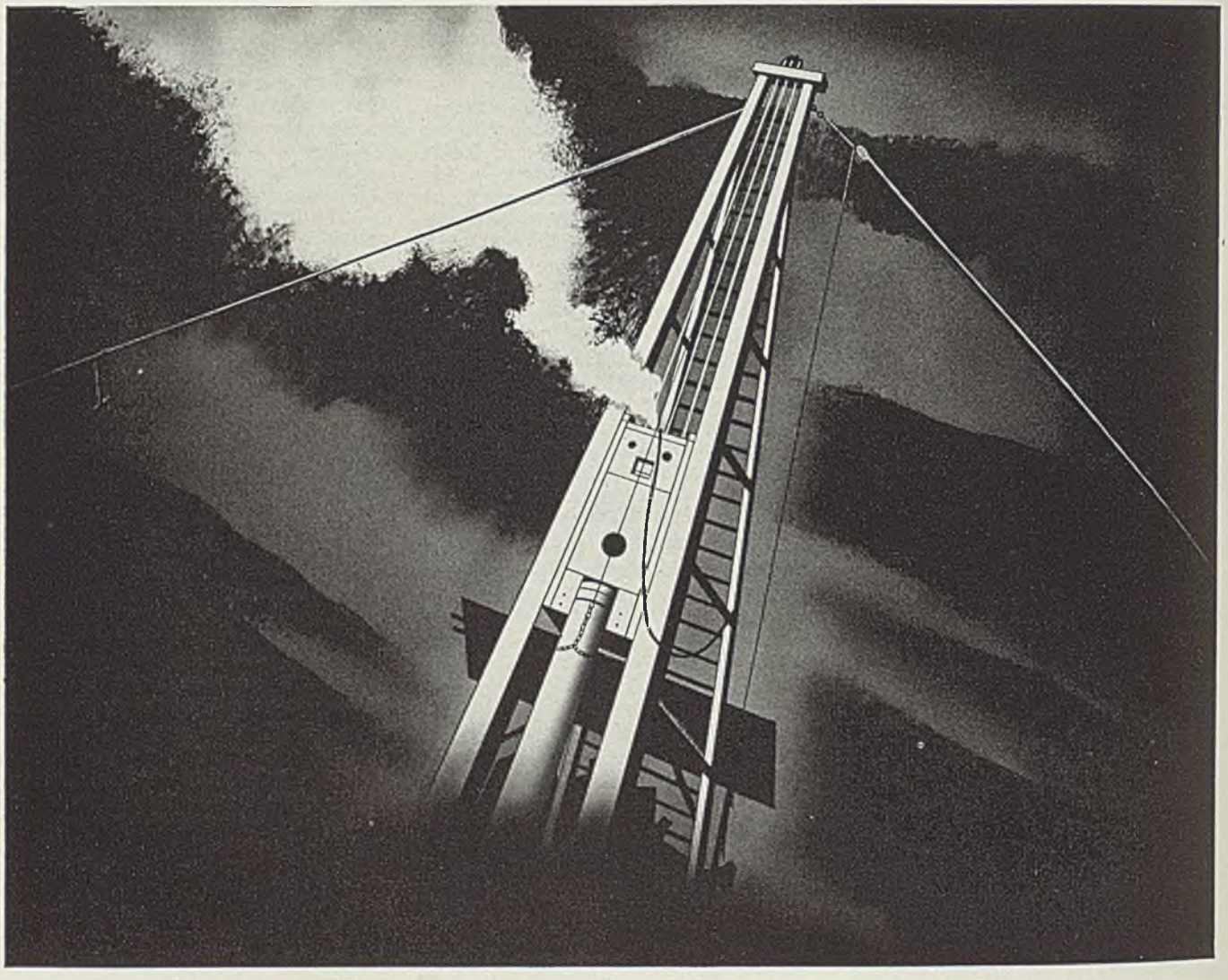
Ingot Capacity Down As Bessemers Decrease

■ Substantial reduction of bessemer capacity in the United States in 1939 resulted in total steelmaking capacity declining less than one-half per cent, the American Iron and Steel institute reports. At the same time the institute announced its reports of iron and steel capacity will be in net tons of 2000 pounds instead of gross tons of 2240 pounds as heretofore. This change to a net ton basis follows similar action by several steel companies.

As of Dec. 31, 1939, the industry's capacity for producing steel ingots by all processes was rated at 80,950,901 net tons per year. This compares with 81,238,045 net tons as of Dec. 31, 1938, which was the highest total capacity on record. This formerly was reported at 72,533,969 gross tons.

Although open hearth and electric furnace steel capacity increased in 1939, these increases were more than offset by a drop of 16 per cent in bessemer capacity. Total capacity of open-hearth furnaces at the year-end establishes a new peak of 73,343,547 net tons of ingots, compared with 72,596,153 net tons Dec. 31, 1938. Electric furnace capacity also rose to a new peak in 1939, increasing from 1,497,658 net tons to 1,592,080 net tons Dec. 31, 1939. Capacity of crucible furnaces was unchanged at 5354 net tons.

Reflecting scrapping of bessemer converters last year total annual bessemer capacity at the year-end was 6,009,920 net tons, against 7,138,880 net tons at the close of 1938. Current bessemer capacity is the lowest in about 40 years. When this steel was in peak demand, from 1905 through 1918, output ran from 11,000,000 to 13,000,000 net tons per year and only a little more than 30 years ago bessemer steel output exceeded that of open-hearth furnaces.



PILE DRIVERS CAN'T CALL "TIME OUT"

When a pile driver goes to work time is generally the essence of the contract, with penalties for non-fulfillment an ever-present threat. Hence the ability to give continuous service under difficult conditions and with a minimum of attention is an essential requirement. That, in turn, depends largely on the choice, for each part, of the material best adapted to the job.

One manufacturer, whose pile drivers have made an enviable record for trouble-free performance, guards dependability by making the ram piston — a vital part — of Nickel-Chromium-Molybdenum Steel. This steel develops to a high degree the particular combination of toughness, strength and hardness, in the heavy sections used, which is necessary to withstand the rigors of the service.

A re-check of your own materials specifications may disclose possibilities for increasing dependability by the use of Molybdenum Steels. You will find our technical booklet, "Molybdenum in Steel", helpful. It will be sent free on request.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ LITTLE is heard these days of developments in automobile forgings. There is of course always the recurrent argument of forgings versus castings with a continual shifting of parts from one type of material to another. However, there is probably concentrated in eastern Michigan as much or more forging capacity than in any other section. Every car built requires a large number of forgings, and hammers ranging from the small board drop type to the large steam units for crankshaft work are banging away daily in this area.

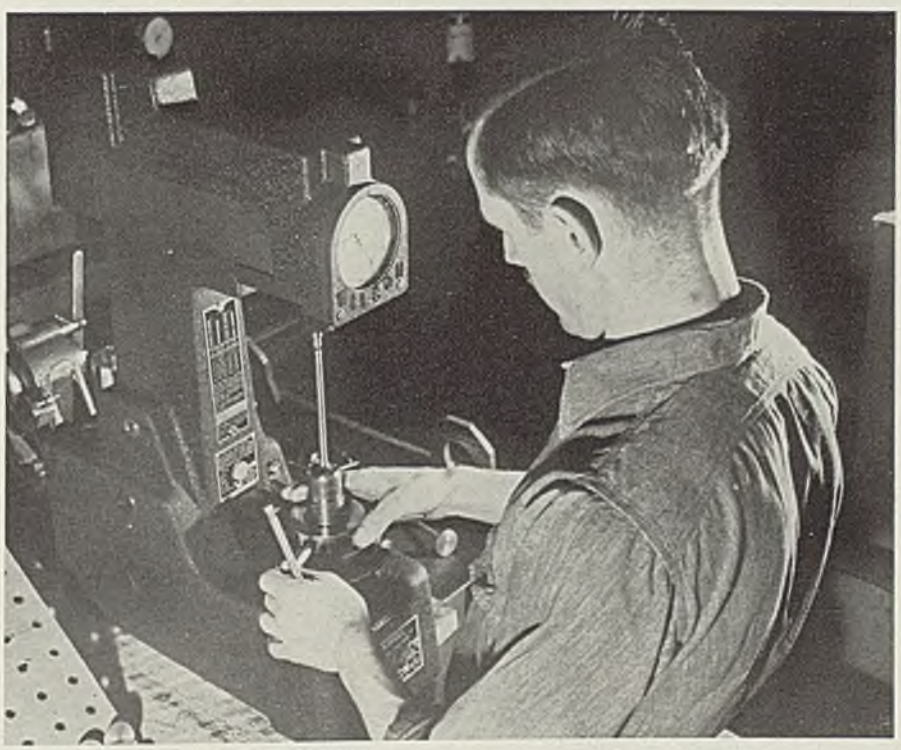
To this capacity likely will be added late this summer the output of a new forge shop which is now being shaped up by the Oldsmobile division of General Motors at Lansing, Mich. Olds has neither forge shop or foundry at present, being supplied necessary parts in these lines by Buick plants at Flint. Buick production has been rising so steadily in the past two years that it is only logical to expect that pinches may be developing in certain departments which supply Pontiac and Olds, as well as Buick.

Present information is that Olds engineers are considering production of all forgings, both large and small, by means of forging machines and presses, instead of hammers. This would mark a noteworthy departure in automotive forge shops. The press method is claimed to produce parts to closer tolerances and without the flash encountered on hammer forgings. Maintenance on forging machines is well under that required by hammers, and foundations do not need to be sunk nearly so deep as is the case with hammers, which sometimes have reinforced supporting structures going down as far as 100 feet.

While numerous types of forging machines and presses are operated in the metalworking industry, they are limited in the size of forging which can be produced. For example, in the automotive industry a 2500-ton press is about the largest. Ford, Buick and Chevrolet are among those using this size press on such parts as ring gears.

But engineers are thinking, perhaps dreaming, of producing crankshafts on this type of equipment. No one has ever done it as yet, but that does not mean anything in automobile manufacture. Equipment builders say they can build the necessary 5000-ton press to handle crankshafts if the industry will give them an order for one (about $150,000). They visualize the possibilities of shaping a shaft from a formed and heated billet in two operations—breakdown and finish-

Speeds Valve Stem Testing



■ Rockwell testing of 600 valve stems per hour is now possible at the Pontiac plant in Pontiac, Mich., by means of this new electric tester. The operation until recently was done on a hand operated machine at a rate of 200 stems per hour. Diamond point is forced into the end of the stem under 70 kilograms of pressure

ing. Instead of the square or rectangular billet from which crankshafts are hammer forged, a specially rolled section would be used, formed so that the steel would be distributed approximately in the contour of a finished shaft.

Two steam hammers of about 12,000-pound rating are used in the forging of 8-cylinder cranks now. Switch to a forging press would mean elimination of one piece of equipment, and reportedly further savings in reduction of finish machining and straightening costs.

It would take eight months to build and deliver equipment for press forging crankshafts, so it is hardly likely that this process will be instituted for 1941 model production, at least at the start.

In the crankshaft picture must be included studies now being made by at least two of the major car builders—De Soto and Buick—on the feasibility of changing to a cast crankshaft. Samples of a cast steel shaft have been submitted to engineering departments, indicating the possibility of saving 30-40 per cent on machining costs over forgings, and at the same time providing a shaft with a modulus of elasticity of better than 28,000,000 psi., only a few pounds heavier than the 84-pound six-throw forging, containing no appreciable amounts of alloys, and suitable for induction hardening.

Should current tests being made on this proposition prove successful, it is considered likely additional foundry capacity would have to be installed in this area to handle the production involved, since such facilities are not available now.

■ FROM forgings to plastics is a far cry, but still in the automotive picture. Recent perfection by Detroit Macoid Corp. here of a process for extruding plastics through steel dies captured attention at the national furniture show and suggested automotive applications. On display at the show were samples of woven plastic furniture—chairs, settees, tables and the like—produced from extruded plastic sections by Ypsilanti Reed Furniture Co., Ypsilanti, Mich. The sections are made from a newly developed plastic, Tenite II, supplied by Tennessee Eastman Corp., Kingsport, Tenn.

This material is a cellulose acetate butyrate, compared with Tenite I which is plain cellulose acetate. Tenite II is claimed to show only one-half the moisture absorption of its predecessor, has a specific gravity of about 1.2, compared with 1.3 for Tenite I, and displays ability to hold its shape unusually well after such a process as extrusion.

The extrusion, of course, is done hot, and as the material emerges from extruding dies, at a rate of anywhere from 35 to 150 feet per minute, it is cooled and then, depending upon the size of the section, can be reeled for subsequent weaving.

The material can be made in a wide variety of colors and moldings, can be extruded in strands, cut and woven in the same manner as reed, rattan or other material. Two types of strands are used in the previously mentioned furniture. One is half-round strips of perhaps 3/16-inch diameter, for machine weaving into chairs, settees, etc.; the other a ⅝-inch strip loosely hand woven.

To the casual observer, it would appear this new plastic will be welcomed in the automotive industry, chiefly because of its properties of holding shape and resisting penetration by moisture. Cost per pound is the same as Tenite I, but of course is slightly higher on a volume basis because of the lower specific gravity. Plastic moldings continue to be essential materials in automobile interiors, often in combination with steel stampings and die castings, and some plants, such as Chrysler, have installed their own molding machines for production of parts. Further installations are expected this year.

One type of plastic molding which has not met with much success in this country is die cast hardware with an injection-molded plastic covering. Closest approach is Detroit Macoid's dipped plastic coating (STEEL, Oct. 18, 1937), which has been used extensively on door handles, escutcheon plates, knobs and similar parts. Injection molded parts of this type are being produced in Australia.

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	.....
March	238,447	389,495	.....
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	.....

*Revised.

Estimated by Ward's Reports

Week ended:	1940	1939†
Feb. 10	95,985	84,500
Feb. 17	95,050	79,860
Feb. 24	102,570	75,660
Mar. 2	100,855	78,705

†Comparable week.

	Week ended Mar. 2	Feb. 24
General Motors	44,490	43,855
Chrysler	26,375	25,865
Ford	20,350	20,350
All others	9,640	12,500

■ DIFFICULTIES which have attended getting out production at the Detroit Transmission division of General Motors where the Olds hydramatic drive is being built have given rise to an assortment of rumors about defects in the transmission, inability to obtain steel of suitable strength, machining problems and the like. So far as is known publicly, however, this automatic transmission still is available at a cost of $57 on Olds models, although some delay may be encountered in getting delivery. It should be remembered that the device is vastly more complicated than the conventional transmission, comprising three sun gears, nine planet pinions, three internal ring gears, two multiple disk clutches, brake drums and brake bands, in addition to a fluid coupling, two centrifugal governors, hydraulic pumps and an intricate valve chamber. These parts are made to precision tolerances and it is no simple matter to tool up a plant for quantity production overnight.

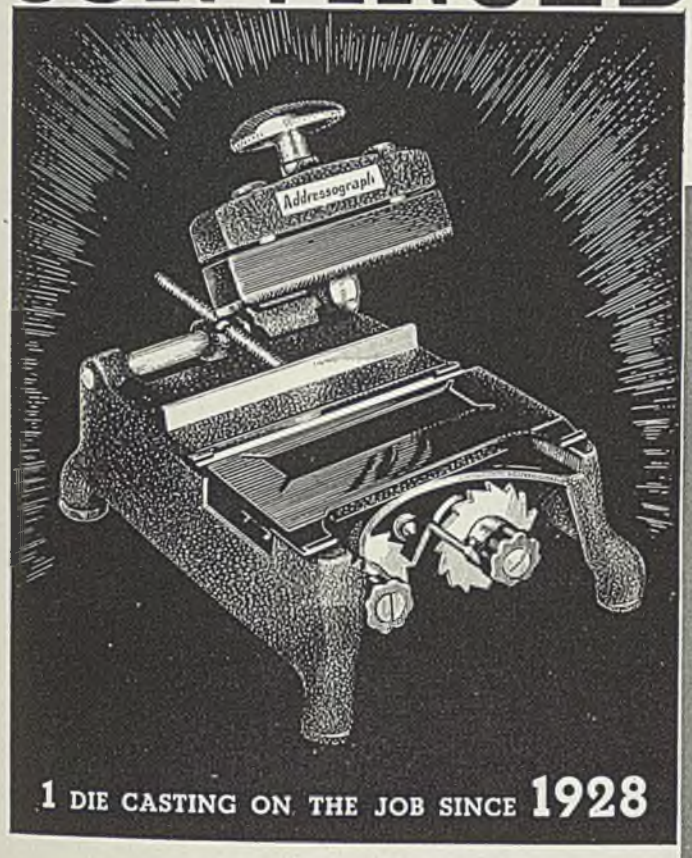
Anent transmissions, a Milwaukee company is understood to be designing an automatic hydraulic transmission similar to that used on Yellow Truck & Coach division buses for application to diesel-powered locomotives, permitting elimination of the electric generator and direct drive from the diesel engine to the wheels. Such a device, if effective, would bring about an important reduction in cost of these locomotives.

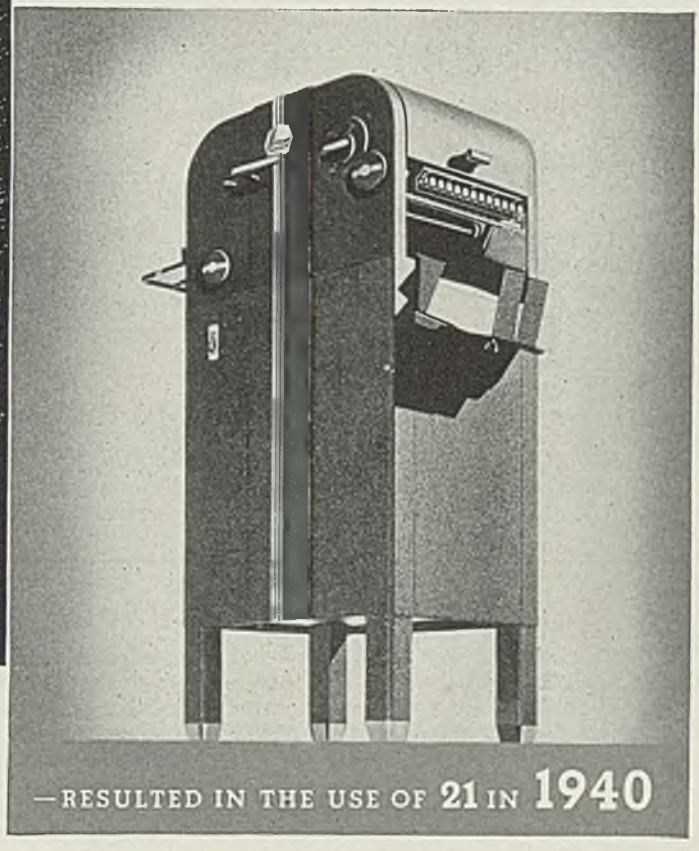
■ DIAMETRICALLY opposed to policies recently instituted by the larger manufacturers, under terms of which the factory-delivered price is shown on cars sold throughout the country, is the proposal announced by August Johnson, executive vice president of Graham-Paige Motors Corp. His plan shoulders the dealer with setting the delivered price of cars sold in his territory, and delivered prices will not be listed or advertised in factory promotion.

Mr. Johnson says, "An advertised factory delivered price is helpful in establishing a car in the minds of the public as low-priced, etc., but local conditions vary so much that this same price serves as only a general guide for the dealer . . . there will be no policing in the Graham picture, no factory interference. The dealer will be his own boss and have freedom of action. No dealer is going to go hog-wild under this policy unless he wants to go broke."

CONVINCED

—DIE CASTINGS ARE THE ANSWER





A service span of over ten years has convinced a prominent business machine manufacturer that ZINC Alloy Die Castings are the answer for many metal parts.

In 1928 this Company employed its first die casting—a base for a hand-operated addressing machine. This machine—still with a die cast base—is an active item in the Company's line today. And (this is the significant engineering fact) ZINC Alloy Die Castings have been specified in increasing quantities for all duplicating equipment since 1928. The latest machine embodies 21 mechanical and decorative parts produced by this metal and method.

This is the third advertisement in a series* designed to illustrate the widespread acceptance and increased use of ZINC Alloy Die Castings in most of today's major industries. If you are not thoroughly informed on the physical and economic advantages offered with ZINC Alloy Die Cast parts, we suggest that you consult a commercial die caster—or write to The New Jersey Zinc Company, 160 Front Street, New York City.

*Copies of earlier advertisements is this series gladly mailed on request.

ZINC
ALLOY DIE CASTINGS

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

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

FINANCIAL

AMERICAN ROLLING MILL CO. NETS $4,011,908 IN 1939

■ AMERICAN Rolling Mill Co., Middletown, O., reports 1939 net profit of $4,011,908, equal to 69 cents a share on common, compared to $1,307,880 net deficit incurred in 1938. Fourth quarter net income, based on nine months' and year's reports, was $1,741,964, compared to $27,721 loss in corresponding 1938 period.

Prices for company's principal products, iron and steel sheets, were considerably lower than in 1938, according to Charles R. Hook, president. Although 61 per cent more tonnage was shipped in 1939, net sales income was only 35 per cent greater than in 1938.

Average prices received in 1940 are better than those in effect over most of last year, said Mr. Hook. "After a leveling off of inventories during the first quarter of 1940, we expect an increase in volume at fair prices."

Dividend of $1.75 a share on account of dividends in arrears on 4½ per cent cumulative preferred stock was declared, payable April 15. This will reduce arrearage on Armco preferred to $2.12½ per share, as of April 15, 1940.

Earnings comparisons:

Quarters	1939	1938	1937
First	$793,479	$197,311*	$2,320,816
Second	875,671	525,854*	4,321,955
Third	600,794	556,994*	2,646,525
Fourth	1,741,964	27,721*	1,057,961*
Year	$4,011,908	$1,307,880*	$8,231,335
Earned on common	$0.69	....*	$2.55

*Loss.

LACLEDE STEEL EARNS NET PROFIT OF $210,053 IN 1939

Laclede Steel Co., St. Louis, reports 1939 net income of $210,053, equal to $1.02 a share, compared to net profit of $331,849 or $1.61 a share in 1938. Dividends aggregating $1 per share were paid, compared to $1.25 in 1938.

Depreciation of $457,991 was taken up last year. Working capital Dec. 31, 1939, was $2,659,865, against $2,714,474 Dec. 31, 1938. Current assets Dec. 31 were $3,153,674; current liabilities, $493,809.

Despite unsatisfactory lower selling price last year business, especially in last quarter, was sufficiently improved to permit operations at a profit, according to Thomas R. Akin, president. Improvements in open hearth, wire mill and tube mill departments, said Mr. Akin, have enabled products of those departments to maintain a position of increasing importance.

DIVIDENDS DECLARED

Allegheny Ludlum Steel Corp., Brackenridge, Pa., 25 cents a share on common, payable April 1 to record of March 18.

♦

Youngstown Sheet & Tube Co., Youngstown, O., 25 cents a share on common, payable April 1 to record of March 2.

♦

Keystone Steel & Wire Co., Peoria, Ill., 25 cents a share on capital stock, payable March 15. Dividend of 20 cents was paid Dec. 15.

♦

Pittsburgh Coke & Iron Co., Pittsburgh, regular quarterly of $1.25 per share on $5 preferred stock, payable June 1 to record of May 20.

♦

Republic Steel Corp., Cleveland, $1.50 a share on 6 per cent cumulative convertible prior preference stock, series A; $1.50 on 6 per cent cumulative convertible preferred, both payable April 1 to record of March 11.

Iron, Steel Consumers' Earnings Statements

■ AGGREGATE 1939 net earnings of 103 iron and steel consumers totaled $110,978,506, compared to net income of $39,692,070 for the same companies in 1938. Only seven reported a net loss for the year, compared to 33 that incurred a deficit in 1938. Previous tabulations in STEEL, Feb. 19, p. 29 and Feb. 26, p. 16, listed 63 companies; the following includes 40:

	Fourth 1939	Fourth 1938	1939	1938
Aetna Ball Bearing Mfg. Co., Chicago†	$ 82,265	$ 34,990	$245,479	$ 69,483
American Can Co., New York	.....	.....	18,284,964	13,645,498
American Stamping Co., Cleveland	.....	.....	80,876	13,991
Atlas Drop Forge Co., Lansing, Mich.	.....	.....	68,638	81,451*
Automatic Washer Co., Newton, Iowa	.....	.....	26,620*	105,175*
Barium Stainless Steel Corp., Canton, O.	.....	.....	154,322*	239,836*
Briggs & Stratton Corp., Milwaukee†	227,398	132,470	943,800	642,113
Buell Die & Machinery Corp., Detroit	.....	.....	109,105	19,011
Campbell, Wyant & Cannon Fdry. Co., Muskegon, Mich.†	293,975	145,872	321,379	112,207*
Central Ohio Steel Products Co., Galion, O.†	51,221	19,691	164,007	114,294
Chain Belt Co., Milwaukee	.....	.....	936,651	436,763
City Auto Stamping Co., Toledo, O.†	110,887	81,448*	415,451	551*
Clearing Machine Corp., Chicago	.....	.....	275,067	313,473
Compo Shoe Machinery Corp., Boston	.....	.....	302,685	250,316
Continental Can Co. Inc., New York	.....	.....	8,635,787	7,101,973
Detroit Gasket & Mfg. Co., Detroit†	127,040	107,755	448,512	122,710
Detroit Gray Iron Foundry Co., Detroit	.....	.....	79,995	67,286
Detroit Steel Products Co., Detroit	.....	.....	616,362	173,288
Easy Washing Machine Co. Ltd., Toronto, Ont.	.....	.....	25,089	17,920
Eaton Mfg. Co., Cleveland†	1,070,310	612,318	2,707,340	23,154
Electric Auto-Lite Co., Toledo, O.†	1,803,105	1,828,579	5,653,839	1,836,150
Electric Controller & Mfg. Co., Cleveland	.....	.....	158,115	85,749
Ex-Cell-O Corp., Detroit†	341,868	135,984	872,382	437,677
Florence Stove Co., Gardner, Mass.†	463,171	407,697	1,233,475	876,833
Globe Steel Tubes Co., Milwaukee	.....	.....	364,998	20,445*
Lima Locomotive Works Inc., Lima, O.	.....	.....	134,326*	687,035*
Mack Trucks Inc., Long Island City, N. Y.†	442,796	174,526	682,987	929,171*
Marion Steam Shovel Co., Marion, O.†	192,032	50,119*	102,966	490,457*
McKay Machine Co., Youngstown, O.†	191*	4,049*	90,427	86,691
Monarch Machine Tool Co., Sidney, O.	.....	.....	529,577	321,398
Murray Ohio Mfg. Co., Cleveland	.....	.....	227,532	104,292
National Bearing Metals Corp., St. Louis	.....	.....	567,758	238,640
Parkersburg Rig & Reel Co., Parkersburg, W. Va.	.....	.....	340,054	435,678
Pressed Metals Co. of America Inc., Marysville, Mich.	.....	.....	331,661	59,679
Remington Arms Co. Inc., Bridgeport, Conn.	.....	.....	1,392,646	685,686
Signode Steel Strapping Co., Chicago†	103,638	79,109	412,377$	138,813
Troxel Mfg. Co., Elyria, O.†	19,119	19,536	63,069	21,736
Universal Products Co. Inc., Dearborn, Mich.	.....	.....	337,292	202,711
Van Norman Machine Tool Co., Springfield, Mass.	.....	.....	256,546	303,297
Worthington Pump & Machinery Corp., Harrison, N. J.†	551,400	221,481*	816,706	29,710

*Loss; †fourth quarter statements based on the nine months' and year's statements; $preliminary report.

Canadian Reports Show Slight Profit Increases

■ Canadian iron and steel consumers' 1939 earnings statements do not reflect large increases in profits over 1938. Many had felt incidence of war would cause sharp increase in net earnings.

Massey-Harris Co., Toronto, Ont., farm machinery manufacturer, reports $705,337 net profit for fiscal year ended Nov. 30, compared to $1,065,638 in previous year.

International Metal Industries Ltd., Toronto, 1939 net income was $762,500, against $487,693 in 1938.

General Steel Wares Ltd., Toronto, 1939 net profit, $626,208; 1938 net income, $321,574.

Dominion Foundries & Steel, Toronto, $1,212,633 net earnings in 1939, $1,179,023 in 1938.

Dominion Bridge Co. Ltd., Hamilton, Ont., $324,965 net income for fiscal year ended Oct. 31, 1939, against $490,672 in year previous.

Burlington Steel Co. Ltd., Hamilton, $110,736 net profit for 1939, $90,684 in 1938.

Canada Foundries & Forgings Ltd., Montreal, Que., $104,986 net 1939 profit; $41,413 in preceding year.

Canadian Car & Foundry Ltd., Montreal, net loss of $504,815 for fiscal year ended Sept. 30, 1939, against net profit of $1,177,314 in previous year.

Canada's Domestic Orders Gain Volume; War Business Heavier

TORONTO, ONT.

■ ALTHOUGH most new orders are directly associated with war, peace-time business is gaining in volume. Awards placed in recent weeks have been widely diversified.

In addition to vast sums placed in war contracts since September, orders totaling more than $1,000,000,000 are pending. New business includes many war products: Airplanes, ships, guns, shells, tanks and motor vehicles.

Orders for $25,000,000 of rolling stock for Canadian National and Canadian Pacific railways, placed last fall, are to be augmented. Purchases by Canadian National railway, totaling $1,500,000, include 150 ballast cars, 25 baggage cars and five mail and express cars.

Toronto transportation commission has ordered from Canadian Car & Foundry Co. Ltd., Montreal, Que., 50 noiseless street cars, to cost $1,150,000. It appears sufficient business will be forthcoming to insure high operating schedules for almost entire year.

Inquiries received by Canadian locomotive and rolling stock builders from other countries, including South America, total several million dollars. Previously much of this business went to Great Britain, but has been diverted to Canada and United States due to war.

Additional shipbuilding contracts placed recently with British Columbia yards totaled $6,500,000. Orders call for six "whale catcher" type anti-submarine craft, by Yarrows Ltd., Esquimalt, B. C., and Victoria Machinery Depot Ltd., Victoria, B. C., at $3,500,000.

Burrard Drydock Co., Vancouver, B. C., will build four "whale catchers," costing $600,000 each. Three will be completed this year, one in 1941. Burrard also has orders for other naval work, bringing contracts on hand to $3,000,000.

Kingston Shipbuilding Co., Kingston, Ont., with orders for three armed trawlers, will start building within two weeks, according to Melville Thompson, superintendent.

Places More War Orders

Canadian war supply board, Ottawa, last week placed orders totaling $10,586,516; $7,273,672 was for airplanes and supplies. The planes, all to be constructed in Canada, will be Harvard advance trainers and de Havilland Tiger Moths. Aircraft contracts distributed: Noorduyn Aviation Ltd., Montreal, $3,001,971; De Havilland Aircraft of Canada Ltd., Toronto, $2,057,845; Irvin Air Chute Ltd., Ottawa, $1,108,005; Fleet Aircraft Ltd., Ft. Erie, Ont., $1,038,675; Ottawa Car & Aircraft Ltd., Ottawa, $9574. Aircraft supplies ordered from British air ministry totaled $34,209.

Report from Montreal states order for airplanes totaling $7,000,000 is pending for National Steel Car Corp., Hamilton, Ont. Order is said to be for 242 Westland-Lysander army co-operative planes, one third for air-training use in Canada, remainder for export to Britain.

Munitions contracts went to: British war office, $307,000; United States Ordnance Engineers Inc., Cleveland, $123,775; British Metal Corp. Ltd., Montreal, $30,635; Consolidated Mining & Smelting Co. of Canada Ltd., Montreal, $30,635; Canadian Industries Ltd., Montreal, $10,368.

Electric equipment orders were placed with Northern Electric Co. Ltd., Montreal, $159,937; Canadian Telephone & Supplies Ltd., Toronto, $160,615; Canadian Westinghouse Co. Ltd., Ottawa, $42,725.

Other contracts awarded: Coulter Copper & Brass Co. Ltd., Toronto, $18,480; Carbide & Carbon Chemicals Corp., New York, $13,000; Anglo-Canadian Wire Rope Co. Ltd., Montreal, $30,113; International Harvester Co. of Canada Ltd., Hamilton, $35,000; T. E. Ryder Machinery Co. Ltd., Montreal, $10,481; Acadia Construction Co., Halifax, N. S., for work at Royal Canadian air force station, Dartmouth, N. S., $650,000.

Contracts placed by war supply board week before last included aircraft supplies to Fleet Aircraft Ltd., Ft. Erie, $2,191,720; British Air Ministry, $336,400 and British Aeroplane Engines Ltd., Montreal, $130,316. Machinery order of $24,058 went to Williams & Wilson Ltd., Montreal. Barracks stores at $204,540 were divided between Dominion Rubber Co. Ltd., Montreal; B. F. Goodrich Co. of Canada, Kitchener, Ont.; Simmons Ltd., Way Sagless Co., and Canadian Comforter Co., Toronto.

Finance Minister Ralston said Canada's expenditure in first year of war will total $375,000,000; this will be increased to $500,000,000 by March 31, 1941. Expenditures to Sept. 1, 1940: Army, $197,000,000; air force, $88,000,000; Canada's share in British Commonwealth air training plan, $50,000,00; navy, $40,000,000. Announcement has just been made in England that Great Britain has earmarked $450,000,000 to be spent in Canada.

Manufactures Steel Shells

■ Europe's war has turned iron and steel industry throughout the British Empire from peace-time tasks to arts of war. Here an English workman maneuvers an embryo shell into position at white heat for further processing. Acme photo

Bar Mill Wage Holds

■ Monthly settlement of bar mill wage base by Western Bar Iron association and Amalgamated Association of Iron, Steel and Tin Workers last week developed a card rate for March on boiling, bar and 12-inch mills at 2.15c; on guide and 10-inch mills, 2.25c. Rates have been unchanged since June, 1939.

Employment Regularization Makes Progress

■ WORTHY of careful study is a 96-page booklet on *"Employment Regularization"* just released by the National Association of Manufacturers. It sets forth results of an intensive survey by the association's employment relations committee as to the extent to which manufacturers have been able to regularize employment and to ascertain the methods which have enabled them to make progress toward this objective. This booklet presents 68 case histories.

Even in the face of depression conditions, the survey reveals, industry generally has managed to keep employment "definitely more stable" than either production or sales. It has done this through measures directed at the two chief factors that cause instability of employment—seasonal fluctuations and cyclical swings.

Many Plans Evolved To Eliminate Seasonal Swings in Buying

A large degree of success has crowned efforts to eliminate violent fluctuations in employment resulting from seasonable production. This has been accomplished through stimulation of off-season business by special discounts and special sales campaigns, future billing to encourage early deliveries, introduction of new models during dull seasons, use of advertising to change consumer buying habits, and promotional campaigns to stimulate new uses for old products.

It also has been accomplished through management policies which provide for careful holding down of normal employment at all times; new employment during peak seasons, by such expedients as "flying squadrons" of workers to help carry peak production loads in different departments on a rotating basis during boom periods; and sharing the work and doing accumulated maintenance and repair work during dull seasons.

Survey results show that much has been accomplished toward regularization of employment in industries which not long ago were regarded as offering scant possibilities for progress in this direction. One steel company, for example, reported that its monthly employment in 1936, when monthly production varied from —20 to +36 per cent, varied from —6 to +21 per cent. In 1938, when production varied from —38 to +36 per cent, its employment varied between —5 and + 8 per cent. A heavy machinery company reported that while its production in 1938 ranged from a low of 26 per cent to a high of 185 per cent, the number of men on its payroll remained constant.

Employers as Well as Employes Profit from Steady Employment

Now in preparation for early publication in STEEL is an article which will shed further light on this subject. It will discuss not only what many companies have done to regularize employment in order to bear the minimum tax burden under the social security laws, but it will cite benefits that can be obtained when employers deal with this problem through co-operative action rather than as one to be solved strictly within individual manufacturing plants. It will reveal, for example, how a group of manufacturers in one Ohio industrial community, by loaning employes to each other, were able to save compensation payments of more than $90,000 in the first year under the Ohio law.

The social security system has confronted industry with difficult problems. Experience to date, however, indicates that smart management can do a great deal to nullify the bad features of this system so far as the tax burden is concerned. Many manufacturers have as a matter of fact been able to convert it from a liability into an asset.

The BUSINESS TREND

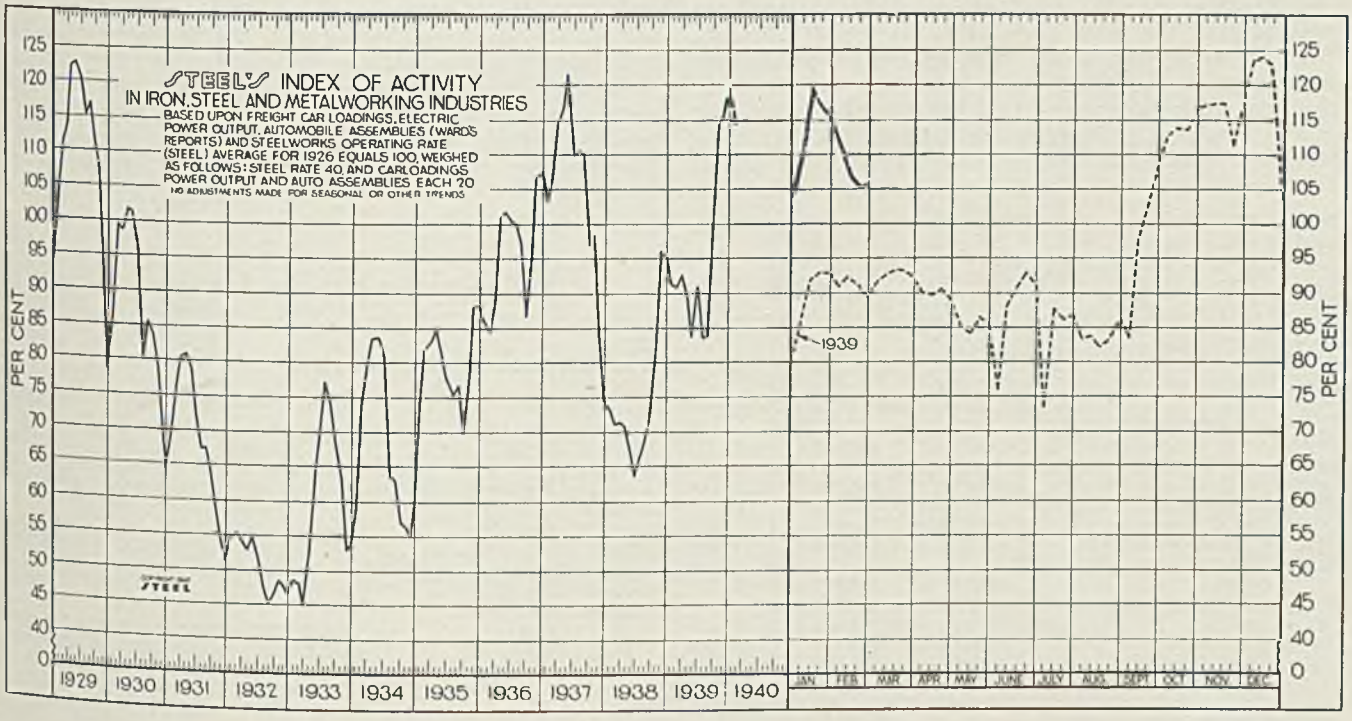
Business Decline Appears To Be Moderating

■ THE downward trend of industrial activity appears to be moderating. This is reflected in the contra-seasonal upturn in automobile production and the gradual slackening in the downward movement of steelmaking operations.

A substantial spread still exists between industrial output and the volume of incoming business. This would indicate that operating schedules are being supported to considerable extent by order backlogs accumulated during the final quarter of last year. Since the backlog of orders are rapidly diminishing it is evident that further adjustment in production schedules will be necessary to bring industrial output to a closer relationship with incoming orders.

Consumption appears to be well sustained in most industrial groups. However, purchasing agents are buying only for fill-in needs, having in most instances decided to let inventories diminish. It is expected that in the event foreign buying develops in considerable volume, the conservative buying policy now generally practiced may be modified.

In this connection it is encouraging to note the marked expansion in the volume of export trade the past two months. January exports were the greatest of any month



STEEL'S index of activity gained 0.3 point to 105.4 in the week ended Feb. 24:

Week Ended	1939	1938
Dec. 23	123.4	94.8
Dec. 30	104.0	79.9
Week Ended	**1940**	**1939**
Jan. 6	110.3	86.5
Jan. 13	119.2	91.9
Jan. 20	117.3	93.0
Jan. 27	115.4	92.9
Feb. 3	111.6	90.7
Feb. 10	107.2	92.1
Feb. 17	105.1	91.1
Feb. 24	105.4	89.3

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

since 1929, and imports exceeded every month in the past 10 years with the single exception of December, 1939. The export balance of trade during January is estimated to have been more than $126,000,000.

Reflecting the encouraging gain in automobile output during the week ended Feb. 24, STEEL's index of activity reversed the downward tendency of the preceding five weeks. The index now stands at 105.4, a gain of 0.3 point above the 105.1 level recorded during the week ended Feb. 17. At this time last year the index stood at 89.3.

Steelmaking operations appear to be leveling off, with some important centers reporting slight gains in recent weeks. However, maintenance of the national steel rate at approximately the 60-65 per cent level depends on the expected improvement in steel buying during coming weeks. Should this fail to develop a further decline in steelmaking is inevitable, for new demand is currently estimated below 50 per cent of capacity.

Automobile output recorded a contra-seasonal increase during the week ended Feb. 24 to 102,670 units. This compares with 95,050 units assembled in the preceding period and 75,660 cars produced in the corresponding week last year. In view of the earlier than seasonal upturn in automobile output, the estimated February production total has been revised upward to 380,000 units. January production numbered 449,314 cars and trucks, while in February, 1939, output totaled 317,517.

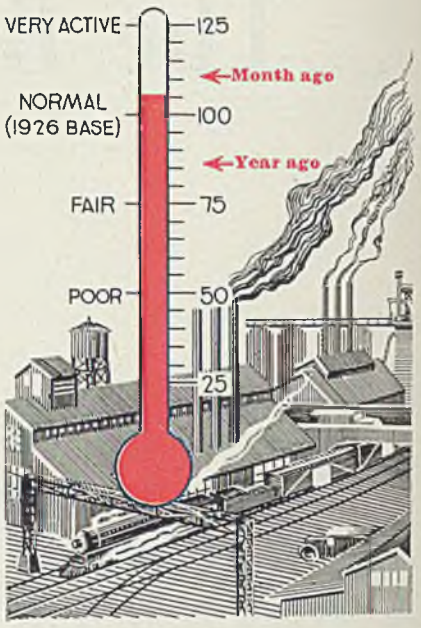
Where Business Stands

Monthly Averages, 1939 = 100

	Jan., 1940	Dec., 1939	Jan., 1939
Steel Ingot Output	125.5	139.5	82.8
Pig Iron Output	134.3	140.7	81.2
Freight Movement	98.1	98.2	87.7
Automobile Production	144.5	150.8	114.8
Building Construction	35.0	119.7	35.1
Wholesale Prices	103.0	102.7	99.6

Industrial Weather

TREND: *Downward*



Revenue freight carloadings declined less than seasonally during the week ended Feb. 24 to 595,032 cars. In the preceding week freight traffic totaled 607,924, while in the corresponding 1939 period loadings numbered 560,609 cars. The holiday interruption played an important part in the decline in freight carloadings during the latest period.

Despite the further recession in electric power output during the week ended Feb. 24, the percentage of gain over the like 1939 week was larger. The decline in power output has been unbroken since mid-January, reflecting seasonal factors as well as the letup in general industrial activity. Electric power consumption for the latest period totaled 2,455,285,000 kilowatts.

