STEEL

ESTABLISHED 1882

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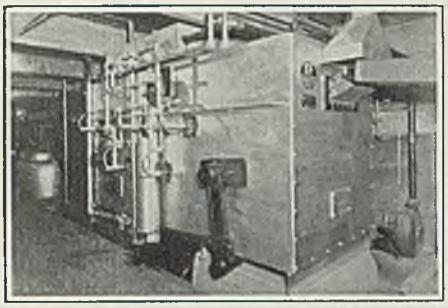
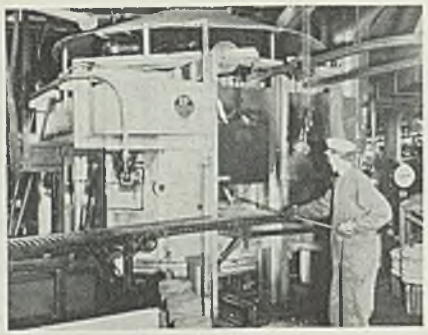
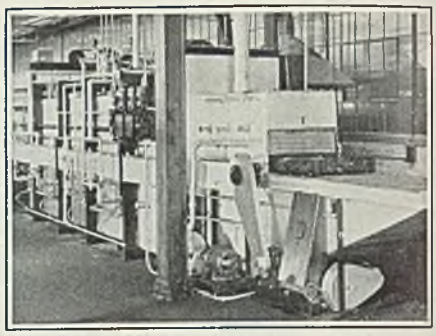


MACHINE GUN CARTRIDGE CLIPS are heat treated uniformly, continuously and scale-free in this E.F. special atmosphere continuous chain belt conveyor type furnace—one of a number of continuous furnaces built by The Electric Furnace Co., Salem, Ohio, adapted to heat treating arms and ammunition components.



FORGING FURNACES. The above oil-fired rotary is one of several continuous and semi-continuous rotary, pusher and other types of furnaces built by The Electric Furnace Co., Salem, Ohio for process heating, heat treating forgings and heating for forging. Send for printed matter.



ANNEALING SHELLS Designed for annealing brass shells, this E. F. gas fired continuous roller hearth furnace is also adapted to treating steel shells. Large shells are carried direct on rollers—smaller shells are loaded into pans on trays. Built in various sizes by The Electric Furnace Co., Salem, Ohio.

AIRCRAFT ENGINE PARTS are nitrided in this battery of double ended reciprocating type furnaces—part of the world's largest nitriding furnace installation. These furnaces were designed and built by The Electric Furnace Co., Salem, Ohio and installed in a prominent U. S. aircraft engine plant.

AIRPLANE PROPELLER BLADES and other aircraft parts are securely joined in this E.F. copper brazing furnace—one of a number of types of continuous and batch type installations made by The Electric Furnace Co., Salem, Ohio for copper and brass brazing and silver soldering, large and small assemblies.

BRASS FOR CARTRIDGES and other products are uniformly treated in various types of EF continuous, semi-continuous and batch type furnaces. The above installation shows 3 gas fired, hearth type forced circulation furnaces with quench, cooling chamber and handling crane—one of several similar installations made in prominent nonferrous plants by The Electric Furnace Co., Salem, Ohio.

HIGHLIGHTING THIS ISSUE OF STEEL

■ AMERICAN Iron and steel institute estimates present steel producing capacity as (p. 26) 84,152,000 net tons of ingots and castings per year. This compares with 81,619,000 net tons a year ago. On the basis of this revised figure last week's rate of production was (p. 27) 97 per cent, up 1½ points from the preceding week . . . Despite pressing demands in numerous directions, no cases are known (p. 99) where manufacturing operations have been halted or slowed down by inability to obtain required steel . . . After extensive preliminary study, construction of a sponge iron plant is under way (p. 27) at Longview, Texas . . . Many new armament awards (p. 41) add to the momentum behind the defense drive.