The Barometer of Business

Industrial Indicators

	Jan., 1940	Dec., 1939	Jan., 1939
Pig iron output (daily average, tons)	115,983	121,535	70,175
Iron & steel scrap consumption	3,775,000	3,805,000	2,495,000
Foundry equipment new order index	197.9	164.8	122.3
Finished steel shipments.	1,145,592	1,443,969	870,866
Ingot output (daily average, tons)	185,837	206,577	122,571
Dodge building awards in 37 states (sq. ft.)	$103,659,000	$354,098,000	$103,757,000
Automobile output	449,314	469,120	356,950
Coal output, tons	46,155,000	37,283,000	35,750,000
Business failures; number	1,237	1,153	1,567
Business failures: liabilities	$15,279,000	$13,243,000	$20,790,000
Nat'l Ind. Conf. board (25 industries, factory):			
†Av. wkly. hrs. per worker	39.1	39.1	36.6
†Av. weekly earnings	$28.53	$28.49	$26.02
Cement production,† bbls.	9,488,000	11,053,000	8,066,000
Cotton consumption bales	730,000	652,695	598,000
Car loadings (weekly av.)	642,464	643,380	574,616

†December, November, 1939 and December, 1938 respectively.

Financial Indicators

	Jan. 1940	Dec., 1939	Jan., 1939
25 Industrial stocks	$191.78	$194.21	$181.82
25 Rail stocks	$23.03	$23.82	$23.64
40 Bonds	$73.01	$72.28	$71.69
Bank clear'gs (000 omitted)	$23,922,000	$26,596,000	$23,187,000
Commercial paper rate, (N. Y., per cent)	½—⅝	½—⅝	½—⅝
*Com'l. loans (000 omitted)	$8,499,000	$8,758,000	$8,233,000
Federal Reserve ratio (per cent)	87.5	86.7	83.9
Capital flotations:			
New Capital	$90,901,000	$26,971,000	$220,531,000
Refunding	$188,559,000	$235,016,000	$56,809,000
Federal Gross debt (millions of dollars)	$42,110	$41,942	$39,631
Railroad earnings†	$60,953,114	$70,345,795	$49,373,173
Stock sales, New York stock exchange	15,991,105	17,768,713	25,185,780
Bond sales, par value	$145,078,150	$176,437,000	$159,507,350

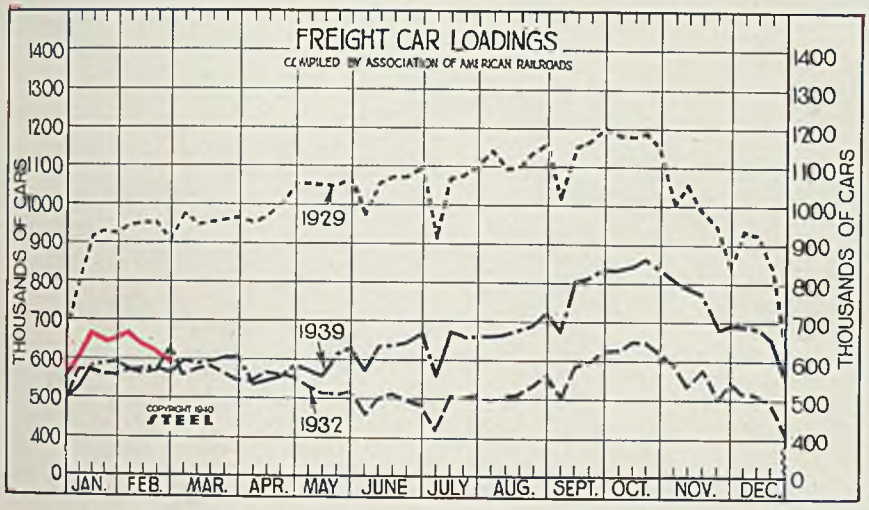
*Leading member banks Federal Reserve System.
†December, November, 1939 and December, 1938, respectively.

Foreign Trade

	Dec., 1939	Nov., 1939	Dec., 1938
Exports	$367,819,000	$292,583,000	$268,943,000
Imports	$246,903,000	$235,500,000	$171,347,000
Gold exports	$11,000	$10,000	$16,000
Gold imports	$451,183,000	$167,991,000	$240,542

Commodity Prices

	Jan., 1940	Dec., 1939	Jan., 1939
STEEL'S composite average of 25 iron and steel prices	$37.09	$37.18	$36.36
U. S. Bureau of Labor index	79.4	79.2	76.8
Wheat, cash (bushel)	$1.19	$1.22	$0.87
Corn, cash (bushel)	$0.73	$0.72	$0.66



Freight Car Loadings

(1000 Cars)

Week ended	1939	1938	1937
Nov. 25	677	562	559
Dec. 2	689	649	623
Dec. 9	687	619	622
Dec. 16	681	606	603
Dec. 23	655	574	460
Dec. 30	550	500	457

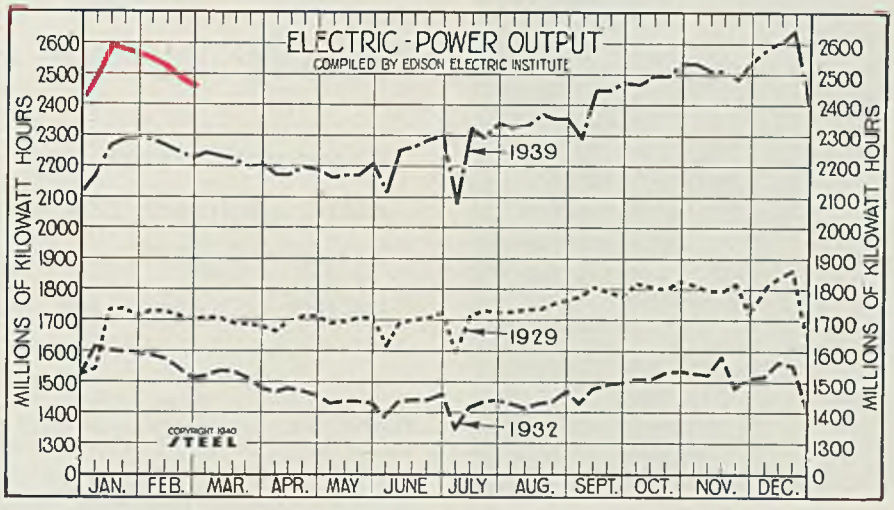
Week ended	1940	1939	1938	1937
Jan. 6	592	531	552	699
Jan. 13	668	587	581	700
Jan. 20	646	590	570	670
Jan. 27	650	594	553	660
Feb. 3	553	577	565	675
Feb. 10	627	580	543	692
Feb. 17	608	580	536	715
Feb. 24	595	561	512	697

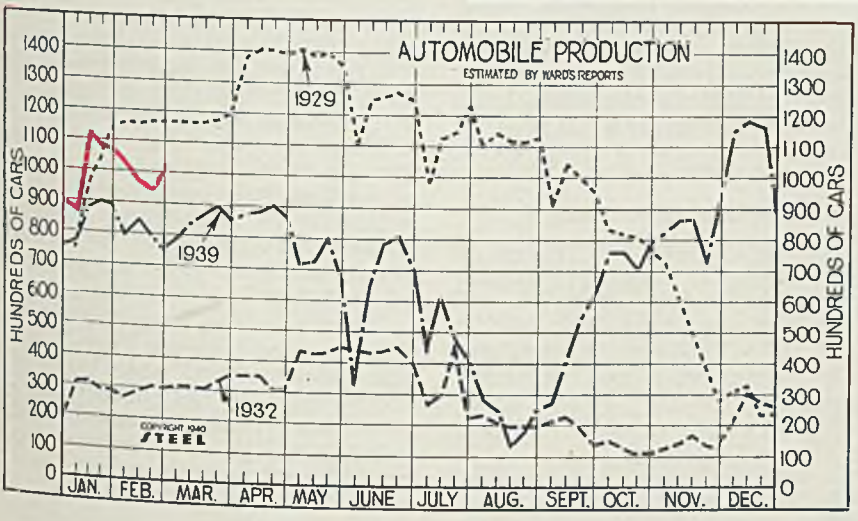
Electric Power Output

(Million KWH)

Week ended	1939	1938	1937
Nov. 25	2,482	2,184	2,065
Dec. 2	2,539	2,286	2,153
Dec. 9	2,586	2,319	2,196
Dec. 16	2,605	2,333	2,202
Dec. 23	2,641	2,363	2,085
Dec. 30	2,404	2,121	1,998

Week ended	1940	1939	1938	1937
Jan. 6	2,473	2,169	2,140	2,244
Jan. 13	2,593	2,270	2,115	2,264
Jan. 20	2,572	2,290	2,109	2,257
Jan. 13	2,566	2,293	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





Auto Production

(1000 Units)

Week ended	1939	1938	1937
Nov. 25	72.5	84.9	59.0
Dec. 2	93.6	97.8	86.2
Dec. 9	115.5	100.7	85.8
Dec. 16	118.4	102.9	82.0
Dec. 23	117.7	92.9	67.2
Dec. 30	89.4	75.2	49.6

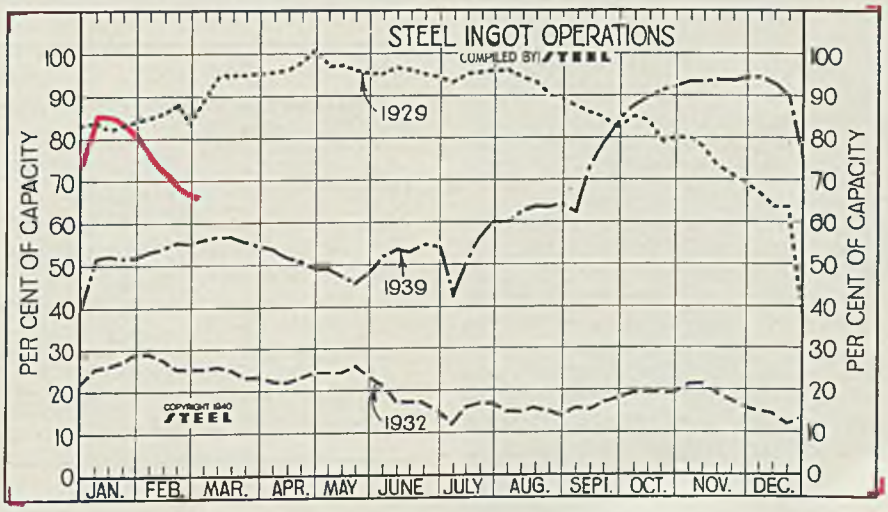
Week ended	1940	1939	1938	1937
Jan. 6	87.5	76.7	54.1	96.8
Jan. 13	111.3	86.9	65.7	91.7
Jan. 20	108.5	90.2	65.4	81.4
Jan. 27	106.4	89.2	59.4	74.1
Feb. 3	101.2	79.4	51.4	72.3
Feb. 10	96.0	84.5	57.8	72.8
Feb. 17	95.1	79.9	59.1	95.7
Feb. 24	102.6	75.7	57.0	111.9

Steel Ingot Operations

(Per Cent)

Week ended	1939	1938	1937
Nov. 25	93.5	62.0	31.5
Dec. 2	94.0	61.0	30.5
Dec. 9	94.0	61.0	27.0
Dec. 16	92.5	58.0	27.0
Dec. 23	90.5	52.0	23.0
Dec. 30	75.5	40.0	21.0

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



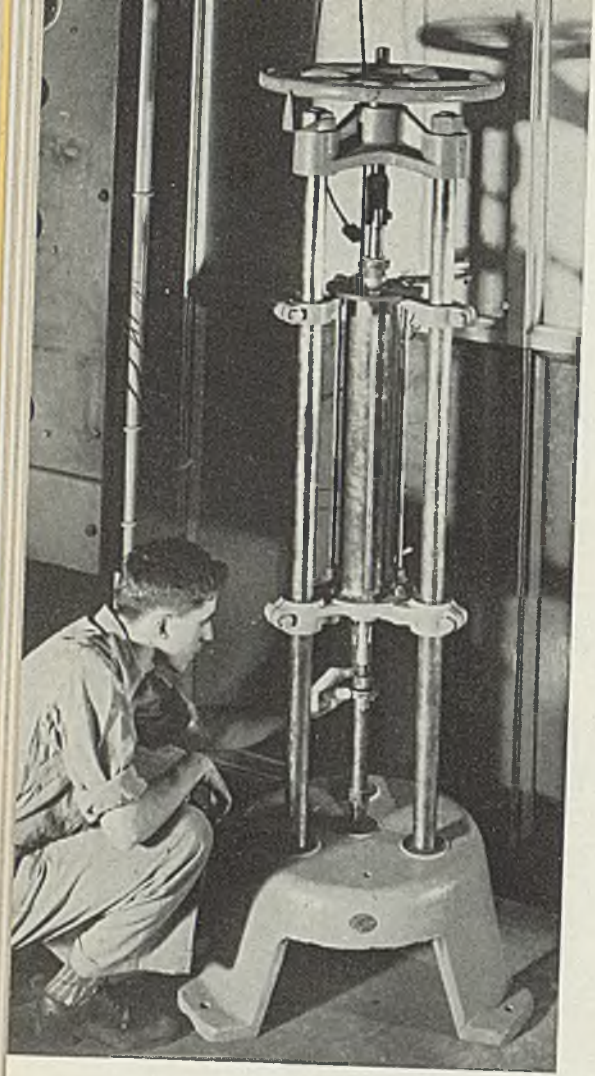


Fig. 1——Relaxation testing unit

Reducing

Creep and relaxation tests reveal a normalizing tre ment improves creep resistance some 3 to 4 tim compared with usual oil-quench-and-draw whe service temperatures over 850 degrees Fahr. are fou

■ ADVANCED working pressures and temperatures in petroleum and chemical process industries require bolting materials with greater capacity to withstand elastic strains at high temperatures. Pressure-holding ability of a bolted joint depends upon force exerted by the bolts and studs in overbalancing the pressure load. Leakage generally occurs when this balance is destroyed.

Pressure which can be kept sealed by a bolted pipe joint thus depends largely upon capacity of the bolts to extend elastically. So long as this elastic extension is maintained, bolts and flange are loaded. When elastic deformation is converted to plastic deformation as takes place in yielding or creep, the loading against pressure is decreased and leakage results. Thus creep is followed quickly by leakage.

Rate of creep depends initially upon load and temperature. It gradually diminishes as bolt load is dissipated. Manner and time in which bolt load diminishes to the leakage point is influenced by amount of elastic "follow-up" permitted by the flange. A rigid flange with practically no elastic deflection permits load on its studs to relax quickly as amount of creep accumulates. However, in the case of a deflecting or "springy" flange, additional creep must occur to equal the elastic displacement of the flange before complete relaxation is attained. Thus, the greater the sum of elastic displacements in a flanged joint, the longer it will be before leakage will develop under creep conditions.

Relaxation of Bolts

Creep or "relaxation" studies of flange bolts are extremely important. Since relaxation occurs under a constantly self-decreasing load or stress, usual type tensile creep test under constant load does not afford information for a strict and direct evaluation of the relaxation character of a bolting steel.

An engineer might suppose that if sufficient creep rate data taken at various constant stresses we available and that if the relati elastic moduli and displacements stud and flanges were known, th by suitable mathematical means could calculate a relaxation sche ule for a joint. Such attempts ha been made, and they do attain rough evaluation of relaxation, b not an accurate one. To hand the problem mathematically, ce tain simplifying assumptions no warranted by actual creep data ar made. These render the results fic titious so far as strict comparison of materials are concerned.

Reliable studies of bolting relax ation require a special kind of ten sile creep test in which rate of creep may be determined under diminishing loads. Decrease in load accompanying an increment of creep movement in the test specimen should be controllable so the

TABLE I

Physical Requirements For Bolting Materials A.S.T.M. Specifications A96-39T

Diameter, inches		Class A	Class B	Class C
2½ and under	Tensile strength, lb. per sq. in.	95,000	105,000	125,000
	Yield point, lb. per sq. in.	70,000	80,000	105,000
	Elongation in 2 in., per cent	20	20	16
	Reduction of area, per cent	50	50	50
Over 2½ to 4, incl.	Tensile strength, lb. per sq. in.	90,000	100,000	115,000
	Yield point, lb. per sq. in.	65,000	75,000	95,000
	Elongation in 2 in., per cent	20	20	16
	Reduction of area, per cent	50	50	45
Over 4 to 7, incl.	Tensile strength, lb. per sq. in.	90,000	100,000	110,000
	Yield point, lb. per sq. in.	65,000	75,000	85,000
	Elongation in 2 in., per cent	20	20	16
	Reduction of area, per cent	50	50	45
Brinell Hardness Number		190-250	210-270	260-320

By J. J. KANTER
Research Metallurgist
Crane Co.
Chicago

CREEP In Alloy Steel Bolting Materials

rigidity conditions of an actual flanged joint may be simulated.

A special machine for conducting such tests, Fig. 1, has been developed in Crane research laboratories. It is constructed so if, for example, a condition is to be studied where the total elastic displacement in flanges and stud is five times the elastic strain or stretch in the stud itself, compression of the machine's columns plus stretch in pull rods may be adjusted to have that ratio to the stretch in the test specimen. Columns and pull rods thus perform the function of the flanges while the tensile specimen functions as the stud or bolt. A furnace is arranged to hold the specimen at a constant desired temperature.

Initial load is adjusted by means of a rising stem and a handwheel. Load is measured by a calibrated elastic "weigh bar" introduced in lower pull-rod well below the furnace. As test progresses, readings on weigh bar reveal amount of residual load acting on the specimen at any time. From these readings, a relaxation curve for stress versus time may be plotted as in Fig. 3, which is for alloy steel bolting tested at 850 degrees Fahr. Such tests may be prolonged for time intervals sufficient to indicate whether service failure due to relaxation for a given bolting condition may be imminent.

Typical Relaxation Tests

In Fig. 3, two relaxation curves are shown for steel "A" distinguished as to "first loading" and "second loading". Relaxation upon "first loading" is seen to progress more rapidly than for "second loading." This indicates that a specific change in relaxation resistance occurs as bolts stretch. It is consistent with the fact that initial portion or creep curve shows a rapid rate of creep as compared to the more or less constant rate which later obtains. In bolting, this initial creep is undoubtedly responsible for a large portion of relaxation from initial "pulling up" of a new bolt.

Sources of relaxation other than in bolts and studs also contribute to joint leakage. A small amount of relaxation occurs in threads engaging nuts but is not generally looked upon as a consequential factor. In some equipment, flanges or lugs may relax more of the load than do the studs. Gaskets also contribute heavily to relaxation in some instances.

Relaxation Studies Made

Extensive studies of relaxation upon actual bolted joints at elevated temperature have been made to determine the relative importance of these factors. Of interest to the present discussion are tests made upon a welded steel flanged Tee, Fig. 2, maintained under internal pressure and temperature. Relaxation measurements of flange bolts were taken carefully.

Direct comparison on the relative merits of various bolting materials was made by using a set of different type in each of the three flanges in each run. Tests were made up to 1200 degrees Fahr. at an internal pressure of 1500 pounds per square inch. Initial stud stress was 30,000 pounds per square inch. Tests showed leakage occurred in most instances when bolt stress had relaxed to about 15,000 pounds per square inch. At this stress, total bolt tension nearly balanced hydraulic load on gasket area. Tests of this type indicate bolting relaxation may be determining factor in maintaining tight joints when service temperatures are exceedingly high.

Extensive relaxation and creep studies have made possible greatly improved properties of alloy steel bolting materials for high temperature service. Systematic studies of heat treatment of bolting steels show some conventional ideas in vogue but a few years ago are quite misleading if optimum relaxation and creep resistance for service at temperatures above 850 degrees Fahr. is sought.

When alloy steel was first used in bolts, oil-quenching-and-tempering treatments known to produce high strength and elastic limit together with great toughness led to the unquestioned acceptance of such a treatment for high-grade alloy-steel bolts. Information avail-

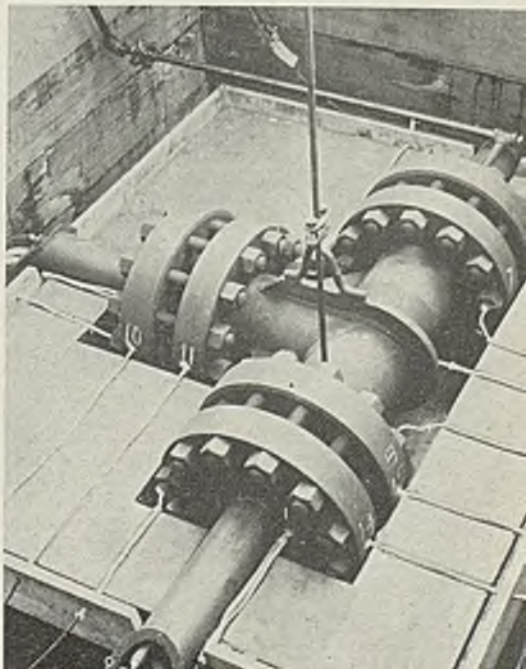


Fig. 2—Steel flanged Tee fitted for studying relaxation of bolts under high pressure and temperature conditions

TABLE II
Chemical Requirements for Alloy Steel Bolting Materials
A.S.T.M. Specifications A193-39T

Class	Ferritic Steels										Auste
Identification Symbol	B4	B5	B6	B7	B7a	B11	B12	B13	B14	B15	B
Grade	Nickel-Chromium-Molybdenum	4 to 6 per cent Chromium	13 per cent Chromium	Chromium-Molybdenum	Chromium-High-Molybdenum	Tungsten-Chromium-Vanadium	Nickel-Chromium	Tungsten-Molybdenum-Chromium	Chromium-Molybdenum-Vanadium	Silicon Chromium-Molybdenum	18 Chr 8 Nic
Carbon, per cent	0.35 to 0.45	0.35 max.	0.12 max.	0.35 to 0.45	0.35 to 0.45	0.40 to 0.50	0.35 to 0.45	0.30 to 0.40	0.35 to 0.50	0.40 to 0.50	0.07 r
Manganese, per cent	0.50 to 0.80	0.30 to 0.50	0.60 max.	0.60 to 0.90	0.60 to 0.90	0.20 to 0.40	0.60 to 0.90	0.60 to 0.90	0.40 to 0.70	0.40 to 0.70	0.20 to
Phosphorus, max., per cent	0.04	0.03	0.140[a]	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.14
Sulfur, max., per cent	0.05	0.03	0.500[a]	0.05	0.05	0.04	0.05	0.04	0.05	0.03	0.50
Silicon, per cent	....	0.50 max.	0.50 max.	0.15 to 0.25	0.15 to 0.25	0.15 to 0.30	....	0.15 to 0.30	0.15 to 0.30	0.50 to 0.80	0.75 m
Nickel, per cent	1.50 to 2.00	....	....	....	....	....	1.00 to 1.50	....	....	....	7.0 to
Chromium, per cent	0.50 to 0.80	4.00 to 6.00	11.5 to 13.0	0.80 to 1.10	0.80 to 1.10	1.00 to 1.50	0.45 to 0.75	0.45 to 0.75	0.80 to 1.10	1.00 to 1.50	17.0 to
Molybdenum, per cent	0.30 to 0.40	0.45 to 0.65[b]	....	0.15 to 0.25	0.45 to 0.65	....	....	0.40 to 0.65	0.30 to 0.40	0.40 to 0.60	....
Tungsten, per cent	....	0.75 to 1.25[b]	....	....	....	1.70 to 2.30	....	0.85 to 1.35	....	....	....
Vanadium, per cent	....	....	....	....	....	0.20 to 0.30	....	....	0.20 to 0.30	....	....

[a] Where phosphorus exceeds 0.045 per cent, sulfur shall not exceed 0.050 per cent. Where sulfur exceeds 0.050 per cent, phosphorus shall not exceed 0.045 per cent. These limits of phosphorus and sulfur shall apply unless otherwise specified.

[b] Either molybdenum or tungsten shall be used as specified.

TABLE III
Tensile Requirements for Alloy-Steel Bolting, A.S.T.M. Specifications A193-39T

NOTE:—Physical properties given in boldface type represent the standard heat treatment to be given mate... as stocked for use under the specification as agreed by manufacturers.

Grade	Diameter, in.	Minimum Draw Temperature, deg. Fahr.	Tensile Strength, min., psi.	Yield Point, min., psi.	Elongation in 2 in., min., per cent	Reduction of Area, min., per cent
FERRITIC STEELS						
B4 Nickel-Chromium-Molybdenum	2½ and under	1000	160 000	135 000	14	45
		1100	140 000	120 000	15	50
		1200	**125 000**	**105 000**	16	50
	Over 2½ to 4, incl.	1000	155 000	130 000	14	45
		1100	135 000	115 000	15	50
		1200	120 000	100 000	16	50
B5 4 to 6 per cent Chromium	2½ and under	1000	120 000	95 000	15	45
		1100	110 000	90 000	16	50
		1200	100 000	85 000	17	55
	Over 2½ to 4, incl.	1000	105 000	85 000	15	45
		1100	100 000	80 000	16	50
		1200	95 000	75 000	17	55
B6 13 per cent Chromium	2½ and under	1000	150 000	125 000	13	45
		1100	120 000	100 000	15	50
		1200	105 000	85 000	17	55
	Over 2½ to 4, incl.	1000	140 000	120 000	13	45
		1100	115 000	95 000	15	50
		1200	100 000	80 000	17	55
B7 Chromium-Molybdenum	2½ and under	1000	135 000	115 000	15	50
		1100	**125 000**	**105 000**	**16**	**50**
		1200	105 000	90 000	17	55
	Over 2½ to 4, incl.	1000	125 000	105 000	15	50
		1100	115 000	95 000	16	55
		1200	105 000	85 000	17	55
B7a Chromium-High-Molybdenum	2½ and under	1000	135 000	115 000	15	50
		1100	**125 000**	**105 000**	**16**	**50**
		1200	105 000	90 000	17	55
	Over 2½ to 4, incl.	1000	125 000	105 000	15	50
		1100	115 000	95 000	16	55
		1200	105 000	85 000	17	55
B11 Tungsten-Chromium-Vanadium	2½ and under	1000	210 000	190 000	11	35
		1100	205 000	180 000	12	35
		1200	185 000	165 000	13	40
	Over 2½ to 4, incl.	1000	205 000	185 000	10	35
		1100	200 000	175 000	11	35
		1200	180 000	160 000	12	40
B12 Nickel-Chromium	2½ and under	**1000**	**125 000**	**105 000**	**16**	**50**
		1100	115 000	95 000	17	50
		1200	105 000	85 000	18	55
	Over 2½ to 4, incl.	1000	120 000	100 000	16	50
		1100	110 000	90 000	17	50
		1200	100 000	80 000	18	55
B13 Tungsten-Molybdenum-Chromium	2½ and under	1000	155 000	130 000	14	45
		1100	**135 000**	**115 000**	**15**	**50**
		1200	120 000	100 000	16	55
	Over 2½ to 4, incl.	1000	145 000	120 000	14	45
		1100	125 000	105 000	15	50
		1200	115 000	95 000	16	55
B14[a] Chromium-Molybdenum-Vanadium	2½ and under	1000	145 000	120 000	14	45
		1100	135 000	115 000	15	45
		1200	**125 000**	**105 000**	**16**	**50**
	Over 2½ to 4, incl.	1000	.....	.....	....	...
		1100	.....	.....	....	...
		1200	.....	.....	....	...
B15 Silicon-Chromium-Molybdenum	2½ and under	1000	160 000	135 000	14	45
		1100	140 000	120 000	15	50
		1200	125 000	105 000	16	50
	Over 2½ to 4, incl.	1000	155 000	130 000	14	45
		1100	135 000	115 000	15	45
		1200	120 000	100 000	16	50
AUSTENITIC STEEL						
B8 18 Chromium 8 Nickel	All diameters	2000 F., water quench	75 000	30 000	35	50

[a] Special normalizing treatment required.

able about elevated-temperatu strength properties of bolting, the time that carbon steel was d carded in favor of alloy steel f high-pressure bolting, was bas upon short-time elevated-tempe ature tests. In general, these ind cated room-temperature strengt and were a fairly good criterion o good high-temperature strengt (short time).

The first A.S.T.M. specificatio for "Alloy-Steel Bolting for Hig Temperature Service A96," adopte in 1926 was drafted primarily upo a basis of tensile testing and brin ell hardness requirements with th idea that the required physica properties be obtained through quenching and tempering treatment No chemical requirements beyond phosphorus and sulphur content limits are mentioned in the specifi cation. Under this specification, it was the vogue for a number of years to use SAE 3140 nickel-chrom ium steel bolts, oil quenched and drawn, as this material could be made to meet any of the physical requirements under Classes A, B or C of A.S.T.M. specifications A96. (See Table I)

Chromium-Molybdenum Steel

As service temperatures ad vanced beyond 750 degrees Fahr., it became apparent that a steel with better high-temperature characteristics was needed. This led to use of SAE 4140 chromium-molybdenum steel, found to have greater high-temperature stability. Even before much creep study had been made of SAE 4140, it was believed more stable for high-temperature use because of the fact that it stands a higher draw tem perature in being brought to the Class C physical properties than does SAE 3140—approximately 1200 degrees Fahr. as against about 1000 degrees Fahr. for SAE 3140. Chrom ium-molybdenum steel, oil quenched and drawn for bolting, has proved through much experience that it may be used without failure by re laxation or creep at service tem peratures up to 850 degrees Fahr.

and is the material standardized upon for Crane Triplex bolts and studs.

Specifications A96 served the purposes for the acceptance of alloy bolting satisfactorily until the service temperature for bolting steel advanced beyond 750 degrees Fahr., whereupon it was soon learned through difficulties in maintaining tight joints that a more critical specification was needed. Sub-committee XXII of A1 committee in A.S.T.M., which had evolved A96 some years before, set out to make a better specification to cover service temperatures from 750 to 1100 degrees Fahr.

Some better criterion of high-temperature permanence than room temperature physical properties was sought. To require high-temperature creep and relaxation tests for acceptance is obviously impractical due to expense and loss of time involved. After several years' study, the only kind of a specification found tenable was based on recognition of a list of nominal alloy steels found useful for applications in this temperature range.

Specifications A193

Eleven compositions or grades, Table II, together with their individual tensile requirements were issued in 1936 as "A. S. T. M. Tentative Specifications A193." They still remain tentative in 1939 standards because of the controversial aspect attending the question of high-temperature acceptance tests and correct heat treatment and physical properties for some of the steels included.

Tensile requirements of steels included in A. S. T. M. specifications A193-39T are based largely upon properties obtainable by liquid quench followed by drawing at a temperature at least 100 degrees Fahr. higher than the proposed operating temperature. This latter provision is perhaps the only genuine high-temperature acceptance requirement in the specifications because it does preclude use of some of the grades at the 1100-degree-Fahr. service temperature. There is no real basis demonstrated in these specifications for accepting any of these grades of steel as relaxation and creep resistant. It yet remains to develop a short-time acceptance test for bolting materials which can be incorporated in A193 to make it "air-tight" in defining high temperature materials.

Templex Steel

In A.S.T.M. specifications A193-39T there is one alloy bolting steel composition included, designated Grade B14, for which the physical properties shown in the table of

Fig. 3—Typical relaxation test curves. Steel "A" relaxes less upon second loading due to work hardening. Steel "B" has less primary creep than steel "A," accounting for its smaller initial relaxation. Secondary rates of relaxation differ showing steel "B" to have greater creep resistance than steel "A"

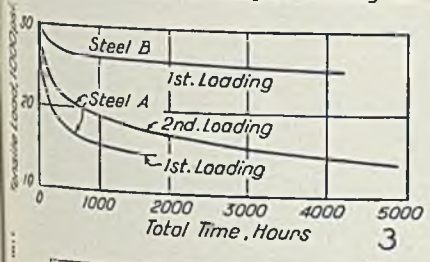


Fig. 4—Effect of drawing temperature and type of quench on the physical characteristics of Templex bolting steel

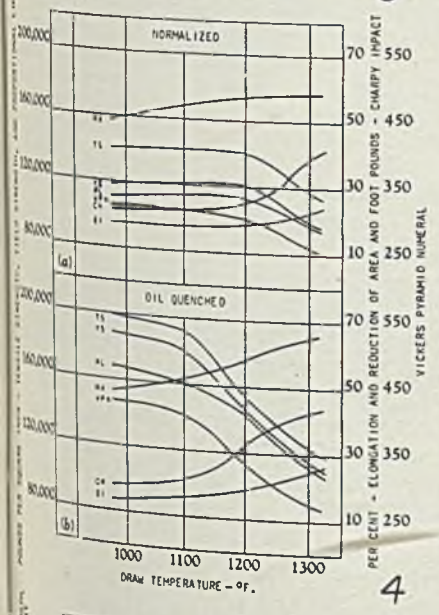


Fig. 5—Effect of size of specimen and type of quench on the physical characteristics of Templex bolting steel

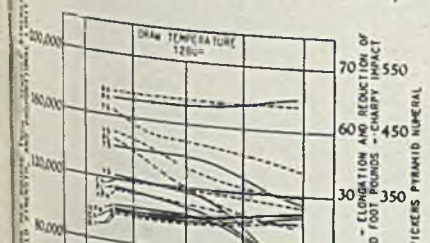


Fig. 6—Effect of heat treatment on the creep characteristics of Crane Templex (B 14) bolting steel

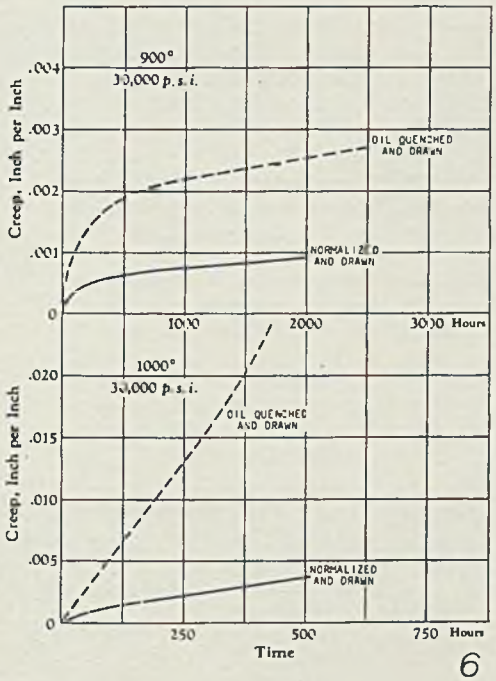


Fig. 9—Relaxation curves comparing Crane Templex (B 14) with Crane Triplex (B 7, SAE 4140) bolting steel

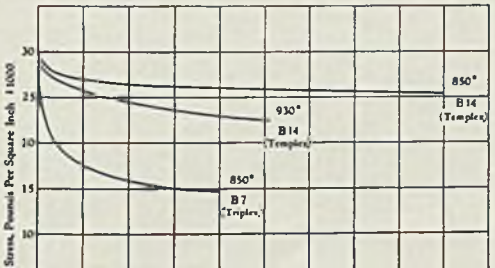


Fig. 7—Crane Templex bolting steel (Grade B 14), average high-temperature tension tests

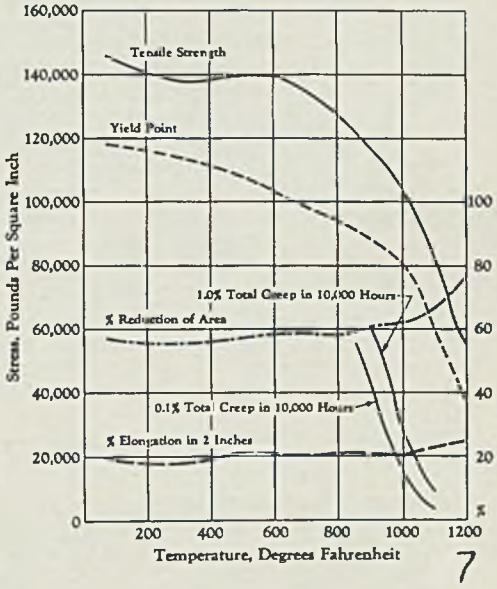


Fig. 8—Triplex bolting steel (Grade B 7, SAE 4140) average high-temperature tension tests

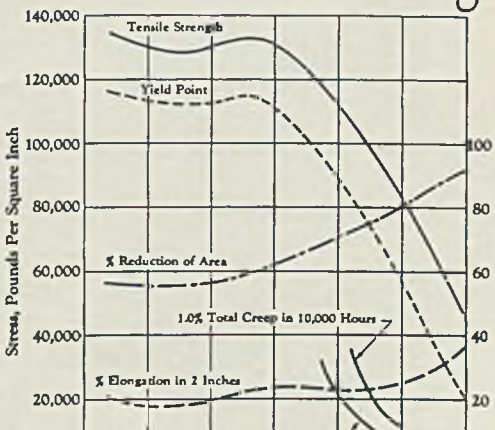


TABLE IV

		Tensile Strength p.s.i.	Yield Point p.s.i.	—CREEP STRESS— 1% per 10,000 hrs.	0.1% per 10,000 hrs.
@900 deg. F.	B7 Oil-quenched ...	98,000	73,000	20,500	10,000
	B14 Normalized	116,000	88,000	59,000	40,000
@1000 deg. F.	B7 Oil-quenched ...	82,000	57,000	11,000	5,000
	B14 Normalized	103,000	80,000	28,000	15,000

tensile requirements, Table III, have been based on a special normalizing treatment. This chromium-molybdenum-vanadium steel is unique among those recognized in the specification in that it is the only one which specifically calls for *normalizing* (sometimes called air quenching) treatment followed by a draw. This superior high-temperature bolting steel was developed as a result of creep and relaxation studies at Crane research laboratories and was introduced for high-temperature applications by Crane Co. under its exclusive trade name Templex with patents pending. A normalized alloy bolting steel for high-temperature application perhaps is a radical departure but this treatment has been found to produce a most advantageous combination of elastic and relaxation-resisting properties in this steel.

In selecting steel for service applications in excess of 850 degrees Fahr., creep and relaxation properties of numerous alloys were studied in both the oil-quenched and normalized conditions. Surprisingly, a number of the steels studied were found to have vastly superior creep resistance in the *normalized* condition. In fact, the superiority of normalized structures over liquid-quenched structures so far as creep resistance is concerned seems to make oil quenching quite a questionable practice when the aim is to achieve a high order of creep and relaxation resistance for service temperatures above 850 degrees Fahr.

Picking a proper alloy steel for bolts and studs in the normalized-and-drawn condition resolved itself into finding one which would combine such a structure with adequate tensile strength, elasticity, hardness and ductility to meet the Class C requirements of A.S.T.M. specifications A96. Not only must a bolt or stud have adequate relaxation resistance while hot, but it must withstand the abuses of being pulled up cold when installed or retightened. Whereas normalizing, instead of oil quenching, improved creep resistance of many steels, few combined normalized structure with good enough tensile properties. Grade B7 or SAE 4140 is perhaps improved in creep resistance if normalized, but does not meet "Class C" physical properties in this condition.

Values Compared

Chromium-molybdenum-vanadium alloy B14 proved unusual in that it comes through a normalized-and-draw treatment with excellent tensile properties. Figs. 4a and 4b show comparisons of tensile end hardness values obtained at various drawing temperatures for normalized and oil-quenched conditions respectively. In curves for normalized condition, physical properties are little affected by drawing up to a temperature of 1200 degrees Fahr., the highest required by A.S.T.M. specifications A193-39T, not exceeded.

Oil quenched, the steel is excessively hard initially and softens on drawing until at about 1200 degrees Fahr. approximately equivalent properties to the normalized steel are established. Since a 1200-degree Fahr. drawing treatment fulfills all service temperature requirements of A193-39T, it becomes of interest to compare the physical properties obtained for different diameter sections at this draw temperature.

Studies have been conducted for various diameters up to 3.5 inches in both oil-quenched and normalized conditions, drawn at 1000, 1100, 1200 and 1300 degrees Fahr. Since 1200 degrees Fahr. is the draw temperature employed for Templex bolting as regularly supplied, the 1200 degree comparison only is shown in Fig. 5.

Having only the information in Fig. 5 and no data at high temperatures, one might conclude that oil-quenched B14 (Templex) was preferable, but as emphasized above, creep studies lead to a quite different conclusion. See comparison of creep curves, Fig. 6. Both creep and short-time tensile stress values at elevated temperature for normalized, 1200-degree Fahr. drawn B14 (Templex) steel are given in Fig. 7. As oil-quenched and drawn, B14 steel has high-temperature short-time tensile properties quite similar to those for B7 (SAE 4140, Triplex) steel shown in Fig. 8. Table IV compares these charts at 900 and 1000 degrees Fahr. It will be seen from these values that the normalized B14 steel has a threefold to fourfold advantage in *creep stress* over the oil-quenched B7 steel.

A comparison of relaxation curves,

(*Please turn to Page 72*)

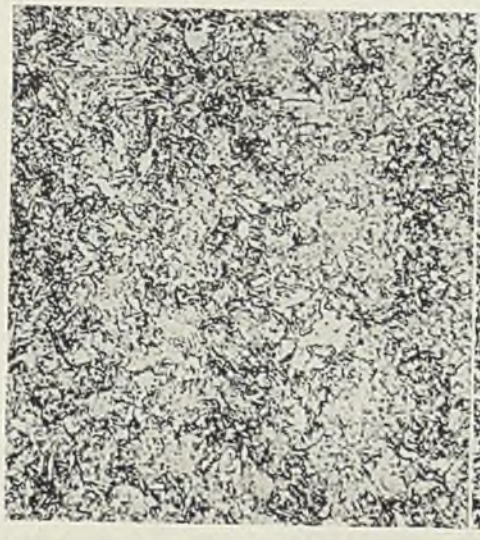


Fig. 10—Microstructure of Grade B 14 steel as oil quenched and drawn. Magnification 500 diameters, at left

Fig. 11—Microstructure of Crane Templex (B 14) as normalized and drawn. Magnification 500 diameters, center

Fig. 12—Microstructure of Grade B 14 steel as oil quenched and drawn, same as Fig. 10, except at 2000-diameter magnification, at right

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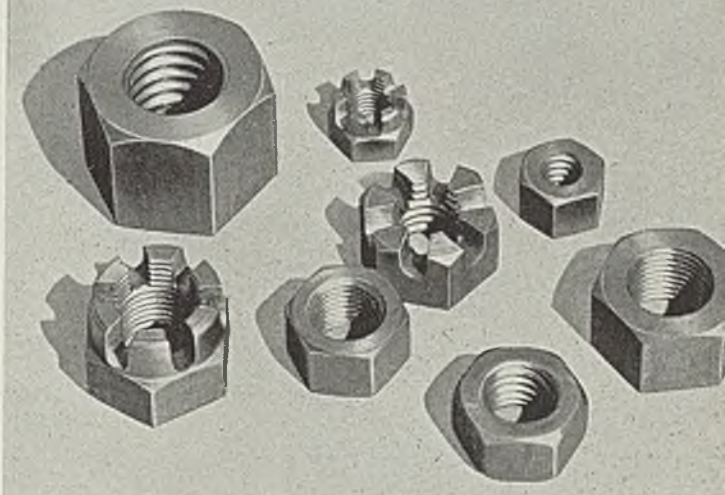

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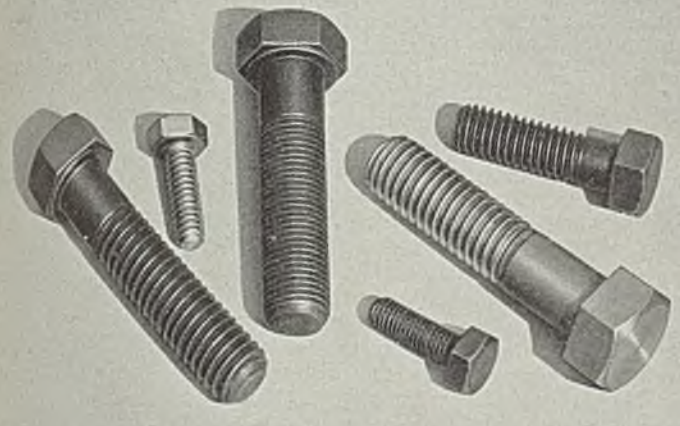

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■ KNOWN as Lindsay structure, a new structural assembly method makes more efficient use of steel by employing the sheet steel covering as a strain-bearing structural member. This increases strength of the resulting structure without adding weight. In many instances the structures are lighter than conventional assemblies as well as being more rigid and better able to withstand wracking, twisting loads.

The new structure employs neither rivets nor welds, nor are the sheets perforated for fastening. Instead the method of attachment is an integral part of framing and sheets, a lip formed on the sheet edges locking into frame members.

Developed by Harvey B. Lindsay, president, Dry Zero Corp., Merchandise Mart, Chicago, it is an outgrowth of efforts to perfect a method of constructing refrigerator cars so they could be repaired from the outside without use of cutting and welding torches. As suppliers of insulation for refrigerator cars, this corporation is interested in the new assembly method as it makes possible more efficient use of insulation material.

Most obvious application of the strain-bearing-panel assembly method detailed here is on mobile structures such as motor truck bodies, railroad cars, marine superstructures and similar applications where light weight and rigidity are of primary importance. As a low-cost rigid simple structure, it can be applied with benefit to industrial buildings, refrigerator lockers, farm buildings, portable shacks, garages and other diverse structures as well. It is believed applicable to almost any structure using metal sheets and framing.

Method Facilitates Assembly

The method has three basic advantages: It eliminates cross braces, gussets and struts by placing the sheets under tension between the framing members and so furnishing all cross-bracing needed. It creates a union between sheets and framing that approximates the full strength of the sheet. It provides an easy method of assembling and disassembling from the outside, equivalent to the simplest bolted construction, as framing members, panel sheets and fittings are put together easily.

Fig. 1 shows four basic elements of a Lindsay structure: A, flanged frame; B, tensioner which fits inside the channel of the flanged frame; C and C, panel sheets with specially shaped edges which fit into the flanged frame; D, patented socket lock screw which draws tensioner into channel of flanged frame.

In Fig. 2 the four elements have been assembled in place, but the tensioner screw has not yet been tightened to place the panels under tension, done by drawing the tensioner down into the flanged frame. Prior to this, edges of panel sheets have been placed in position and flanged frame A and the tensioner B applied over the edges. When socket lock screw is drawn up tight, the frame, which of course extends on all four sides of the sheet, is in complete mechanical union with the sheet and passes on to it all wracking stresses. Sheets are taut. Specially shaped portion along edges of sheet C as well as depth of channel A and tensioner B are carefully calculated to produce the exact stress desired on the panel sheet when tensioner B is drawn completely against bottom of channel A.

In Fig. 3, framing is assembled for a low structure such as a container or similar item where height is not so great as to necessitate use of two or more sheets vertically. For buildings, truck bodies, etc., sheets usually are not more than 4 x 8 feet, although larger ones can be used if desired. Fig. 3 also shows T and X fittings for joining frame sections together.

Frame in Fig. 4 is nearing completion with circled portion show-

Fig. 1—Sheets and framework units employed in Lindsay structures

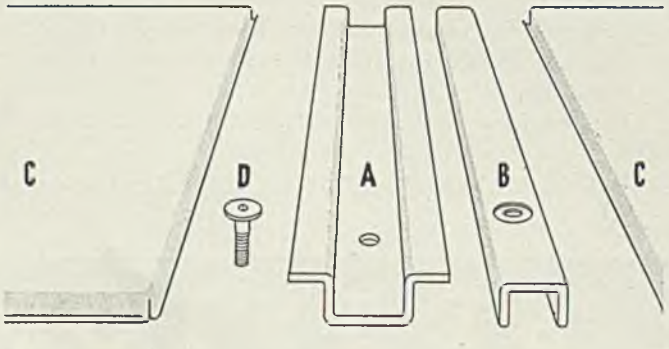
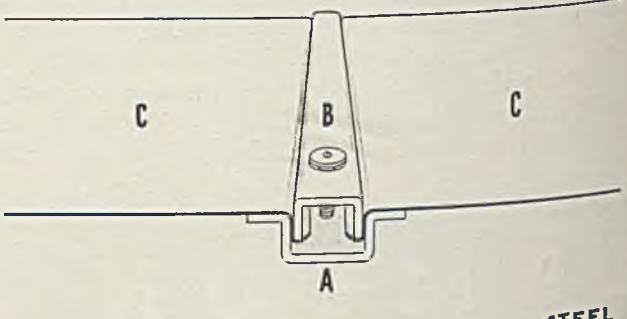


Fig. 2—Here the units in Fig. 1 are assembled ready for tensing sheets



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

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

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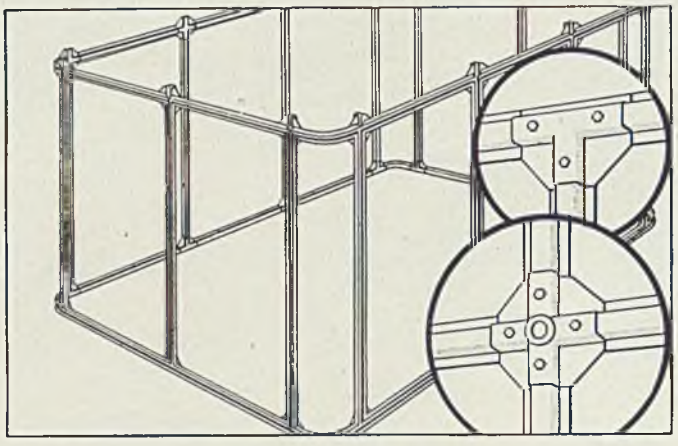

Fig. 3—Cabinet or small structures employ framework of this nature. Larger structures necessitate intermediate horizontal members and additional sheets

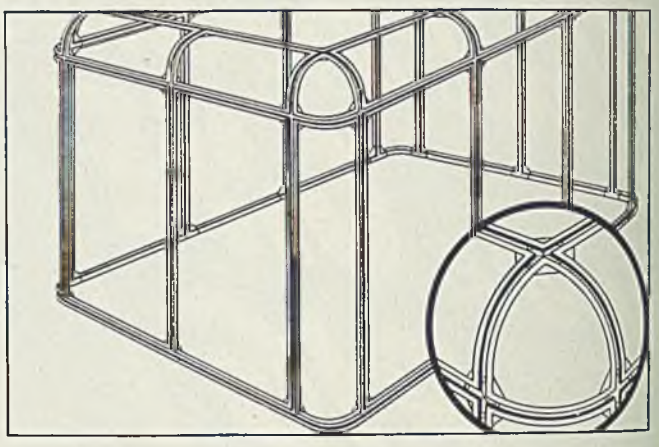

Fig. 4—Showing cove corners and close-up of fittings used in framework

ing manner in which fittings for curved corners are applied.

Dry Zero Corp. plans to manufacture no complete structures themselves but will furnish the necessary materials for application by the purchaser. This will include framing members, panel sheets and fittings. Structural shapes are supplied in mild steel, plain or electro-galvanized. Sheets are either mild steel, plain or galvanized and annealed.

Flanged frame tensioners are supplied cut to exact specified lengths with ends mortised. Holes are accurately spaced, drilled and tapped for fastening screws. Standard frames and tensioners are 7/64-inch cold-roll-formed shapes with 1/64-inch pitch overall accuracy.

Panels are supplied with preformed edges accurately dimensioned for assembly. Standard sheets are 26-gage with standard widths measured from frame centers of 23, 25, 27, 29, 35 and 41 inches. Lengths are available up to 11 feet 11 inches.

Flanged frames, tensioners and sheets are also provided for rounded corners using a standard cove radius of 8½ inches. System likewise is suitable for pitched-roof structures with either square or cove corners. T's and X's and other special pieces for assembly are die formed.

Adapted for Any Finish

Steel doors and windows are easily incorporated where desired. Similarly, the method lends itself to double-wall construction for insulated structures and sound-deadening partitions as there need be no connection between inner and outer shells except at foundation, particularly advantageous for insulated truck bodies.

Structure is easily adapted to receive any special finish on either side from paint to paneling. Screw sockets are plugged during painting to prevent filling and to maintain ease of disassembly.

Fig. 5 shows how the assembly system has been utilized in making a truck body. Fig. 6 reveals the ease with which partitions in factories, stores and offices can be erected. In Fig. 7, the system has been applied to canopies over a loading dock, also applicable to filling stations, etc., at low cost.

Containers of a wide variety of sizes and shapes are easily constructed for ice cream cabinets, storage cases and similar items. Cabinets can be manufactured with practically no dimensional limits

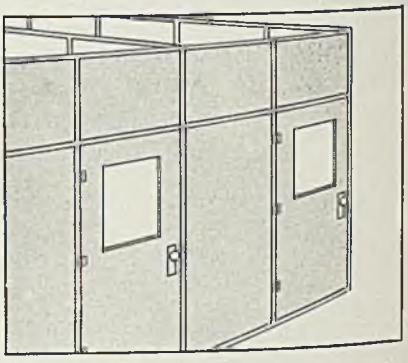

Fig. 6—Lindsay structural system is easily adapted to erection of partitions

from only a few basic sizes of shapes and sheets. See Fig. 8.

Fig. 9 shows application of Lindsay structure to small buildings with pitched roofs. Similar structures with rounded corners and flat roofs are easily erected, also.

Outstanding advantage of this assembly method appears to be that the pretensed sheets instantly resist the slightest movement of the framing, thus distributing load over entire frame area and so producing a much more rigid structure. Ordinary structures necessitate cross-bracing or gussetted framing to withstand initial wracking stresses. When framing begins to "work," these stresses are concentrated at rivet, bolt or screw holes or weld points. Such load concentration is avoided in the Lindsay structure as sheets are joined tightly to the framing over entire circumference.

Cost of a structure often can be

(*Please turn to Page 83*)

Fig. 5—Highway truck body made by system described here

. . . . AND HERE IS YOUR Rx FOR SPRING FEVER

If *your* designing fancy has suddenly turned toward thoughts of spring (mechanical) for the improvement of your product—then *what you don't know CAN hurt!* . . . In addition to the truthfulness of this phrase, it's the title of a little booklet that LEE has just had printed for your immediate reading.

Also, our revised *specification form* just off the press, will be extremely helpful in designing and specifying springs. Not only does it show you how to specify the physical dimensions of springs—but it also lists the vital factors which enter into the calculations if the physical dimensions are to be successfully fixed . . . It's a co-partner to the above booklet and they're *both* yours for the prompt return of the coupon below.

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Gentlemen:

Please send me a copy of your new spring specification form togeth with the booklet: *"What You Don't Know CAN Hurt!"*.

NAME .....

COMPANY .....

Hack Saw Blades

Ingenious methods in tooling and heat treating yield better hack saw blades at lower costs, using new continuous hardening furnace. Flame-hardening setup hardens teeth, leaves blade backs flexible

By RALPH D. HAWKINS*

HEAT TREATING work at plant of Forsberg Mfg. Co., Bridgeport, Conn. is a mass production proposition since approximately 150,000 hack saw blades and 30,000 to 40,000 screw driver blades as well as hack saw frames and other hardware items are made *each week* at this plant. With such a volume, a fraction of a penny saved per piece, a few per cent decrease in rejects or the elimination of scale in a single hardening operation often makes the difference between profitable and profitless manufacture.

Possibly the two most important items in making hack saw blades are the cutting and setting of the teeth and the heat treating of the finished blade. At this plant, raw sheet steel stock, 2 x 6 feet, first is blanked and then fed to a trimming press where the ends are rounded, the holes punched and the trade mark stamped all in one blow. Next, the blades are clamped to the table of the tooth-cutting machine, 2200 blades at a time.

Here in a newly developed and patented machine, the blades now clamped on edge have the teeth machined as precisely to form as the teeth on the finest of gears. The cutter automatically indexes horizontally along the stationary head of the machine, one tooth at a time. The bed and its charge of blanks ride back into position after each cutting stroke.

Cutter blocks are of high-speed tool steel 2 inches thick and from 3 to 5 inches in length. Cutting face carries two rows of teeth, one directly behind the other, each tooth in the first row making a roughing bite for the finishing form directly behind it. The cutting teeth on each tool block numbering from 4 to 32 per block are graduated so the full gullet depth is developed in a number of passes. This method permits undercut teeth and is important because such teeth can actually cut under and lift out steel being sawed.

Another special machine designed and built at the Forsberg plant sets teeth after cutting and does away with previous variations in tooth angle caused by shifts in thickness of the stock. The new machine sets teeth accurately without any variation, regardless of sheet thickness. Blades are fed and set between guides automatically at a rate of 250 feet per minute.

Use of Batch Operation Diminishing

In the heat treating department, low cost with high standards of accuracy and uniformity are maintained by extremely thorough fuel and process engineering at each step. City gas at 530 B.t.u. per cubic foot is used throughout the plant to supply heat requirements. It is boosted from city pressure to burners.

Batch operation, although still used in lower production items, has been practically discarded for all main run jobs and important economies obtained thereby.

The old setup for hardening includes two batch pot type furnaces with refractory walls encased in steel shells—one for preheat and one for high heat. Both pots are 30 inches deep, one being 20 and the other 14 inches in diameter. Each

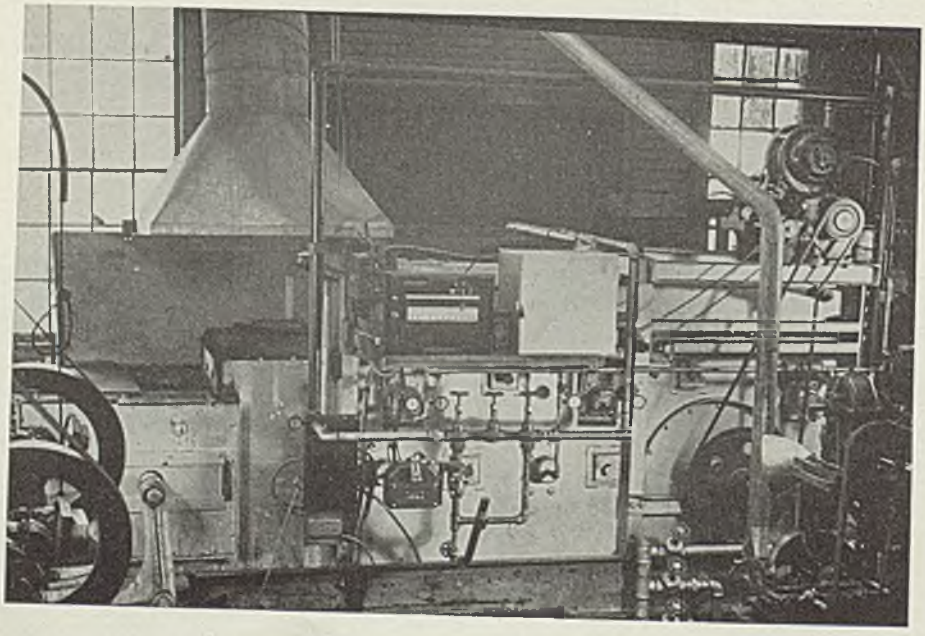
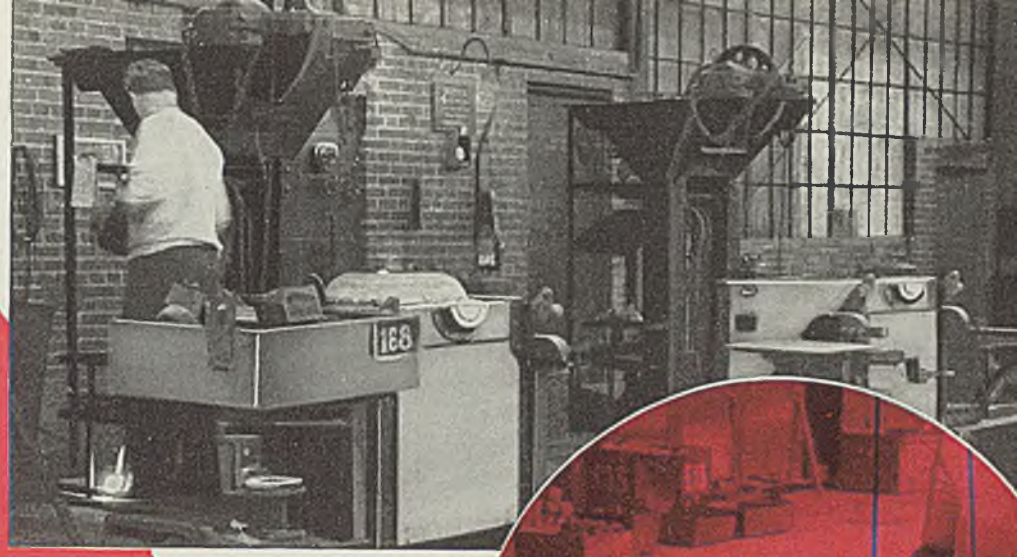


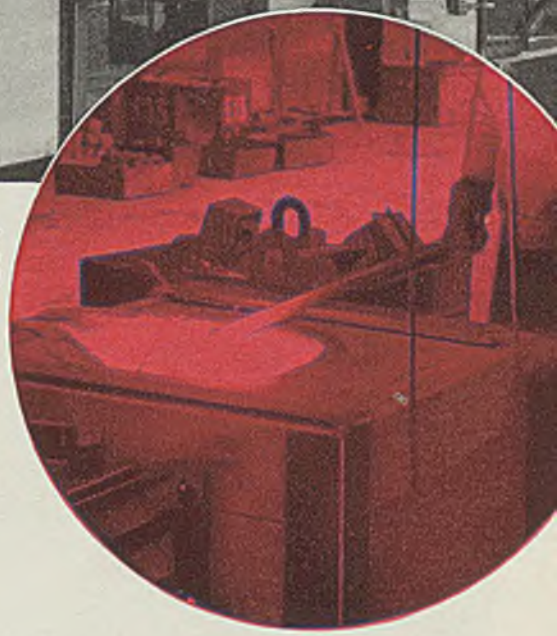
Fig. 1—New continuous gas-fired furnace used to harden all hard-back saw blades and screw drivers

* Industrial Engineer, Bridgeport Gas Light Co., Bridgeport, Conn., and chairman, nonferrous metals committee, American Gas association, 420 Lexington avenue, New York.

HEPPENSTALL GIVES 7 REASONS WHY—



Two Ajax Furnaces, 1300 lb. capacity each for E-I-S.



Removing slag from top — ready to pour.

ELECTRIC INDUCTION STEELS

The first requirement in the manufacture of good shear knives is quality in the base metal, which must be kept clean and homogeneous. Electric induction steels (E-I-S) held to close ranges of chemical composition in 960 cycle 1300 lb. capacity induction furnaces are used in the manufacture of shear knives by the Heppenstall Co., Pittsburgh. M. A. Baudry, electrical engineer, says induction melting is quick, accurate, prevents oxidation of chrome and alloy steels and gives a better product by causing an actual circulation of elements in the melt. Furnace maintenance is lowered because only the metal is heated and 90 to 100 melts without rebuilding linings are common.

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is heated with four single-stage velocity-type burners firing tangentially into the combustion chamber.

Hack saw blades are suspended in these pots from special hanger. Atmosphere control is provided by forcing city gas into the covered pots. Temperature is controlled automatically through thermocouples located both in the pots and in the combustion chambers. Heating periods are controlled closely with the aid of a time clock. When molybdenum steel blades are treated, they first are dipped in borax to eliminate loss of molybdenum from the surface during heating.

Quenching is done in hot oil. Blades are removed from the oil while still warm and are clamped immediately in steel frames to prevent warpage when drawing. Temperature of quenching oil is maintained accurately within one or two degrees Fahr. by means of steam and cold water coils.

Drawing oven in the old setup is a hot-air forced-convection unit with a chamber 30 inches long, 27 inches high and 18 inches wide. Combustion space below the heating chamber is fired by four atmospheric nozzle-type venturi gas burners. Hot products are pulled from the combustion chamber into the heating chamber and around the work. Automatic temperature control is provided. Oven is operated within 1050-1100-degree Fahr. range.

New Setup Lowers Costs

Above equipment and procedure, although used successfully for many years and still employed for low production items, now have been replaced by a modern gas-fired automatic continuous hardening-quenching-drawing unit which has made the important economies and production improvements listed below.

New continuous unit has produced a 10 per cent reduction in cost of individual hooking of each blade to the conveyor. Due to random charging on the conveyor, screw driver loading cost was reduced 85 per cent as compared with placing on pans in previous batch operations. Also, it permits a 6 per cent cost reduction in clamping saws in frames preparatory to tempering. This is possible due to the extremely straight condition of the work as it comes from the quench. By eliminating scale and producing straight work, cost of finishing and polishing screw driver blades was reduced 10 per cent.

The new equipment saved one-fourth of cost in gas consumption.

Quality of work has improved. In screw drivers, more uniform hardness is obtained, varying less than 1½ to 2 points Rockwell C. Also increased physical properties have entirely eliminated previous rejections.

Saw blades are improved by elimination of "soft skinning" resulting from decarburization. The new furnace with its protective atmosphere greatly improves quality and wearing ability of the blades. Also, the work now has a better appearance, with the elimination of loose oxides. Equally important is the increased uniformity obtained. Saw blades show high uniform hardness resulting in more cuts per blade by actual test.

Efficiency Is Increased

The new heat-treating equipment has permitted more rigid specifications as to blade straightness to be established and followed.

This new hardening unit is of the full-muffle continuous type. Bright hardening is obtained through use of controlled atmosphere. Furnace is 4 feet wide, 14 feet long including the quench tank. Muffle is 22 inches wide and 14 inches high. Running through the muffle is a moving plate conveyor 18 inches wide which operates between a fixed reel under the hopper and an adjustable reel in the quench zone at the opposite end.

Heat is supplied by ten 2-stage high-pressure velocity-type gas burners, five on a side with overfiring and four underfiring the muffle. A thermocouple with indicating and control potentiometer with proportioning motor valves and auxiliary equipment provides automatic temperature control. Work is charged in bulk into the hopper and discharged directly into oil quench tank through a hole at bottom of muffle at far end. Furnace has a capacity of approximately 250 pounds per hour.

As in batch operations, the temperature of the oil quench is regulated carefully by use of steam and cold water as may be necessary.

Immediately after quenching, blades are clamped, 200 at a time, in steel frames. Drawing is done in hot oil at 300 to 400 degrees Fahr., giving a hardness of 62 to 66 Rockwell C.

Operating data on the new continuous unit shows the high efficiency of this equipment. Some 5900 cubic feet of gas is required to heat the furnace from cold to 1575 degrees Fahr., 700 cubic feet per hour holding the furnace at this temperature. Atmosphere gas consumption is 420 cubic feet per hour. To heat 100 pounds of work to 1575 degrees Fahr. requires 94 cubic feet of gas. To hold the furnace at 1250 degrees Fahr. requires 349 cubic feet per hour. To heat the furnace from 1250 to 1575 degrees Fahr. about 1180 cubic feet of gas is required.

A close check on fuel consumption shows a 25 per cent reduction in gas required for the work as compared with previous methods and equipment described above. These savings are in addition to the labor savings noted and important improvements in quality of work handled.

Aside from this new continuous hardening unit, there is another heat treating operation of interest in this plant.

Certain types of hack saw blades

(*Please turn to Page* 82)

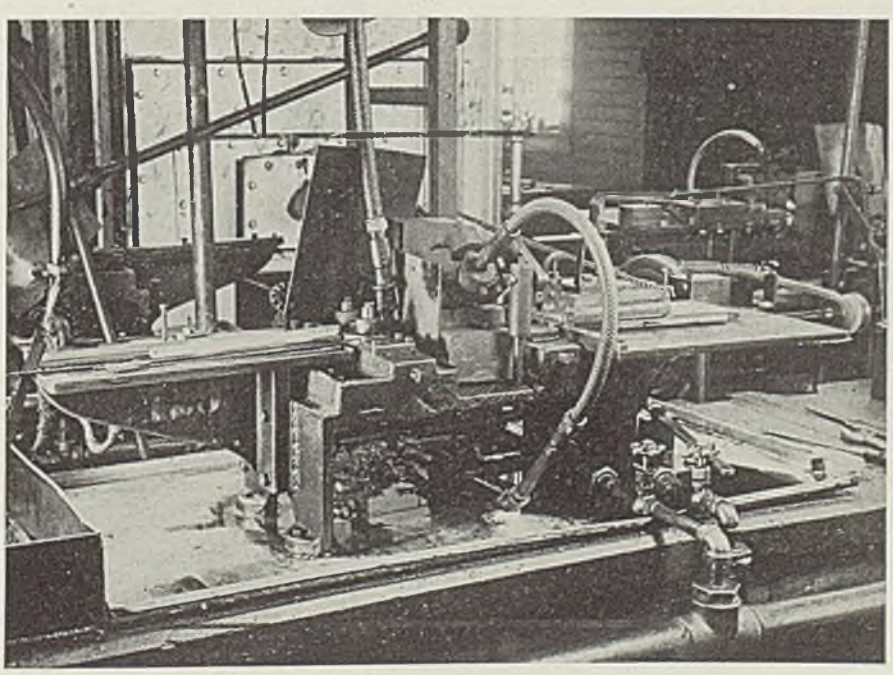


Fig. 2—Novel arrangement of equipment for flame-hardening flexible-back blades as they pass rapidly between feed rollers, followed by quenching jets

Modern Physics May Be Key to Baffling Metallurgical Problems

■ WHILE some properties of metals can be calculated accurately on paper, the problem of tensile strength continues to baffle the scientist. So stated Dr. Saul Dushman, research laboratory, General Electric Co., Schenectady, N. Y., at a recent meeting of the Detroit chapter, American Society for Metals. Ultimate tensile strengths of metals, he explained, are only one-tenth to one-hundredth of what theoretical calculations of the physicist say they should be.

On the basis of the electronic theory of atomic structure and quantum mechanics, the speaker said, it is possible to account for the typical metallic properties such as electrical and thermal conductivity, occurrence of magnetism for some of the metals, and observations on relation between composition and phase pattern for a number of alloys. In the case of the alkali metals and copper it is possible to calculate heat of evaporation and compressibility from the known electron configurations of the atoms.

However, such "structure sensitive" properties as tensile strength, rate of creep under stress, especially at higher temperatures, phenomena of recrystallization and age-hardening, etc., cannot be interpreted on any purely atomic basis.

It seems to be generally accepted Dr. Dushman continued, that fine cracks or similar defects in crystalline structure account for the discrepancy between observed and calculated tensile strengths. For instance, ultimate tensile strength increases with decrease in size of wire, with decrease in grain size, and with increase in cold working.

G. I. Taylor, Becker, Orowan and others have developed a theory of plastic deformation under stress and of rate of creep. The observations on effect of temperature on ultimate tensile strength, rate of creep, and life to rupture are important, although we do not understand the significance of the observed "activation energy."

Is this activation energy connected with energy of diffusion? We know that diffusion governs rate of crystallization, also rate of alloy formation. Considerable work on this topic has been carried out by Mehl and his associates. Results have been applied to account for the observations on the rate of transformation of austenite as affected by temperature. In this connection the study of self-diffusion is of extreme importance. So far, results have been obtained on only two or three metals. Diffusion also plays an important role in hardening phenomena.

Study of Metals Needed

Closely allied with the phenomena of diffusion are the "order-disorder" transformations in alloys which have been investigated by Bragg and others.

Observations in which the metallurgist is interested are so varied and so extremely complex that progress toward a satisfactory explanation must necessarily be slow. We are dealing in nearly all cases with phenomena in which the energy changes involved are relatively small, and to calculate them involves from the point of view of atomic structure, a consideration of second and third-order perturbation effects. What we need at present is not so much a study of engineering materials as of pure metals and simple binary alloys.

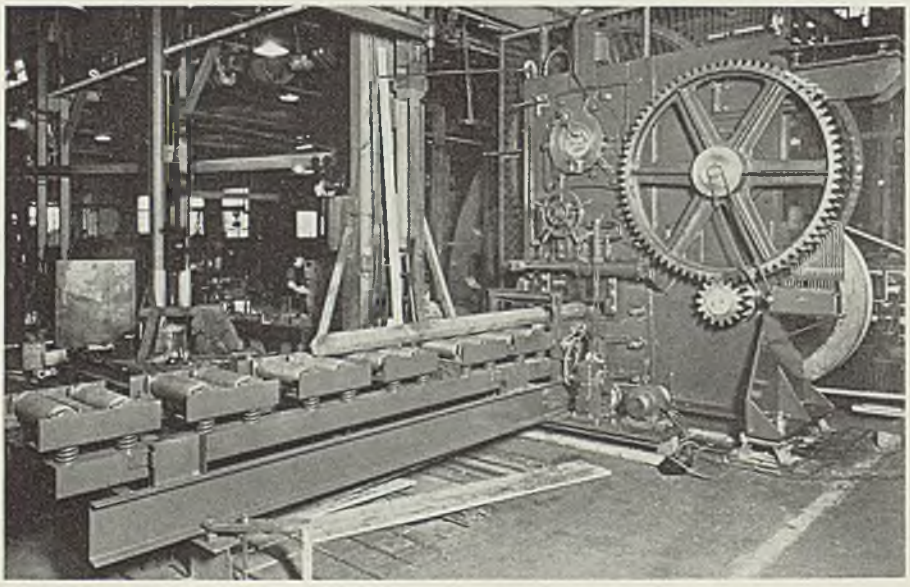
Dr. Dushman listed cohesion and plastic deformation as the most important metallurgical problems. He said that tensile strengths of metals are not only considerably less than those calculated on a theoretical basis but that tensile strength and other cohesive properties may be varied over large ranges by varying the composition, by heat treatment, and by mechanical working.

Billet Shear Features Automatic Feed Table

■ A new development in shearing equipment for steel billets has just been built by Buffalo Forge Co., 490 Broadway, Buffalo, for use in the automotive industry. This latest billet shear has an 18-foot automatic feed table. Other innovations are the automatic air-operated hold-down and an improved type of rear gage. Pneumatic operating controls are synchronized for continuous operation permitting feeding, gaging and shearing at maximum capacity at every stroke.

The automatic feed table is universally adjustable for a considerable range of material sizes and feeding lengths. Table rollers are mounted in sealed roller bearing units on preloaded spring cushions. The constant drive feed roll is of the under-slung floating type with air pressure control. It contacts the billet only while shear knives are open. An automatic cutout stops the shear when tail end of the billet leaves the feed roll.

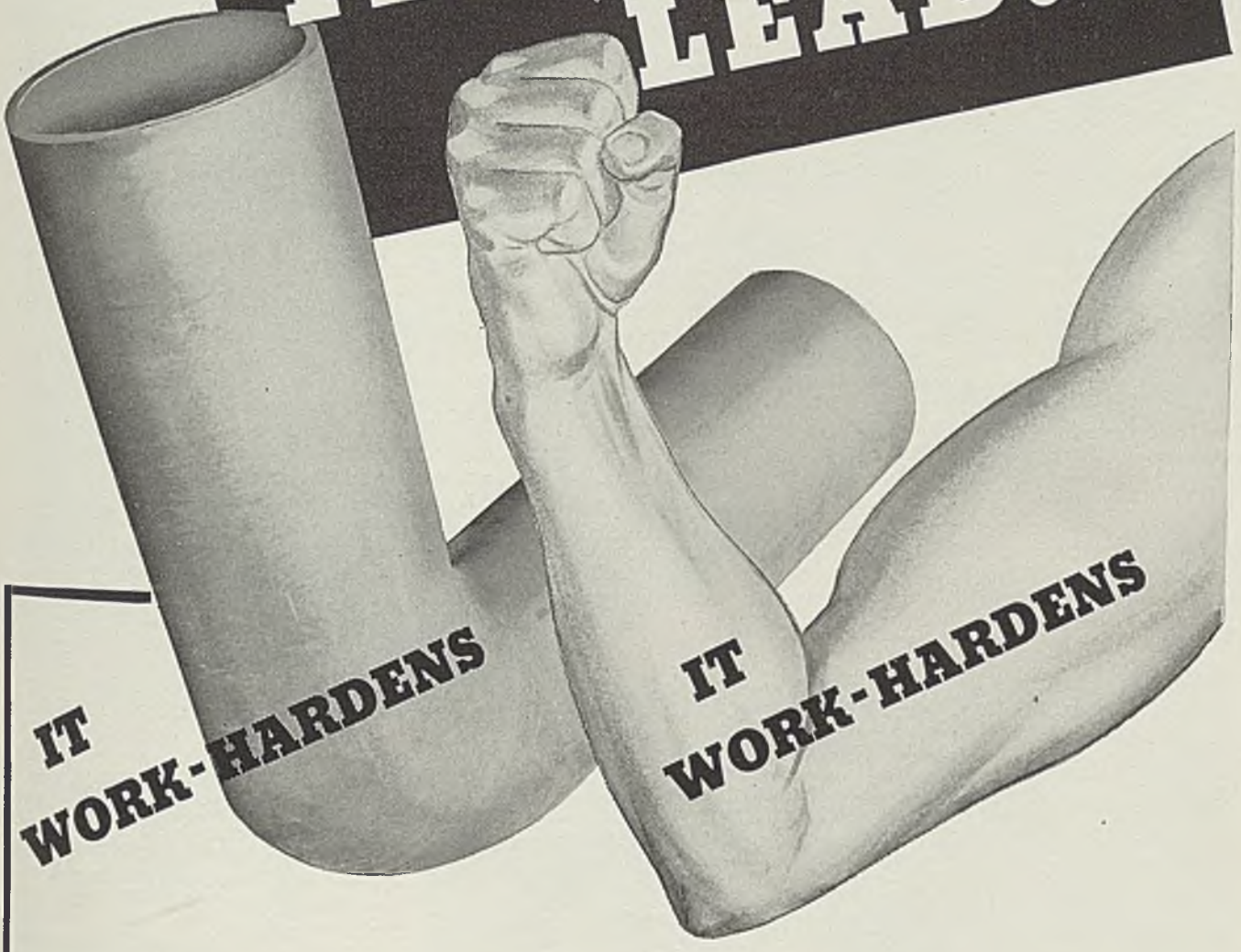
Heavy duty billet shear with automatic feed table having cushioned rollers



Office Equipment Finish

■ A new specialty finish for office furniture, business machines, etc., "S-W Satin-Glo," developed by Sherwin-Williams Co., 101 Prospect avenue, Cleveland, is offered in two spraying and two dipping qualities. It is said to produce a finish of pronounced beauty, lustre and mar-resistance in one coat. It also is claimed resistant to abrasion, perspiration, chemicals and cleaning soaps. Finish is offered in olive green, and in other colors if quantity requirement justifies special runs.

TELLURIUM LEAD...



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Work Tellurium Lead. Hammer it. Stretch it. Roll it. Bend it. And the result is greater toughness.

Hard knocks — far from weakening this lead — merely develop its latent strength. Therefore:

1. *Turnover points and joints are less subject to cracking.*
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Another point to remember! Tellurium Lead dulls the bite of sulphuric and other corrosive acids. This improved acid resistance holds good even at temperatures not far from the metal's melting point.

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead, alloyed with a small quantity of tellurium. It gives the desirable advantages of this well-known chemical lead plus important new ones. Yet the cost is only a fraction of a cent more per pound than chemical lead. In sheets, pipe and coils. For further facts, write to our nearest branch.

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Trans-Shipping Plant for Coal

New boat loader provides terminal with complete handling facilities, features revolving and motorized shuttling provisions. Built-in weightometer automatically weighs, records coal as it is delivered

■ ONE OF the largest mechanical coal-handling systems in Canada was recently completed at Three Rivers, Quebec, where for a number of years the Dominion Coal Co. Ltd. has had facilities for unloading ocean-going boats carrying coal up the St. Lawrence from terminals on the Atlantic. Here also is a large coal bridge used in storing and reclaiming operations. Until just recently, however, reshipping facilities had been limited to rail deliveries as there was no means of loading outgoing shipments on boats efficiently and at low cost. However, the new shuttle-type conveyor shown in accompanying illustrations, now affords rapid loading on ships.

The Three Rivers terminal of Dominion Coal Co. Ltd. serves the mining region and the paper industries of Quebec and northern Ontario with rail shipments on the Canadian Pacific railway. Now with the boat-loading conveyor recently installed, shipping facilities are extended to include the entire upper lake region. These facilities now make it possible to handle the very considerably increased tonnage of Nova Scotia coal demanded west of Montreal. This is a comparatively recent development, but it appears the demand will continue.

In addition to the Three Rivers terminal, Dominion Coal Co. Ltd., miners, shippers, suppliers of bituminous coal with mines in Cape Breton and in Nova Scotia mainland, also has terminals at Sidney, Louisburg and Halifax in Nova Scotia; and others at St. John, New Brunswick; Quebec, Que.; Hochelaga Wharf (Montreal) east), Que.; Bickedike Pier (central harbor at entrance to Great Lakes canal), Que.; Toronto and Ojibway, Ont. The now fully equipped Three Rivers terminal supplements the Montreal plant and provides a balance of operation between the company's terminal facilities.

The new boatloading conveyor loads lake carriers at a rate of 800 to 1000 tons per hour.

Shown in Fig. 1 is a side view of the new boat loading conveyor with bridge. As will be noted, the yard hopper is loaded by the large coal

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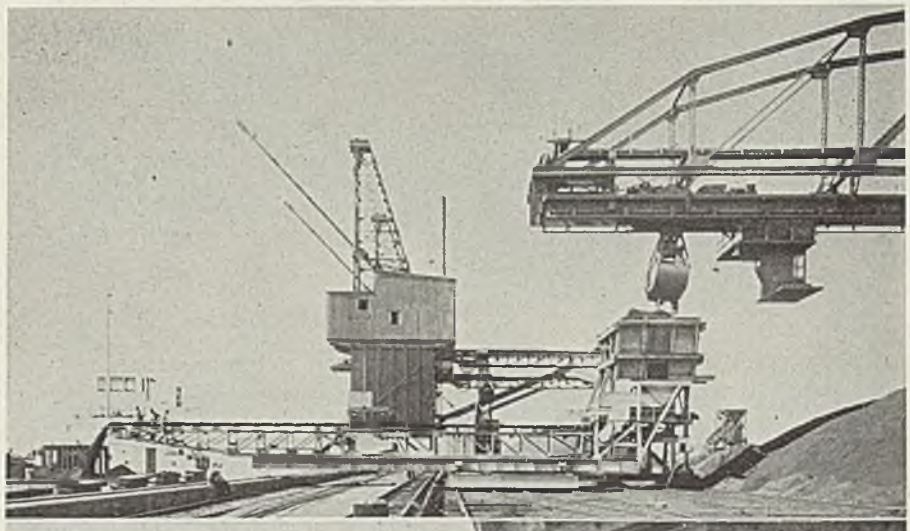


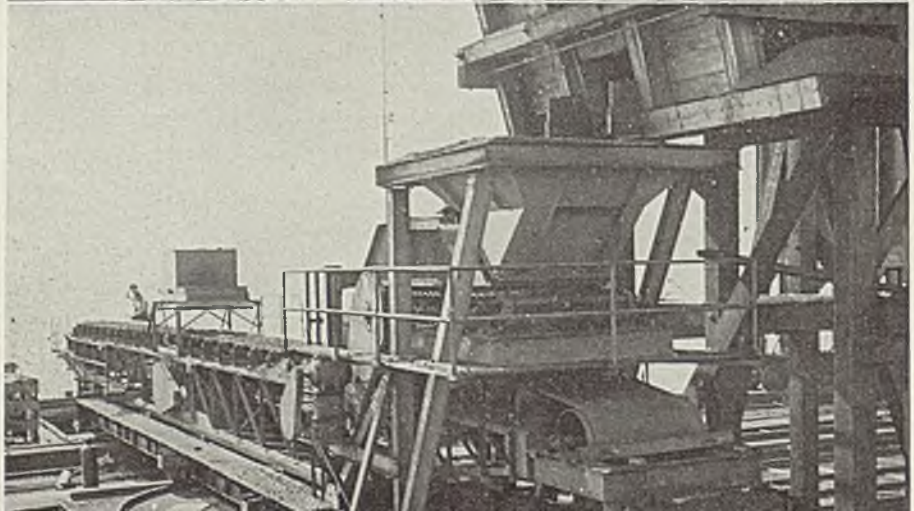


Fig. 1. (Upper)—Two boat unloading towers are in background here. In front are the bridge at extreme upper right, track hopper, apron feeder and shuttle conveyor loading boat at extreme left. Note outboard supports under shuttle extension

Fig. 2. (Lower)—Closeup of shuttle conveyor at loading end showing track hopper discharging into apron feeder, in turn distributing coal on the conveyor belt. Turntable at left foreground. Photos courtesy Stephens-Adamson Mfg. Co., Aurora, Ill.

Power For Testing

■ A NEW type of precision metalworking machine was formally demonstrated March 2 to a group of testing engineers, government officials, military and naval officers and industrialists at New Kensington, Pa., laboratories of Aluminum Co. of America. Called the Templin machine after R. L. Templin, chief engineer of tests of the company, it is capable of exerting a force of 3,000,000 pounds in compression and 1,000,000 pounds in tension. While not the largest machine of its kind, it is the most powerful for it can exert these forces at speeds up to 36 inches a minute—faster than any other testing machine.

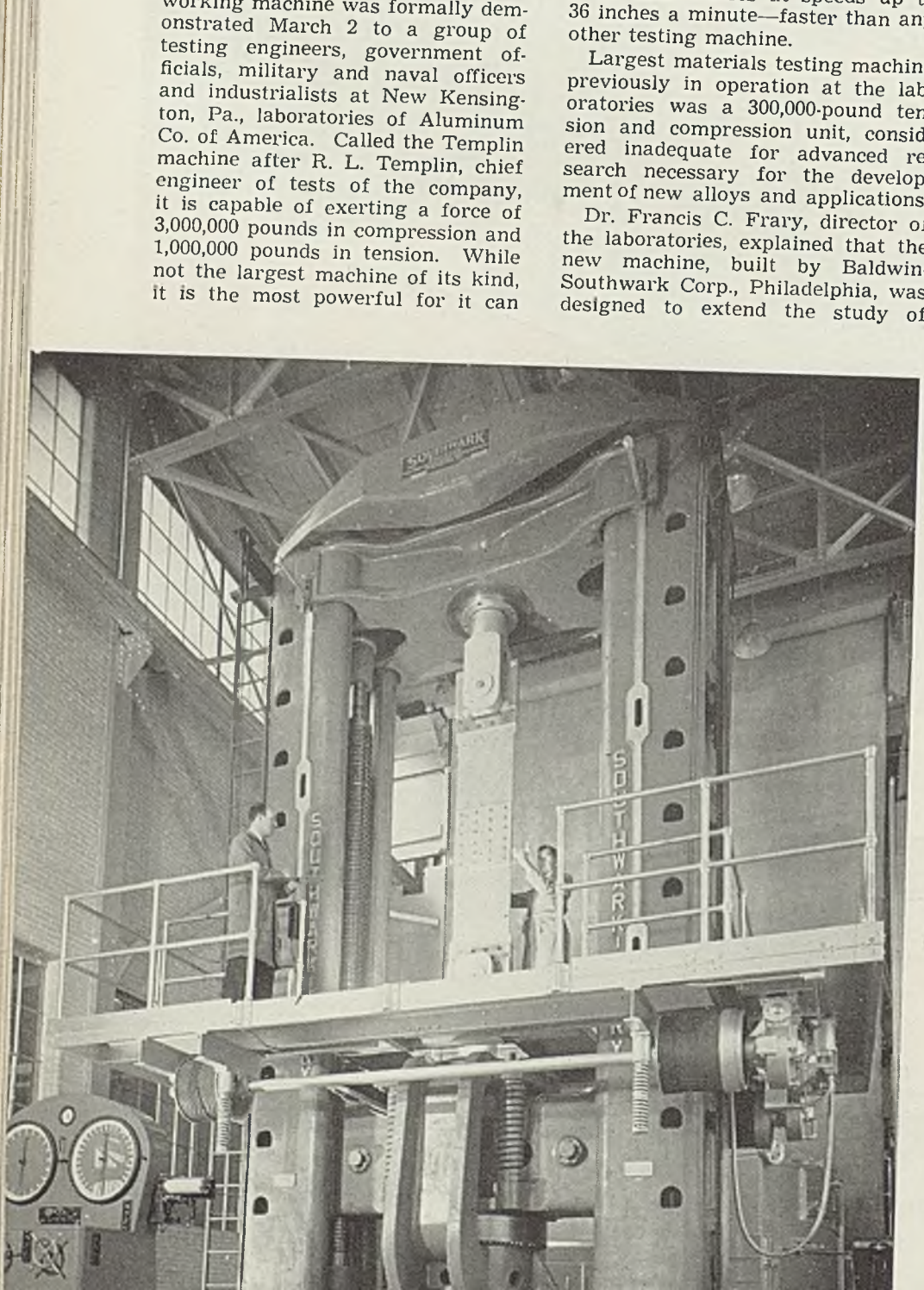
Largest materials testing machine previously in operation at the laboratories was a 300,000-pound tension and compression unit, considered inadequate for advanced research necessary for the development of new alloys and applications.