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Thumbs Down on Murray's Plan

The steel industry does not take kindly to the proposal (p. 26) by Phillip Murray, CIO head, that it be operated by an "industry council" composed equally of representatives of management and of SWOC, with a chairman appointed by the government. It takes exception to some of his statements, as "smaller steel firms are operating their open-hearth departments as little as 45 per cent of capacity." E. G. Grace says (p. 21) "let's not try a lot of untried things." He points to the steel industry's record; it always has adjusted itself to meet all demands—and will continue to do so. He sees no shortage of steel ahead and sees no reason for formal application of priorities.

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Priorities on Machine Tools

Ceiling on No. 1 heavy melting steel (p. 29) is to be $21 per gross ton delivered at Pittsburgh district consuming plants . . . All machine tool builders have been requested (p. 27) not to deliver any product after Feb. 28 to customers who have not obtained a priority rating . . . Nothing in federal labor statutes, reports L. M. Lamm, STEEL's Washington editor, prohibits employment of detectives (p. 30) to protect industrial plants from sabotage, theft or for any other legal purpose . . . Chamber of Commerce of the United States is opposed (p. 30) to federal anti-strike legislation . . . A vital defense need (p. 29) is 4000 miles of road within and approaching military encampments and industrial sites.

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Time To Study Munitions Now

Should we find ourselves in a "shooting" war industrial America will be called on to produce munitions in great quantity and in intricate and unusual designs. There will be no time then for careful study or long preparation. Hence this matter needs close study now on the part of manufacturers who are logical potential armament producers. In this issue (p. 54) Prof. Arthur F. Macconochie helpfully discusses metallurgical and other considerations entering into the manufacture of high-explosive shells; he mentions the bottlenecks which will have to be overcome in order to get ample production. . . . Carl Ulrich (p. 62) tells how to arc weld stainless steel—obtaining welds that take almost a mirror finish.

• • •

Alloy Steel Drop Forgings

S Rosenthal (p. 84) outlines the procedure to be followed in inspecting erected structural steel. . . . Reginald Trautschold (p. 79) describes the normalizing of alloy steel drop forgings in a 3-zone furnace where all factors are held uniform by automatic controls. . . . Fred B. Jacobs (p. 68) tells of fixtures and methods that save time in the assembly of sewing machines. . . . H. N. Barrett (p. 74) relates recent developments in making quick monolithic repairs of banks, walls and bottoms of open-hearth furnaces. . . . A new non-loosening nut is designed (p. 96) on the cotter principle. . . . A new arch bead which creates corners (p. 76) can be bent around corners and formed into curves of any shape

Prescribed for Tough Forming Jobs

THE above sheet has an important history. It was prescribed by Inland metallurgists to solve a specific forming problem, to take a fine finish, and to make a better product.

It was conceived when a manufacturer, looking for sheets best suited for his needs, called in an Inland metallurgist. Together they studied the part design, fabrication method, finish, and use of the product.

From this study came a sheet specification written by Inland metallurgists, who personally checked processing methods and quality. These metallurgists, working side by side with Inland skilled inspectors, made certain that this sheet will meet the customer's requirements. Every order placed in the future against this specification will be given the same care and attention. As a result users can depend on Inland quality and uniformity from sheet to sheet, and from order to order.

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"LET'S NOT TRY A LOT OF UNTRIED THINGS"

—E. G. GRACE

Steel Industry Coped with Emergencies Before; Proven Methods Should Be Considered First, if Emergency Again Arises. . . History Shows Steel Always Has Kept Ahead of Actual Needs. . . Is Ahead, Now. . . If Still Greater Requirements Develop "I Haven't Any Doubt They Will Be Met"

NEW YORK

■ UNTRIED proposals for the organization of the steel industry to cope with whatever emergency defense demands may develop should be avoided, in view of the success of methods of procedure used in past emergencies, E. G. Grace, president, Bethlehem Steel Corp., said in a press conference following the directors' meeting last week. He pointed out that there was a special organization of the industry to meet a special emergency upon two occasions, once during the World war and once during the NIRA period.