Dr. Francis C. Frary, director of the laboratories, explained that the new machine, built by Baldwin-Southwark Corp., Philadelphia, was designed to extend the study of methods of improving alumin products into fields inaccessible previously available testing mech isms. Improvements in fabrica products and development of n ones necessitate not only chan in design of existing fabricat equipment and creation of new m chinery, but also careful investi tion of fundamental physical pr ciples controlling flow of aluminu To pursue this study of the sc contemplated in the new resear program outlined by Mr. Templi staff, a testing machine of unpre dented power and speed was neede

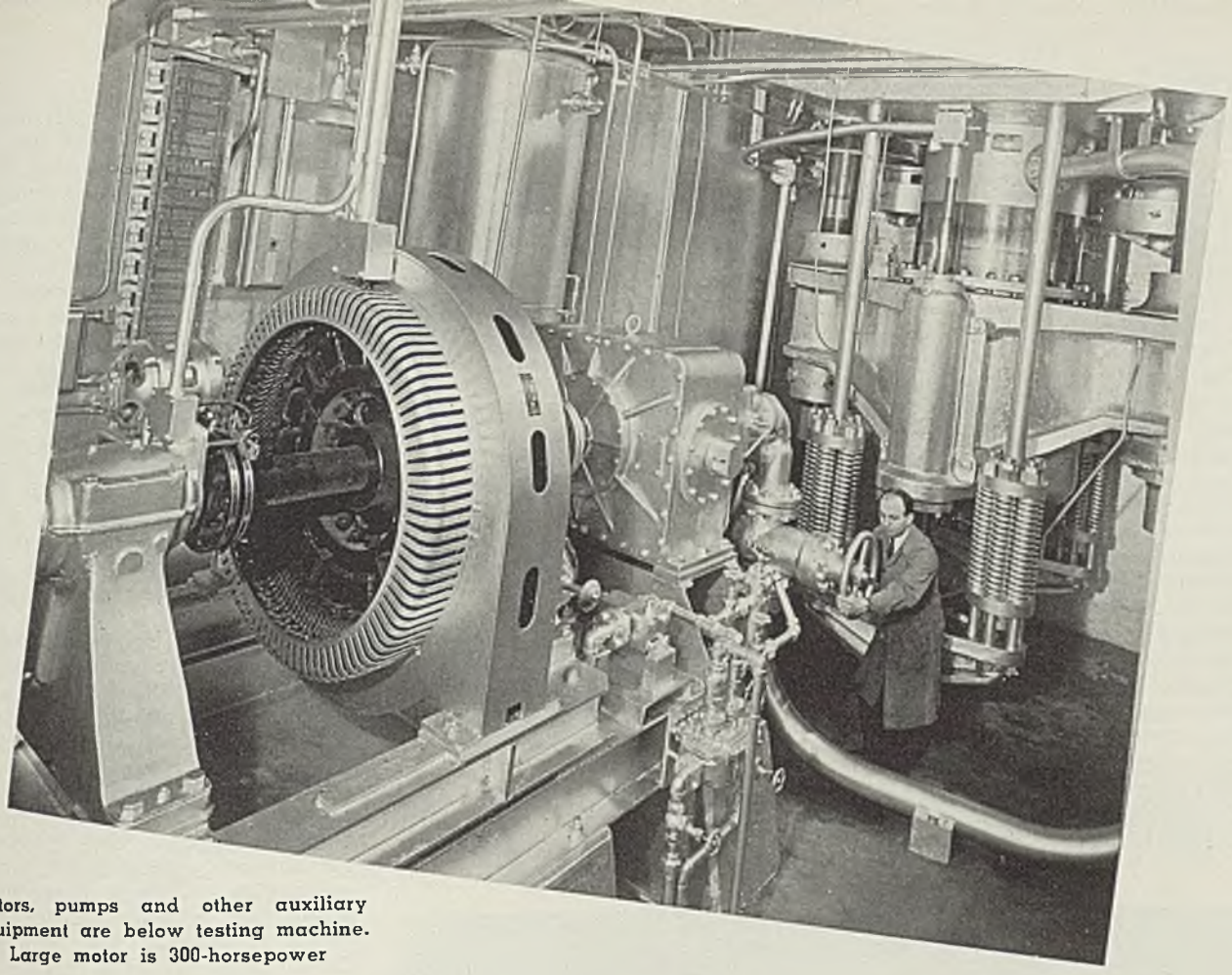
In the new machine, special co sideration is given to adaptabilit manipulatory features and mea for both measuring and recordi loads applied to experimentatio Note control and instrument pulp on floor near the 1500-ton precisio metalworking machine. A featur is the special power plant of a siz which permits high-speed operatio at the machine's maximum capacity

The machine can be operated as an extrusion, forging or forming press. It has auxiliary equipment which will permit defining within close limit relationships between various forces involved in plastic flow of aluminum.

The overall height of the machine is 40 feet, 4 inches of which 25 feet is above the floor line, the rest below. It is 16 feet 4 inches wide and 9 feet front to back. Ample space is available for testing. In compression work, 90 inches is available from right to left and 108 inches from front to back, with a maximum height of 186 inches. In tension work, a similar space is available from left to right, with a maximum height of 150 inches plus



Testing engineers are dwarfed by size of new Templin precision metalworking machine at research laboratories of Aluminum Co. of America, New Kensington, Pa. Elevated platform around machine can be raised or lowered as desired permitting operators to take strain readings at any elevation



Motors, pumps and other auxiliary equipment are below testing machine. Large motor is 300-horsepower

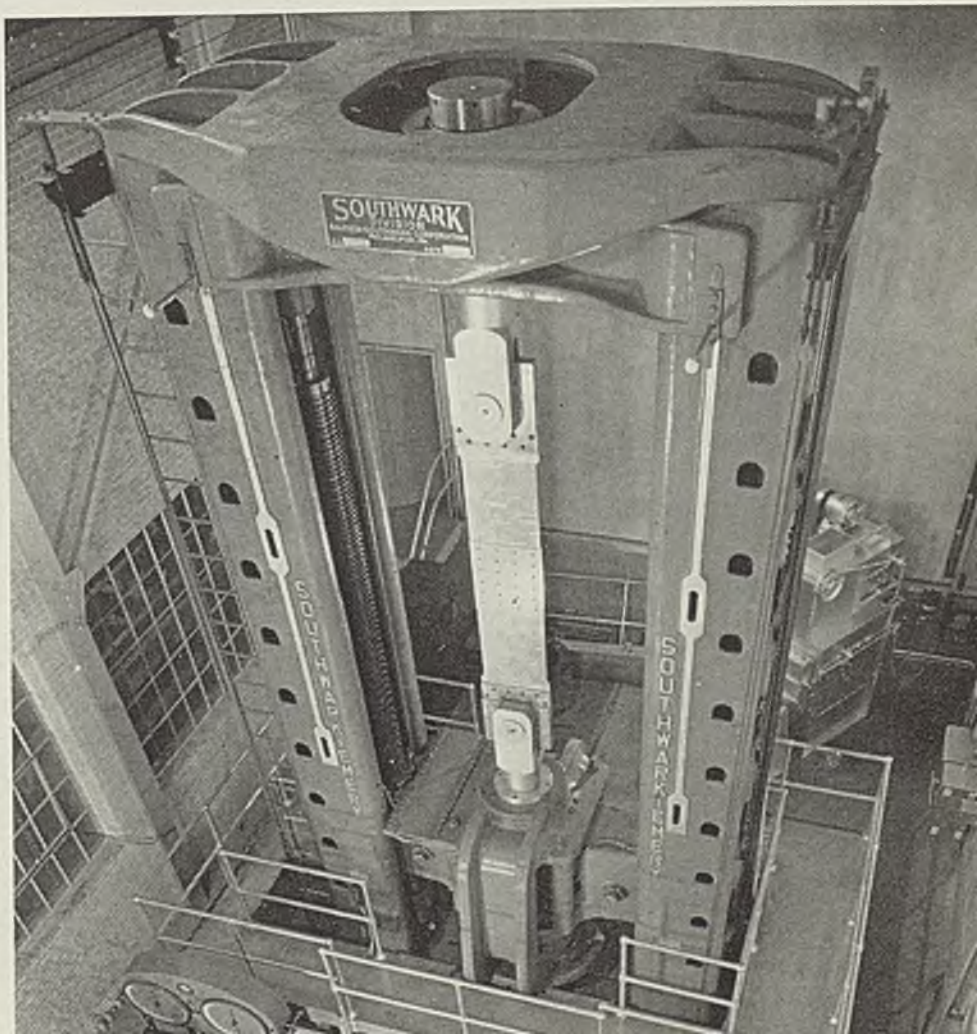
a 36-inch stroke. Frame is entirely open.

Main ram has 46-inch diameter, 36-inch stroke. Pullback rams have 12-inch diameter. While hydraulic stroke has a maximum range of 36 inches, machine heads can be adjusted over the full height by means of a 50-horsepower motor. Adjustments in excess of 36 inches are made by motor rather than hydraulically.

For testing large structural specimens, a pump delivering 18 gallons of oil a minute is driven by a 20-horsepower motor. A 300-horsepower motor is needed for high-speed testing at 270 gallons per minute.

Extreme accuracy is necessary for certain work. The Templin machine is capable of weighing a load of 3,000,000 pounds with an error less than 2 parts in a thousand. Yet it is so sensitive that a person's weight will move the indicator over nearly ¼-inch of arc in the low range. The machine also will record pressure needed to crack an egg.

The high speed of 36 inches a minute is one of the most interesting features of the machine. The loading rate is such that the yield point of a given specimen would be passed in less than 1 second, and specimen would fail in less than 15 seconds.



Machine can exert 3,000,000 pounds in compression, 1,000,000 in tension, can also be used as extrusion, forging or forming press

Screen Made by Electroforming

■ A NEW development in production of metal screens is an electroforming process which builds the screen fabric as one piece by electrodeposition without the aid of woven or other foundation structure in the deposit.

The development is known as Lektromesh, and screen is produced in nickel, copper and other materials. Tensile strength of plated nickel screen is the same as that characteristic of other electrodeposits of nickel and runs from 50,000 to 100,000 pounds per square inch. It has an elongation of from 20 to 30 per cent in 2 inches and is susceptible to annealing.

The new screen is produced commercially in sizes from 25 to 400 mesh, with bulk of production to date between 25 and 150 mesh. Wire sizes range from what in round woven wire would be 0.0008 to 0.025-inch in diameter. Percentage of openings is between 16 and 50 per cent of total area. Screen can be made 36 inches wide and up to 1400 feet long.

In manufacture, the desired design is transferred by a succession of sensitzing, etching, filling and surface-treating processes to a metal plate or matrix, leaving metal surface of matrix in a condition to receive the electrodeposit uniformly where desired and yet allow it to be withheld where open spaces are necessary. When completed, the matrix with its exposed and masked sections is fastened to a circular cylinder revolving in plating bath. As cylinder revolves, metal deposits are built up evenly and uniformly on exposed areas of matrix. Thickness of deposit depends on current density and rotating speed of cylinder. The deposit, in form of a continuous sheet of screen, is stripped off the matrix automatically.

The resulting screen has a smooth surface and is readily fabricated by drawing, stamping, welding, soldering, etc. It is claimed to be stiff, tough and strong and to allow a latitude in design which makes possible any shape and a variety of sizes. In some sizes and designs, a 2-inch piece may be stretched to 1 foot. Screen also can be designed to avoid heat conduction. Since it is an integral structure, screen will not unravel.

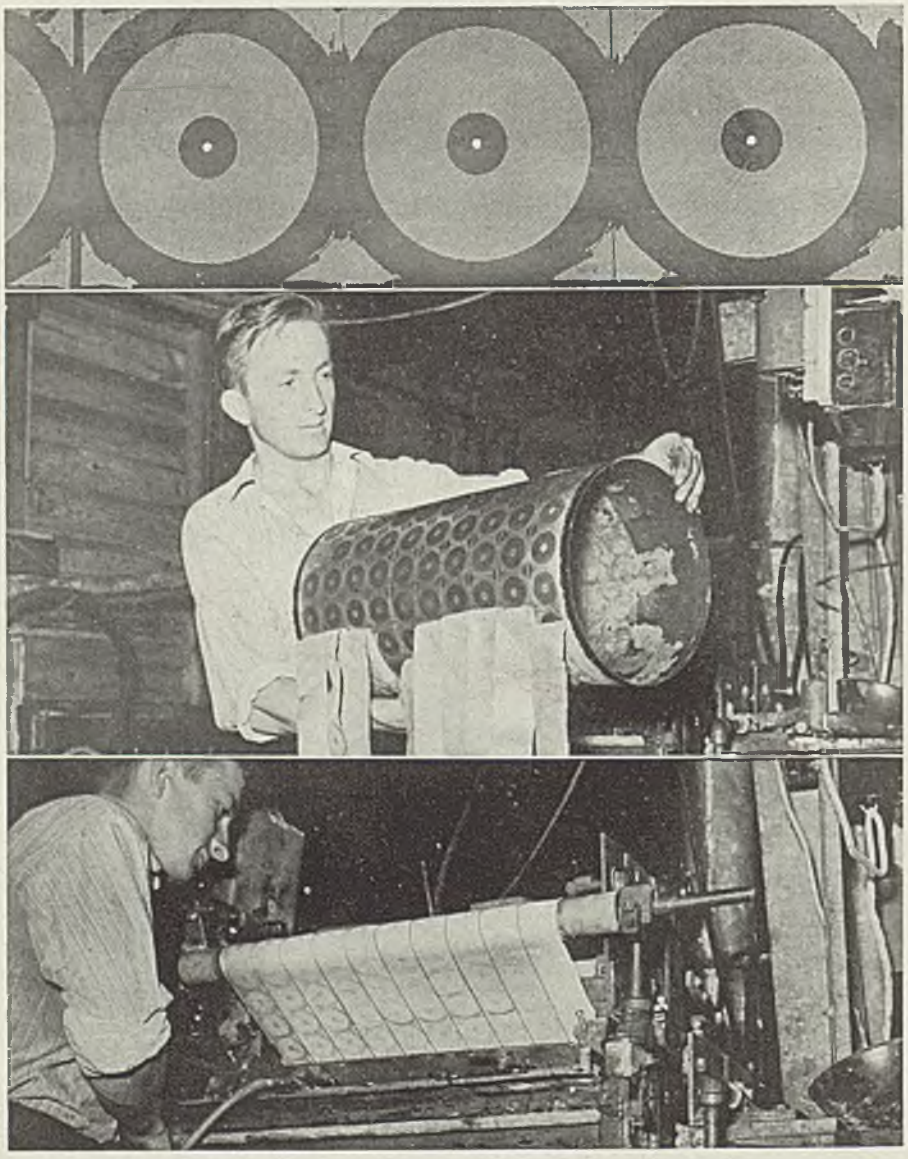
An important application of this screen is in strainers for automotive fuel systems. These strainers can be produced in multiples to accurate shape and size in sheet form and then punched from sheet without requiring any further fabrication. Fabric also has been used for accurately shaped screens for pumps and several types of filters.

Complete processes of production are covered by patents under which C. O. Jelliff Mfg. Co., Southport, Conn., holds exclusive rights.

Top—A strip of carburetor strainers produced by electroforming ready for final stamping

Center—Revolving cylinder on which is affixed the matrix

Bottom—Screen is stripped from matrix and collected on a reel. Illustrations courtesy International Nickel Co. Inc., 67 Wall street, New York



Enamel-Coated Roofing, Tanks, Siding Available

■ Porcelain enameled water tanks, roofing and siding are offered by Porcelain Steels Inc., Cedar and Ashland roads, Cleveland. Hot water tank is coated inside and out with tough and elastic porcelain enamel recently developed by Ferro Enamel Corp., Cleveland. Roofing and siding, made under Kor-Lok patents, are interlocking corrugated steel sheets. All fastenings holding product to building are concealed. The new enamel is pastel gray and also will be available in maroon, gray, green and black. For industrial operations requiring light reflectance, a white undersurface is offered giving a white light reflectance value of 70 to 75 per cent.

Protective Wax

■ A new wax, Production Wax No. 2, to protect finish during handling, shipping and erection has been developed by Skybryte Co., 3125 Perkins avenue, Cleveland. The wax, a liquid, is applied with brush or cloth and is allowed to remain on until after erection. When rubbed down it leaves a firm, transparent surface which serves as protection against discoloration. It may be used on all aluminum surfaces given an anodic type of treatment and also on bronze, chromium and other bright surfaces.

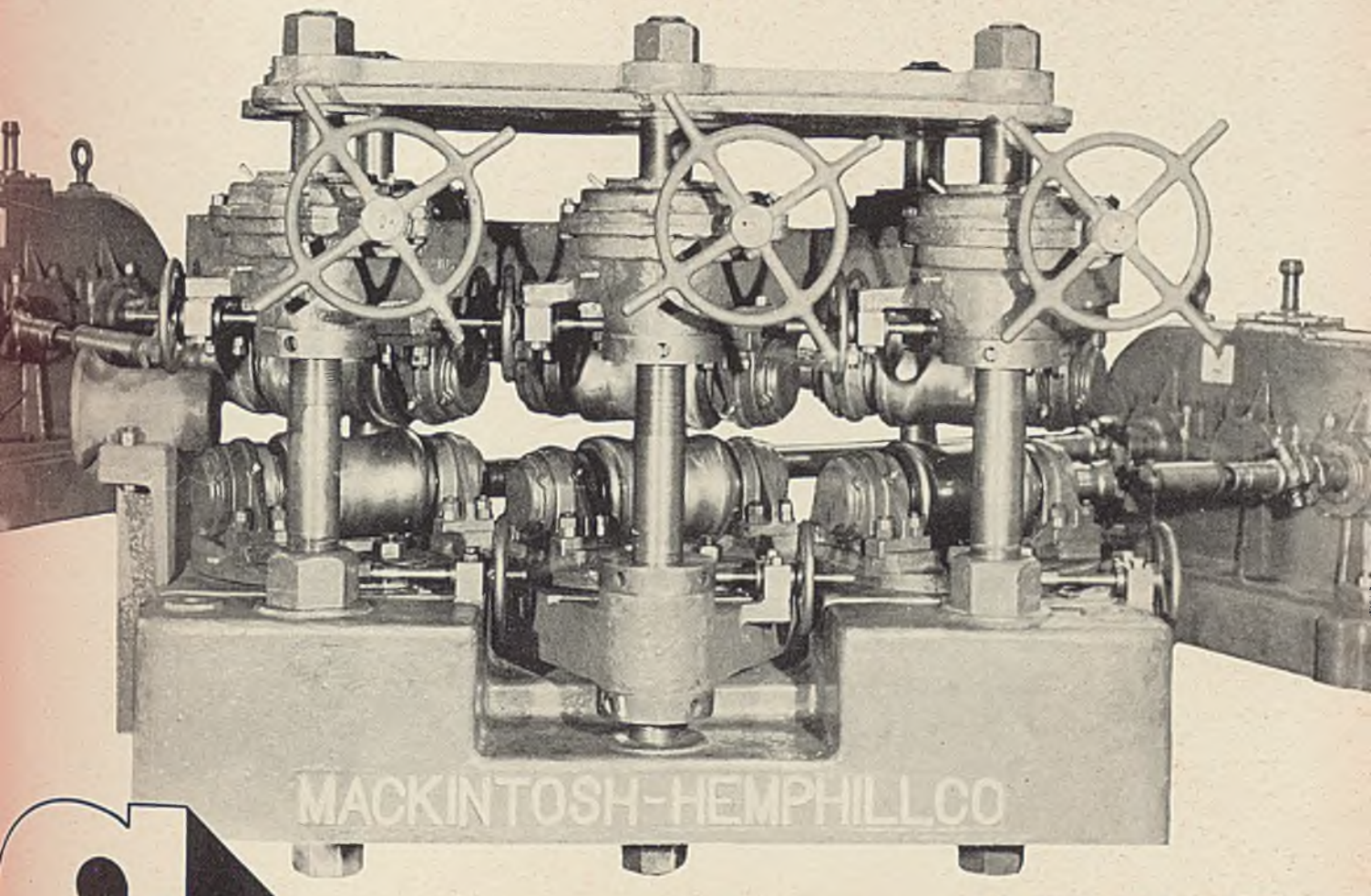
Mackintosh Hemphill Company

Announces

THE NEW ABRAMSE

These machines are built for straighten-
ing all rounds, pipe and tubing.

They are also built with special features
for sizing and polishing.



A New High Speed Straightener for Continuous Butt-Weld Pipe which straightens and sizes from end to end at speeds up to 500 feet per minute.

Straightener

A MACKINTOSH DEVELOPMENT WHICH OFFERS

Superior Straightening . . . Greater Production Speeds . . . Removal of End Bends . . . No Ringing or Scoring . . . Excellent Sizing . . . Elimination of Guides . . . Reduction in Power . . . Quicker Roll Change . . . Longer Roll Life . . . Less Maintenance

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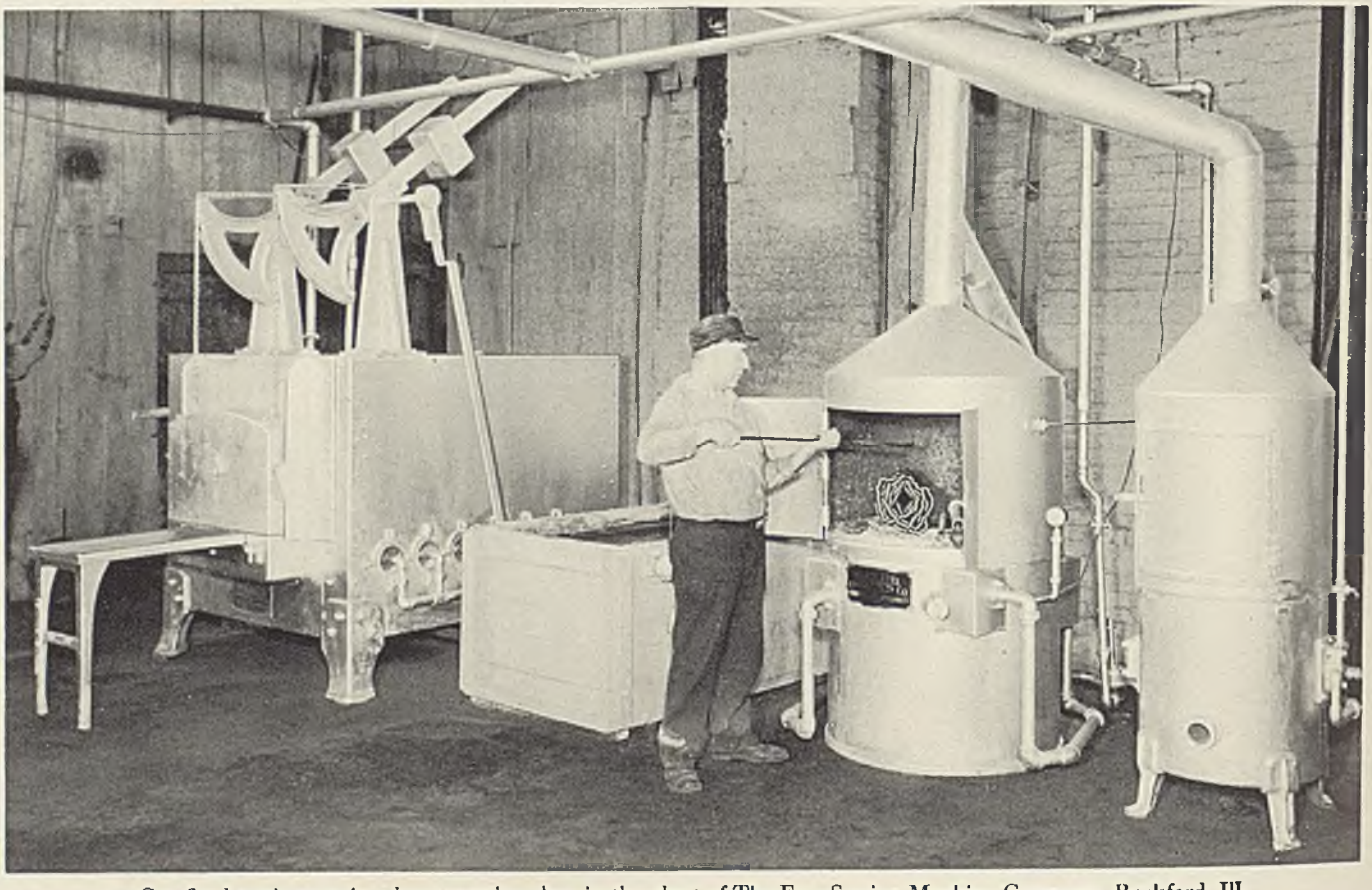


Gas-fired equipment in a heat-treating shop in the plant of The Free Sewing Machine Company, Rockford, Ill.
Photo courtesy Eclipse Fuel Engineering Company, Rockford.

More work in less time for Sewing Machine Plant with GAS heat treating

Heat treating with Gas plays a very important role in the manufacture of sewing machines, as witnessed by the experience of The Free Sewing Machine Company of Rockford, Ill.

Four years ago—with old-type equipment—it "took a full day to bring the oven furnace up to temperature and an even heat throughout the chamber was practically impossible." As a result, on carburizing work the plant could place in the furnace only one layer of boxes. With this equipment, it could get two carburizing heats per day, and by allowing the furnace to run through the night, it could get one annealing heat.

Since installing the new Gas equipment, it is possible to get two carburizing heats and one annealing in an eight-hour day, and to double the loadings in each charge. With no annealing to do, the plant can run through *three* carburizing heats.

Working space has been increased by the new installation. And with this Gas-fired equipment it is now possible to control temperatures more accurately. Working conditions are better, too, since the heat loss is less; and the plant can also be kept very clean, says Mr. R. E. Johnson, an official of the company.

Laying Lead Linings

Lead-lined tanks show long life when proper design, installation and grade of lead are employed. New type of construction permits all joints to be made outside of tank for maximum accessibility

By ERNEST MANTIUS

National Lead Co.
111 Broadway
New York

■ MAJORITY of failures of lead-lined pickling tanks and similar equipment are due more to poor application methods than unsuitability of the material itself. Considering all factors such as corrosion resistance under high operating temperatures, installation costs, maintenance, uniform quality, lack of deterioration by aging and high salvage value, lead stands out as one of the most suitable materials for acid-resistant construction. However, certain fundamental precautions must be observed in selecting proper grade of lead, design of equipment and actual installation of the lead parts.

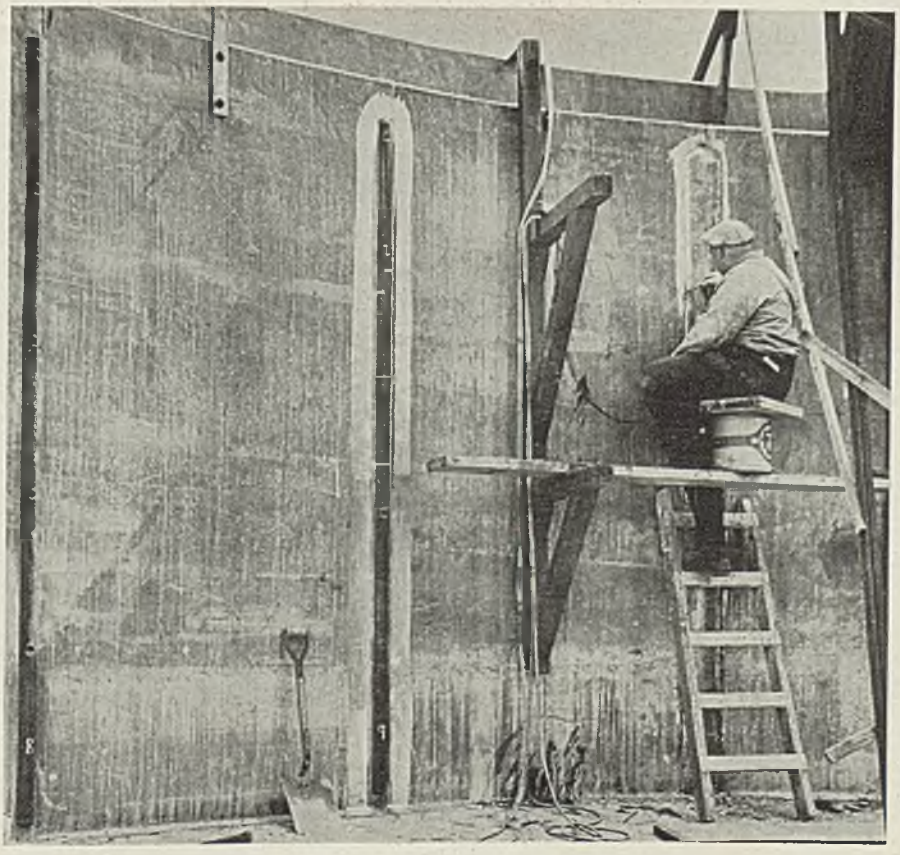
Two Factors Important

Most important factors to be considered in choosing proper grade of lead are corrosion resistance and mechanical strength. A suitable grade having both of these properties to a marked degree is known as "chemical lead" which conforms to the specifications B-29-35, grade 2 of the American Society for Testing Materials. Chemical lead is virgin metal with a definite composition particularly suitable for chemical equipment. There are many other grades of lead which have their uses but are not recommended for loose tank linings as distinguished from homogeneous lead linings and pipes. Neither should they be mixed with antimony in manufacture of hard lead pipes, valves, fittings and other castings for those processes where corrosion resistance and strength are of first importance.

Practically all usual shapes and sizes of tanks are adapted to lead lining. Circular tanks with flat bottoms, perhaps, are the easiest to line but long rectangular and elliptical shapes or circular tanks with cone or dished bottoms present no difficulties. Tanks themselves may be of wood, concrete or preferably of steel. The construction must be strong enough not only to give rigid support for the lead lining but also to take care of stresses occurring in the completed tank during its operation. Mechanical framework of the tank should be sufficiently rigid to prevent distortion under load. Interior surface must be smooth and free from raised wells, rivets, nails and other protrusions which might damage the lead lining.

Lead sheets for tank lining for tanks should be purchased in large sizes to reduce joints to a minimum.

Here lining is held to interior tank surface by quarter-round steel flats which later are covered with a lead strip as at right



Abstract from paper presented at St. Louis meeting of American Zinc Institute Inc.

On the other hand, the sheets must not be too heavy to handle, about 3000 pounds being the maximum.

Joints should be located where they will be subjected to the least stress and where they will be most accessible. In lining any vessel, it is of utmost importance that the lead sheets be placed solidly against the supporting surface because hydrostatic or gas pressure or the expansion of a brick lining may rupture an unsupported lead sheet.

All sloping, vertical or overhead portions of a lead lining must be fastened securely at frequent intervals as weight of the lead itself will cause the lining to stretch and sag, especially with an increase in temperature. Usual fastening method is to place 2-inch quarter round steel flats against the lead and bolt the flats with countersunk bolts through the lead lining to the supporting structure. These flats in turn are covered with lead straps fusion welded or "burned" to the lining.

Spacing for vertical flats is about 24 to 30 inches, or closer for cone or dished tops. In vessels more than 10 feet high, the lining also must be supported by horizontal steel flats placed not more than 10 feet apart.

After lead sheets are placed and fastened, the joints between the sheets are burned. The "flat seam" which can be burned only in a horizontal position is the strongest and most satisfactory type as it can be peened, thereby strengthening the joint. Small tanks can be turned so all seams are burned flat. Even quite large horizontal tanks can be rolled if space permits. Large rectangular, cylindrical and odd-shaped vessels cannot be moved after the lead lining has been placed; therefore the joints are burned by some form of flat or vertical seam.

Frequently a lead lining is protected by bricks or tiles placed inside it and laid in a suitable cement. Supporting vessel is essentially the same but is made somewhat stronger to take care of any possible stress due to thermal expansion of the brick. As such an internal lining of brick or tile is a suitable support for the lead, steel flats usually are omitted. Bricks must be placed tightly against the lead with or without an intermediate protective coating of cement, asbestos paper or plastic. It is most essential that the bricks or tile be cut or fitted properly at those points where they come over a burned joint to prevent cutting or shearing of the lead at those points.

Brick linings for support and protection of lead linings generally are used at temperatures above 200 degrees Fahr. and at points where corrosion and mechanical wear might unduly shorten the service life of the lead. Brick linings are essential for pickling tanks to protect the lead from the steel sheets or billets which may easily cor the sides of the tank during imm sion and cause considerable dam if not protected.

Recently a special construc has been developed for lead-li steel tanks and other equipm The tank, of any desired shape made of heavy steel plates in form of numerous properly sha sections. Plates are stiffened placing extra-heavy angles at four edges in such a manner t the edges of the angles are fl with the edges of the plates. gles are drilled so plates can assembled and firmly bolted toge er to form a rigid structure.

Just before assembly, the st sections are covered with one c tinuous sheet of lead which flanged over the edges of the st at all four sides. Such flat sectio can be moved and turned readily permit use of a flat seam where is necessary to burn flanges, pi connections, etc.

Several Advantages Featured

With the steel sections or wal of the container covered with lea they are assembled and bolted t gether. Inside of the tank the presents a smooth and practicall flush lead surface suitable for bric lining. All the joints between th lead sheets on the steel sections ar burned together on the outside o the tank where they are alway visible and accessible.

This type of construction ha many advantages because it re lieves the joints from strain and removes them from the inside o the tank where they might be sub ject to shearing by bricks or to cracking due to vibration and rapid temperature changes. Also, effects of corrosion are less severe.

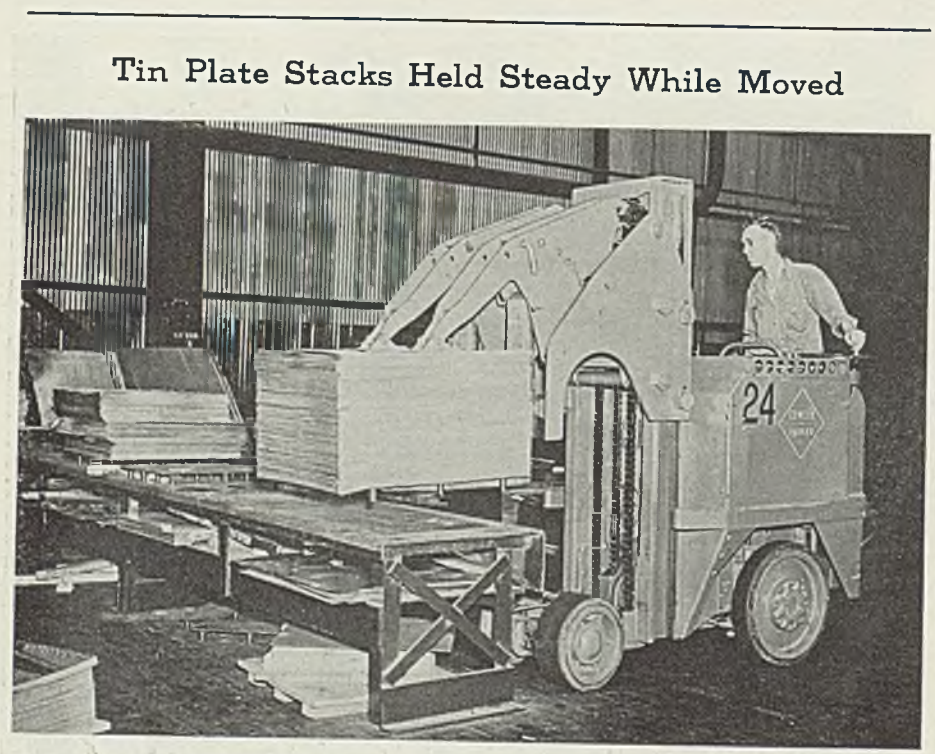
Lead pipelines may be fabricated from chemical or antimonial lead with 4 per cent antimony. This latter is recommended for acid solutions which may contain suspended salts, dirt and scale.

Pipes are usually made up of sections joined together by means of cut joints or preferably by butt or rolled joints. Flanged joints are used for connections to tanks, pumps and valves. Such flanged joints may be made by flanging the lead pipe over against a loose steel ring drilled for bolts. A more suitable joint is made by burning a drilled lead flange to the pipe, flange in turn being backed by a loose steel flange. With antimonial lead pipe, drilled cast-lead flanges not requiring the use of steel backing rings can be burned directly on the pipe.

Wherever possible, full face gaskets of rubber or asbestos composi-

(*Please turn to Page 82*)

Tin Plate Stacks Held Steady While Moved



■ To prevent skewing or spilling of stacked tin plate in transit, this handling truck is equipped with compressing arms to press down on pile while moving it to and from sorting table. Plate is placed on platforms spaced from table to allow truck arms being inserted underneath. Photo courtesy Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland

Revised Ratings for Belt Drives Announced

■ Based on studies of belt life made by Allis-Chalmers Mfg. Co. engineers, in conjunction with industry representatives, the power ratings of multiple V-belt drives have been revised to provide maximum belt life. Sheave diameters and correction factors are now standardized according to formulae based on results with multiple V-belt drives over a period of ten years.

Overload factors are being arranged also to allow for the type of prime mover and driven machine specified.

The new ratings provide in many cases for a more compact drive and also for the longest belt life at the lowest initial cost.

Companies co-operating in the new standards include: American Pulley Co., Philadelphia; Browning Mfg. Co. Inc., Maysville, Ky.; Dayton Rubber Mfg. Co., Dayton, O.; R. & J. Dick Co. Inc., Passaic, N. J.; Dodge Mfg. Corp., Mishawaka, Ind.; Fort Worth Steel & Machinery Co., Fort Worth, Tex.; Gates Rubber Co., Denver; L. H. Gilmer Co., Philadelphia; Goldens' Foundry & Machine Co., Columbus, Ga.; B. F. Goodrich Co., Akron, O.; Goodyear Tire & Rubber Co. Inc., Akron, O.; W. A. Jones Foundry & Machine Co., Chicago; Manhattan Rubber Mfg. division of Raybestos-Manhattan Inc., Passaic, N. J.; Medart Co., St. Louis; Pyott Foundry & Machine Co., Chicago; Rockwood Mfg. Co., Indianapolis; United States Rubber Co., New York; T. B. Wood's Sons Co., Chambersburg, Pa.; Worthington Pump and Machinery Corp., Harrison, N. J.

Handbook on Packings Offered to Engineers

■ Chicago Belting Co., 113 North Green street, Chicago, has compiled a handbook on hydraulic and pneumatic leather packings embodying illustrated designs and applications with dimensional standards.

In 11 chapters covering approximately 50 pages, the handbook includes such subjects as cup, flange, multiple V-leather and U-packings, springs and expanders, surface speeds at various pressures and temperature limits, besides 18 "don'ts" for the user. Entitled "Hydraulic and Pneumatic Packing Design and Application," it is offered free to officials of engineering departments and designing engineers only in industrial plants using packings either for replacement or standard equipment.

Reducing Creep

(*Concluded from Page* 48)

Fig. 9, further emphasizes the advantage in high-temperature strength of the new normalized steel over the oil-quenched steel. After 180 days (4320 hours) at 850 degrees Fahr. a decline from 30,000 pounds per square inch to 25,300 pounds per square inch was registered for the B14 (Templex) steel. This indicates that a number of years would be required for relaxation to 15,000 pounds per square inch, the approximate stress at which leakage occurs in the usual high-pressure flanged joint.

The B7 (Triplex) steel under this condition is observed to relax to this 15,000-pound-per-square-inch leakage point in but 63 days (1512 hours) at which time retightening of the joint would become necessary. Even at 930 degrees Fahr., the curve for B14 (Templex) indicates that an indefinitely long period is required before retightening becomes necessary. Thus B14 may be applied under conditions of service where periodic retightening of the nut is not feasible.

Microstructure of Creep

The metallurgist naturally is interested in interpreting in terms of microstructure the striking improvement in creep resistance for alloy bolting steel which normalizing effects over liquid quenching. These materials in general tend to develop martensitic structures upon oil quenching with hardnesses in excess of 500 brinell. A "draw" or temper subsequent to the quench tends to coalesce the highly dispersed carbide constituents.

Micrograph, Fig. 10, shows chromium-molybdenum-vanadium Grade B14 at 500 diameters when given a conventional oil quench from 1500 degrees Fahr. and draw at 1200 degrees Fahr., resulting in a hardness of about 300 brinell and tensile properties shown in Figs. 4b and 5.

Normalizing, or air quenching from the proper temperature above the critical range produces a much slower cooling effect than liquid quenching and results in the microstructure for chromium-molybdenum-vanadium B14 shown in Fig. 11, again at 500 diameters. Actually, Fig. 11 depicts B14 steel after proper drawing treatment at 1200 degrees Fahr. and in the condition representative of Templex bolts and studs. Unlike oil-quenched alloy steel, the microstructure in this case, as normalized, does not materially alter upon being drawn at 1200 degrees Fahr., although changes do occur in hardness, elasticity, internal strains, etc.

Grade B14 steel as freshly normalized, prior to draw usually has a hardness of about 280 brinell, but upon drawing the hardness is observed to *increase* slightly to about 300 brinell. Such an increase, produced upon drawing or tempering, seems to be characteristic of some steels containing vanadium. Normalized chromium-vanadium steels showed no increase.

Increased hardness upon drawing also is reflected in tensile strength, yield strength and proportional limit curves, Fig. 4a, which shows only the portions of these curves for temperatures above 1000 degrees.

The normalized structure of B14 steel, Fig. 11, is characterized by much coarser features than oil-quenched, Fig. 10. If magnification of section in Fig. 10 is increased to 2000 diameters, as in Fig. 12, and then compared with Fig. 11, features of the same general "coarseness" are observed.

In the normalized structure of B14 steel, Fig. 11, may be observed a definite outline of grains. These are of a size equivalent to austenitic or *"heat treatment temperature range"* grains which, due to the relatively slow cool, were not highly affected or distorted as is the case in liquid quenching. In normalizing, each austenite grain has transformed into a ferritic-pea grain without subdivision. dark constituents dispersed thr the grains in Fig. 11 are believe be essentially carbides of vanad and possibly molybdenum. In case of oil quenching, however, austenite grain appears to given rise to a number of "granular" subdivisions.

Interpreting the 2000-diameter crograph, Fig. 12, upon this ba the "grain size" of oil-quenched is estimated to be about A.S.T.M. grain size scale. For malized B14 steel, however, ab 6.7 is the corresponding numb Such an interpretation and ev ation of grain numbers introduce controversial concept, quite new the original sort of microstructu features or units for which A.S.T.M. grain size numbers h been adopted. Nevertheless, it convenient for describing mic structural features which must taken into account in discussing creep behavior of steel. A "gr size" represented by A.S.T.M. 11.3 is about 29 times as numero in a given microsection as A.S.T. No. 6.7, as about 150 times many "granular units" are to found in B14 steel as oil quench and drawn than as normalized.

Regardless of the interpretati placed upon these microstructure there is little question that quenc ing results in a greater disorgan zation of the crystalline structu of the steel than normalizing. Pe haps it is this greater degree of di organization, or smaller "granula unit," that is largely the cause creep resistance. Studies upon rel tionship of creep resistance to m crostructure tend to show that a optimum "grain size" range exist in which an alloy steel is most re sistant to creep. In the case o B14, this range seems to be abou A.S.T.M. No. 5 to 7, interpreted a suggested above. Finer grain siz than this range represents too grea a proportion of the material in th "disorganized" condition which pro motes creep, while larger grain size does not afford enough "keying" against plastic deformation, some times called "slip interference."

Thus, optimum creep resistance may be conceived as existing for that "grain size" which permits the least grain boundary or disorganized material in ratio to "keyed" slip planes.

Actual mechanism of creep is, needless to say, a too complicated phenomenon to attempt to explain with accuracy in detail.

Already, however, this "grain size" concept has proved useful in interpreting much creep data and particularly in working out heat treatments for attaining improved creep strength and relaxation resistance in alloy steel for application at high temperatures.

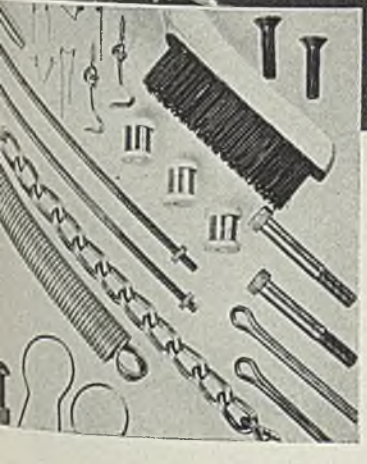
J. J. Kanter

Mr. Kanter is research metallurgist in the research and development laboratories of Crane Co., 836 South Michigan avenue, Chicago. He attended Armour Institute of Technology and the University of Chicago, obtaining a degree from the latter. He has been engaged in research relative to application of materials to high temperature service for a number of years and has written extensively on this subject. In 1929, jointly with the late L. W. Spring, he was awarded the Dudley medal by the A. S. T. M. for outstanding investigations concerning creep of steel. He is a member of A.S.M., A.I.M.M.E., A.S.T.M., A.S.M.E., and the A.F.A. including the A.S.M.E.-A.S.T.M. joint committee for research on the effect of temperature on metals.

ACCURACY

. . . OR ELSE!

It takes more than Good Intentions to do a Job Right



AND it takes more than good intentions to put quality into wire. We have been making wire for over 100 years. In that time we have built up a background of experience which has been of great value to our customers. For in that time we have fully developed all of the requirements for putting high quality into wire. You can count upon American Quality Wire to give the best results with the greatest economy.

American Quality Wire is carefully checked at every stage of its manufacture to assure that it is accurate in both metallurgical and physical properties. This product is produced in a complete range of sizes, grades, shapes and analyses. Our Sales Department and Engineering Staff will be glad to assist you in determining which wire will best serve your own particular requirements and our plants are strategically located so that deliveries can be made to meet your production schedule.

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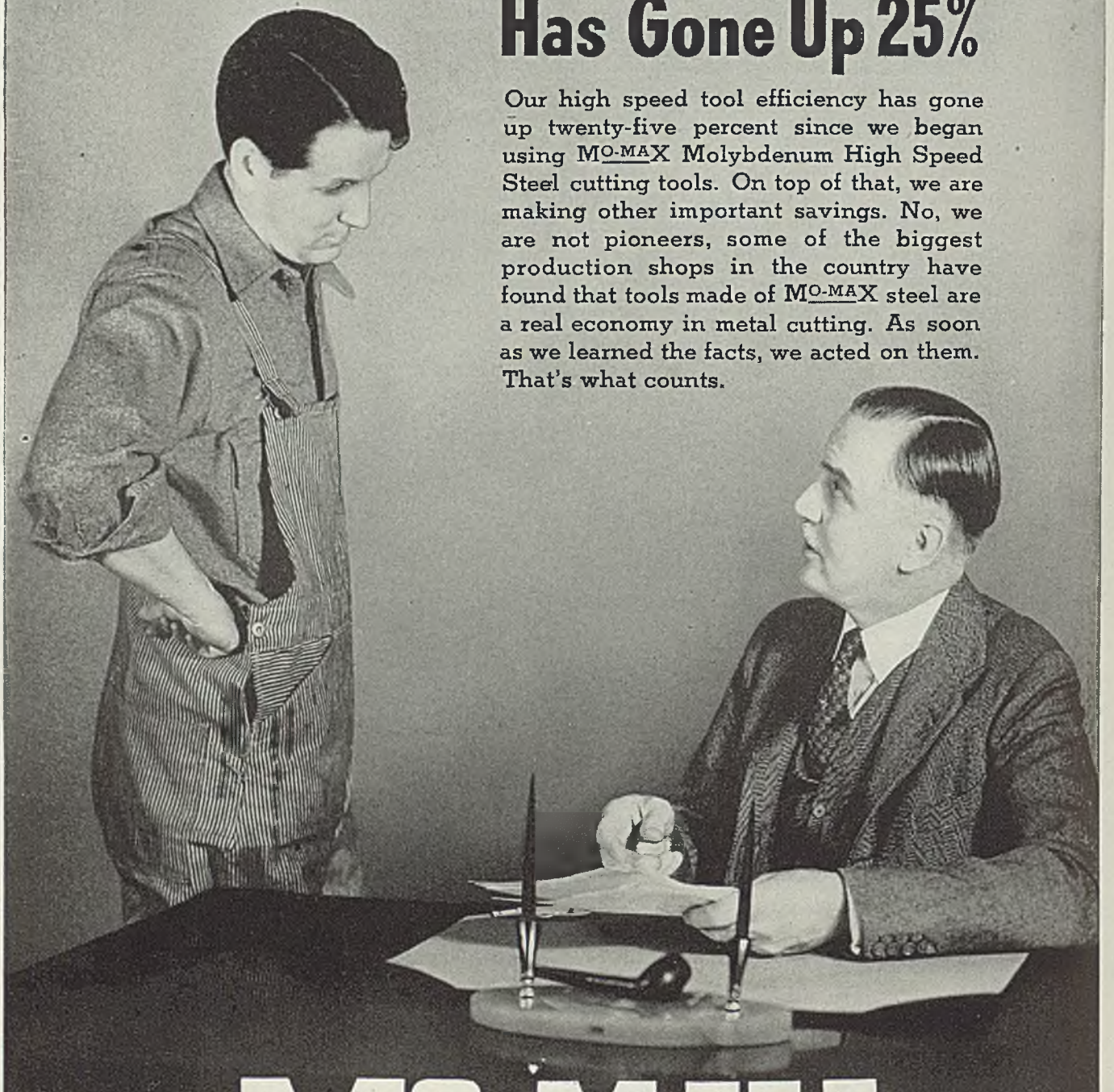

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MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

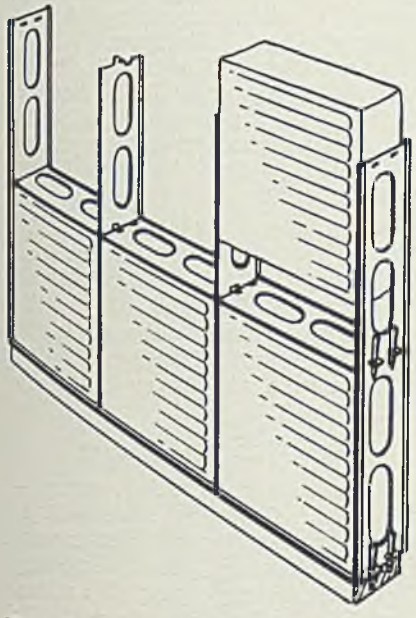
J. V. Emmons, Metallurgist of The Cleveland Twist Drill Co., Cleveland, Ohio, has written a technical pamphlet on this subject. They will be glad to send you a copy if you'll ask for it.

⊕ 163

Metal Shapes for Glass Block Construction

■ A new method of erecting glass block structures, using prefabricated and interlocking metal members, has been developed by Revere Copper & Brass Inc., 230 Park avenue, New York. Metal members are bronze and aluminum alloy extruded shapes and provide a strong self-aligning framework enclosing and securing each glass block into a rigid integral unit.

System consists primarily of two extruded shapes. One is a perimeter shape for top, bottom and sides of a panel and has one side to fit block, while other side connects glass block panel to adjacent construction. Other shape has both sides fitting sides of block and is used in continuous horizontal lengths and short vertical lengths between each course of block. Hooks on ends of short verticals interlock with L shaped holes in continuous horizontals which in turn, interlock with the perimeter members by means of tenons, mortice slots and wedge keys.



Vertical and horizontal bronze and aluminum extruded members form the frame for this new method of glass block construction

Two sizes of glass block can be erected by this method. For 8 x 8-inch blocks, the members provide for construction up to 18 blocks wide and 18 blocks high. For 12 x 12-inch blocks, the maximum is 12 blocks wide and 12 blocks high, but in both cases, there is provision for longer walls by joining panels together in straight line or at angles. No provision is made for curved construction or for 6 x 6-inch block.

Supplementary extruded shapes and prefabricated members provide for doors, windows and cased openings in either architectural bronze or aluminum alloy or in a combination of both.

Considerable emphasis is placed upon the possibility of 100 per cent salvage value of this construction as only reasonable care is required to dismantle. All material, both glass block and metal, is immediately ready for re-erection.

System for Insulux glass is available from Owens-Illinois Glass Co., Insulux Products division, Toledo, O., and that for P-C glass blocks from Pittsburgh Corning Corp., 4337 Fifth avenue, Pittsburgh.

Gives Analysis of Distribution Costs

■ *Analysis and Control of Distribution Costs,* by J. Brooks Heckert; cloth, 420 pages, 5¾ x 8½ inches; published by Ronald Press Co., New York; supplied by STEEL, Cleveland, for $5.

A volume for sales executives and accountants, this volume is designed to assist in the task of analyzing, directing and controlling marketing efforts. No one knows certainly the total national outlay for distribution effort but most reliable estimates place it in excess of production cost. Yet methods and technique by which distribution outlay has been given direction and control have not been highly perfected. In many concerns information pertaining to distribution operations is meager and the cost is subjected to less rigid tests than cost of production operations.

The effort of this book is to offer a statement of basic problems and suggestions of illustrating methods which will help them. There is always some basically sound plan by which to attack a business problem. If this is known and followed the detailed procedure can be developed readily.

Heat Resisting Alloy

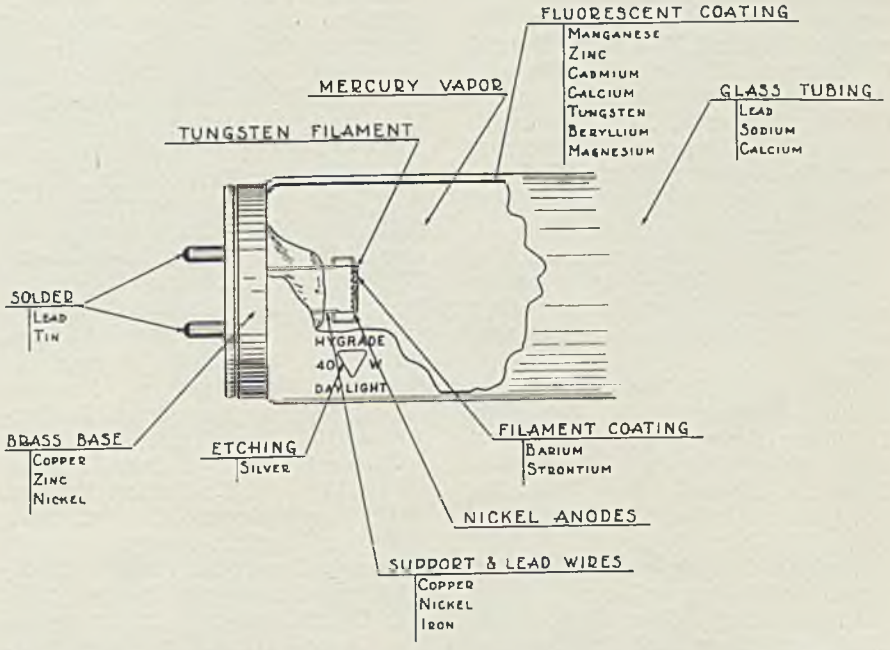
■ A new alloy called Cuferco having great strength, high heat resistivity, high mechanical endurance and low electrical conductivity has been developed by J. M. Kelly, research metallurgist at Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Because of its iron content, Cuferco can be hardened by heating. As repeated applications of heat softens the alloy very little, it can be used for such applications as tips for spot welders.

Metal Panel Insert

■ The F. C. Russell Insulation Co., 235 East 131st street, Cleveland, is marketing a new metal panel insert for "boarding up" the combination screen and storm windows previously developed by them. The panel inserts are made of Armco galvanized Paintgrip, a special bonderized sheet metal that not only takes paint without pretreatment but also prolongs paint life. Standard finish is a silver grey baked enamel, but other colors are available.

Metals Are Important in Fluorescent Tube



■ Seventeen metals are utilized in construction of a single fluorescent lighting tube. Above chart, prepared by engineering department of Hygrade Sylvania Corp., Salem, Mass., shows where various metal parts are used

Modern Pioneers

(*Concluded from Page 23*)

Corp., and a national award recipient, declared that despite the inventions of the past half century, science is no nearer the end of invention than it was 50 years ago. Speaking by radio from his Florida laboratory, Mr. Kettering said we can create as many new jobs as may be necessary if management, research and invention all will work together.

A feature of the dinner was a tableau presentation of "fifteen pioneers of the past." Bust models of the past pioneers were arranged at a long table and John B. Kennedy, radio commentator and editor, dramatized the tableau through a loud speaker. Pioneers of the past thus honored were Benjamin Franklin, Eli Whitney, Robert Fulton, John Deere, Cyrus Hall McCormick, Charles Goodyear, Samuel F. B. Morse, Richard Marsh Hoe, Elias Howe, Alexander Graham Bell, George Westinghouse, Ottmar Mergenthaler, Thomas A. Edison, George Eastman and Wilbur Wright. Also presented was a radio dramatization of modern pioneer achievement, with Graham McNamee broadcasting.

Nylon Inventors Honored

Presentation of the national awards to the 18 individuals whose photographs appear on pages 21-23 was made by Mr. Lund. The nineteenth award was made to a group of E. I. du Pont de Nemours & Co. researchers for the development of Nylon, the first synthetic protein. It is a silk fibre, superior in quality to natural silk and producible in sizes from the finest filaments to bristles or rods. The 11 sharing this award: Willard E. Catlin, Donald D. Coffman, Winfield W. Heckert, Benjamin W. Howk, George D. Graves, Wilbur A. Lazier, John B. Miles Jr., Wesley R. Peterson, Frank K. Signaigo, Edgar W. Spanagel, and Wallace Hume Carothers (deceased).

Mr. Lund also presented the scrolls to the five score inventors and researchers from the New York and New Jersey area. The recipients:

Henry Abbott, Calculagraph Co., New York; Herman A. Affel, Bell Telephone Laboratories Inc., New York; Edwin Howard Armstrong, Columbia university, New York; Dr. Leo Baekeland, Bakelite Corp., New York; Dr. John C. Baker, Wallace & Tiernan Co., Newark, N. J.; Dr. Frederick M. Becket, Union Carbide & Carbon Corp., New York; H. S. Black, Bell Telephone Laboratories Inc., New York; Frank Gottlob Breyer, Singmaster & Breyer, New York; Edwin Franklin Britten Jr., Monroe Calculating Machine Co., Orange, N. J.

J. R. Carson, Bell Telephone Laboratories Inc., New York; Dr. William David Coolidge, General Electric Co., Schenectady, N. Y.; Sanford Lockwood Cluett, Cluett, Peabody & Co. Inc., Troy, N. Y.; Dr. George O. Curme Jr., Carbide & Carbon Chemicals Corp., New York; Garland Hale Barr Davis, Standard Oil Development Co., New York; John Van Nostrand Dorr, Dorr Co. Inc., New York; Dr. Camille Dreyfus, Celanese Corp. of America, New York; Gano Dunn, J. G. White Engineering Corp., New York.

Carleton Ellis, Standard Oil Development Co., New York; Gustav W. Elmen, Bell Telephone Laboratories Inc., New York; Colin Garfield Fink, Columbia university, New York; Harry Linn Fisher, United States Industrial Alcohol, New York; Hannibal C. Ford, Ford Instrument Co. Inc., Long Island City, N. Y.; Frederick Lincoln Fuller, International Business Machines Corp., New York; George Herbert Gibson, Montclair, N. J.; Dr. Albert Norton Goldsmith, New York; William Nelson Goodwin Jr., Weston Electrical Instrument Corp., Newark, N. J.

Alan Hazeltine, Stevens Institute of Technology, Hoboken, N. J.; R. A. Heising, Bell Telephone Laboratories Inc., New York; C. J. Holslag, Electric Arc Cutting & Welding Co., Newark, N. J.; John McDonald Hothersall, American Co., New York; Martin Hill Ittner, Colgate-Palmolive-Peet Co., Jersey City, N. J.; Dr. David Schenck Jacobus, Babcock & Wilcox Co., New York; B. W. Kendall, Bell Telephone Laboratories Inc., New York; John Kirgan, Elizabeth, N. J.; Lester Kirschbraum, Flintkote Co., New York.

Walter Savage Landis, American Cyanamid Co., New York; Irving Langmuir, General Electric Co., Schenectady, N. Y.; B. Loeffler, Mack Mfg. Corp., Long Island City, N. Y.; Adolph Wilhelm Machlet, American Gas Furnace Co., Elizabeth, N. J.; William Henry MacKay Lolley, L. N. S. Corp., New York; Leon S. Moisseiff, New York; Henry W. Pleister, Diamond Expansion Bolt Co. Inc., Garwood, N. J.; Charles H. Prange, Austenal Laboratories Inc., New York; Richard H. Ranger, Rangerstone Inc., Newark, N. J.; Heyman Rosenberg, Parker-Kalon Corp., New York.

Elmer C. Schacht, Behr-Manning Corp., Troy, N. Y.; Herbert Edward Shreeve, Maplewood, N. J.; Max Spillman, Worthington Pump & Machinery Corp., Harrison, N. J.; Christian Steenstrup, General Electric Co., Schenectady, N. Y.; Howard George Walker, Western Electric Co. Inc., Kearny, N. J.; Charles Frederick Wallace, Wallace & Tiernan Co. Inc., Newark, N. J.; Harold Alden Wheeler, Hazeltine Service Corp., New York; Willis R. Whitney, General Electric Co., Schenectady, N. Y.; Robert R. Williams, Bell Telephone Laboratories, New York; Robert E. Wilson, Pan American & Petroleum Transport Co., New York; G. Wirrer, Mack Mfg. Corp., Long Island City, N. Y.; William E. Woodward, Lima Locomotive Works Inc., New York.

Joint awards—Roy A. Shive, Colco Chemical Co., Bound Brook, N. J., with others from other areas; Earle C. Pitman, E. I. du Pont de Nemours & Co., Parlin, N. J., with others from other areas; John Francis Grace and Thomas Canning McBride, Worthington Pump & Machinery Corp., Harrison, N. J.; George Dolan and Harry B. Smith, United Engineers & Public Service, Newark, N. J.; Leopold Godowsky Jr., Westport, Conn., and Leopold D. Mannes, New York, Eastman Kodak Co.

Radio Corp. of America, RCA Tubes group—RCA Mfg. Co. Inc., Harrison, N. J.—E. Anthony Lederer, Loris E. Mitchell, George M. Rose Jr., Bernard Salzberg, Otto H. Schade, Terry M. Shrader, Browder J. Thompson and Harry C. Thompson.

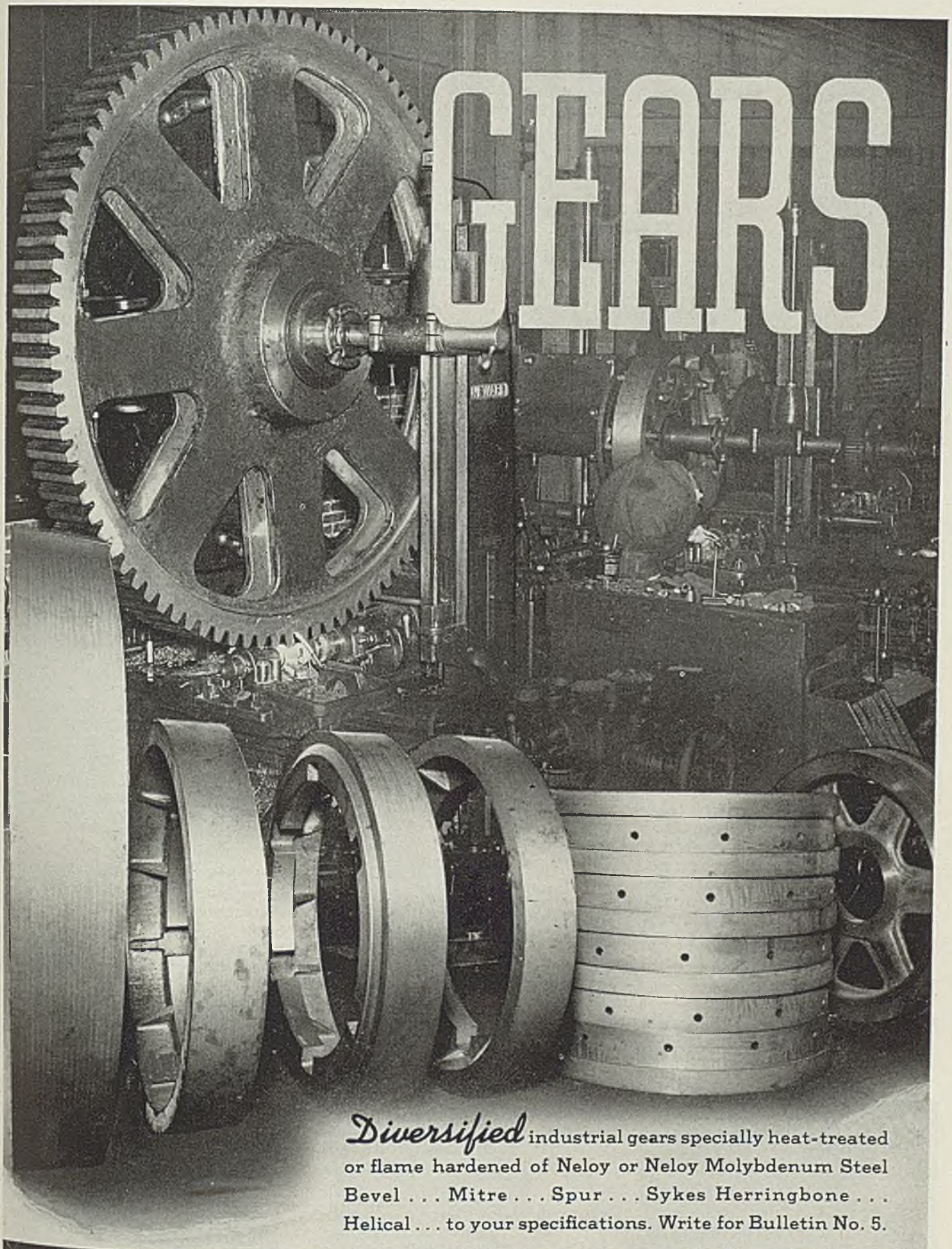
Radio Men Recognized

RCA communications group — Harold H. Beverage, Riverhead, L. I.; Irving F. Byrnes, Radiomarine Corp. of America, New York; Philip S. Carter, Rocky Point, L. I.; Murray G. Crosby, Riverhead, L. I.; James L. Finch, Rocky Point, L. I.; Clarence Weston Hansell, Rocky Point, L. I.; Fred H. Kroger, Rocky Point, L. I.; Nils Erik Lindenblad, Riverhead, L. I.; Harold O. Peterson, Riverhead, L. I.; George L. Usselman, Rocky Point, L. I.

General radio group—Dudley E. Foster, R.C.A. License Laboratories, New York; O. B. Hanson, National Broadcasting Co., New York; Gerrard Mountjoy, R.C.A. License Laboratories, New York; Walter Van B. Roberts, Radio Corp. of America, New York; Stuart W. Seeley, R.C.A. License Laboratories, New York; Arthur F. Van Dyck, R.C.A. License Laboratories, New York; Julius Weinberger, R.C.A. License Laboratories, New York.

Television group — Harley A. Iams, RCA Mfg. Co. Inc., Harrison, N. J.; Humboldt W. Leverenz, RCA Mfg. Co. Inc., Harrison, N. J.; Richard R. Orth, RCA Mfg. Co. Inc., Harrison, N. J.

Honorable mention—E. I. du Pont de Nemours & Co.; Charles Gerald Geary, Perth Amboy, N. J.; Dale Glendon Higgins, Newburgh, N. Y.; John Dorman McBurney, Newburgh, N. Y.; Walter Nebel, Parlin, N. J.; Alfred Siegel, Newark, N. J.

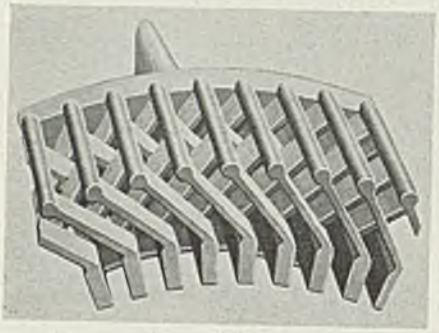


Diversified industrial gears specially heat-treated or flame hardened of Neloy or Neloy Molybdenum Steel Bevel . . . Mitre . . . Spur . . . Sykes Herringbone . . . Helical . . . to your specifications. Write for Bulletin No. 5.

NATIONAL-ERIE
CORPORATION
ERIE, PA., U.S.A.

Larger Cast Aluminum Rotors Used in Motor

■ General Electric Co., Schenectady, N. Y., announces Valv-Amp rotor which makes possible use of cast-aluminum rotors in larger sizes of double-squirrel-cage motors for



high-starting-torque, low-starting-current service. Without use of a switch or other moving parts, current is permitted to flow in outer squirrel-cage when motor is started, producing high-starting torque. When motor comes up to speed, current is allowed to flow through entire rotor winding, for good running characteristics.

Belt Vulcanizer

■ B. F. Goodrich Co., Akron, O., announces its 36-42 belt vulcanizer having platen 12 inches wide and long

enough to span a 36-inch belt when clamped on belt at 22½-degree angle. It also can be used on a 42-inch belt when placed across belt at 12-degree angle from line drawn at right angles to edge of belt. Thermostats maintain automatically proper temperature of 287 degrees Fahr.

Soldering Iron

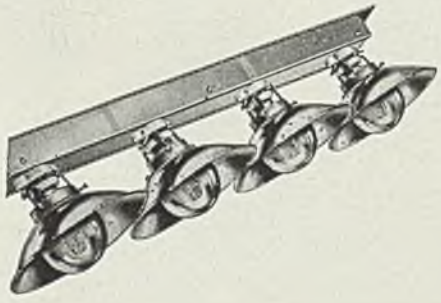
■ Hexacon Electric Co., Roselle Park, N. J., has introduced three electric, constant - duty soldering irons for industrial use. Element core cannot come loose or turn in

outer housing. Element is further protected by hexagon shaped housing, which can be held in a vise without denting. Nickel-chromium resistance wire and mica are used in element construction, and irons have extra flexible, twine braid cord.

Irons are respectively: 60-watt with ⅛-inch diameter tip listing at $5.50; 120-watt with ⅝-inch diameter tip at $7; and 170-watt with 1-inch diameter tip at $9.25.

Infra-Red Ray Drying Units

■ North American Electric Lamp Co., 1014 Tyler, St. Louis, has developed standard units of light banks having from three to eight lights for infra-red drying. Banks



are furnished complete with lights, reflectors and porcelain sockets mounted on rigid conduit and equipped with 12½ feet of rubber cord and plug. Individual lights and reflectors also are available.

Convertible Shovel

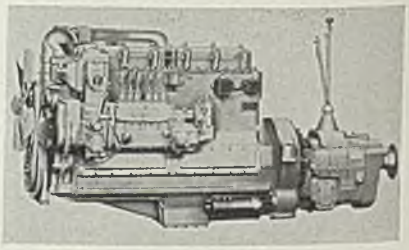
■ Paymaster convertible shovel of Lima Locomotive Works Inc., Shovel & Crane division, Lima, O., has a ¾-cubic yard shovel and weighs 35,000 pounds. Equipped as clamshell or dragline, capacity depends upon length of boom and material to be handled. As crane, it has 12-ton capacity. As a shov it has 18-foot boom and 15-foot di per handle. Standard crane boo

is 35 feet and inserts can extend it to 50 feet.

Machine revolves around pintle cast integral with base casting. All control levers are within cab and are of short easy throw. Rotating base is one-piece casting with machinery supports mounted with finished bolts. Main clutches are internal expanding band type. Crawler treads are 22 inches wide, and 30-inch treads are available.

Diesel Truck Engine

■ The 90-horsepower diesel truck engine announced by Caterpillar Tractor Co., Peoria, Ill., is a 6-cylinder, 4-stroke valve-in-head water-cooled model with a 4¼-inch bore



and 5½-inch stroke. Maximum horsepower is developed at 1800 revolutions per minute. Maximum torque is 305 pound-feet at 900 revolutions per minute. Piston displacement is 468 cubic inches.

Engine fuel system features solid injection into precombustion chambers. All injection pumps and valves are factory set. Pistons are aluminum alloy. Cylinder head, block and crankcase unit are cast alloy iron. Water circulation is by pump, with operating temperature of water controlled by thermostat. Air-cooled type lubricating oil cooler is provided. Connecting rod bearings are of 2⅝-inch diameter and are 1⅞ inches long. Crankshaft torsional vibration damper is furnished.

Disconnecting Switch

■ Albert & J. M. Anderson Mfg. Co., 289 A street, Boston, announces a disconnecting switch of large area, high pressure contact type. It em-

ploys operating mechanism which applies pressure so operation is

easy. Various types of single and multipole construction are available for ordinary voltages and for current capacities from 2000 amperes up. Switches can be furnished for single-pole or gang operation either local or remote control.

Wheel Shank Support

■ Dumore Co., Racine, Wis., offers mounted wheel shank support for quick, efficient internal grinding with small diameter wheels in small

diameter holes. Tapered support slips over wheel shank and is claimed to minimize possibility of "whip." Shank is 2 11/16 inches long, 0.2204-inch in diameter at its larger end and has ¾-inch per foot taper.

Welded Steel Kettles

■ Treadwell Construction Co., Midland, Pa., has introduced a line of all-welded steel refuse kettles of fire-box quality for use in smelting,

refining, steel, chemical and other industries. Rated capacity of kettles is 19½ cubic feet. Inside diameter at top is 42 inches and inside depth 24 inches. Top flange, 1½ inches thick, is slotted to receive swing bolts. Bottom is a standard A. S. M. E. ellipsoidal head of ⅝-inch plate.

Coating Thickness Gage

■ Aminco-Brenner Magne-Gage of American Instrument Co., Silver Spring, Md., now has interchangeable magnets of different types for measuring local thickness of coatings on metals by magnetic method. Gage is said to measure nickel coatings up to 0.001-inch thick on nonmagnetic base metals; nonmagnetic, metallic or organic coatings up to 0.025-inch thick on iron or steel; and polished nickel coatings up to 0.002-inch thick on iron or steel. Accuracy is claimed to be plus or minus 10 per cent for coatings thicker than 0.0002-inch.

Stainless Steel Scale

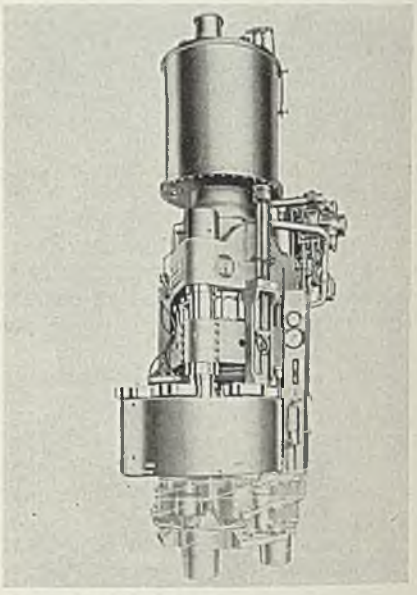
■ A corrosion-resisting scale of unpainted stainless steel, monel and 18-8 stainless with anodized aluminum chart is announced by Triner

Sales Co., 222 West North Bank drive, Chicago. Cups, drains, overlapping flanges and shields protect working parts against clogging with liquids. Platform is 15 x 16 inches with 3-inch up flange. Base of scale is 14 x 24 and overall height is 27½ inches. Scales have capacities of 30, 40, 50, 60, 70 and 100 pounds.

Cartridge-Case Heading Press

■ Hydraulic Press Mfg. Co., Mount Gilead, O., has introduced a turret-type cartridge-case heading press having three strain rods which permit 6-station turret to revolve clockwise around one of the rods so pressing position is directly beneath pressure ram and stations on either side can be used as work stations. Station preceding heading position can be used as an indenting station by placing an indenting tool on main platen. Station directly following heading position is ejecting station, and remaining three stations which are outside of press are used for loading.

Press platen has air-operated sliding toolholder accommodating two heading tools. Direct-current gear motor with magnetic brake automatically revolves turret. Cartridge cases are ejected by a hydraulic ram beneath turret ejecting station.



Manually operated air hoist with automatic clamping fixture lifts headed case clear of turret. Press cycle is semiautomatic.

Heading presses are available with maximum tonnages ranging from 550 to 3000 and accommodating shell sizes from 37 to 155 millimeters. Operating system is mounted overhead on a power bracket fastened to press head.

Telephone Booth

■ Designed by Acoustic division, Burgess Battery Co., 500 West Hu-

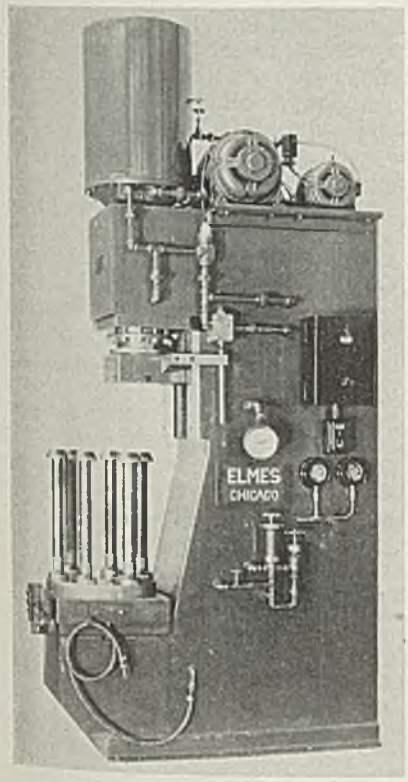
ron street, Chicago, this model 204 telephone booth is for use in in-

dustrial locations. It has no doors and is lined with heavy layer of sound absorbing material protected by perforated steel facing. Noises and disturbances are absorbed so completely by lining that telephone conversations can be carried on in ordinary tones.

Booth is of heavy gage, black finished steel for exterior walls. Interior walls are finished in gray. It is furnished complete with metal shelf for telephone, a small panel for ringer box and pull-chain overhead light. Booth is 79¾ inches high and 31 inches wide.

Metal Marking Press

■ Hydraulic metal marking press announced by Charles F. Elmes Engineering Works, 230 North Morgan street, Chicago, will die stamp any marking on metal pieces of a wide

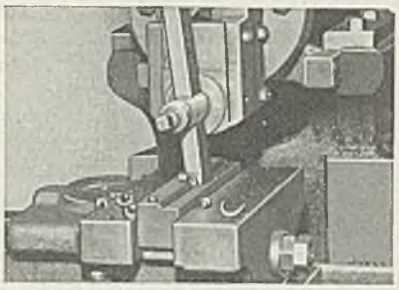


range of sizes and shapes at rate of 20 per minute.

Operation is fully automatic and is controlled by pushbuttons. Turn table with its six stations can be moved independently of ram and vice versa. Machine is arranged so it will not stamp a blank mandrel. Pressure may be released at a predetermined tonnage or after the die has marked the work to a specified depth. Range of pressure is controllable from 15 to 100 tons.

Tipped Shaper Tools

■ McKenna Metals Co., Latrobe, Pa., offers standard steel-cutting shaper tools tipped with Kennametal grade KS for use on shapers and planers to machine steel of



hardnesses up to 550 brinell. Tool angles employed are 10-degree negative back rake, 5-degree negative side rake, 15-degree side cutting edge angle and 2-degree clearances. These tool angles, made possible by low frictional resistance between Kennametal and work being cut, should be maintained when regrinding tools.

Less frictional heat, however, is developed than when high-speed steel tools with conventional high side rake angles are used.

Die blocks of 42 Rockwell C hardness may be hardened before machining with Kennametal, saving later grinding operation. Sizes of tools furnished will fit standard clapper boxes of shapers and planers.

Laying Lead Linings

(*Concluded from Page* 70)

tion should be used on lead-flanged joints. Lead pipelines must be supported along entire length and provided with expansion bends. Lead-lined steel pipe can be used to advantage under certain conditions. While original cost of such pipe is higher, cost of installation and the pipe supports is less.

Lead pipe coils used for cooling and heating purposes should have walls of suitable thickness and be supported adequately. Steam pressures up to 45 pounds commonly use coils of 1½ x 2½ inch lead pipe coiled on a 30-inch diameter. Vertical stiffening blocks about 2½ x 6 inches are burned together to form continuous vertical supports which should not be more than 18 inches apart.

To prevent uneven wall thickness, the pipe may be purchased coiled to approximate finished diameter. Uneven wall thickness often causes undue twisting and breaks in coils.

For steam pressures over 45 pounds, homogeneous lead-covered copper coils have been quite satisfactory. Valves and fittings are made from chemical lead with 6 per cent or more antimony, known as hard lead. Valves of straight flow Y or angle pattern are usually made with hard lead bodies, plugs and seats. Where solutions carry abrasive matter, the replaceable plugs and seats may be made of rubber or stainless steel for low temperatures or of high-silicon iron for high temperatures.

Of utmost importance in lead-lined equipment is the handling, placing and burning of the lead sheets, pipes and fittings. This work should be done only by experienced and qualified lead burners. Several lead burning contractors who guarantee their work can be found in almost any part of the country.

Hack Saw Blades

(*Concluded from Page* 57)

and all band saw blades must have highly flexible backs along with hardened teeth. To achieve this end, a novel piece of flame-hardening equipment has been designed and built here. As can be seen in Fig. 2, this unit is small, treating but one blade at a time.

However, it is continuous in operation. It consists of two stationary steel plate guides between which the blades pass with their teeth up. Two sets of small rollers at either end push and pull the blades to feed them through the unit. The teeth are exposed above the guides and are heated by three small blast-type gas burners firing down upon them. Quenching is accomplished by a stream of oil pouring down on the teeth where the blade leaves the guides.

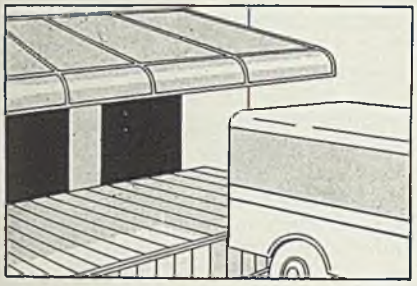
As there is about an inch of travel in cold air between the last burner and the quenching stream of oil, the teeth are heated to a temperature about 100 degrees Fahr. higher than that attained in the continuous furnace described above. This compensates for the cooling effect of the air travel. Temperature of the quenching oil ranges from 75 to 100 degrees Fahr., according to composition and thickness of the steel being treated.

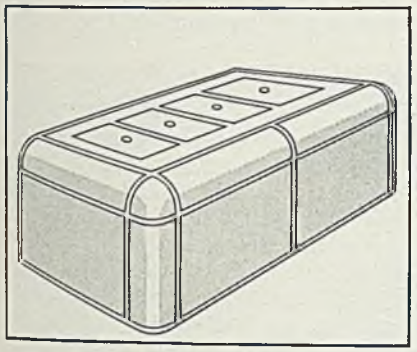
Next the flexible-back blades are drawn in the same oil bath as used for the regular run of hack saw blades mentioned above. Finally, the end of the blades are annealed to a dead softness so the eyes will not pull out. For this anneal, a slowly revolving drum with hooks to support each blade is provided with gas burners at each end. Blades are fed onto the hooks from a slide, the end protruding over the gas flames as the wheel rotates. Blades are discharged automatically into boxes at the low point in the wheel travel.

New Structural System

(*Concluded from Page* 52)

reduced by the new method due to its simplicity and ease of erection. Since all parts are fabricated on a mass production basis, this is another important cost-saving feature. Structures can be fabricated to within ⅛-inch of any desired dimension. Only tool necessary to erect them is a socket wrench.





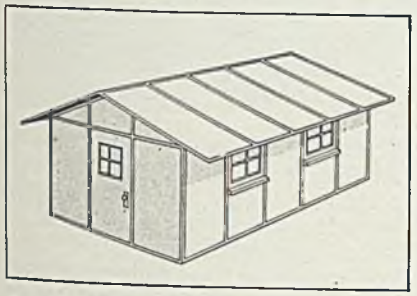


Fig. 7 (Top)—Here it is applied to a canopy over truck docks

Fig. 8 (Center)—Wide range of cabinet sizes made easily from few standard units

Fig. 3 (Bottom)—Pitched roofs not difficult with this construction

In mobile structures, an important advantage is that damaged sections can be replaced at nominal cost without disturbing other sections. Thus damaged trucks or freight cars can easily be repaired at low cost.

Use of the units is not limited to purpose for which they were originally purchased. Sections from one structure can easily be taken out and used in another entirely different structure. For example, a truck body can be dismantled and the parts used in making an industrial building, or vice versa. Similarly additions and dimensional changes are made easily. This extreme flexibility is quite desirable in many instances.

♦

Introduces Stainless Steel Electrode

■ New electrode, Stainweld D, announced by Lincoln Electric Co., 12818 Coit road, Cleveland, is for arc welding stainless steel of the 25 per cent chromium and 20 per cent nickel type. It also is used for welding various stainless steels to mild steel and for welding of steels which are air hardening and cannot be heat treated after welding.

Stainless D comes packed in 25-pound containers and is 11½ inches in length, in sizes of 3/32, ⅛, 5/32, 3/16 and ¼-inch.

Fan Assemblies

■ Heavy-duty, high-efficiency, six-blade fan assemblies in sizes from 30 to 72 inches are announced by William J. Lohman Inc., 62 Ninth avenue, New York. The hardened steel blades, balanced by weight before assembly, are said to be made from perfect stampings and forming dies. No drillouts, slugs or filling are needed to make them balance.

Trans-Shipping Plant

(*Concluded from Page* 60)

bridge at the extreme right which reclaims coal from storage. The yard hopper into which the bridge discharges is capable of taking about three loads from the 10-ton bucket.

This yard hopper also serves the receiving hopper at the extreme right end of the shuttle conveyor in Fig. 1 and shown in better detail in center foreground of Fig. 2.

From receiving hopper, coal is withdrawn by an apron feeder and discharged on the shuttle conveyor which deposits it in the hold of the vessel, Fig. 1. Coal passing over shuttle conveyor belt is automatically weighed and recorded.

In background of Fig. 1 can be seen two boat-unloading towers which are employed to unload the ocean-going boats from Sidney. Each tower has an off-bearing conveyor which builds up a cushion pile at the rear of these towers. The bridge picks up the coal from these cushion piles and builds up the storage to the right or places it in the yard hopper feeding the boat-loading shuttle conveyor.

When operating with the bridge reclaiming from the cushion crew can load around 1000 tons hour. When cushion pile is hausted, it is necessary to go b under the bridge for coal. Load is thus reduced to an average 800 tons per hour.

The shuttle conveyor is an tremely heavy unit and is novel that it has several modifications su as revolving and motorized sh tling features and employs a belt extra width to hold down the u load on the belt to avoid spilla Belt conveyor is electrified, the m tor being visible in Fig. 2. It h an automatic weightometer se overhead near the approximate ce ter of the conveyor in Fig. 2. Th is the unit that automatically weig and records amount of coal pasi over the conveyor.

Entire Loader Can Be Moved

Shuttle conveyor boom is ca ried on a turntable, Fig. 2. Tur table has wheels which engage rai permitting it to be moved up an down the docks easily by means o a haulage line which also locates th unloading towers and haulout car The entire boat-loading outfit ca be moved up and down the dock b this haulage line. In addition, th overhanging boom supporting th belt conveyor is revolved on th turntable by means of this same haulage line.

After belt conveyor has been lo cated at the point on the dock where it is to be used, outboard supports or jacks which are provided on the boom are run down to rest on a concrete pier paralleling the track and thus providing support for the overhung end of the boom. When it is desired to move the loader, these jacks are screwed back so they do not contact the pier and the haulage line is actuated to move the entire loader.