These methods, he said, have been proved and should be considered first if the necessity for such organization arises in the present crisis.

Upon the last occasion, a special board was set up comprising the directors of the American Iron and Steel institute, which represented 90 per cent of the steelmaking capacity of the industry. This board was organized to co-ordinate the activities of the industry during the code days, and he said that he had never heard anything but praise for the efficient manner in which it was done.

He thought, further, that no emergency had yet confronted the steel industry, but added that if it should come "let's not try a lot of untried things."

(A day or two before this Philip Murray, president, Congress of Industrial Organizations, and chairman, Steel Workers Organizing committee, submitted to President Roosevelt a plan "to achieve total steel output" by having the President appoint an "industry council," consisting of an equal number from the management and SWOC. See page 26.)

Mr. Grace saw no shortage of steel ahead, and no reason for the formal application of priorities.

He estimated the industry has

Net Earnings of Eleven Steel Producers Summarized

■ ELEVEN major steel producers, first to issue earnings statements for 1940, reported an aggregate net income of $231,961,571, after all charges, but before preferred dividends. This is nearly double $117,112,476 net profit earned by the same companies in 1939. In 1937, their combined net profit was $190,015,388. Aggregate ingot capacity of the 11 companies was 64,299,640 net tons. This represents nearly 80 per cent of the total for the entire industry.

Aggregate net profit in fourth quarter, 1940, was $79,663,058. This was nearly 17 per cent more than $68,289,158 earned by the same companies in the corresponding period in 1939, and about 16 per cent more than $68,784,820, their net income in third quarter, 1940.

Operating rate for the industry in 1940 was 82.2 per cent of capacity, nearly 18 points above the average of 64.7 per cent in 1939, and almost 10 points above average of 72.4 per cent in 1937. In fourth quarter last year, the rate averaged 95.5 per cent, with several companies reporting operations in excess of 100 per cent of theoretical capacity. In the corresponding period in 1939, operating rate for the industry was 89.8 per cent; in quarter ended Sept. 30, 1940, 77.8 per cent.

	1940	1939	Fourth Quarter 1940	Third Quarter 1940	Fourth Quarter 1939	Ingot Capacity, Dec. 31, 1939 Net Tons
United States Steel Corp.	$102,181,321	$ 41,119,934	$32,763,251	$33,103,067	$28,729,177	28,885,000
Bethlehem Steel Corp.	48,677,524	24,638,384	14,516,779	12,462,288	13,028,928	11,247,040
Republic Steel Corp.	21,113,507	10,671,343	8,480,174	6,183,880	6,772,693	7,280,000
Jones & Laughlin Steel Corp.	10,277,029	3,188,944	4,044,126	2,956.647	2,907,755	4,099,200
National Steel Corp.	15,066,341	12,581,636	6,271,187	3,827,311	5,292,331	3,808,000
Youngstown Sheet & Tube Co.	10,815,468	5,004,484	5,549,976†	2.842,280	3,693,225	3,494,400
Inland Steel Co.	14,450,385	10,931,016	4,561,901	4,918,818	4,574,441	3,091,200
Wheeling Steel Corp.	5,663,930	5,560,753	2,388,744	1,611,103	2,152,452	1,960,000
Keystone Steel & Wire Co.*	1,295,185†	1,390,758†	288.966	280.410	418,489	280.000
Copperweld Steel Co.	1,140,082	934,348	341,345†	277,423†	323,799†	110 000
Rustless Iron & Steel Corp.	1,280,799	1,090,876	456,609	321,588	395,868	44,800
Totals	$231,961,571	$117,112,476	$79,663,058	$68,784,820	$68,289,158	64,299,640

†Indicated; *fiscal years ends June 30.

three to four times as much steel capacity as will be needed to meet the requirements of the national defense program and of Great Britain, on the basis of present prospects. The most liberal estimate he had heard in an authoritative source was 20,000,000 tons for these requirements, which left between 64,000,000 and 65,000,000 tons to meet general commercial demands, more than was produced in 1929 and practically as much as last year.

The steel industry will always manage to keep ahead of needs; this has been demonstrated by its entire history, he said. Within the past 10 years capacity has been increased 20 per cent; last year approximately 2,500,000 tons was gained, and this year a similar increase is in prospect.

"If still greater needs develop," he stated, "I haven't any doubt they will be met."

With reference to expanding consuming demand based on expanding national income, Mr. Grace asserted: "When it becomes evident that producers of consumer goods will have to increase their capacity, steel will do the same thing."

Mr. Grace pointed out that ingot capacity in 1914, at the outbreak of the World war, was 44,452,000 net tons, against 84,152,000 today. This represents an increase in 27 years of almost 100 per cent, and during that time, he added, there has never been a year in which there has not been some increase in capacity.

Mr. Grace also took exception to statements his company had so much steel business on its books that it in itself represented a bottleneck in the industry. To refute this idea, he analyzed the unfilled business of the company. Of the estimated $1,204,100,000 value of orders on hand Dec. 31, 1940—an all-time high—ship construction work amounted to $1,036,100,000, leaving $168,000,000 for all other business on its books.

Translated into steel, unfilled orders on that date were 2,224,000 net tons, against 1,670,000 a year previously, a gain of 554,000 tons at a time when operations were much higher. This tonnage represented considerable defense work, including notably ship steel, much of which will not be needed for some time. However, he emphasized, if necessary Bethlehem can produce all this steel in three months' time. "Speaking of bottlenecks, it looks in this case as if the neck were a good deal larger than the bottle," he remarked.

Mr. Grace said that Bethlehem has a minimum of 850,000 tons of ingot capacity authorized for this year, which will be in addition to its present rated capacity of 11,850,000 tons.

Bethlehem's own program for expansion this year calls for the expenditure of $34,862,124, but in addition the company will spend $59,000,000 of government money for ship yards and certain steel facilities, all of which will revert to the government for operation when the emergency is over. To this latter sum, he said, approximately $8,000,000 could also be added for repair and expansion to facilities at a yard in Baltimore, where 13 ways are going to be provided for building 50 prefabricated cargo ships for the government. He estimated approximately 200,000 tons of plates would be required for the 200 prefabricated ships, saying he saw no bottleneck in plates.

Last year 27.1 per cent of Bethlehem's steel output was shipped abroad, with about two-thirds of that going to England and Canada. He said this was about double the average movement for the past three years, which was a little over 13 per cent.

Unless costs advance, prices will remain steady, Mr. Grace said. He pointed out that prices had been stable for considerable time, not advancing even at the outbreak of the European war. He thought every effort should be made to avoid inflation and was convinced that this could be done.

The company is in good position with respect to raw materials. It has two years' supply of manganese ore on hand, and well more than a year's supply of tin.

Bethlehem had 131,785 on its payroll in December, the highest on record, with still more to be added. For the year of 1940 as a whole, the average enrollment was 118,439, against 95,029 in 1939.

Payrolls last year amounted to $212,233,000, compared with $158,490,000 in 1939. Average hourly wages in the fourth quarter of last year were 96.9 cents, and in the third quarter, 93.2, which was the highest up to that time. Weekly schedules in the fourth quarter averaged 38.2 and in the third, 36.6.

In Bethlehem shipyards workers are on a 48-hour week schedule, receiving overtime for all above 40 hours. He explained that the shipyard schedules were taken into account in computing the general average.