Where moved considerable distance, the carriage usually is swung 90 degrees so it clears the railway siding supporting the turntable. Before the carriage can be turned through these 90 degrees, it is necessary to bring in the shuttle about 30 feet, relieving the load on the girders. Then the undercarriage and shuttle is swung around to clear the towers and any cars which may be loaded on the siding between the tower tracks.

This installation is a heavy job throughout. Motors are oversize in each instance. A steel grille catwalk extends along both sides of the conveyor with similar platform around the weightometer. The operator's cab is fully enclosed and is mounted on the shuttle carriage with windows so the attendant has a clear full view of the dock at all times.

COPPER ALLOY BULLETIN

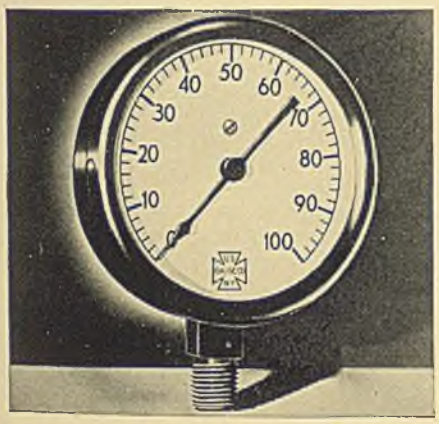
REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Brass and Bronze used In U.S. Pressure Gauges

The United States Gauge Company makes extensive use of brass and bronze in the manufacture of its popular line of indicating and recording pressure gauges.

Illustrated is the company's Type 500-S Gauge, which is widely used on steam boilers, engines, compressors, pumps, and water



supply systems. Brass supplied by Bridgeport is used in making the dials and sockets for these gauges.

Other uses for copper alloys in these gauges include bronze springs and tubes.

Memos on Brass—No. 7

The machinability of brass can be increased by the addition of lead. Bridgeport's Ledrite* Rod, a leaded brass, is exceptionally well suited to the requirements of high-speed automatic screw machinery. Ledrite Rod is a precision product, smooth in surface and accurate in dimensions. Its use frequently permits higher machine speeds.

Anodic Polishing May Offer Possibilities

Originally developed as a method of preparing samples for metallographic examination, anodic polishing is receiving increased attention as a possible industrial means for metal finishing.

Essentially, the method consists in making the metal to be polished the anode in an electrolyte bath. As the electrolyte attacks the metal, the surface irregularities are removed, leaving a brilliant surface.

Anodic polishing, it is said, is best adapted to pure metals or alloys of homogeneous structure, and requires careful control of electrolyte composition and current density. In general, it appears that anodic polishing is better adapted to copper and alpha brass than to bronzes or alpha-plus-beta brasses.

Brass Is Readily Cupped and Drawn When Proper Technique is Employed

Careful Attention to Tools and Lubricants Is Necessary to Produce Satisfactory Results

Brass of the correct alloy and temper is admirably adapted to the production of shapes by the cupping and deep drawing processes. Best results can be obtained by careful attention to the details of the technique used in the operations. Brass, because of its greater ductility and lower tensile strength compared to steel, requires a certain amount of additional care, particularly in the design and maintenance of tools and in the selection of drawing lubricants.

Difficulties in drawing brass are chiefly attributable to the tools and to retention of metal during cupping. Often *careful lapping of the die and punch and removing of sharp corners on the punch and die* will eliminate these difficulties.

Factors in Tool Design

Experience in the cupping of brass has shown that the following precautions are helpful:

1. Die radii should be relatively large.
2. Die radii should be highly polished and free from scratches. The polishing should be done in the direction in which the metal is flowing, and not circumferentially,which is perpendicular to the flow of metal. This reduces the resistance to an easy flow of metal into the die.
3. All holding surfaces should be polished or lapped. This also helps to cut down friction and prevent breakage in the die.
4. The press must be adjusted to give equal pressure on all holding surfaces. Pressure should be as high as possible without causing breaking. High pressures aid in preventing wrinkling.

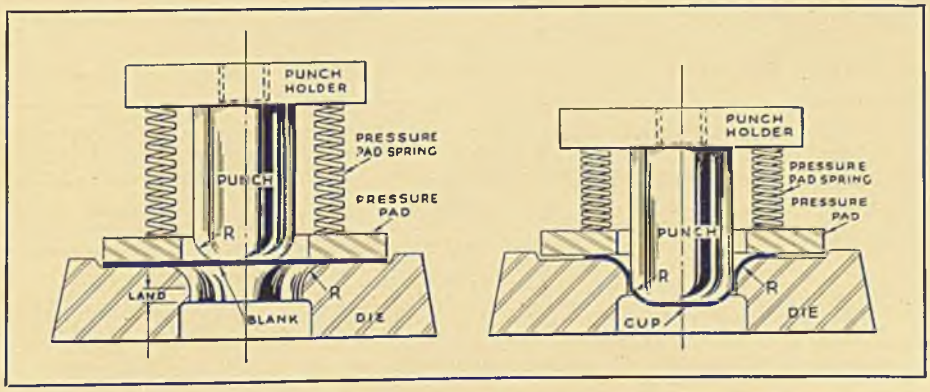
In general, heavy gauge metal, such as .040 gauge or heavier, requires a heavy lubricating oil—for example, lard oil or lard oil diluted with other lubricating oils. Lighter gauge metals—.025 or lighter—take lighter lubricants, such as soap water made up from soap chips, the concentration depending on the job. Some of the various combinations of oil and soap compounds can be used in water solutions for light, medium, or heavy work.

Importance of these factors is clearly illustrated by the case of a recent typical investigation made by Bridgeport metallurgists. A manufacturer accustomed to drawing steel undertook some brass cupping, and found that the brass broke on one corner of a rectangular cup. A check by Bridgeport showed that the brass had the proper surface and temper. Further study showed that tools were rough and that the operator was using the cutting oil previously used on steel. As a result, excessive friction was encountered in pulling the brass over the punch and through the die. Retention of the metal at the pressure pad resulted in breakage. Correction of these defects gave an entirely satisfactory job.

Correct Brass Selection

Correct selection of brass is equally important. If the brass is too soft, a rough (orange peel) cup may be produced, which may break off at the corners, since overannealed brass has a lower tensile strength than brass with a smaller grain structure. Where the metal is shaped without appreciable reduction in gauge at the wall of the cup, a fine-grained brass, annealed at low temperature, is best, since such an operation requires a very strong metal to prevent breaking.

(Continued on Following Page, Column 2)



These two views illustrate the cupping process. At left is seen the position of the punch before cupping. At right is shown the position of the punch during cupping.

COPPER ALLOY BULLETIN

ALLOYS OF COPPER

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

LOW BRASS

Low Brass is produced in the form of sheet, wire, and tubing as regular commercial practice. Low Brass, however, is not so generally used as the 85-15 alloy (Rich Low Brass). The color of Low Brass is only slightly redder than High Brass, and for this reason the alloy is not so valuable for cheap jewelry as the higher copper alloy. The mechanical properties are not materially different from those of High Brass, although they are superior to those of the higher copper alloys. The freedom from season cracking is greater than in the high brasses, but not so great as in the 85-15 alloy. From these points it may be seen that the 80-20 alloy is an intermediate alloy in several respects, and for this reason its uses are generally limited to those applications which require maximum strength and reasonable freedom from season cracking. One rather wide use of this alloy is in the production of thermostatic bellows.

Other uses for this alloy are those in which the combination of fair corrosion resistance and strength characteristics is necessary. In view of the higher cost of the 80-20 alloy compared with 70-30, relatively small quantities of the 80-20 are used.

The physical properties of the 80-20 alloy are given in the following table:

Specific Gravity	8.67
Density, lbs./cu. in.	.313
Electrical Resistance, ohms/circ. mil ft.	32.61
Electrical Conductivity, I. A. C. S.	31.8
Thermal Conductivity, cal./sq. cm./cm./sec./°C. at 20° C.	0.334
Thermal Conductivity, % copper	35.5%
Temperature Coefficient of Linear Expansion	0.0000100/°F.
Tensile Strength, lbs./sq.in.	
—Annealed Sheet	44,000-50,000
Hard	68,000-77,000
Elongation in 2 in.	
—Annealed Sheet	35-60%
Hard	2-10%
Standard Specification (A. S. T. M.)	B36-39T

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

Duronze III Widely Used for Valve Parts

Duronze* III, the high-strength silicon aluminum bronze manufactured by Bridgeport Brass Company, is being used in increasing quantities for making parts requiring high strength and corrosion resistance. A typical application is in the manufacture of valve parts, such as stems and bodies. In valve stems, Duronze III possesses the additional advantage of having a comparatively low coefficient of friction.

A technical bulletin describing in full detail the properties and applications of Duronze III may be obtained on request from Bridgeport Brass Company.

New Acid Treatment Brightens Copper

Bright surfaces can be produced on copper by immersion in an acid bath, it is claimed in a recent patent. The bath, according to the patent, is an aqueous solution of:

Concentrated sulphuric acid	80-20 parts
Concentrated nitric acid	20-80 parts
Hydrochloric acid	0.1-10 parts
Chromic acid	5-200 parts

Bridgeport will gladly refer readers to the holder of the patent.

Bichromate Dip

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

Sodium Bichromate	6 ounces
Sulphuric Acid	½ pint
Water to make	1 gallon

The dip is used at room temperature (70° F.) and the time is 5 to 10 seconds.

If action is too severe, the amount of sodium bichromate can be reduced to as low as 3 ounces per gallon.

All work immersed in this dip must be clean before dipping and must be thoroughly rinsed afterwards.

Brass Readily Cupped

(*Continued from Preceding Page, Column 3*)

The services of Bridgeport's laboratories are available for the solution of just such problems as these in the selection of brass of the correct temper and in the use of properly designed tools and choice of lubricants.

NEW DEVELOPMENTS

A new ointment is reported to be effective in healing sores caused by chromium plating solutions or fumes. Other ointments made by the same manufacturer are intended for the treatment of cyanide or nickel solution sores. **(No. 11)**

A portable sander is said to be equipped with a flexible sanding pad that closely simulates hand sanding motions. It has a self-contained motor and can be plugged into any outlet. **(No. 12)**

A patented coating method deposits a plating of tin on the surface of copper or copper alloys, it is said. Treatment is reported to use an alkaline aqueous solution of tin in stannous form, together with a cyanide. **(No. 13)**

A stock reel is operated by a solenoid that actuates a pawl lever. The lever in turn engages a ratchet wheel on the reel, thus imparting the required feeding motion to the reel, it is claimed. **(No. 14)**

An electric "nibbler" is said to be suitable for cutting all kinds of sheet metal. Manufacturer states that curves and circles with a radius as small as 1 inch can be cut successfully. Tool weighs only 3¾ pounds. **(No. 15)**

A new lathe for buffing and polishing is said to be compactly and ruggedly built. Lathe is also said to use a new method of changing V-belts. Any spindle speeds from 1,800 to 3,600 RPM can be secured. **(No. 16)**

A wire stripper of the power-driven brush type is said to be equipped with a vacuum attachment which draws the insulation material into a compartment in the base of the unit, thus eliminating dust and dirt. **(No. 17)**

A tubular anode for chromium plating is said to give unusually even throwing power. Maker recommends it particularly for the center anode bus-bars of a tank, because of the even current distribution on all sides. **(No. 18)**

A paced solder is said to permit substantial savings in soldering time, and to be suitable for use in hard-to-reach places. According to the maker, it is applied with an ordinary brush and melted with any heat source. Melting temperature is slightly above 400 Degrees F. It is reported to eliminate the need for soldering iron and melting pot, and to require no flux. **(No. 19)**

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.

More Stability Appears In Demand, Production

Broad upturn yet to appear in steel buying, but decline appears definitely checked. Structural orders up sharply

MARKET IN TABLOID ★

Demand
Holding or slightly heavier for most products.

Prices
Steady; reaffirmation expected for next quarter.

Production
Down 1½ points to 65½ per cent.

FINISHED steel demand generally is marking time. The recent decline appears to have been definitely checked, but changes for the better are too slight to be regarded as a complete reversal of the previous trend.

Ingot production still is giving ground, although last week's reduction of 1½ points to 65½ per cent was the smallest in six weeks. A year ago the rate was up 1 point to 56 per cent, practically the peak of 1939's first half, and at the end of last August the average was 64 per cent. Some districts will curtail operations further this week. Since orders still are short of production, no marked revival in steelmaking is in immediate prospect, despite the likelihood of a steadier trend than has prevailed so far this year.

Possibilities of improved steel buying are aided by steady curtailment in consumers' inventories and by the approach of seasonal expansion in requirements of some industries. Railroad equipment markets are more active, but freight car and locomotive buying must increase further to offset completion of orders placed last fall. Building and engineering construction soon should be reflected in better activity in shapes, reinforcing bars and pipe.

February pig iron production averaged 101,648 gross tons daily, off 12 per cent from January but 38 per cent larger than a year ago.

Automobile production continues relatively active. Last week's assemblies of 100,855 units represented a drop of 1715 from the week before, but the curtailment was not general. Operations of the three leading interests were steady or higher, independent makers accounting for all of the reduction. Output a year ago was 78,705 units.

Steel buying is more active in number of orders than in total tonnage. Business includes a fairly large number of fill-in purchases to balance stocks. In some products such buying is increasing, pointing to continued reduction in inventories.

Freight car awards involved more than 1000 units. New York Central has placed 500 hopper cars, and General American Transportation Corp. will build 500 refrigerator cars for its own use. The government and two other roads have closed on 87 units of various types. Pending business, in addition to 1000 cars for the New York Central, includes 1200 to 1250 box and hopper cars for the Gulf, Mobile & Northern.

Structural shape and concrete reinforcing bar orders last week jumped sharply to nearly the best level this year. Principal item was a Queens, N. Y., viaduct involving 13,250 tons of structurals and 1120 tons of reinforcing material. Other large awards include 9600 tons of shapes and 1370 tons of bars for a grade crossing, Rockaway, N. Y.; 5000 tons of shapes and 1300 tons of bars for a war department building, Washington; 3000 tons of shapes for a grade crossing, Dunkirk, N. Y.; and 1950 tons for a borough hall, Queens, N. Y.

Export business in steel products continues in the best volume since the last major European war but holds well below the peak of the 1914-1918 period.

Action of the scrap market suggests a leveling off in steelmaking. Demand is quiet, but prices are steady, except for a few minor irregularities. These left the steelworks scrap composite unchanged last week at $16.67, compared with $15.50 just prior to last September's sharp advance.

Tin plate production continues to moderate, contrary to the usual trend for this period. Operations last week were down 2 points to 56 per cent.

Finished steel prices remain steady, and the announcement soon of second quarter quotations is arousing little interest among buyers. Extension of present prices into next period generally is expected. Wire producers are adopting new extras for second quarter, these affecting coated products principally and being designed to reflect changes in manufacturing costs.

A 4½-point reduction to 59 per cent at Chicago largely was responsible for the latest decline in steelmaking. Several other districts also retrenched, including declines of 3 points to 65 in eastern Pennsylvania, 9 points to 58 at Buffalo, 7 points to 56 in New England and 2 points to 57 at Cincinnati. Gains of 3 points to 71 and 2 points to 94 occurred at Cleveland and Detroit, respectively. Unchanged were Pittsburgh at 63, Wheeling at 94, Birmingham at 90, Youngstown at 40 and St. Louis at 63½.

COMPOSITE MARKET AVERAGES

	Mar. 2	Feb. 24	Feb. 17	One Month Ago Feb., 1940	Three Months Ago Dec., 1939	One Year Ago Mar., 1939	Five Years Ago Mar., 1935
Iron and Steel	$36.83	$36.83	$37.00	$36.97	$37.18	$36.40	$32.36
Finished Steel	56.10	56.10	56.10	56.10	56.10	56.50	54.00
Steelworks Scrap..	16.67	16.67	16.79	16.98	17.88	14.98	10.75

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

	Mar. 2, 1940	Feb. 1940	Dec. 1939	Mar. 1939
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.25
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Chicago	2.30	2.15	2.15	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.225	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.15
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.15
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.00	2.00	1.98	1.92

Pig Iron

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

Scrap

Heavy melting steel, Pittsburgh	$17.25	$17.75	$18.50	$15.75
Heavy melt. steel, No. 2, E. Pa.	16.00	16.31	17.60	13.375
Heavy melting steel, Chicago	15.75	15.75	16.25	14.25
Rails for rolling, Chicago	18.25	18.25	19.75	17.25
Railroad steel specialties, Chicago	18.50	18.50	18.50	16.25

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 points	2.60c

Cold Rolled

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

Galvanized No. 24

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

Black Plate, No. 29 and Lighter

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

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

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

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

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

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30 50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp.	22.00	22.50	32.00	52.00

Steel Plate

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

Steel Floor Plates

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

Structural Shapes

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

Tin and Terne Plate

Tin Plate, Coke (base box)

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

Mfg. Terne Plate (base box)

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

Bars

Soft Steel

(Base, 20 tons or over)

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

Rail Steel

(Base, 5 tons or over)

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

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

Iron

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

Reinforcing

*New Billet Bars, Base**

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

*Rail Steel Bars, Base**

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

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

Wire Products

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

Standard and cement coated wire nails	$2.55
(Per pound)	
Polished fence staples	2.55c
Annealed fence wire	3.05c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	67
Single loop bale tier, (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	2.65c
Spring wire	3.20c

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

Cut Nails

Carload, Pittsburgh, keg..$3.85

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem Detroit, delivered 2.70c 2.80c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20
4100	0.15 to 0.25 Mo.		0.55
4600	0.20 to 0.30 Mo. 1.50-2.00 Ni.		1.10
5100	0.80-1.10 Cr.		0.45
5100	Cr. spring flats		0.15
6100	bars		1.20
6100	spring flats		0.85
Cr. N., Van.			1.50
Carbon Van.			0.85
9200	spring flats		0.15
9200	spring rounds, squares		0.40

Electric furnace up 50 cents.

Strip and Hoops

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

Hot Strip, 12-inch and less

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

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

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

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

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

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

Cents per pound

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

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

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, 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	2.90c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural	3.40c
⅛-inch and under	65-10 off

Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off

Welded Iron, Steel Pipe

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

Butt Weld

Steel

In.	Blk.	Galv.
⅛	63½	54
¼	66½	58
1—3	68½	60½

Iron

¼	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

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

Iron

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

Line Pipe

Steel

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

Iron

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

Boiler Tubes

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

Lap Welded

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

Seamless

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

Cast Iron Pipe

Class B Pipe—Per Net Ton

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

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

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

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

Forging Quality Billets

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

Sheet Bars

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

Wire Rods

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

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

Skelp

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

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$4.35- 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	6.75c

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

Sulphate of ammonia	$28.00

Pig Iron

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

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

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

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.31	25.31	24.81	25.81
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.	$27.0
Pitts. dist. fur.	22.50	do., del. Chicago	30.3
		Lyles, Tenn.	26.5

†Silvery

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

Bessemer Ferrosilicon†

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

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

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

Refractories

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

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

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

Second Quality

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

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Domestic dead - burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$50.00
Chem. bonded chrome	50.00
Magnesite brick	72.00
Chem. bonded magnesite	61.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	22.00
Do. barge	22.00
No. 2 lump	22.00

Ferroalloy Prices

Ferromanganese, 78-82%, lump and bulk, carlots tide., duty pd. $100.00
Ton lots 110.00
Less ton lots 113.50
Less 200 lb. lots 118.00
Do., carlots del. Pitts. 105.33

Spiegeleisen, 19-21% dom.
Palmerton, Pa., spot 32.00
Do., 26-28% 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 82.00
Do., 75 per cent 126.00
Do. ton lots 142.00
Spot, $5 a ton higher.

Silicomanganese, c.l., 2½ per cent carbon, 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 2.00-2.10

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del.

	Carloads	Ton lots	Less ton
carlots			11.00c
Do., ton lots			11.75c
Do., less-ton lots			12.00c
67-72% low carbon:			
2% carb.	17.50c	18.25c	18.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, freight allowed, lb. spot carlots, bulk 7.00c
Do., ton lots 7.50c
Do., less-ton lots 7.75c
Do., less 200 lbs. 8.00c
Spot, ¼c higher.

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 84.00c
Do., spot 89.00c
88% chrome, contract 83.00c
Do., spot 88.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $69.50
Ton lots 79.50
Less-ton lots, lb. 3.75c
Less 200 lb. lots, lb. 4.00c
Spot ¼-cent higher.

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton $97.50
Do, spot 102.50

34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. $2.60
200-lb. kegs, lb. 2.75
Do, 100-200 lb. lots 3.00
Do, under 100-lb. lots

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.98	4.16	5.16	3.85	3.85	5.66	3.81	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	4.50	3.51	4.09	8.59	7.19
Philadelphia	3.85	3.85	4.35	3.55	3.55	5.25	3.55	4.55	4.75	3.51	4.06	8.56	7.16
Baltimore	3.95	4.05	4.45	3.70	3.70	5.25	3.55	....	5.05	....	4.05	....	....
Norfolk, Va.	4.15	4.25	....	3.90	3.90	5.45	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	6.40	4.20	4.40	4.50	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.75	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.72	3.20	3.75	8.15	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.84	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.67	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.85	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	5.00	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.98	3.54	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.95	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.68	3.75	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.71	....	4.69	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.88	3.45	....	4.75	....	4.43	....	....
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	....	4.80	5.00	4.60	....	....
Houston, Tex.	4.05	6.20	6.20	4.05	4.05	5.75	4.20	....	5.25	....	....	....	....
Seattle	4.00	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	4.65	6.45	4.00	4.00	6.40	4.30	6.50	5.25	....	6.60	10.65	9.80
San Francisco	3.50	4.00	6.00	3.35	3.35	5.60	3.40	6.40	5.15	....	6.80	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	4.10	7.31	5.86	5.61	8.56
Baltimore	4.10	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.48	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 300-4999 in San Francisco, Portland; any quantity in Twin Cities; 300-1999 in Los Angeles.

Galvanized Sheets: Base, any quantity in New York, 150-1499 pounds in Cleveland, Milwaukee, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-4999 in Portland, Seattle, San Francisco; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, St. Louis, Tulsa; 1500 and over in Chattanooga, Philadelphia; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Feb. 29

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports: £ s d	Quoted in dollars at current value	Continental Channel or North Sea ports, gross tons: £ s d	**Quoted in gold pounds sterling
Foundry, 2.50-3.00 Si.	$23.70 6 0 0	$33.23	3 18 0	
Basic bessemer	....	19.59	2 6 0N	
Hematite, Phos. .03-.05	24.69 6 5 0	....	....	
Billets	....	$31.95	3 15 0	
Wire rods, No. 5 gage	....	61.34	7 4 0	
Standard rails	$41.48 10 10 0	$48.99	5 15 0	
Merchant bars	2.41c 13 9 0	2.76c	7 5 0	
Structural shapes	2.17c 12 2 6	2.87c	7 11 0	
Plates, +¼ in. or 5 mm.	2.30c 12 17 6	3.24c	8 10 6	
Sheets, black, 24 gage or 0.5 mm.	3.04c 17 0 0	2.98c	7 17 0°	
Sheets, gal., 24 ga., corr.	3.49c 19 10 0	4.47c	11 15 0	
Bands and strips	2.19c 12 5 0N	2.76c	7 5 0	
Plain wire, base	3.49c 19 10 0N	3.23c	8 10 0	
Galvanized wire, base	4.16c 23 5 0N	3.90c	10 5 0	
Wire nails, base	....	3.71c	9 15 0	
Tin plate, box 108 lbs.	$6.44 1 12 6	....	....	

British ferromanganese $100.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich §§Mark	
Fdy. pig iron, Si. 2.5.	$21.92	5 11 0(a)	$17.65	788	$29.49	875	$25.33	63
Basic bess. pig iron	20.64	5 4 6(a)	....	....	26.96	800	27.94 (b)	69.50
Furnace coke	7.01	1 11 8	5.04	225	10.45	310	7.64	19
Billets	37.03	9 7 6	26.05	1,163	42.97	1,275	38.79	96.50
Standard rails	2.00c	11 3 0	1.59c	1,588	2.06c	1,375	2.38c	132
Merchant bars	2.51c	14 0 0††	1.45c	1,454	2.06c	1,375	1.98c	110
Structural shapes	2.23c	12 8 0††	1.41c	1,414	2.06c	1,375	1.93c	107
Plates, +¼-in. or 5 mm.	2.24c	12 10 6††	1.85c	1,848	2.42c	1,610	2.29c	127
Sheets, black	3.13c	17 10 0§	2.19c	2,193‡	2.85c	1,900‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.58c	20 0 0	2.85c	2,850	4.80c	3,200	6.66c	370
Plain wire	3.49c	19 10 0	2.34c	2,340	3.00c	2,000	3.11c	173
Bands and strips	2.64c	14 15 0††	1.63c	1,632	2.18c	1,450	2.29c	127

†British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions. N—Nominal.

**Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1	16.00-16.50
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	15.50-16.00
Chicago, auto. no alloy	14.50-15.00
Chicago, No. 2 auto	12.50-13.00
Cincinnati dealers	12.50-13.00
Cleveland, No. 1	16.00-16.50
Cleveland, No. 2	15.00-15.50
Detroit, No. 1	†12.50-13.00
Detroit, No. 2	†11.50-12.00
Eastern Pa., No. 1	17.00-17.50
Eastern Pa., No. 2	16.00
Federal, Ill.	13.25-13.75
Granite City, R. R.	14.25-14.75
Granite City, No. 2	13.25-13.75
Los Ang., No. 1, net	12.50-13.00
Los Ang., No. 2, net	11.50-12.00
L. A., No. 1 f.a.s.	16.00-17.00
L. A., No. 2 f.a.s.	15.00-16.00
N. Y. dock No. 1 exp.	14.00
Pitts., No. 1 (R. R.)	18.00-18.50
Pittsburgh, No. 1	17.00-17.50
Pittsburgh, No. 2	16.00-16.50
St. Louis, R. R.	†14.25-14.75
St. Louis, No. 2	†13.25-13.75
San Fran., No. 1, net	12.50-13.00
San Fran., No. 2, net	11.50-12.00
Seattle, No. 1	14.50-15.50
Toronto, dirs., No. 1	11.00
Valleys, No. 1	16.50-17.00

COMPRESSED SHEETS

Buffalo, new	15.00-15.50
Chicago, factory	15.00-15.50
Chicago, dealers	13.50-14.00
Cincinnati, dealers	12.00-12.50
Cleveland	15.50-16.00
Detroit	†13.00-13.50
E. Pa., new mat.	17.00-17.50
E. Pa., old mat.	14.00-14.50
Los Angeles, net	10.50-11.00
Pittsburgh	17.00-17.50
St. Louis	†10.50-11.00
San Francisco, net	10.50-11.00
Valleys	16.00-16.50

BUNDLED SHEETS

Buffalo, No. 1	14.50-15.00
Buffalo, No. 2	13.00-13.50
Cleveland	11.50-12.00
Pittsburgh	16.00-16.50
St. Louis	†8.50- 9.00
Toronto, dealers	9.75

SHEET CLIPPINGS, LOOSE

Chicago	10.00-11.00
Cincinnati, dealers	8.00- 8.50
Detroit	†9.00- 9.50
St. Louis	†8.00- 8.50
Toronto, dealers	9.00

BUSHELING

Birmingham, No. 1	13.00
Buffalo, No. 1	14.50-15.00
Chicago, No. 1	14.50-15.00
Cincin., No. 1, deal.	9.00- 9.50
Cincin., No. 2 deal.	3.00- 3.25
Cleveland, No. 2	9.50-10.00
Detroit, No. 1, new	†12.00-12.50
Valleys, new, No. 1	15.50-16.00
Toronto, dealers	5.50- 6.00

MACHINE TURNINGS (Long)

Birmingham	5.00
Buffalo	10.00-10.50
Chicago	9.25- 9.75
Cincinnati, dealers	5.00- 5.50
Cleveland, no alloy	8.50- 9.00
Detroit	†7.00- 7.50
Eastern Pa.	10.00-10.50
Los Angeles	4.00- 5.00
New York	†6.50- 7.00
Pittsburgh	10.50-11.00
St. Louis	†6.00- 6.50
San Francisco	5.00
Toronto, dealers	6.75- 7.00
Valleys	10.50-11.00

SHOVELING TURNINGS

Buffalo	12.50-13.00
Cleveland	9.50-10.00
Chicago	9.50-10.00
Chicago, spcl, anal.	12.50-13.00
Detroit	†8.50- 9.00
Pitts., alloy-free	12.00-12.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	†4.50
Buffalo	10.50-11.00
Cincinnati, dealers	3.75- 4.25
Cleveland	9.50-10.00
Eastern Pa.	9.50
Detroit	†7.25- 7.75
New York	†5.75- 6.00
Pittsburgh	8.00- 8.50
Toronto, dealers	6.00

AXLE TURNINGS

Buffalo	16.50-17.00
Boston district	†9.50-10.00
Chicago, elec. fur.	16.50-17.00
East. Pa. elec. fur.	16.50-17.00
St. Louis	†10.00-10.50
Toronto	6.00- 6.50

CAST IRON BORINGS

Birmingham	7.50
Boston dist. chem.	†8.00- 8.50
Buffalo	10.50-11.00
Chicago	9.25- 9.75
Cincinnati, dealers	3.75- 4.25
Cleveland	9.50-10.00
Detroit	†7.25- 7.75
Chemical	14.50-15.00
New York	†7.00
St. Louis	†5.00- 5.50
Toronto, dealers	6.25- 6.50

RAILROAD SPECIALTIES

Chicago	18.25-18.75

ANGLE BARS—STEEL

Chicago	17.50-18.00
St. Louis	†14.50-15.00

SPRINGS

Buffalo	19.50-20.00
Chicago, coil	18.50-19.00
Chicago, leaf	17.50-18.00
Eastern Pa.	21.00-21.50
Pittsburgh	20.50-21.00
St. Louis	†16.25-16.75

STEEL RAILS, SHORT

Birmingham	16.00-16.50
Buffalo	21.50-22.00
Chicago (3 ft.)	18.00-18.50
Chicago (2 ft.)	18.50-19.00
Cincinnati, dealers	19.00-19.50
Detroit	†19.50-20.00
Pitts., 3 ft. and less	20.50-21.00
St. Louis, 2 ft.& less	†18.00-18.50

STEEL RAILS, SCRAP

Birmingham	15.50
Boston district	†14.00-14.50
Buffalo	17.00-17.50
Chicago	16.00-16.50
Cleveland	18.50-19.00
Pittsburgh	18.50-19.00
St. Louis	†15.25-15.75
Seattle	18.00-18.50

FROGS, SWITCHES

Chicago	†15.25-15.75
St. Louis, cut	15.50-16.00

PIPE AND FLUES

Chicago, net	10.00-10.50
Cincinnati, dealers	9.75-10.25

RAILROAD GRATE BARS

Buffalo	11.50-12.00
Chicago, net	10.00-10.50
Cincinnati, dealers	8.50- 9.00
Eastern Pa.	15.00
New York	†10.50-11.00
St. Louis	†10.00-10.50

RAILROAD WROUGHT

Birmingham	14.00
Boston district	†9.50-10.00
Eastern Pa., No. 1	18.00-18.50
St. Louis, No. 1	†10.25-10.75
St. Louis, No. 2	†13.25-13.75

FORGE FLASHINGS

Boston district	†10.00-10.25
Buffalo	14.50-15.00
Cleveland	15.00-15.50
Detroit	†11.50-12.00
Pittsburgh	15.50-16.00

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	18.00-18.50

LOW PHOSPHORUS

Cleveland, crops	21.50-22.00
Eastern Pa. crops	21.00-21.50
Pitts., billet, bloom, slab crops	21.50-22.00

LOW PHOS. PUNCHINGS

Buffalo	19.50-20.00
Chicago	17.50-18.00
Cleveland	17.50-18.00
Eastern Pa.	21.50-22.00
Pittsburgh	19.50-20.00
Seattle	15.00
Detroit	†13.25-13.75

RAILS FOR ROLLING

5 feet and over

Birmingham	16.50
Boston	†15.75-16.00
Chicago	18.00-18.50
New York	16.00-16.50
Eastern Pa.	20.00-21.00
St. Louis	†17.50-18.00

STEEL CAR AXLES

Birmingham	19.00-20.00
Boston district	†16.00-16.50
Chicago, net	20.50-21.00
Eastern Pa.	22.00
St. Louis	†18.00-18.50

LOCOMOTIVE TIRES

Chicago (cut)	18.00-18.50
St. Louis, No. 1	†15.00-15.50

SHAFTING

Boston district	†17.00-17.25
New York	†18.00-18.50
Eastern Pa.	23.00-23
St. Louis, 1¼-3¾"	†16.50-17

CAR WHEELS

Birmingham, iron	16
Boston dist., iron	†13.00-13.
Buffalo, steel	21.00-21.
Chicago, iron	17.00-17.
Chicago, rolled steel	17.50-18.
Cincin., iron, deal.	16.50-17.
Eastern Pa., iron	20.00-20.
Eastern Pa., steel	21.00-21.
Pittsburgh, iron	18.50-19.
Pittsburgh, steel	20.50-21.
St. Louis, iron	†16.00-16.
St. Louis, steel	†16.00-16.

NO. 1 CAST SCRAP

Birmingham	15.
Boston, No. 1 mach.	†14.
N. Eng. del. No. 2	14.00-14.
N. Eng. del. textile	17.75-18.
Buffalo, cupola	16.50-17.
Buffalo, mach.	17.50-18.
Chicago, agri. net	12.50-13.
Chicago, auto net	14.50-15.
Chicago, railroad net	13.50-14.
Chicago, mach. net	14.00-14.
Cincin., mach. deal.	16.00-16.
Cleveland, mach.	20.00-21.
Detroit, cupola, net	†14.50-15.
Eastern Pa., cupola	19.50-20.
E. Pa., No. 2 yard	15.50-16.
E. Pa., yard fdry.	16.50-17.
Los Angeles	16.50-17.
Pittsburgh, cupola	17.50-18.
San Francisco	14.50-15.
Seattle	16.00-16.
St. Louis, breakable	†13.75-14.
St. Louis agri. mach.	†16.50-17.
St. L., No. 1 mach.	†17.00-17.
Toronto, No. 1, mach., net dealers	15.50

HEAVY CAST

Boston dist. break.	†12.25-12.50
New England, del.	15.00-15.50
Buffalo, break	14.50-15.00
Cleveland, break. net	15.25-15.75
Detroit, auto net	†15.50-16.00
Detroit, break	†11.00-11.50
Eastern Pa.	18.00-18.50
Los Ang., auto, net	13.00-14.00
New York break	†13.50-14.00
Pittsburgh, break	15.00-15.50

STOVE PLATE

Birmingham	10.00
Boston district	†10.50-11.00
Buffalo	13.50-14.00
Chicago, net	8.50- 9.00
Cincinnati, dealers	7.75- 8.25
Detroit, net	†9.00- 9.50
Eastern Pa.	15.00
New York fdry.	10.00
St. Louis	†11.00-11.50
Toronto dealers, net	11.50

MALLEABLE

New England, del.	21.00
Buffalo	16.50-17.00
Chicago, R. R.	18.50-19.00
Cincin., agri., deal.	13.25-13.75
Cleveland, rail	20.50-21.00
Eastern Pa., R. R.	21.50-22.00
Los Angeles	12.50
Pittsburgh, rail	21.00-21.50
St. Louis, R. R.	†16.00-16.50

Ores

Lake Superior Iron Ore

Gross ton, 51½ %

Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract.	9.00-10.00

Foreign Ore

(Prices nominal)

Cents per unit, c.i.f. Atlantic

Manganiferous ore, 45-55% Fe., 6-10% Mn.	14.00-15.00
Swedish low phos.	14.00
North African low phos.	14.00
Spanish, No. African basic, 50 to 60%	14.00
Chinese wolframite, short ton unit, duty paid	$23.00-23.50
Scheelite, imp.	$23.50-24.50
Chrome ore, 48% gross ton, c.i.f.	$26.00-28.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	48.00-50.00
So. African, 50-52%	48.00-50.00
Indian, 49-50%	nom
Brazilian, 48-52%	46.00-48.00
Cuban, 50-51%, duty free	61.20

Molybdenum

Sulphide conc., per lb., Mo. cont., mines	$0.75

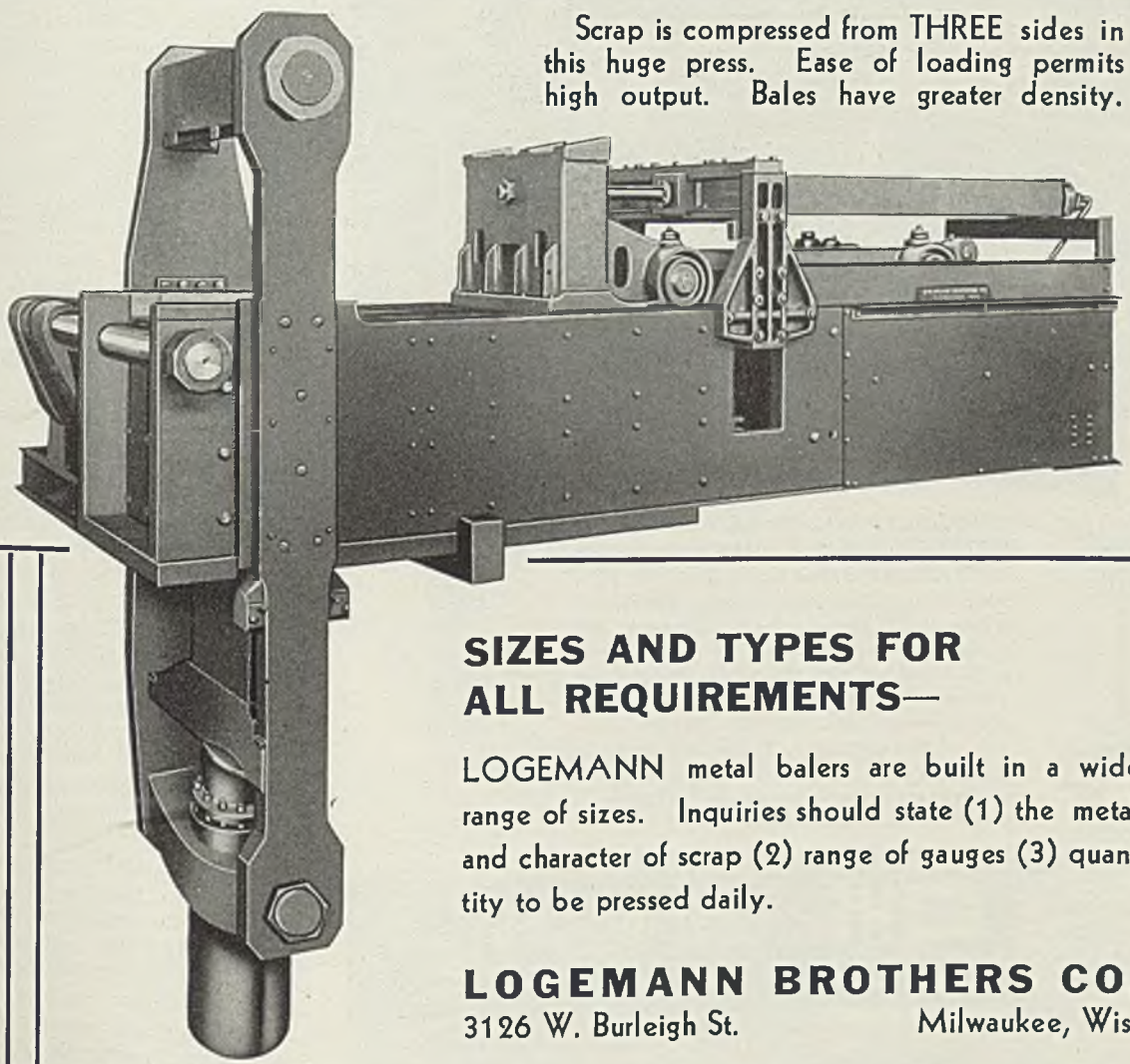
SHEET SCRAP?

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 88, 89

Pittsburgh—Although sheet mill operations still are declining slowly, the letdown in orders apparently has reached bottom. Automotive buying so far has been disappointing, but some fairly large inquiries promise better bookings by spring. Business fom warehouses still is slow, with improvement in galvanized demand seen with appearance of more favorable weather in rural areas. Prices are steady and are expected to be reaffirmed for next quarter.

Boston—More fill-in orders for narrow cold strip are appearing, although the increase in total tonnage is slight. Inventories of consumers are being lowered substantially. Some second quarter volume is being booked at open prices. Mill backlogs continue to decline, also shipments, although February deliveries by mills in this district were only about 10 per cent under January, one of the heaviest in a long period. Consumption shows a spotty improvement, more tonnage going to the automotive trade. Sheet demand is light, although more small gasoline service station tanks are up, 1000 and 550-gallon containers.

Chicago—Sheet and strip business shows no significant improvement, but prospects are believed good for early betterment, in view of reductions in consumers' stocks. Best sources of demand are automotive interests, agricultural implement makers, and domestic appliance manufacturers. Farm equipment requirements are active and fairly steady despite a tapering in some directions.

New York — Specifications are gaining slightly, following a fortnight when demand was only steady. Most improvement is coming from manufacturers, although warehouses are more active, which should be reflected in mill bookings later. Makers of household appliances are best consumers, some of them now being at a seasonal peak in operations. Stamping shops generally are specifying more freely. Prices on the whole are firm.

Some mills producing narrow cold strip are booking orders for April shipment at open prices while others are accepting business at current quotations, expecting no change next quarter. Buying has improved slightly, but most purchases are for fill-in needs which are increasing as inventories shrink.

Philadelphia—Eastern sheet sellers continue to take a firm stand on prices, several grades having successfully withstood severe tests. Automotive releases are slightly heavier. Several round lots are included in current miscellaneous business.

Buffalo—Slight improvement is noted in miscellaneous demand, but buying is insufficient to maintain present operations of around 70 per cent. Inquiries for strip are relatively better than for sheets, with galvanized demand lagging.

Cincinnati—Sheet and strip buying has been slightly above 50 per cent of rolling capacity. Automobile and refrigerator manufacturers are in the market, but business placed so far has been below expectations. Miscellaneous demand, except for galvanized which is slow, is well sustained.

St. Louis—With more open weather, heavier purchases of galvanized sheets are expected. Meanwhile, warehouses are deferring commitments until stocks have been reduced further.

Birmingham, Ala.—While buying of sheets, particularly roofing, has shown occasional gains, shipments

and backlogs tend downward. A comfortable output in strip, mostly cotton ties, is reported, but the volume is rather small.

Plates

Plate Prices, Page 88

Cleveland—Backlogs have moderated and deliveries have shortened, generally being three weeks or less. Only a small tonnage for freight car building and repairs remains to be shipped.

Chicago—Plate demand for freight cars ordered several months ago continues fairly active, but the outlook for additional business from that source is uncertain. Storage tanks, petroleum industry needs, bridge work and shipbuilding are other principal factors in demand.

Boston—Plate buying still lags with tank and specified work light. Bulk of buying is for miscellaneous needs, with prompt shipment asked. Less-than-car lots predominate. Boiler and structural shop buying is slow, and railroads are placing little business. Shipyard specifications are steady.

New York—Plate specifications have been sustained for more than two weeks. Seasonal influences soon may be expected to stimulate tank fabrication, while the railroad outlook is slightly better with placing of 500 hopper cars by the New York Central which also is inquiring for 1000 box cars and 25 locomotives. Plate backlogs for railroad equipment ordered last fall are nearing depletion.

Philadelphia—Pusey & Jones has distributed approximately 4500 tons of plates for two C-1 boats among six mills, with 2.10c, base, applying in all instances. Miscellaneous business last week was not up to expectations. Export orders include several round lots. Export prices are firm at 2.20c and 2.30c, f.a.s., the latter applying to Scandinavia.

Birmingham, Ala.—Plate production holds close to last quarter, although bookings are much less than output and shipments. Some backlog is still available, but is dwindling rapidly.

San Francisco—Some improvement in plate demand is noted and bids have just been taken on 450 tons of a 24-inch welded steel pipe line for the Sierra Light & Power Co., Reno, Nev. Bids open March 20 for close to 6000 tons for replacement work on the Los Angeles aqueduct, Los Angeles, involving large diameter welded steel pipe, with credit for salvaging 1466 tons of riveted steel pipe. Awards were

confined to lots of less than 100 tons and to date this year 15,292 tons have been placed, compared with 11,448 tons for the same period a year ago.

Toronto, Ont.—Inquiries continue to appear despite capacity bookings of Canadian producers. Much tonnage required for quick delivery is going to United States mills, with booking across the border for Canadian delivery reported around 10,000 tons. In addition, it is understood heavy purchases also will be made by Canadian shipbuilders on the Pacific coast in connection with the $10,000,000 in ship contracts placed there recently. Large plate orders also are expected with the placing soon of orders for freight cars.

Seattle—The outlook is improved as several important projects have developed. Richfield Oil Co. plans immediate construction of a marine storage terminal in Seattle, involving 11 steel storage tanks, total capacity 500,000 barrels. Awards will be placed soon by J. J. Downey, Los Angeles, engineer. Decision is expected in about 30 days on plan of Inland Refineries Inc., Spokane, Wash., to build a 320-mile crude oil line from Cut Bank, Mont., to Spokane, Wash.

Plate Contracts Placed

985 tons, four barges, 195 x 35 x 10 fe River Terminals Corp., New Orlean to Nashville Bridge Co., Nashvill Tenn.

630 tons, tunnel linings, Fort Peck dar to Chicago Bridge & Iron Co., Chicag through United States engineer o fice, Kansas City, Mo.

120 tons, 100,000-gallon standpip American Water Works & Electric Co Milton, Pa., to Graver Tank & Mf Co. Inc., East Chicago, Ind.

Plate Contracts Pending

6000 tons, 8-foot 6-inch to 10-foot 3 inch welded steel pipe; replacemen work on Los Angeles aqueduct, Lo Angeles; bids March 20.

488 tons, 24-inch ¼-inch welded stee pipe, Sierra Light & Power Co., Reno Nev.; bids opened.

Unstated, 11 steel storage tanks, 500,000 barrel capacity, for Richfield Oil Co terminal, Seattle; bids soon.

Unstated, reclamation bureau siphon, Deschutes river, Oreg.; bids soon.

Bars

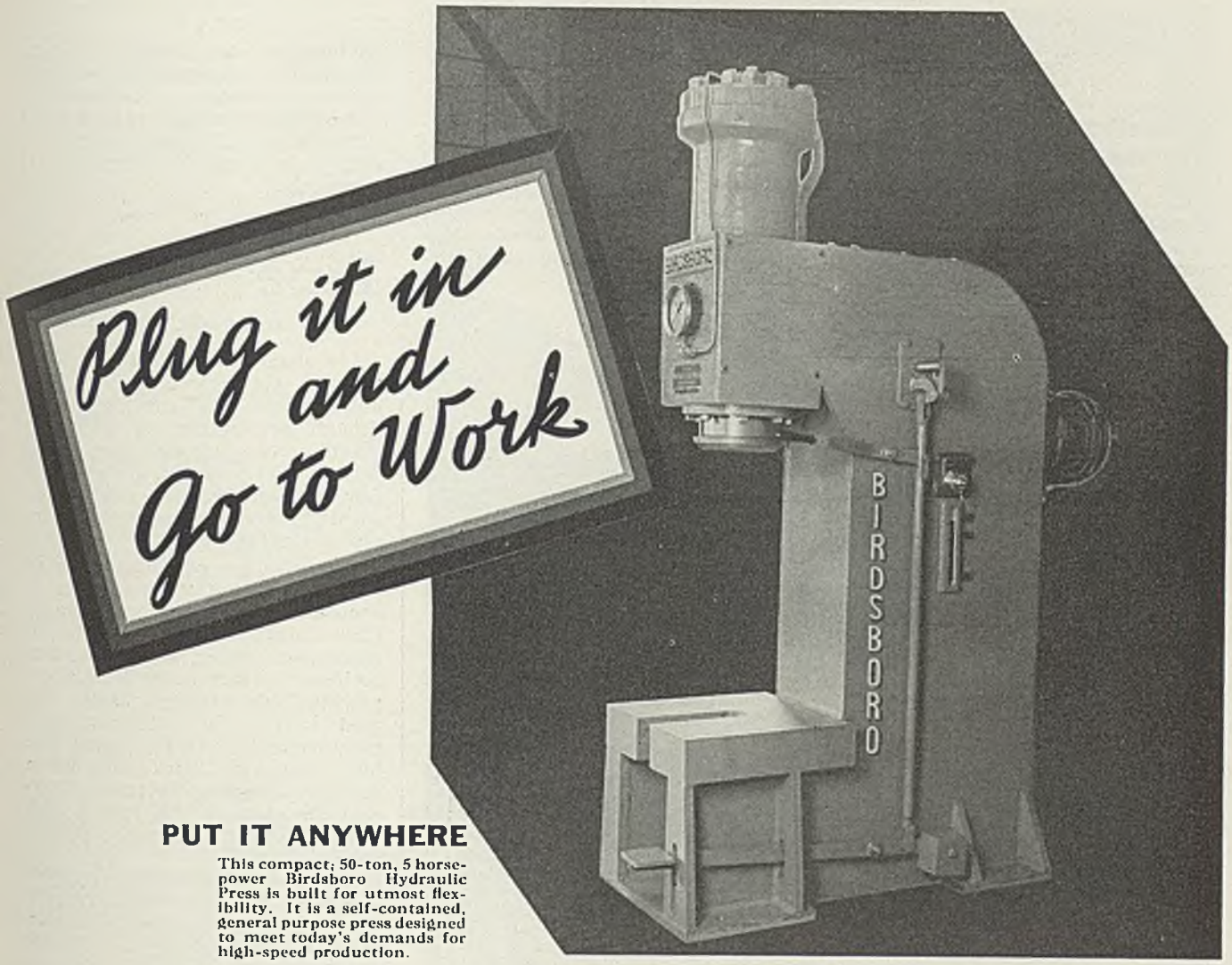
Bar Prices, Page 88

Cleveland — Demand is fairly steady, but buying makes a better showing in number of orders than in total tonnage. Consumption is somewhat spotty, with requirements relatively heaviest among machine tool builders and the automotive industry. Backlogs of the former again have been extended to the largest volume in recent years. Carbon bar deliveries average two to three weeks.

Chicago — Demand has flattened out at a rather low level, with some producers noting a slight upturn in orders and inquiries for certain grades. Consumers generally are reducing inventories, a situation expected to be reflected in buying the next 60 days, barring an unexpected letdown in manufacturing operation.

Boston—Demand for carbon steel bars is spotty and light. Consumption is less active and jobber stocks are generally sufficient to meet expected demand during the next few weeks, which will limit warehouse purchases to fill-in needs. Buying of alloys holds relatively well. Bids close March 5 on an additional tonnage of nickel-steel bars for chainmaking at the Boston navy yard. The Portsmouth yard closes the same day on nickel-copper bar stock.

New York—Bars continue most active of major heavy products. Shipments are fairly good, particularly to machine tool, textile machinery and airplane engine builders. Specifications for government account also are sustained, especially for cold-drawn and alloy bars. Av-



PUT IT ANYWHERE

This compact, 50-ton, 5 horsepower Birdsboro Hydraulic Press is built for utmost flexibility. It is a self-contained, general purpose press designed to meet today's demands for high-speed production.

Here's the self-contained, versatile hydraulic press you've been waiting for. All you have to do is plug it into your power lines and go to work.

This oil-operated, open-gap type, general purpose press is ideal for assembly, forcing and miscellaneous shop work and is equally adaptable to job lot or continuous production. Pressing speed is adjustable from a standstill to full speed by stepless increments. Mechanism provides for fast approach, for automatic slow-down to pressing speed at contact, and for quick return.

Controls are both foot and hand operated with automatic return to full open position when released. Overload protection is provided.

Made in all sizes, capacities and speeds, this hydraulic press is one of Birdsboro's most versatile and generally useful machines. Furthermore, due to Birdsboro's complete facilities for manufacturing hydraulic presses, they can be built and shipped in a hurry. Write for prices and specifications.

BIRDSBORO Hydraulic Presses

BIRDSBORO STEEL FOUNDRY AND MACHINE CO.

Plants at Birdsboro and Reading, Pa.
District Sales Offices: New York and Pittsburgh

Hydraulic Machinery • Steel Castings • Iron Castings
Steel, Alloy Steel, Grain & Chilled Rolls
Steel Mill Equipment • Special Machinery • Crushing Machinery

erage deliveries are two to three weeks on hot carbon bars, three to four for cold-drawn and four to five for alloy bars.

Birmingham, Ala.—Bar specifications have shown little improvement, but output is steady and considerable tonnage remains both from manufacturers of agricultural implements and concrete reinforcing bars.

Philadelphia—Practically all mills now can make prompt delivery on plain bars, but some delay still is noted on special alloys. Miscellaneous business continues fair, with prices steady in most directions. Italy is inquiring for bars.

Keystone Drawn Steel Co., Spring City, Pa., has been awarded 260,000 feet of alloy steel rod at 3.86c per foot, for Frankford arsenal, Philadelphia, on proposal 40-1128.

Buffalo—Bar mill schedules hold near the level of recent weeks. Buying is slow, but mills still have fairly large backlogs.

Semifinished

Semifinished Prices, Page 89

Pittsburgh — Semifinished steel shipments have dropped slightly although February as a whole was ahead of January. Inventories of nonintegrated mills are light, and consumption is being directly reflected in releases to semifinished producers.

Pipe

Pipe Prices, Page 89

Cleveland—Business in merchant pipe has yet to be influenced favorably by building construction, although an upturn in such consumption is indicated for coming weeks. Oil country goods are in fair demand despite a tendency toward moderation recently. Line pipe orders are small.

Boston—Cast pipe inquiry is up slightly and cities and towns in some instances are beginning to place blanket contracts for 1940 requirements which are expected to be less than last year. Utilities are placing little tonnage, having covered fairly well. Merchant steel pipe demand is spotty in small lots, held down by slack construction activity. Fueling systems at several air stations will take a moderate tonnage. Wrought pipe is slow.

New York—Despite little improvement in merchant pipe buying, a substantial gain is expected as soon as the weather moderates. Considerable private work is understood to be on engineers' boards, and a spurt in government-financed construction is looked for since contracts for the latter may have to be let before the end of the fiscal year in June.

Cast pipe buying is mostly in small lots. Financing is a factor in municipal budgets covering water line extensions and considerable work is held up until next month. New York city is expected to close on several thousand tons in April. Export inquiry is brisk.

Seattle—Volume of sales is at seasonal normal with prospects improved over a month ago. Several awards are pending, including 400 tons of 6 to 12-inch for Everett, Wash., and 140 tons of 16-inch for East Forty-fifth street, Seattle. Award is pending at Billings, Mont., for 540 tons. Toppenish, Wash., plans additions to water system and Port Townsend, Wash., will replace mains and also lay one mile of 4-inch pipe.

San Francisco—Movement of cast iron pipe in small lots is holding up well and numerous orders have been placed recently. Awards aggregated 818 tons and brought the total for the year to 4631, compared

with 5635 tons for the corresponding period of 1939.

Cast Pipe Placed

540 tons, 18-inch, Class B pipe, Billings, Mont., to unstated interest.

200 tons, 6-inch for Lewiston, Idaho, to Pacific States Cast Iron Pipe Co., Provo, Utah.

125 tons, 6 and 8-inch pipe, Lewiston, Idaho, to unstated interest.

100 tons or more, 8-inch, Marlboro, Mass., to Warren Pipe Co., Everett, Mass.

Cast Pipe Pending

100 tons, 6-inch, Panama, bids March 7, Washington.

Steel Pipe Placed

726 tons, 12¾ O. D. steel pipe, Inspiration-Consolidated Copper Co., Miami, Ariz.; divided between Republic Steel Corp., Cleveland, and Naylor Spiral Welded Pipe Co., Chicago.

Steel Pipe Pending

Unstated, 2700 feet 18 and 24-inch for Spokane, Wash.; bids March 7.

Wire

Wire Prices, Page 89

Pittsburgh—Revised extras have been announced on manufacturers' wire. The new schedule, affecting coated products principally, is intended to adjust selling prices in line with variations in manufacturing costs. Changes accompany a reduction in base price of galvanized wire to a parity with bright basic and bessemer wire, with increases in galvanizing extras. Revisions also have been made in size extras on larger sizes. Other changes affect size and finish extras on high carbon spring wire and stapling wire. Dated March 1, the new schedule is effective on all second quarter shipments.

Cleveland—Business has improved slightly, but production still is supported to a large extent by backlogs, and a more substantial increase in buying will be necessary to maintain shipments. February bookings were moderately ahead of January, although volume the latter month was poor. Consumers' reports of a steady decline in inventories aid prospects for heavier buying. Changes in manufacturing costs are reflected in new extras being adopted on manufacturers' wire.

Chicago—Wire and wire products buying is slightly improved in some directions, but overall does not show significant betterment. Awaited now is renewal of automotive demand, for which prospects are good, and an improvement is expected to

from partsmakers. Agricultural implement requirements remain about the largest single source of demand, but there are some indications of an early easing, farm machinery production having passed a peak. Spring prospects for increased wire and wire product buying still are considered encouraging.

Boston — Mild improvement in wire buying has not been sufficient to halt the decline in mill backlogs. Production in some departments is still tapering, but the trend in buying indicates consumer inventories have been lowered materially in some instances. Merchant products are more active and rod shipments remain heavy. The gain in specialties is spotty. March shipments are expected to be under last month which were in turn slightly below January.

New York—Wire buying has improved slightly. Consumer inventories are generally lower, resulting in more releases and a moderate upturn in orders. Shipments in February, while below the previous month, were heavy and mill backlogs are now small on most products. Some further reductions in finishing operations are being made. Demand for merchant wire goods is heavier and rod shipments are maintained. Incoming volume with some mills is now estimated at close to 50 per cent of capacity.

Birmingham, Ala. — Wire products, including virtually all specifications, are being booked in rather substantial quantities, but considerably less than last quarter's high. Mills are producing near capacity and making considerable inroads into backlogs.

Rails, Cars

Track Material Prices, Page 89

Inquiry for 1200 box and hopper cars by Gulf, Mobile & Northern is the largest new business appearing in the railroad market. Bids will be for carbon or high-tensile steel.

A new all-steel box car of medium weight and 50 tons capacity was exhibited by the Delaware, Lackawanna & Western at its passenger terminal, Hoboken, N. J., recently. The car is the first of 500 of this type ordered last November from the Magor Car Corp., Passaic, N. J.

Built of light-weight steel, the total weight is 44,000 pounds, 2300 pounds lighter than the type previously ordered by the railroad; the capacity of 3712 cubic feet represents an increase of 747 cubic feet.

Car Orders Placed

Atchison, Topeka & Santa Fe, 27 ore cars, to Pressed Steel Car Co., Pittsburgh.

Cincinnati Street Railway Co., Cincinnati, 26 four-motor cars; to St. Louis Car Co., St. Louis; motors to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Colorado & Southern and Fort Worth & Denver City railway, two diesel-powered streamlined trains; cars to Edward G. Budd Mfg. Co., Philadelphia.

General American Transportation Corp., 500 refrigerator cars, to own shops for own operation.

Navy department, Washington, four freight cars, to Haffner-Thrall Co., Chicago, and one tank car to General American Transportation Corp., Chicago.

New York Central, 500 seventy-ton covered hopper cars, to Despatch Inc., Rochester, N. Y.

Pacific Electric Co., 10 trolley cars, to Pullman-Standard Car Mfg. Co., Chicago.

St. Louis Refrigerator Car Co., 25 refrigerator cars, to own shops.

War department, chief of engineers, Washington; 24 forty-ton box cars, to Greenville Steel Car Co., Greenville, Pa.; six flat cars to Haffner-Thrall Car Co., Chicago.

Car Orders Pending

Gulf, Mobile & Northern, 1000 box cars, 200 seventy-ton or 250 fifty-ton hop-

pers; alternate bids asked on carbon and high-tensile steel.

Locomotives Placed

Colorado & Southern and Fort Worth & Denver City railway, two 4000-horsepower, two-unit, diesel-electric, to Electro-Motive Corp., La Grange, Ill.

Rail Orders Placed

City of Long Beach, Calif., 162 tons 128-pound rails and accessories, to Columbia Steel Co., San Francisco.

Rail Orders Pending

Quartermaster department, Hill Field, Ogden, Utah, 590 tons 80-pound rail, 182 kegs spikes, 39 kegs bolts and 29,800 tie plates.

Shapes

Structural Shape Prices, Page 88

Pittsburgh—Inquiries for private construction are numerous and largely offset the decline in public works activity. Awards are smaller than inquiries, but a heavy tonnage is pending. Considerable pressure for price concessions has developed in many sections.

Cleveland—Another section of the local river straightening program, involving 800 tons of piling, is up for bids next week. A few inquiries taking several hundred tons each are pending, but miscellaneous industrial work is slow to increase and fabricators' backlogs are light.

Chicago—The market continues slow in both awards and inquiries, but more activity is indicated for later months. Larger inquiries are for public projects, headed by 700 tons for a St. Paul postoffice addition.

Boston — Structural inquiry is heavier, due largely to government projects in connection with the defense program. Bids on the superstructure building No. 16, a shop building at South Boston for the bureau of yards and docks, were postponed to March 12 from Feb. 27. This takes 3500 tons. A double hangar for the naval air station, Squantum, Mass., closes March 21. Awards are light, but include 200 tons for a housing project, Bridgeport, Conn.

Philadelphia—Bethlehem Steel Co. has been awarded 5000 tons for the war department building, Washington. New work includes a telephone building, Baltimore, taking 2500 tons. Fabricated prices continue soft.

New York—Two projects, Dutch Kills bridge approaches, Queens, 13,250 tons, and the Long Island railroad grade crossing program, Rockaway, N. Y., 9600 tons, first contract, ultimately taking 25,000 tons, are the largest structural steel orders. Also outstanding among awards is 3000 tons for a series of grade crossings at Dunkirk, N. Y., to Bethlehem Steel Co., through C. B. Moon Co., Cleveland, bids Jan. 25, at Albany.

American Institute of Steel Construction, New York, reports estimated tonnage of structural contracts closed in January at 75,830 tons, compared with 101,712 tons in January, 1939, a loss of about 25

Shape Awards Compared

	Tons
Week ended March 2	43,070
Week ended Feb. 24	14,121
Week ended Feb. 17	49,490
This week, 1939	19,602
Weekly average, year, 1940	20,974
Weekly average, 1939	22,411
Weekly average, February	31,399
Total to date, 1939	218,644
Total to date, 1940	188,765

Includes awards of 100 tons or more.

per cent. January shipments were 107,633 tons, compared with 84,281 tons in January, last year. Tonnage available for future fabrication at the end of January was 349,695 tons.

Buffalo—Although still not active, the market shows more life with pending tonnage heavier. In addition to the 6000-ton Rainbow bridge, Niagara Falls, up for bids March 20, bids close the same day on five New York grade crossings involving a total of 1525 tons.

Seattle—Business pending for the Bonneville project and dam totals in excess of 1600 tons but no other important projects are up at the moment. Bids for the Washington state Kettle River bridge will be called in April, it is announced, requiring 1000 tons or more.

San Francisco—While structural awards were not heavy, over 17,000 tons is now pending. Awards totaled 1541 tons and brought the aggregate for the year to 41,516 tons, compared with 27,105 tons for the same period last year. Bids have been opened on 100 tons for a shop warehouse at Hill Field, Ogden, Utah, and bids will be opened March 6 for 1500 tons of sheet steel piling for a graving dock at Mare Island, Calif.

Bimingham, Ala.—Some improvement is noted in current bookings of shapes, largely for bridge and smaller construction work. Production is about 60 per cent.

Toronto, Ont.—Demand is gaining steadily. Larger lots pending include 1000 tons for a bridge over the Lievre river, Buckingham, Que., for Quebec department of public works, and 2000 tons for Canadian National railway bridge and concourse at Montreal. Approximately 3000 tons will be required for a plant addition at Drummondville, Que., for Canadian Celanese Ltd.

Shape Contracts Placed

13,250 tons, Queens approach viaduct, Midtown tunnel, New York, to Bethlehem Steel Co., Bethlehem, Pa., through Corbetta Contracting Co., New York.

9600 tons, grade crossing elimination, Long Island railway, Rockaway, New York, to Bethlehem Steel Co., Bethlehem, Pa., through Tully & DiNapoli Inc., Long Island City, N. R., contractor.

5000 tons, first unit, war department buildings, Washington, to Bethlehem Steel Co., Bethlehem, Pa.; John McShain Co., Philadelphia, contractor.

3000 tons, grade crossings, Dunkirk, N. Y., to Bethlehem Steel Co., Bethlehem, Pa., through C. B. Moon Co., Cleveland.

1950 tons, borough hall, Kew Gardens, Queens, New York, to Harris Structural Steel Co.; bids on steel direct.

1310 tons, trash racks, Texas, department of interior, bureau of reclamation, spec. 891, to Stupp Bros. Bridge & Iron Co., St. Louis.

1100 tons, twelve wheeled intake gates, power house, Bonneville, Oreg., to Willamette Iron & Steel Corp., Portland, Oreg.

750 tons, apartment, Fifty-Sixth street and Lexington avenue, New York, to Harris Structural Steel Co., New York.

565 tons, two buildings for Lockheed Aircraft Corp., Burbank, Calif., to Bethlehem Steel Co., Los Angeles.

550 tons, state bridge LU-577-73, Toledo, O., to Bethlehem Steel Co., Bethlehem, Pa.

500 tons, piling, Cuyahoga river straightening, Cleveland, to Carnegie-Illinois Steel Corp., Pittsburgh; Western Foundation Co., Cleveland, contractor.

500 tons, building 3-B and extension to building 14, for Aluminum Co. of America, Edgewater, N. J., to American Bridge Co., Pittsburgh.

400 tons, steel piling, Fullerton avenue beach protection, Chicago, to Inland Steel Co., Chicago, through Great Lakes Dredge & Dock Co., Chicago.

350 tons, bridge cranes for shipways, Brooklyn navy yard, to Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.; awarded general contract at $157,560, Spec. 9547.

345 tons, flight research building, Moffett Field, Calif., to Bethlehem Steel Co., San Francisco.

340 tons, building addition, Consolidated Cigar Co., Broadway and Thirty-fifth street, New York, to Taylor-Fichter Steel Construction Co., New York.

340 tons, alterations to Herald Square building, New York, to American Bridge Co., Pittsburgh.

340 tons, two bridges, project 3W2, Natchez, Miss., to Virginia Bridge Co., Roanoke, Va.

320 tons, bomb dunnage units, war department, Proving Ground, Ill., to F & W Machine & Welding Co., Savanna, Ill.

315 tons, nurses' home, Shadyside hospital, Pittsburgh, to American Bridge Co., Pittsburgh.

310 tons, building, First & Merchants' National Bank, Richmond, Va., to Richmond Structural Steel Co., Richmond, Va.

250 tons, bridge route 35055, Lackawanna county, Pennsylvania, to American Bridge Co., Pittsburgh.

230 tons, bridge W-186-5, Dubuque, Iowa, to American Bridge Co., Pittsburgh.

200 tons, store building addition, for W. T. Grant Co., Cleveland, to Bethlehem Steel Co., Bethlehem, Pa.

200 tons, housing project, Bridgeport, Conn., to Bethlehem Steel Co., Bethlehem, Pa.

190 tons, bridge, docket 1.220, Abbeville county, South Carolina, to Virginia Bridge Co., Roanoke, Va.

160 tons, five buildings for state at Chino, Calif., to Pacific Iron & Steel Co., Los Angeles.

140 tons, flue and fan house, for American Smelting & Refining Co., Federal, Ill., to Mississippi Valley Structural Steel Co., Decatur, Ill.

140 tons, gates, specification 1325-D, Pine River project, Colorado, unstated interest.

115 tons, addition, Sylvania Inc., Fredericksburg, Va., to Virginia Bridge Co., Roanoke, Va.

110 tons, reconstruction of bridges C-39-8, New York, for state, to Bethlehem Steel Co., Bethlehem, Pa.

100 tons, steel piling, Wepo diversion dam, Keams Canyon, Ariz., to Bethlehem Steel Co., Bethlehem, Pa.

100 tons, shapes and bars, addition, Randall junior high school, Washington, to Dietrich Bros., Baltimore, and Hudson Supply Co., Washington; John W. Hunt Co., Washington, contractor.

Shape Contracts Pending

60,000 tons, additional sections, grade crossing eliminations near Rockaway, N. Y., and Atlantic avenue, Brooklyn. Bids on both expected about March 20.

15,000 tons, elevated highway and approaches, Midtown plaza, Queens, New York, for city.

11,415 tons, shapes, plates, bars, sheets and strip, navy department, bids March 12, delivery to nine yards.

2500 tons, telephone building, Baltimore; bids March 12.

2200 tons, Fort Hamilton high school, Brooklyn; bids March 11.

1500 tons, sheet piling, graving dock, Mare Island, Calif.; bids March 6.

1200 tons, apartment buildings, Fifty-seventh and Fifty-eighth streets, New York.

800 tons, manufacturing building, for A. C. Spark Plug Co., Flint, Mich.

800 tons, piling, Cuyahoga river straightening program, Cleveland; bids March 15.

750 tons, apartment house, for Lexington House Inc., New York.

700 tons, addition to post office, St. Paul, Minn., bids March 12.

650 tons, viaduct, Longview, Wash., for Weyerhaeuser Timber Co., Seattle.

650 tons, manufacturing buildings, for B. F. Goodrich Co., Oaks, Pa.

600 tons, fourth building group, Willowbrook state hospital, Staten Island, N. Y.; bids March 27, Albany.

550 tons, grade crossings, Erie county, New York; bids March 20, Albany.

550 tons, training school building, La-Guardia Field, New York.

529 tons, Bonneville project substations; Lehigh Valley Structural Steel Co., Allentown, Pa., low.

525 tons, grade crossings, Monroe county, New York; bids March 20, Albany.

440 tons, power house, etc., for Tri-State Power Co-operative, Genoa, Wis.

400 tons, plant addition, Kimberly-Clark Corp., Neenah, Wis., bids March 1.

400 tons, trashracks for Bonneville dam; Bethlehem Steel Co., Bethlehem, Pa., low.

325 tons, addition to postoffice, St. Paul, Minn.

300 tons, state bridge 1897, Marion, Ind.

300 tons, state bridge 1895, Flat Rock, Ind.

300 tons, state highway bridge, Yadkin-Surry counties, North Carolina.

275 tons, bridge C-3, Hoffmans, N. Y., for New York Central railroad.

270 tons, warehouse, for United States Gypsum Co., Flushing, N. Y.

250 tons, building for Friehofer Baking Co., Philadelphia; bids March 12.

220 tons, engineering and research laboratory buildings, for The Texas Co.,

Glenham, N. Y.

220 tons, factory building, for Ranger Engineering Corp., Farmingdale, N. Y.

200 tons, building, for Bluepoints Inc., division of General Foods Corp., Greenport, N. Y.

200 tons, state bridge, Ayr, Nebr.

200 tons, housing project, Akron, O.; bids March 8.

200 tons, Benedictine high school, Cleveland.

175 tons, grandstand, Wilmington, Del.; new bids asked.

175 tons, bottling plant, Coca-Cola Co., New Haven, Conn.

150 tons, gates and stoplogs, Bonneville dam; Pacific Car & Foundry Co., Seattle, low.

150 tons, hospital for mental diseases, Atlantic county, New Jersey; bids March 13; includes 50 tons reinforcing bars.

120 tons, high school, for Sisters of St. Dominic, Detroit.

110 tons, store building, Montgomery Ward & Co., Charleston, W. Va., for W. B. Geary.

100 tons, shop warehouse, Hill Field, Ogden, Utah; bids opened.

100 tons, branch bank building, Pennsylvania Co., Philadelphia; bids March 6.

Unstated, diesel electric crane; bids to United States engineer, Bonneville, Oreg., March 19.

Reinforcing

Reinforcing Bar Prices, Page 89

Pittsburgh—The market is dull, with few new inquiries and only a handful of awards for jobs involving more than 100 tons. Prices are unchanged, with concessions small and the tendency toward firmness in most sections.

Chicago—Concrete bars are quiet, although considerable work is pending and numerous new jobs are expected shortly. Coath & Goss, Chicago, is low on an addition to the customs house, Chicago, involving 394 tons. A power house at Genoa, Wis., will require 225 tons.

Boston—Reinforcing buying lags, few purchases of more than 100 tons being made. Small-lot inquiry is up slightly, but the bulk of pending tonnage is for federal buildings in connection with the defense program. Bridge and highway needs are small. Most housing projects have been placed. Prices are still subject to shading.

New York — Reinforcing bar awards are heavier, led by about 2500 tons for grade crossing and viaduct construction, this tonnage covering bars, mesh and reinforcing trusses. New inquiry is gradually mounting.

Philadelphia—Business is confined mostly to small lots, as reflected in smaller backlogs of fabricators. The spring outlook appears fairly bright.

Seattle—Inquiry for reinforcing items is slow and no important projects are pending. Local mills are operating part time as backlogs are reduced. Small tonnages of merchant bars are being rolled for stock.

San Francisco—A fair volume of reinforcing bar business was placed, aggregating 2020 tons, bringing the

Concrete Bars Compared

	Tons
Week ended March 2	6,684
Week ended Feb. 24	2,156
Week ended Feb. 17	5,671
This week, 1939	16,578
Weekly average, year, 1940	7,545
Weekly average, 1939	9,197
Weekly average, February	5,457
Total to date, 1939	108,121
Total to date, 1940	67,901

Includes awards of 100 tons or more.

year's total to 16,782 tons, compared with 45,186 tons for the corresponding period in 1939. Soule Steel Co. was awarded 570 tons for a 600-man barracks at Hickam Field, T. H., 245 tons for barracks at Yountville, Calif., for the state and 221 tons for a flight research building at Moffett Field, Calif. Pending business is of good proportions and exceeds 29,000 tons.

Toronto, Ont.—Business is improving, with principal contracts pending involving around 6000 tons. Dominion Steel & Coal Corp., Trenton, N. S., has contract for 300 tons for building at Halifax for Robert Simpson Co. Ltd.

Reinforcing Steel Awards

1370 tons, including 120 tons mesh, grade crossing elimination Long Island railway, Rockaway, N. Y., to Jones & Laughlin Steel Corp., Pittsburgh, through Tully & DiNapoli Inc., Long Island City, N. Y., contractor.

1300 tons, first unit, war department buildings, Washington, to Sweets Steel Co., Williamsport, Pa.; John McShain Co., Philadelphia, contractor.

1120 tons, including 550 tons reinforcement trusses, for Queens approach viaduct, Midtown tunnel, New York; bars to Fireproof Products Co., New York, trusses to Jones & Laughlin Steel Corp., Pittsburgh, through Fireproof; Corbetta Contracting Co., contractor.

570 tons, 600-man barracks, Hickman Field, T. H., to Soule Steel Co., San Francisco.

500 tons, five buildings for state at Chino, Calif., to Consolidated Steel Corp., Los Angeles.

300 tons, Oklahoma state highway department, to Sheffield Steel Corp., Kansas City, Mo.

245 tons, barracks at Yountville, Calif., for state, to Soule Steel Co., San Francisco.

221 tons, flight research building, Moffett Field, Calif., to Soule Steel Co., San Francisco.

200 tons, St. Louis retail store for Lerner Stores Corp., through Fruin-Colnon Construction Co., to Laclede Steel Co., St. Louis.

168 tons, state bridge over Ottawa river, project 283, Toledo, O., to Truscon Steel Co., Youngstown, O.

150 tons, navy airbase, Sitka, Alaska, to Seattle Steel Co., Seattle.

135 tons, Roza dam, Washington state, to Bethlehem Steel Co., Bethlehem, Pa.

105 tons, hospital addition, Brighton district, Boston, to Concrete Steel Co., Boston.

100 tons, store building, John M. Smythe & Co., Evanston, Ill., to Concrete Steel Co., Chicago.

100 tons, bars and shapes, aircraft storehouse, Norfolk, Va., to Truscon Steel Co., Youngstown, O.; R. R. Richardson & Co. Inc., Norfolk, contractor.

100 tons, Atlas office building, Charleston, W. Va., to Bethlehem Steel Co., Bethlehem, Pa.

Reinforcing Steel Pending

1300 tons, for Coulee dam; bids in to reclamation bureau, Denver.

1200 tons, Carrville, La., United States hospital; bids March 1.

1175 tons, midtown tunnel plaza, New York.

950 tons, silos and packing house, Lone Star Cement Co., Hudson, N. Y.; Rust Engineering Co., Pittsburgh, low.

394 tons, addition to customs house, Chicago; Coath & Goss, Chicago, low.

350 tons, treasury department, invitation A-9997, schedule 64613, Los Angeles; bids opened.

200 tons, borough hall, Kew Gardens, N. Y.; bids Feb. 24.

200 tons, generating plant, Tri-State Power Co., Genoa, Wis.

192 tons, bridge, Stevens and Ferry counties, Washington, for state; bids opened.

170 tons, building addition, Sears-Roebuck & Co., Brooklyn.

170 tons, Safeway Store distributing plant, San Francisco; bids opened.

125 tons, Delaware aqueduct, contract 343, board of water supply, New York; bids Feb. 28.

105 tons, Saw Mill River parkway section, Yonkers, N. Y.

100 tons, building, Schmidt Bottling Works, Detroit.

100 tons, equipment repair buildings, invitation 6812-40-83, Hickam Field, T. H.; bids opened.

100 tons, army post exchange, invitation

6812-40-68; Hickam Field, T. H.; bids opened.

100 tons, factory addition, W. C. Ritchie & Co., Chicago.

Unstated tonnage, annexes to and completion of air corps hangar, Rantoul, Ill., bids March 12.

Unstated tonnage, factory Cromwell Paper Co., Chicago.

Pig Iron

Pig Iron Prices, Page 90

Pittsburgh—Pig iron production still is declining slowly. The merchant market is quiet, with buying light and shipments practically unchanged. Coke markets are dull, particularly beehive. Prices of the latter are not appreciably weaker, principally because of absence of buyer interest. Lower levels of coke and scrap compared with a few months ago lend an easier tone to pig iron.

Cleveland—Except for seasonal slackening in some industries, foundry operations are steady here. Foundry coke shipments were up slightly in February, despite the shorter month, but merchant iron deliveries showed little change. Reduced demand from steelworks, however, resulted in a further decline in total iron movement. Buying continues slow, and there is little occasion for formal opening of second quarter books immediately.

Chicago—February shipments were considerably below earlier expectations, running about 45 per cent behind January. March movement will be better but no large pickup is expected. February buying, like shipping, was about half that of the previous month. Second quarter books likely will be opened this week for any consumers caring to make forward coverage. By-product foundry coke shipments held a 10 per cent gain over January at month's end.

Boston—Buying is light, consumers operating on stocks, with the general trend of melt downward. Machine tool trade is active, but foundries in most instances have built up fair stocks of castings. Jobbing shops, when buying, place only enough tonnage to meet early requirements. Most builders of textile mill equipment are well stocked into next quarter. Prices for that period are expected to be unchanged.

New York—Specifications point to a substantial upturn in pig iron shipments in March. Orders, however, continue slow. Needs of machine tool builders remain outstanding, although soil pipe producers should be more active as the building season opens. No change in second quarter prices currently is indicated. Export inquiry gradually is expanding, despite absence of large lots. Orders also are increasing but at a slower rate.

Philadelphia—Sellers still have considerable unfilled business taken last September before the $1 price advance. In view of the current slower melt part of this tonnage may carry over into next quarter. Buying is confined to spot carloads and a small amount of government business.

Gray iron foundries in the Philadelphia federal reserve district produced 5399 short tons of castings in January, off 1.8 per cent from December but 45.9 per cent more than a year ago. Shipments of 5221 tons showed gains of 2.9 and 51 per cent compared with December and last year, respectively. Unfilled orders Feb. 1 were 1131 tons, down 15.2 per cent from December but 83.6 per cent ahead of the year before. Pig iron stocks declined 4.2 per cent in January but were 109.8 per cent larger than a year ago.

Buffalo—Activity in merchant iron continues appreciably better than in metal for steelmaking. Ship-

ments to foundries have been well sustained, the February movement by some sellers having been ahead of January. Foundries generally are operating four to five days a week. Reflecting lighter needs of steelworks, one blast furnace has been shut down, leaving production at 64 per cent.

Cincinnati—Pig iron shipments are barely steady, but foundry coke specifications are moderately heavier. Part of the melt is supported by iron from stock. Prompt shipment generally is requested on specifications and on small-lot buying. By-product foundry coke has been reaffirmed for March at $10.50, delivered.

St. Louis—Melters show little interest in pig iron. Purchases are small, and shipments are far behind the late-1939 pace, reflecting ample stocks and heavy previous commitments. While no cancellations are being received, melters are asking that shipments on contracts be delayed.

Birmingham, Ala.—Pig iron output is steady. Merchant iron men report shipping instructions fairly steady, but there is some apprehension over prospects for continued high production.

Toronto, Ont.—Sales are steady and almost entirely to small melters. Sellers look for heavier orders for second quarter when books open, although forward contracts late in 1939 were in excess of consumers' needs.

Scrap

Scrap Prices, Page 92

Pittsburgh—Business is the lightest in many months, but some consumers show a little more interest in future needs. Railroad offerings are slightly larger than last month but still relatively small. Scrap prices are unchanged but in many cases are nominal. It is possible pending railroad lists will give a more accurate indication of true market levels.

Cleveland—Sales are light but strength is apparent in prices. It is believed renewal of buying will bring a strong situation. Material moving on contracts is principally from factories, yard material being difficult to handle under prevailing weather conditions.

Chicago—The market is quiet but generally firm. Prices tend somewhat to the strong side despite declining mill operations and inactivity in consumer buying. No. 1 steel holds at $15.50 to $16, dealers generally selling at $15.75. Railroad sales of this grade are reported at $16.65, delivered, and more recently at better than $17.

Boston—Downward trend in scrap prices continues, notably for delivery in New England. No. 1 heavy melting steel, textile cast and railroad malleable are $1 lower. Borings and turnings, No. 1 machinery cast, forge flashings and machine shop turnings are also weaker. Domestic buying is light, also shipments to eastern Pennsylvania. Ship loadings for export are heavier, most of the tonnage having been bought previously. Bulk of material being shipped is No. 2 steel for which brokers are paying $14, dock. No. 1 steel and No. 2 cast for dock delivery are slightly easier.

Philadelphia—Scrap prices apparently are scraping bottom, being unchanged except for minor adjustments. Breakable cast is up 50 cents on business at $18.50. An eastern mill is understood to have bought 25,000 tons of scrap on the basis of $17.50 for No. 1 steel. E. G. Budd Mfg. Co. sold approximately 4000 tons of new compressed sheets March 1 at around $16, f.o.b. plant.

New York—Prices of most scrap grades, dock delivery for export,

Behind the Scenes with STEEL

Choice Understatement

■ When a woman complained to the manager that telephone repair men were using strong language in front of her home, he investigated and promptly received this report: "*Dear Boss*: Bill and I was splicing cable in front of Mrs. So-and-So's house. Bill was on the ground and I was on the platform. Bill sends up a pot of hot metal and when I gets it my foot slips and I spills the metal down on Bill. It runs down his neck inside his overalls and into his show. Bill leaps sideways, turns a somersault, and then looks up at me and says, "Harry, you really must be more careful, hereafter."—*Harry.*

Coffin Nails

■ If you have become blase to billions, reflect on the fact that if one cigarette had been lit each minute since the birth of Christ, the number of cigarettes lit would not have totaled one billion until about five o'clock in the morning of May 26, 1902. Then, podner, you would have only 1/163rd of the cigarettes smoked in the United States in an average year. Have you tried a Lucky lately?

Blame It On Liedy

■ We swore that last week's *Confucius Say* was our swan song (and especially since we got called for misspelling the wise old gentleman's name). Then Ken Liedy (Electric Controller & Mfg.) put us on a spot. Says he, with all the persuasiveness of a nice regular advertiser, "Here's one you should put in your column: *Man who sit in electric chair, has amps in pants.*" (adv.)

White Orchid

■ We hope you don't think the infrequent slaps on the back that we run here are the only ones we get. Shecks no, it's jest that every so often some guy tells us we're good in such a way we really believe it. Take for instance H. B. Neill, of Larchmont, N. Y.: *May I congratulate you on the splendid appearance of your magazine, and its typographic excellence, to say nothing of its complete news coverage.*

M-Day

■ Next week you can look forward to a story in STEEL detailing the production lines at the U. S. Frankford Arsenal in Philadelphia. When M-Day rolls around many a manufacturer may become involved in armament production and this description of the latest methods has been obtained by STEEL's editors and approved for release by the U. S. Government.

Play Safe

■ Riley's Truck Line must have hidden away in its employ, a budding copywriting genius who missed his calling, except for that choice bit of safety promotion on page 52 this week.

Reader Interest

■ You may or may not be interested to know that an average of 9 pages in every issue of STEEL last year were reprinted for further distribution—a total of over 300,000 reprints altogether.

Attention, Class!

■ Thomas A. Edison used to give this simple problem to the young engineers taking his examinations: Suppose you had a perfect greyhound which was endowed with illimitable speed, and you tied a saucepan to its tail. The dog runs away, and on hearing the noise made by the pan behind him, keeps increasing his speed to escape the noise. What will be the maximum speed he will reach?

SHRDLU

have dropped 50 cents to $1 per ton with brokers now paying $14 for No. 1 heavy melting steel. Quotations on most grades for domestic shipment are steadier although rails for rolling and old compressed sheets are down slightly, and No. 1 machinery cast for nearby delivery is 50 cents. Buying is light and most activity is in small shipments against orders.

Buffalo—Despite an inactive market there are indications the recent price recession has been arrested. Quotations have a steady undertone, with No 1 steel $16.50 to $17. A strengthening factor is the small volume of offerings, resulting partly from interference of snow with yard activities and rural collections.

Detroit—Scrap continues weak, recent lists bringing somewhat lower prices, in line with previous revisions in Detroit quotations. Only strong items are cast grades, principally due to shortage of this material and fair demand from foundries active on automotive die programs. A small tonnage of rails has been purchased by one of the larger die foundries here. Borings are down 25 cents. Recent purchases made by the leading steelmaker here were about 50 cents a ton off from prices prevailing two weeks ago.

Cincinnati—Prices again are lower, with heavy melting steel down to $12.50 to $13, lowest since last September. Consumers are covering only early needs and shipments are off from last quarter. Ohio river traffic has been resumed without any apparent effect on prices.

St. Louis—Recent mill purchases have developed into price reductions of 25 to 50 cents on various grades. Steelworks show little interest in additional buying in view of ample inventories and shipments against previous orders. Scrap movement from the country is heavier.

Birmingham, Ala.—Scrap men are rather pessimistic and report wavering prices. Shipments are scattered and in small volume.

Seattle—Export movement is dull, only small orders coming from Japan, which bought rather heavily in December and early January in anticipation of the end of the trade treaty. No. 1 melting, shipside, Seattle, is quoted at $15.50 to $16. Rolling mills are out of the market and other domestic buyers are not active.

Toronto, Ont.—While heavy snow has interrupted deliveries to dealers, business continues fairly active and both steelworks and foundries are showing more interest in the market. Dealers have marked up buying prices on steel turnings, cast borings and bushelings 50

cents a gross ton. Other grades are unchanged but firm.

San Francisco—Producers of open-hearth steel, effective March 1, will buy scrap on the net ton basis. No. 1 heavy melting steel, f.o.b. cars, metropolitan area, Los Angeles and San Francisco holds at $12.50 to $13 a net ton with No. 2 at $11.50 to $12 a net ton. Compressed sheets are $10.50 to $11 a net ton, f.o.b. cars metropolitan area, San Francisco and Los Angeles. Borings and turnings are priced at $4.50 to $5 a net ton. Movement is not heavy and present buying consists only of renewing material taken from yard stock piles for current consumption. No new export business for shipment to Japan has been noted of late.