Comparison of Bethlehem's Earnings

	Fourth Quarter 1940	Third Quarter 1940	Fourth Quarter 1939	Year 1940	Year 1939
Consolidated income...	$23,249,779	*$20,671,862	$20,432,849	$81,177,910	*$52,326,031
Interest, other charges	1,548,667	1,600,993	1,929,900	7,616,132	7,494,614
Provision for depletion, depreciation	7,184,333	*6,608,581	5,175,021	24,884,254	*20,193,033
Net income	$14,516,779	$12,462,288	$13,028,928	$48,677,524	$24,638,384

*Restated for purposes of comparison.

U. S. Steel's 1940 Earnings Equal $8.84 a Common Share

United States Steel Corp.'s net income in 1940 totaled $102,181,321, highest since 1930, and approximately 2½ times the 1939 net, $41,119,934. Fourth quarter earnings were $32,763,251, compared with $28,729,178 in the final period of 1939.

After provision for preferred dividends, earnings were equal to $8.84 per common share for the year and $3.04 per common share for the fourth quarter.

Finished steel shipments for fourth quarter increased 10 per cent over the third period and 8 per cent over the last three months in 1939. Fourth quarter shipments were 4,542,383 net tons, or at a rate of 93.3 per cent of capacity, compared with 4,196,029 tons, or 84.3 per cent of capacity, in the last three months of 1939. Shipments for the entire 12 months last year totaled 14,976,110 tons, 77.3 per cent of capacity, against 11,707,251 tons, 59.3 per cent of capacity, in 1939.

Taxes in 1940 totaled $85,294,204, of which $59,119,204 were for state, local and social security levies and $26,175,000 for federal income taxes. Comparable figures for 1939: $67,017,086 total; $54,042,086 state, local and social security; and $12,975,000 federal income.

Corporation's payroll in 1940 at $438,621,292 was highest in history and currently is running at a rate of $492,000,000 annually. Previous peak was in 1937 when $432,000,000 was expended for wages and salaries. In 1929, payroll was $420,000,000.

Average employment was 254,393 for the full year and 272,087 for the fourth quarter. In 1939, employment averaged 223,844 for the year and 257,783 for the last three months.

Irving S. Olds, board chairman, announced the corporation's capacity at the beginning of this year was 29,720,000 net tons of steel ingots, an increase of 1,925,000 net tons, or 6.9 per cent, since the beginning

of 1940. He explained some of the gain resulted from additional electric furnace capacity and some from enlargement of existing open hearths. Resumption of operations in various marginal units also has been a factor. Further increase of about 500,000 net tons will result from the improvement program at Tennessee Coal, Iron & Railroad Co. and from electric furnaces projected or under way.

Asked whether he believed present capacity is adequate to fill defense, export and normal needs, Mr. Olds said:

"Current capacity of the steel industry is more than 84,000,000 net tons of ingots. According to what we know, about 20,000,000 net tons should take care of national defense needs and exports. This leaves 64,000,000 net tons for orders from domestic consumers, or more than all the ingots produced in 1929 and only a little under total output last year. This seems to us as if there is enough steel to go around. About 2,500,000 additional net tons will be available late this year or early in 1942."

No Bottlenecks Yet

Mr. Olds said he did not see any bottlenecks at present and that if any arose they probably would be temporary. Priorities, he believes, are unnecessary at this time.

Finishing capacity is larger than ingot capacity, and finishing capacity is flexible, he remarked. The Irvin works, with some alterations, could produce plates, for example.

Direct government requirements now constitute about 5 per cent of the corporation's total output, Mr. Olds said. The total going into defense work is impossible to estimate due to the variety of orders coming from consumers who may have government orders.

Exports for 1940 took about 15 per cent, dollar value, of production. Fourth quarter shipments were slightly lower than those in the third quarter.

Unfilled orders are equal to about three months' shipments at current rate. Domestic demand still is running ahead of shipments, although volume has been slightly lower in recent weeks.

Mr. Olds expressed the hope there would be no increases in costs that would necessitate an increase in prices. Labor is the biggest cost item. In regard to this, Mr. Olds said the corporation has not received any requests from the Steel Workers Organizing committee for a change in contract and that recent conferences between SWOC and corporation officials have been exploratory and informal.