Tin Plate

Tin Plate Prices, Page 88

Production is down to a new low for the year, off 2 points to 56 per cent. Releases for packers' cans remain light, but general line can and export tonnage remains good. However, demand from abroad is somewhat less active than it was earlier in the year. Specifications from domestic users generally so far this year have been lighter than in 1939.

Warehouse

Warehouse Prices, Page 91

Pittsburgh—Sales increased last week to above the level of the previous 60 days, although there is no certainty the betterment is permanent. However, spring business shortly will be stimulating demand.

Chicago—Demand leveled off last week, but total February business was off moderately from January. Distributors expect improvement in March.

New York—Despite fewer days some jobbers report February volume slightly ahead of January and all had daily average business equal to that month. Special and lighter lines were most active with heavier products, shapes and plates lagging. Mill deliveries of alloys are better but electric furnace material is still slow. While stocks are well balanced in most cases a few are top-heavy.

Philadelphia—February business was disappointing, being 5 to 10 per cent under January. Stocks continue heavy, being estimated about 30 per cent above normal.

Buffalo—Sales have tapered somewhat but still are considered good by most distributors. February vol-

ume was off from January but well above the level a year ago.

Seattle—Improved weather conditions have stepped up jobbing sales, with demand diversified. The price situation is unchanged. Sheets are reported moving in better volume.

Cincinnati — February business was little changed from January but well above the level a year ago. Prices are steady.

Steel in Europe

Foreign Steel Prices, Page 91

London — (*By Cable*) — Little change has taken place in the steel and iron market in Great Britain except intensificatiton of war effort and output. Export expansion is still limited though tonnages of black and galvanized sheets have been released for that purpose. Tin plate exports are satisfactory despite limited steel supplies.

Belgium and Luxemburg report exports to Britain and France expanding and substantial orders for barbed wire are being received from Scandinavian countries. Prices are firmer.

Equipment

Seattle — Seasonal requirements have stimulated movement of general items, public works projects still furnishing a large share. General Electric Co., Schenectady, N. Y., is low at $85,736 to Bonneville project for four circuit breakers. Same project will open bids March 14 for a 115-kw transmission line to Hood River, Oreg., Spec. 813 and March 5 for conductor hardware, Yakima-Ellensburg line, Washington, Spec. 819. Fort Lewis, Wash., has called bids March 1 for sub-metering equipment. Fairbanks, Morse & Co. is low to Tacoma at $18,721 for furnishing four vertical turbine pumps.

MEETINGS

BROAD PROGRAM ARRANGED FOR ACETYLENE CONVENTION

■ LATEST practices and developments in oxyacetylene process will be highlighted at the annual convention of the International Acetylene association at Hotel Schroeder, Milwaukee, April 10-12. The program is being arranged to appeal to operators of welding and cutting equipment, shop foremen, plant superintendents, operating and designing engineers, and executives.

Simultaneous sessions will be held on the first afternoon. One will deal with welding of carbon-molybdenum pipe, welding of industrial piping, silver soldering, and layout and management of a welding shop; the other with reclamation, repair and maintenance, with special reference to shipyards, foundries, steel mills and railroad shops.

Round-table discussions on flame treating, hard facing, machine cutting, welding alloy steels, air-acetylene applications, pipe welding, riser cutting, and welding nonferrous

metals will feature the first evening. A panel discussion on oxyacetylene machine cutting is scheduled for the afternoon of April 11.

Two simultaneous sessions on the afternoon of April 12 will close the convention. One will be concerned with foundry and heavy industrial applications of the oxyacetylene process, including flame cleaning, dehydrating and descaling, scarfing and gouging, heavy cutting, the oxygen lance, and efficiency control in cutting. The other is on the broad subject of fabrication and production, with papers on welding and brazing light-gage metal, design and construction of jigs and fixtures, welding for enameling, and automatic bronze welding.

INDUSTRIAL ADVERTISERS IN CHICAGO REGIONAL MEETING

A regional conference for industrial advertisers will be held in Chicago, April 19, under sponsorship of the Indianapolis, St. Louis, Milwaukee and Chicago chapters of the National Industrial Advertisers association.

TRADE GROUP EXECUTIVES TO MAKE PROGRAM AWARD

American Trade Association Executives will conduct its spring meeting in Washington, April 29. The program schedules morning and afternoon sessions, a luncheon and a reception. At the luncheon, Secretary of Commerce Harry Hopkins will present the main award and honorary certificates in the association's eighth annual contest for the best trade association program.

METAL SHOW FLOOR PLANS ARE MAILED TO EXHIBITORS

Floor plans for the twenty-second National Metal exposition, to be held in Public Auditorium, Cleveland, Oct. 21-25, have been mailed to previous show exhibitors by the American Society for Metals, sponsor of the event. Deadline for requests for space is April 6, according to W. H. Eisenman, secretary of the society and show manager.

Co-operating with the American Society for Metals again this year as in recent years in the National Metal congress to be conducted simultaneously with the exposition, will be the American Welding society, Wire association, and the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers.

REINFORCING STEEL GROUP TO MEET IN HOT SPRINGS

Concrete Reinforcing Steel institute will conduct its sixteenth annual meeting at the Homestead, Hot Springs, Va., April 25-26. H. C. Delzell, 2257 Builders building, Chicago, is executive secretary.

Nonferrous Metal Prices

Feb.	Copper Electro. del. Conn.	Copper Lake, del. Midwest	Casting refinery	Straits Tin New York Spot	Straits Tin New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
24	11.50	11.50	11.25	46.12½	45.87½	5.00	4.85	5.50	20.00	14.00	35.00
26	11.50	11.50	11.25	47.25	47.00	5.00	4.85	5.75	20.00	14.00	35.00
27	11.50	11.50	11.25	48.00	48.00	5.00	4.85	5.75	20.00	14.00	35.00
28	11.50	11.50	11.25	47.70	47.50	5.25	5.10	5.75	20.00	14.00	35.00
29	11.50	11.50	11.25	47.70	47.62½	5.25	5.10	5.75	20.00	14.00	35.00
March											
1	11.50	11.50	11.25	47.50	47.00	5.25	5.10	5.75	20.00	14.00	35.00

*Nominal.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except specified. Copper brass products ba on 11.50c Conn. copper

Sheets

Yellow brass (high)	18
Copper, hot rolled	20
Lead, cut to jobbers	8
Zinc, 100 lb. base	11

Tubes

High yellow brass	21.
Seamless copper	20.

Rods

High yellow brass	14.
Copper, hot rolled	16.

Anodes

Copper, untrimmed	17.

Wire

Yellow brass (high)	18.

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	7.25-7.5
Cleveland	8.25-8.5
Chicago	7.75-8.0
St. Louis	7.75-8.2

Heavy Copper and Wire

New York, No. 1	9.00-9.25
Cleveland, No. 1	9.00-9.25
Chicago, No. 1	9.00-9.25
St. Louis	8.75-9.25

Composition Brass Turnings

New York	7.00-7.25

Light Copper

New York	7.00-7.25
Cleveland	7.00-7.25
Chicago	7.00-7.25
St. Louis	6.75-7.00

Light Brass

Cleveland	4.25-4.50
Chicago	4.50-4.75
St. Louis	4.50-4.75

Lead

New York	4.50-4.75
Cleveland	4.00-4.25
Chicago	4.25-4.50
St. Louis	4.00-4.25

Zinc

New York	3.00-3.25
Cleveland	2.50-2.75
St. Louis	3.25-3.50

Aluminum

Mixed, cast, Cleveland	8.75-9.00
Borings, Cleveland	6.75-7.00
Clips, soft, Cleveland	15.75-16.00
Misc. cast, St. Louis	8.75-9.00

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads	12.00
Standard No. 12 aluminum	14.50-14.75

Nonferrous Metals

New York—Heavy demand for lead, a spurt in zinc sales, and a reduction in the tin export quota for the second quarter resulted in price advances in these metals last week. Following exceptionally heavy sales in copper earlier in the month, demand tapered although undertone remained firm. Part of the increased activity in metals was attributed to prospects for heavier consumption over the coming months.

Copper—February sales of 147,197 tons have been exceeded since the compilation began by totals for only two months in 1939 and three months in 1936. Electrolytic was firm in the producers' market at 11.50c, fairly steady in the resale market at 11.75c, Connecticut, and easier in the export market at about 11.55c, f.a.s. New York.

Lead — Leading producers sold freely following the advance in prices of ¼-cent to the basis of 5.10c,

East St. Louis, but they found it difficult to satisfy consumers' demands fully. Some sellers exceeded their daily intakes and drew heavily on reserve stocks. Sales were limited to delivery within 60 days in an effort to curb speculative buying.

Zinc—After a short buying movement on Monday which lifted prime western prices ¼-cent to 5.75, East St. Louis, consumers reverted to a routine buying policy. Production of galvanized sheets declined two points further to only 55 per cent of capacity.

Tin — Following announcement that tin export quotas would be cut 40 points to a rate of only 80 per cent of standard tonnages, prices soared in all leading markets. This move surprised some observers who point out the uncertainty of continued uninterrupted flow of tin from producing centers. Straits spot jumped to 48.00c in the domestic market before easing toward the weekend to 47.50c.

Antimony—Only occasional carlot and usual caselot business was done in the antimony market on the basis of 14.00c, New York, for American spot and nominally 16.50c, duty paid New York, for Chinese spot.

Activities of Steel Users and Makers

■ JULIUS KAHN, former president, Truscon Steel Co., and later Republic Steel Corp. vice president, is head of a new steel fabricating company, United Steel Fabricators Inc., which is using some of the space formerly occupied by United Engineering & Foundry Co. at Wooster, O. The company will make corrugated drainage steel pipe, some steel building parts and other fabricated steel products. Officers are: Chairman of the board, Mr. Kahn; president, W. C. Martin; vice president in charge of operations, Walter F. Schulz; treasurer, Keith MacLeod; secretary, Walter Locker.

♦

Cowles Detergent Co., Cleveland, maker of industrial alkalies and soaps, has appointed Eaton-Clark Co., Detroit, distributor in Michigan.

♦

Robert W. Wilson, Cleveland, has removed his office for the practice of patent and trade mark law to 406 East Ohio Gas building, East Sixth street and Rockwell avenue.

♦

Magnetic Engineering & Mfg. Co., Clifton, N. J., has been organized to design and build a complete line of magnetic separators, ore concentrators, chucks and clutches and special magnetic equipment. Officers are: President, J. J. Ferris; vice president, J. L. Hope; secretary-treasurer, F. E. Ferris.

♦

Champion Rivet Co., Cleveland, has concluded arrangements with the United States Steel Export Co., New York, to handle exclusive sale of its welding electrodes for export throughout the world.

♦

E. E. Free Laboratories have been merged with the United States Testing Co. Inc., Hoboken, N. J., and will henceforth be known as the engineering and research division of the Testing company. The Free laboratories will continue at their present location, 175 Fifth avenue, and E. A. Graham, heretofore associated with the late Dr. E. E. Free, will be in charge.

♦

Koppers Co., engineering and construction division, Pittsburgh, has

opened a branch office in the National Bank of Tulsa building, Tulsa, Okla., to serve the oil and gas industries in the southwest. W. A. Leech Jr., a number of years engaged in research and plant construction and operation for Koppers, is in charge of the new office.

♦

Globe Stainless Tube Co., Milwaukee, has appointed Edgcomb Steel Corp., Newark, N. J., distributor for its line of seamless and stainless steel pipe and tubing.

♦

Ajax Metal Co., Philadelphia, has appointed Refractory Products Co., E. W. Woodruff, 219 East North Water street, Chicago, its representative in Chicago and the Middle West for the sale of brass, bronze, nickel and aluminum alloys in ingot form. The Ajax company this year is celebrating its sixtieth anniversary.

♦

McIntosh Stamping Corp., Detroit, has moved from 6134 Epworth boulevard, to its new plant at 13881 Elmira avenue.

♦

Otto Kafka Inc., New York, exporter of iron and steel products, has moved into larger quarters on the twentieth floor of the 50 Broad street building.

♦

Blaw-Knox Co., Pittsburgh, has received an order from the Bessemer & Lake Erie railroad to equip 100 box cars with its newly developed open mesh steel running boards and brake steps.

♦

Iron & Steel Products Inc., Chicago, has established a merchant iron and steel department under direction of J. C. Beggs, formerly with Joseph T. Ryerson & Son Inc., Chicago.

♦

AC Spark Plug division of General Motors Corp., Flint, Mich., plans construction of a new spark plug plant in Flint, comprising 156,000 square feet of floor space. The new plant will be adjacent to the company's other factories.

♦

General Electric Co., Schenectady, N. Y., announces that central plant air conditioning and industrial refrigeration equipment of more than 5 horsepower will henceforth be sold direct to authorized contractors who, with engineers and architects, will assume all application engineering and installation functions. Samuel Martin Jr., associated with General Electric since 1925, has been appointed head of the new contractor sales division.

♦

Williams & Kilsby, Standard Oil building, Los Angeles, has been formed by W. Woodward Williams, recently resigned as general manager of Babcock & Wilcox Tube Co., and Perry Kilsby, who has acted as sales representative on the West coast for several companies manufacturing various steel products. They will represent the following firms on the West coast: Babcock & Wilcox Tube Co., Beaver Falls, Pa.; Sivyer Steel Casting Co., Milwaukee; William F. Klemp Co., Chicago, and Pittsburgh Crucible Steel Co., Pittsburgh.

♦

A new engineering department devoted to the general commercial design and production of radio apparatus of all types, and associated products, has been created by the radio division of Westinghouse Electric & Mfg. Co. at Baltimore. The new department will be known as the special apparatus engineering section and will be under direction of Ralph N. Harmon. The nucleus of the group is composed of engineers formerly associated with the company's broadcast activities.

♦

National Radiator Corp., Johnstown, Pa., has acquired assets and business of Century Specialty Co., Johnstown, and will continue its operation as the Century division. James P. Thomas, president of Century, has been appointed manager of the new division.

Bethlehem Liberalizes 1940 Vacation Plan

■ More liberalized vacation plan, affecting more than 60,000 workers, will be inaugurated by Bethlehem Steel Co. for 1940 season, as a result of negotiations between employe representatives and management at company's various plants last week.

New plan for hourly, piece-work and tonnage employes will provide one week's vacation with pay for those having a three-year service record. Former service requirement was five years. Two weeks vacation with pay will be granted those having 15 years' service, instead of one week as heretofore.

Ajax Flexible Coupling Co. Completes Plant Addition

■ Ajax Flexible Coupling Co., Westfield, N. Y., has completed a new plant addition to house enlarged electric welding and assembly departments. Ajax vibrating screens, conveyors and packers are manufactured.

"Increasing importance of accurate separations in processing operations throughout industries ranging from plastics and foods to coal and ore has focused attention on increased vibrating speeds and strokes made possible by the operating principle of Ajax-Shaler Shakers," stated Wayne Belden, vice president.

Ajax-Shaler Shakers are used in scalping, single and multiple deck screening, level and off-level conveying and packing. Standardized equipment has been developed by the company to cover a wide range of uses in these fields.

Bethlehem Will Build Williamsport Addition

■ Bethlehem Steel Co. has awarded contract for construction of a one-story brick and steel addition, 80 x 425 feet, to its Williamsport wire rope division plant, Williamsport, Pa. Addition will be built on a three-acre site recently acquired adjoining present property.

U.S. Steel, G.E. Revise Fair Exhibits

■ United States Steel Corp. will revise its 1940 New York's World Fair exhibit to portray new aspects of the industry.

Realistic dioramas will follow production of steel from ore mining through blast furnace to rolling mill. Hall of Research, dramatically displaying qualities of steel, is to be continued.

General Electric Co., Schenectady, N. Y., is planning extensive changes at its 1940 exhibit to accommodate more people, provide new entertainment. Television space will be doubled, "Magic Kitchen" will have a small theater, and Steinmetz Hall will have a new lighting display.

Blaw-Knox Report Shows Employe-Consumer Ties

■ Furthering the trend toward simplifying and humanizing company reports is the explanatory booklet published by Blaw-Knox Co., Pittsburgh. Devoted to bridging the gap between employes' jobs and consumers, it undertakes an examination of the company's production phase. Last year's report explained company's financial structure, indicated relationship existing between stockholders and employes.

Declared the first publication of its kind to be printed by rotogravure, report illustrates steps in manufacture of Blaw-Knox products.

Reminder of importance of consumer considerations in ordinary job routine, report is also a basis for analysis of what company's products mean to the world.

WHERE-TO-BUY

A classified list of advertisers according to products. ¶Index to advertisements gives page number of any advertiser.

ABRASIVES (Blast Cleaning)
American Foundry Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

ABRASIVES (Polishing)
Abrasive Co., Taconey & Fraley Sts., Philadelphia, Pa.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ACCUMULATORS
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
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.

ACID-PROOF LININGS
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

ACIDS (Pickling)
American Chemical Paint Co., Box 310, Ambler, Pa.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

AIR COMPRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

AIRLESS BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., Mishawaka Ind.
Pangborn Corp., Hagerstown, Md.

ALKALI CLEANING COMPOUNDS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

ALLOYS—See FERROALLOYS

ANGLES, CHANNELS—See BEAMS, CHANNELS, ANGLES

ANNEALING BOXES—See BOXES (Annealing)

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.

BABBITT METAL
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BAGS (Cotton)
Ames Bag Machine Co., 1991 E. 66th St., Cleveland, O.

BALING PRESSES
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BALL TRANSFERS
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

BALLS (Brass or Bronze)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Strom Steel Ball Co., 1850 So. 54th Ave., Cicero, Ill.

BALLS (Special Alloy Metals)
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel)
(*Also Stainless)
*Strom Steel Ball Co., 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.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BAR BENDERS
Kardong Bros. Inc., 346 Buchanan St., Minneapolis, Minn.

BAR DRAWER AND STRAIGHTENING MACHINES
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

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. SI-29, 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. 2A, P. O. Box 6800-A, Chicago, Ill.
Midvale Co., The Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, 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.
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.

BATTERY CHARGING APPARATUS
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

BEAMS, CHANNELS, ANGLES, ETC.
(*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, 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.
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)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.

BEARINGS (Brass, Bronze)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
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)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
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)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
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)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
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)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Metal, Conveyor, High and Low Temperature)
Cyclone Fence Co., Waukegan, Ill.

BELTING (Rubber)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

BENDING AND STRAIGHTENING MACHINES
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.

BENZOL AND TOLUOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., Youngstown, O.

BILLETS (Alloys and Carbon Steel)
Alan Wood Steel Co., Conshocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS (Forging)
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jones and Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

BILLETS AND BLOOMS (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BINS (Storage)
Petroleum Iron Works Co., Sharon, Pa.

BLAST CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co., 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.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Broslus, 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.
Graybar Electric Co., 420 Lexington Ave., New York City.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

BLOWPIPES (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
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, 19 Rector St., New York City.
Oil Well Supply Co., Dallas, Texas.
Semet-Solvay Engineering Corp., 40 Rector St., New York City.

BOLT AND NUT MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Landis Machine Co., Inc., Waynesboro, Pa.

BOLTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Townsend Co., New Brighton, Pa.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

WHERE-TO-BUY

BOLTS (Track)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9371, Scranton, Pa.

BORING MACHINES (Precision)
Ex-Cell-O Corp., 1200 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.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

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 (Hydraulic)
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keasbey 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, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., Sharon, Pa.

BROACHING CUTTERS
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
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, 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.

BUSHINGS (Jig)
Ex-Cell-O Corp., 1200 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.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.

CARBURIZERS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Grant Bldg., Pittsburgh, Pa.

CARS (Dump)
Pressed Steel Car Co., (Koppel Div.) Grant Bldg., Pittsburgh, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Car Co., (Koppel Div.) Grant Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

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. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Shoop Bronze Co., The, 344-60 W. 6th Ave., Tarentum, Pa.

CASTINGS (Controlled Grain Structure)
Sorbo Mat Process Co., 1004 Market St., St. Louis, Mo.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American 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.
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.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.
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. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Baldwin Duckworth Div. of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Jeffrey Mfg. Co., 889-99 No. Fourth St., Columbus, O.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 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.

CHAINS (Power Transmission)
Jeffrey Mfg. Co., 889-99 No. Fourth St., Columbus, O.

CHAIN (Roller)
Baldwin Duckworth Div., of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIRS (Steel)
Harter Corp., The, Sturgis, Mich.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & 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.

CLEANING SPECIALTIES
American Chemical Paint Co., Box 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

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.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Twin Disc Clutch Co., 1379 Racine Ave., Racine, Wis.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.

CLUTCHES (Magnetic)
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.
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.

WHERE-TO-BUY

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.

COMMUNICATIONS SYSTEMS
Graybar Electric Co., 420 Lexington Ave., New York City.

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 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.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

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.
Graybar Electric Co., 420 Lexington Ave., New York City.

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.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Box 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9371, Scranton, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 401 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.

COUPLERS
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 111 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The 5112 Hamilton Ave., Cleveland, O.

COUPLINGS (Flexible)—Con.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Poole Fdy. & Mach. Co. Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
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.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

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)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.,
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

DIES (Cast)
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES

Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1200 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., 519 N. Holmes 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.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

DRUMS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

DRUMS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Pangborn Corp., Hagerstown, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
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)
Trufio Fan Co., Harmony, Pa.

FANS (Exhaust Ventilating)
Graybar Electric Co., 420 Lexington Ave., New York City.
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Trufio Fan Co., Harmony, Pa.

FANS (Portable)
Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Trufio Fan Co., Harmony, Pa.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

FANS (Wall)
Graybar Electric Co., 420 Lexington Ave., New York City.
Trufio Fan Co., Harmony, Pa.

WHERE-TO-BUY

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLOORING (Monolithic)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Box 310, Ambler, Pa.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

FORGING ROLLS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Hollow Bored)
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
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.,

FORGINGS (Iron & Steel)—Con.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp. Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.

FURNACES (Brazing)
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp. P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
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)
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.
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.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Harter Corp., The, Sturgis, Mich.

GAGE BLOCKS
Dearborn Gage Co., 22036 Beech St., Detroit, Mich.

GAGES
Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Gregory, Thomas, Galvanizing Works. Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS SCRUBBERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)
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. Sl-29, 3830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Broach & Machine Co., 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., 3280 E. 80th St., Cleveland, O.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
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.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
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.

WHERE-TO-BUY

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-6.
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., 1200 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1200 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)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. Sl-29, 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)
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Steam)
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The Alliance, O.

HANGERS
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland, O.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

HEATERS (Air)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

HEATERS (Electric Space)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

HEATERS (Oven)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HELMETS (Blast Cleaning)
Pangborn Corp., Hagerstown, Md.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
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
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

HOSE (Rubber)
United States Rubber Co., 1790 Broadway, New York City.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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
Ex-Cell-O Corp., 1200 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)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Box 310, Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INJECTORS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Building)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JETS (Steam, for Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Petroleum Iron Works Co., Sharon, Pa.

KEYS (Machine 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. 166-S-B, Nela Park, Cleveland, O.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHE DOGS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

LATHES
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.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEAD WORK
Dietzel Lead Burning Co., Coraopolis, Pa.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Dept. 166-S-B, Nela Park, Cleveland, O.
Graybar Electric Co., 420 Lexington Ave., New York City.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Treadwell Construction Co., Midland, Pa.

MACHINERY (Second Hand)
Emerman, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Broach & Machine Co., 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., 2638 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., 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., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL FINISHES
American Nickeloid Co., 1310 Second St., Peru, Ill.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING CUTTERS
Ex-Cell-O Corp., 1200 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.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
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-6.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., The, Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NAILS (Special Only—All Metals)
Townsend Co., New Brighton, Pa.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NOZZLES (Descaling)
Aldrich Pump Co., The, Allentown, Pa.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2934 E. 79th St., Cleveland, O.
Elastic Stop Nut Corp., 1001-S Newark Ave., Elizabeth, N. J.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Self Locking)
Elastic Stop Nut Corp., 1001-S Newark Ave., Elizabeth, N. J.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

OILS (CUTTING)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Box 310, Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)
Maehler, Paul, Co., The, 2200 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

PACKING (Asbestos or Rubber)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

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., Box 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., Box 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 321 W. Huron St., Chicago, Ill.

PARTS (Precision)
Ex-Cell-O Corp., 1200 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., Box 310, Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
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 (Ball)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINS (Clevis)
Townsend Co., New Brighton, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 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, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Welded Steel)
Treadwell Construction Co., Midland, Pa.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., 836 So. Michigan Ave., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE FITTINGS
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th and Walworth Ave., Cleveland, O.

PIPE STRAIGHTENING MACHINERY
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

PIPING CONTRACTORS
Grinnell Co., Inc., Providence, R. I.
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.

PISTON RODS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Riverson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.

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.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

PRESSES (Bending)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

PRESSES (Forging)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Hydraulic)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.

PRESSES (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Limited, 403 Duke St., York, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Stamping)
Zeh & Hahnemann Co., 180 Vanderpool St., Newark, N. J.

WHERE-TO-BUY

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bdlg., Pittsburgh, Pa.

PULLEYS (Magnetic)
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.
Roper, Geo. D., Co., Rockford, Ill.
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.
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., 1200 Oakman Blvd., Detroit, Mich.

PUMPS (Hydraulic)
Aldrich Pump Co., The, Allentown, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St. Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Roper, Geo. D., Co., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)
Aldrich Pump Co., The, Allentown, Pa.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
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., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Emerson, Louis E., & Co., 1760 Elston Ave., Chicago, Ill.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

RECEIVERS
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
Falcon St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
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.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., The, Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.
*Townsend Co., New Brighton, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.

RODS (Piston)
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., The, Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

ROLLER LEVELERS (Backed-up)
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

ROLLING DOORS & SHUTTERS—See DOORS AND SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry Co., First National Bank Bldg.,
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ROLLS (Bending and Straightening)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

ROLLS (Sand and Chilled)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machine)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

RUST PREVENTIVES
Alrose Chemical Co., Mill St., Cranston, R. I.
American Chemical Paint Co., Box 310, Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Flood Co., The, 6217 Carnegie Ave., Cleveland, O.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 1100 Koppers Bldg., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Box 310, Ambler, Pa.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 100 Koppers Bldg., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES
Lenco Laboratories, Inc., The, 623 Bondi Bldg., Galesburg, Ill.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

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)
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 9371, Scranton, Pa.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Progressive Mfg. Co., The Torrington, Conn.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Windsor, Vt.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

WHERE-TO-BUY

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., The, Torrington, Conn.
Townsend Co., New Brighton, Pa.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2934 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Townsend Co., New Brighton, Pa.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Townsend Co., New Brighton, Pa.

SCREWS (Hardened Self-Tapping)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Progressive Mfg. Co., The, Torrington, Conn.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Box 579, Jenkintown, Pa.

SCREWS (Thread-Cutting)
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SEPARATORS (Sand)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAKERS
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

SHEARS
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hanniffn Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

SHEARS—Con.

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.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)

American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., Dept. SI-29, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)

American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Deep Drawing and Stamping)

Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Electrical)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)

American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)

Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Long Terne)

Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Perforated)

Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)

Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jessop Steel Co., 584 Green St., Washington, Pa.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)

Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)

Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)

Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)

Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

SMALL TOOLS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS

Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLENOIDS (Electric)

Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

SOLVENT (Degreasing)

Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS

Cleveland Worm & Gear Co., 3280 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5311 S. Western Blvd., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.

SPELTER (Zinc)

New Jersey Zinc Co., 160 Front St., New York City.
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)
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

STAMPINGS (Blanking)
Van Syoc, G. W., 5-220 General Motors Bldg., Detroit, Mich.

STAMPS (Steel)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Chrome Cobalt)
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, 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)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
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)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa. New York City.
Crucible Steel Company of America, 405 Lexington Ave.,

STEEL (Electric)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago. New York City.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 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)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, 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.
Republic Steel Corp., Dept. ST. Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 2A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 540 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST. Cleveland, O.
*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.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, 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, 19 Rector St., New York City.

STOPPERS (Cinder Notch)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Broslus, 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. 166-S-B, Nela Park, Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TACHOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
United States Rubber Co., 1790 Broadway, 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., 1790 Broadway, New York City.

TANKS AND TOWERS
Treadwell Construction Co., Midland, Pa.

TANTALUM CARBIDE
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

TESTING 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., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

THERMOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Chain Pipe)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.

TOOL HOLDERS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
Ex-Cell-O Corp., 1200 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., 1200 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.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

TOY PARTS
Townsend Co., New Brighton, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 Depot St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

TRANSMISSIONS—VARIABLE SPEED
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.,) 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
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, 2167 W. 25th St., Cleveland, O.
Elwell-Parker Electric Co., The 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)
Towmotor, Inc. 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE MILL MACHINERY
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBE REDUCTION
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
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)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Steel & Tube Co., Canton, O.
Tube Reducing Corp., 24 Grafton Ave., Newark, N. J.

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 (Copper, Brass, Aluminum)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich
Shenango-Penn Mold Co., Dover, 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.
Standard Tube Co., The, 14600 Woodward Ave., Detroit Mich.
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)
Brosium, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TUNGSTEN CARBIDE (Tools and Dies)
Carboloy Co., Inc., 11141 E. 8 Mile Rd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)
Cutler-Hammer, Inc., 315 No. 12th St., Milwaukee, Wis.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

VALVES (Brass, Iron and Steel)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Check)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Control—Air and Hydraulic)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.

VALVES (Electrically Operated)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hunt, C. B., & Son, Salem, O.
Ross Operating Valve Co., 6474 Epworth Blvd., Detroit, Mich.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

VALVES (Globe)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Hunt, C. B., & Son, Salem, O.

VALVES (Hydraulic De-Scaling)
Hunt, C. B., & Son, Salem, O.

VALVES (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

VALVES (Needle)
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES (Steam and Water)
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

VISES (Bench)
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

WALKWAYS—See FLOORING—STEEL

WASHERS (Gas)
McKee, Arthur G., Co., 2422 Euclid Ave., Cleveland, O.

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., The, Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHERS (Spring)
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., Newark, N. J.
Shakeproof Lock Washer Co., 2501 N. Keelor Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WELDERS (Electric—Arc, Spot, Seam, Flash, Butt, Automatic Projection, Hydromatic, Etc.)
Federal Machine & Welder Co., Dana St., Warren, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-6.
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-6.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-6.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-6.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Bronze)
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS OR WIRE
Air Reduction Sales Co., 60 East 42nd St., New York City.
American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Champion Rivet Co., The, Harvard Ave. at E. 108th St. Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. Y-6.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
*Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.

WHERE-TO-BUY

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.
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.

WIRE BUGGIES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

WIRE CLOTH
Cyclone Fence Co., Waukegan, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE FORMING MACHINERY
Nilson, A. H., Machine Co., Bridgeport, Conn.

WIRE FORMS, SHAPES AND SPECIALTIES
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Seneca Wire & Mfg. Co., Fostoria, O.
Townsend Co., New Brighton, Pa.

WIRE MILL EQUIPMENT
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
Accurate Spring Mfg. Co., 3823 W. Lake St., Chicago, Ill.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hubbard, M. D., Spring Co., 410 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Pittsburgh Steel Co., 1653 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Townsend Co., New Brighton, Pa.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)
American Cable Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE ROPE SLINGS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.

WIRE STRAIGHTENING AND CUTTING MACHINERY
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Shuster, F. B., Co., The, New Haven, Conn.
Roebling's, John A., Sons Co., Trenton, N. J.
Williams, J. H., & Co., 225 Lafayette St., Buffalo, N. Y.

WRENCHES (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

ZINC (Rolled Sheets, Strips, Coils)
New Jersey Zinc Co., 160 Front St., New York City.

ZIRCONIUM METAL AND ALLOYS
Electro Metallurgical Sales Co., 30 E. 42nd St., New York City.

CLASSIFIED

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ALLOY CASTING REPRESENTATIVE

Must be well acquainted in Pennsylvania, West Virginia and Ohio.

Address Box 175, STEEL Penton Bldg., Cleveland.

OPPORTUNITY AVAILABLE FOR SALES executive experienced in marketing various grades of sheets. Give record of experience. Replies confidential. Address Box 170, STEEL, Penton Bldg., Cleveland.

OPERATING EXECUTIVE CAPABLE OF filling position with large manufacturer. Must have had several years practical experience in machine shop practice and general all around experience with production equipment used in forging and upsetting operations. Would give preference to man 35 to 45 years of age with technical education. State experience and education. Address Box 162, STEEL, Penton Bldg., Cleveland.

MANUFACTURERS REPRESENTATIVES with established lines. We are just changing our sales policy. If interested in exclusive territory for a leading line of precision drafting machines, investigate our unusually liberal commission arrangement. Drafting experience NOT necessary. Address Box 163, STEEL, Penton Bldg., Cleveland.

Help Wanted

WANTED — EXPERIENCED GENERAL manager for forging plant, location East. Must be thoroughly familiar with die design, heat treating, hammer operations, estimating and sales. Prefer technically trained man. State references, experience, and salary expected. Address Box 146, STEEL, Penton Bldg., Cleveland.

THOROUGHLY PRACTICAL ROLLER for 12" mill. Must be capable of getting results and acquainted with production and miscellaneous shapes. Location Central States. Address Box 149, STEEL, Penton Bldg., Cleveland.

REPRESENTATIVE WANTED IN NEW York territory to handle line of special alloy steel castings for use on bar, tube and rod mills. Commission basis. Address Box 148, STEEL, Penton Bldg., Cleveland.

ROLLING MILL SUPERINTENDENT wanted for foreign service, 3 year contract. Experienced with rolling structurals, bars and plates. In application state age, experience and salary desired. Address Box 164, STEEL, Penton Bldg., Cleveland.

Positions Wanted

OPEN HEARTH SUPERINTENDENT. 16 YEARS EXPERIENCE, BASIC AND ACID, CARBON AND ALLOY STEELS, ROLLS AD CASTINGS. GRADUATE ENGINEER. ADDRESS Box 158, STEEL, PENTON BLDG., CLEVELAND.

Positions Wanted

MANUFACTURING EXECUTIVE, 15 years practical experience on steel tubing, mainly welded. Thorough knowledge estimating, cost control, production and supervision, as well as buying and selling experience. Address Box 173, STEEL, Penton Bldg., Cleveland.

INDUSTRIAL FURNACES AND REFRACtories construction and maintenance, all types, very broad experience, oil, gas, or coal fired. Available soon. Address Box 150, STEEL, Penton Bldg., Cleveland.

LATIN-AMERICA
Export Sales Engineer, M.E., wide experience Latin-American countries; fluent Spanish and German, workable French and Portuguese; anxious cooperate present trade opportunities. Address Box 174, STEEL, Penton Bldg., Cleveland.

MAN 40 YEARS OF AGE, 20 YEARS EXperience steel fabricating business. Experienced in office bookkeeping and purchasing with majority of time spent in selling to industrial plants. Desires job in any locality. Address Box 172, STEEL, Penton Bldg., Cleveland.

DIE ROOM FOREMAN
11 years executive experience, capable of estimating, designing and supervision of manufacture of dies and stampings. Address Box 171, STEEL, Penton Bldg., Cleveland.

FACTORY MANAGER. 15 YEARS EXPERience including design, cost, purchasing, production. M. E. training. Recent pneumatic and hydraulic equipment experience. Age 36. Executive ability. Write Box 169, STEEL, Penton Bldg., Cleveland.

Classified

HELP WANTED
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Seven words of ordinary length make a line.
FIRST LINE IN BOLD FACE TYPE
A box number address counts as one line

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Employment Service

SALARIED POSITIONS
$2,500 to $25,000

This thoroughly organized advertising service of 30 years' recognized standing and reputation, carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 110 Delward Bldg., Buffalo, N. Y.

Accounts Wanted

ELECTRICAL, IN THE PITTSBURGH DIStrict. Have considerable electrical and mechanical experience in both selling and installation. Address Box 160, STEEL, Penton Bldg., Cleveland.

MANUFACTURERS REPRESENTATIVE contacting industrial plants in Indiana and S. W. Ohio, desires additional line on commission basis. Must have volume and repeat possibilities. Address Box 165, STEEL, Penton Bldg., Cleveland.

SALES REPRESENTATIVE HAVING CLIentele among industrials in Eastern Pennsylvania District, would like to take on additional line such as iron and steel products, machine tools, etc. Commission basis. Address Box 168, STEEL, Penton Bldg., Cleveland.

ARE YOU SATISFIED WITH YOUR PITTSburgh representation? If not, an established firm in business for 16 years desires new accounts, preferably those selling to steel plants, foundries and other industrial concerns. Commission basis. Address Box 166, STEEL, Penton Bldg., Cleveland

DETROIT REPRESENTATIVE
First class, wants forging, stamping, cast steel or malleables to sell automobile manufacturers. New model inquiries soon. Address Box 161, STEEL, Penton Bldg., Cleveland.

A PHILADELPHIA SALES ORGANIZAtion with years of experience in iron and steel commodities is desirous of representing another mill in this area together with present cold-rolled strip steel account. Address Box 157, STEEL, Penton Bldg., Cleveland.

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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.

PENNSYLVANIA

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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LIQUIDATION SALE
Retiring from Business
NEW ENGLAND STRUCTURAL COMPANY
310 Second Street Everett, (Boston) Mass.

H. & J. Angle Shear 8 x 8 x 1"; Newton column facer and rotary planer; Bausch multiple spindle drills; Hanna riveters; L. & A. horizontal punch etc.

TRAVELING CRANES

HIRAM A. LERNER,
Liquidating Agent

FOR SALE, COAL MINE
Large Acreage
OWEN MURPHY
200 Lloyd Ave., Latrobe, Pa.

Wanted

Live national welding equipment and supply dealer wants best manufacturers prices on 50,000 and 100,000 ft. ARC WELDING CABLE. Also need 100 ARC WELDING UNITS for cash or high trade allowance. **Write Box 152, STEEL, Penton Bldg., Cleveland.**

Bids Wanted

Federal Works Agency, Public Buildings Administration, Washington, D. C., Feb. 23, 1940.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Standard Time, Mar. 22, 1940, for construction of the U. S. P. O. at Brevard, N. C. 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.

Duplicate Parts

WELDED STEEL FABRICATION

Specialists in duplication of castings and machinery parts with rolled steel shapes.

Send blue prints and specifications for quotation.

MORRISON METALWELD PROCESS INC.
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150 ton United St-Hyd Forging Press.
No. 7 W-F Thread Roller, 1¼" cap.
No. 5 H&J Guill. Shear 4¼" rd., M.D
10'x¼" Bliss Sq. Shear 18" gap.
18"x36" Gang Slitters.

WEST PENN MACHINERY CO.
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Rails—"1 Ton or 1000"

NEW RAILS—5000 tons—All Sections—All Sizes.
RELAYING RAILS—25,000 tons—All Sections—All Sizes, practically as good as New.
ACCESSORIES—Every Track Accessory carried in stock—Angle and Splice Bars, Bolts, Nuts, Frogs, Switches, Tie Plates.
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L. B. FOSTER COMPANY, Inc.
PITTSBURGH NEW YORK CHICAGO

FOR SALE LIKE NEW
5,000 Steel Split Pulleys
3,000 ft. Line Shafting
1,000 Hangers Bearings Couplings
H. M. CROSS & SONS
Mill & Platt St., Rochester, N. Y.

Bids Wanted

Federal Works Agency, Public Buildings Administration, Washington, D. C., Feb. 9, 1940.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Standard Time, Mar. 12, 1940, for construction of the U. S. P. O. at Anchorage, Ky. 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.

The New Fafnir "Mechani-Seal" Ball Bearing

QUICK FACTS: Here's a brand new, frictionless, permanent seal that absolutely keeps grease in, dirt out; built integral with the bearing itself, and proved 100% efficient under extreme service tests.

Many a design engineer has burned the midnight oil over the problem of bearing seals for extreme conditions. Heretofore, efficient sealing has demanded: a rubbing member of felt or other material built into the bearing itself, supplementary sealing pieces which also involved rubbing members, or a complicated and expensive external labyrinth assembly.

Seal and Bearing Integral

But now Fafnir has combined a precision ball bearing with a precision-built, frictionless seal into a single unit that is *mounted* as one unit! It's compact; it's unbelievably effective; and it simplifies assembly and disassembly tremendously.

No Rubbing Parts

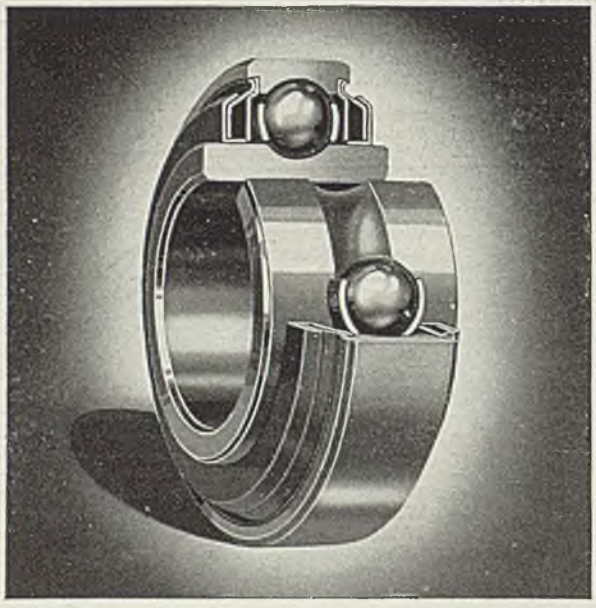
Two steel plate shields form the innermost members. They are tightly fitted to the bearing outer ring. An outer steel plate shield, pressed on the inner ring, clears these inner plates by definite but close tolerances. As the inner ring revolves, this exterior plate acts as an efficient slinger. The inner plates are widely separated, to trap any dust on the way in, or grease on the way out. The outer member is specially corrosion-proofed.

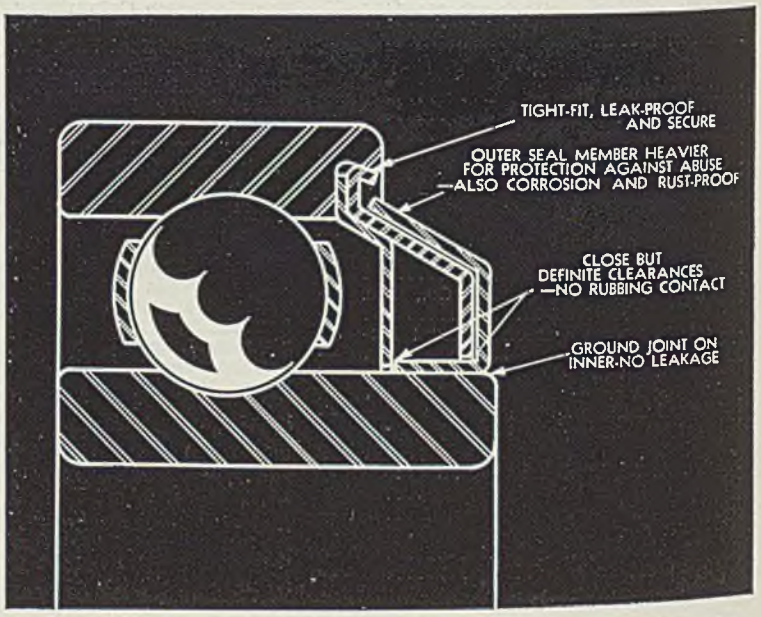
Two Years' Testing

Over two years' experimenting and exhaustive testing are behind the Fafnir "Mechani-Seal" design. Even after prolonged tests in the "dust box torture chamber" the grease within these bearings was 100% free from contamination . . . and they have outlasted other types of sealed bearings, tested at the same time, *three and four to one.*

Write for Folder

The new Fafnir "Mechani-Seal" Folder gives full details on the design and construction of these bearings, and separate Data Sheets give complete dimensional information and sizes available in Single Seal, Double Seal, and Seal-and-Shield types. You should have copies – write for them today! The Fafnir Bearing Company, New Britain, Connecticut.





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THE BALANCED LINE . . MOST COMPLETE IN AMERICA