No labor shortage exists in the steel industry, he said. The industry has adjusted itself to the 40-hour week and now is working at a continuous rate. A longer week would not add greatly to production, Mr. Olds believes.

Corporation directors last week declared the quarterly dividend of $1.75 per share on preferred stock, payable Feb. 20 to record Feb. 3, and $1 per share on common stock, payable March 20 to record Feb. 20.

Net current assets of corporation and subsidiaries on Dec. 31, after deducting both current dividend declarations, were $472,559,334, compared with $453,723,226 on Sept. 30, and $431,988,446 on Dec. 31, 1939.

Unexpended balances on authorizations for property additions and replacements amounted to approximately $148,600,000 at year's end. Capital outlays for improvements and additions in 1940 were $64,600,000.

Inland's 1940 Income $14,450,385; Production, Sales at New Levels

Inland Steel Co., Chicago, earned $14,450,385 net profit in 1940, as production, sales, number of employes and payrolls reached new high levels, according to Edward L. Ryerson, chairman. This was equal to $8.87 per capital share, and compared with net profit of $10,931,016 or $6.73 per share in the preceding year.

Earnings in fourth quarter, 1940, totaled $4,561,901, equal to $2.80 per share, slightly less than net profit of $4,574,441 or $2.81 per share in the period in 1939. This despite record operations in the quarter, and due to provision of $1,165,551 for estimated excess profits tax. Provision for excess profits tax for the year was $1,749,368.

Consolidated sales in 1940, said Mr. Ryerson, were approximately 23 per cent greater than in the preceding year. Employes in last quarter averaged 20,785; for the year, 19,868 against 17,278 in 1939. Payrolls aggregated about $36,000,000 last year, compared with $32,281,261 in 1939.

Inland's exports were 7.5 per cent of shipments for the entire year and 9.9 per cent in the last quarter. In 1939 exports were 1.4 per cent of shipments.

Ingot production for the year was 2,901,870 net tons, averaged 93.8 per cent of theoretical capacity as against 77.7 per cent in 1939. Rate in fourth quarter was 106.7 per cent; in last quarter, 1939, it was 102.6 per cent.

Cash dividend of $1 per share was declared last week, payable March 3 to record of Feb. 14.

Youngstown Sheet & Tube's 1940 Net $10,815,486, Double 1939 Profit

Youngstown Sheet & Tube Co., Youngstown, O., earned a net profit of $10,815,486 in 1940, more than double that of $5,004,484 in the preceding year and about 10 per cent less than 1937's aggregate, $12,190,649. Net income last year, after provision for preferred stock dividends, was equal to $5.96 per common share, against $2.49 per share on common in 1939.

Indicated fourth quarter, 1940, net profit computed from quarterly reports, was $5,549,976. It compared with net income of $3,693,225 in fourth quarter, 1939, and $2,842,280 in the period ended Sept. 30, 1940.

Republic Steel Plans $100,000,000 Refinancing of Funded Debt

Republic Steel Corp., Cleveland, last week reported intention to file with the securities and exchange commission early in February plans for financing in excess of $100,000,000. Proceeds will be used to refund all the corporation's existing funded debt and to increase its working funds slightly.

Registration statement will sum-

Big Steel's Fourth Quarter and 1940 Earnings

	Fourth Quarter	Year 1940
Earnings and income (excluding items below)	$85,367,044	$280,066,069
Less, state, local and social security tax provisions	15,201,482	59,119,204
Net earnings after above taxes	$70,165,562	$220,946,865
Less, depreciation, depletion and obsolescence allowances	19,388,810	71,168,471
Profit from operations	$50,776,752	$149,778,394
Net profit from sales of capital assets and securities (and sundry adjustments)	+550,303	+1,035,395
Expense of patent litigation (less reserve therefor)	.....	—1,850,000
Expense of future pensions (of employes retired in 1940 on account services prior thereto)	—6,969,318	—6,969,318
Net income before interest charges and federal income taxes	$44,357,737	$141,994,471
Interest, discount and premium (bonds, mortgages and notes):		
Of subsidiary companies	1,773,771	6,430,815
Of United States Steel Corp.	2,474,064	7,207,335
Net income before federal income taxes	$40,109,902	$128,356,321
Provision for federal income taxes	7,346,651	26,175,000
Net income applicable to capital stocks	$32,763,251	$102,181,321

marize Republic's plant expansion and modernization program and its property acquisitions in the past five years. Statement will show the corporation expended in that period approximately $76,800,000 in constructing new facilities and in modernizing and extending its existing facilities. Properties and equipment totaling about $30,900,000 were retired.

Republic's steel ingot capacity was increased more than 1,000,000 tons to 7,888,000 tons in the period; pig iron capacity was increased from 3,954,000 tons to 4,830,000 tons. Alloy steel capacity was expanded from 159,000 tons to 388,000 tons; two new furnaces now under construction will increase this to 500,000 tons per year.

Dillon, Read & Co.; Glore, Forgan & Co.; and Lehman Bros. are expected to head the underwriters.

Sixty-five representatives of banking, investment and insurance firms from a dozen eastern cities inspected northern Ohio plants of Republic Steel Corp. last week.

Tour, which was made in chartered buses, started in Youngstown with inspection of Republic's plants there and of Truscon Steel Co., a Republic subsidiary. Thursday afternoon a visit was paid to the Niles and Warren plants, after which the visitors were entertained at dinner in Cleveland. Cleveland steelworks were visited Friday morning and in the afternoon alloy operations in Canton and Massillon.

Wheeling Nets $5,663,930, Clears $31.50 Accumulation on Preferred

Dividend of $33 per share on its 6 per cent preferred stock was declared last week by Wheeling Steel Corp., Wheeling, W. Va. Accumulations on the stock totaled $31.50 per share and the dividend included these accruals plus $1.50 due April 1, 1941. Corporation's directors passed resolution calling for redemption April 1 of all the 6 per cent preferred outstanding at that date. Redemption price is $100, plus the $33 dividend.

Directors also reported that currently outstanding 6 per cent preferred would remain exchangeable at the rate of one share of $5 cumulative prior preferred and one-half share common for each share of the 6 per cent preferred surrendered before March 14. Exchange offer will terminate at that date.

Wheeling's net income last year aggregated $5,663,930 after all charges, and was equal to $6.59 per share on common after preferred dividend requirements. This compared with net profit of $5,560,753 or $6.40 per share on common in 1939.

Regular quarterly dividend of $1.25 per share on the $5 cumulative convertible prior preferred was also declared, payable April 1 to record of March 14.

Steel Employment 585,000 in December

■ Steel employment in December was approximately 585,000, an increase of 8000 over November, according to the American Iron and Steel institute. Payrolls were $91,233,000 against $$87,921,000 the month before. Wages received averaged 86.5 cents per hour compared with 86.2 cents in November. Average hours per week were 37.6 against 38.2 in November.

Jones & Laughlin Net $10,277,029; Fourth Quarter Profit Increases

Jones & Laughlin Steel Corp., Pittsburgh, reports 1940 net profit, subject to audit and year-end adjustments, was $10,277,029. This was equal, after annual preferred dividend requirements, to $10.70 per share on common. Net income in 1939 was $3,188,944 or $5.43 per share on the $7 preferred.

Fourth quarter net income was $4,044,126, and was equal to $5.23 per share on common after quarterly dividend requirements on the $7 cumulative preferred stock. This compared with net profit of $2,907,755 or $3.26 per share on common in the fourth quarter of 1939 and $2,956,647 or $3.35 per common share in period ended Sept. 30, 1940.

Dividend accumulation on the $7 cumulative preferred stock totaled $45 per share as of Jan. 1, 1941.

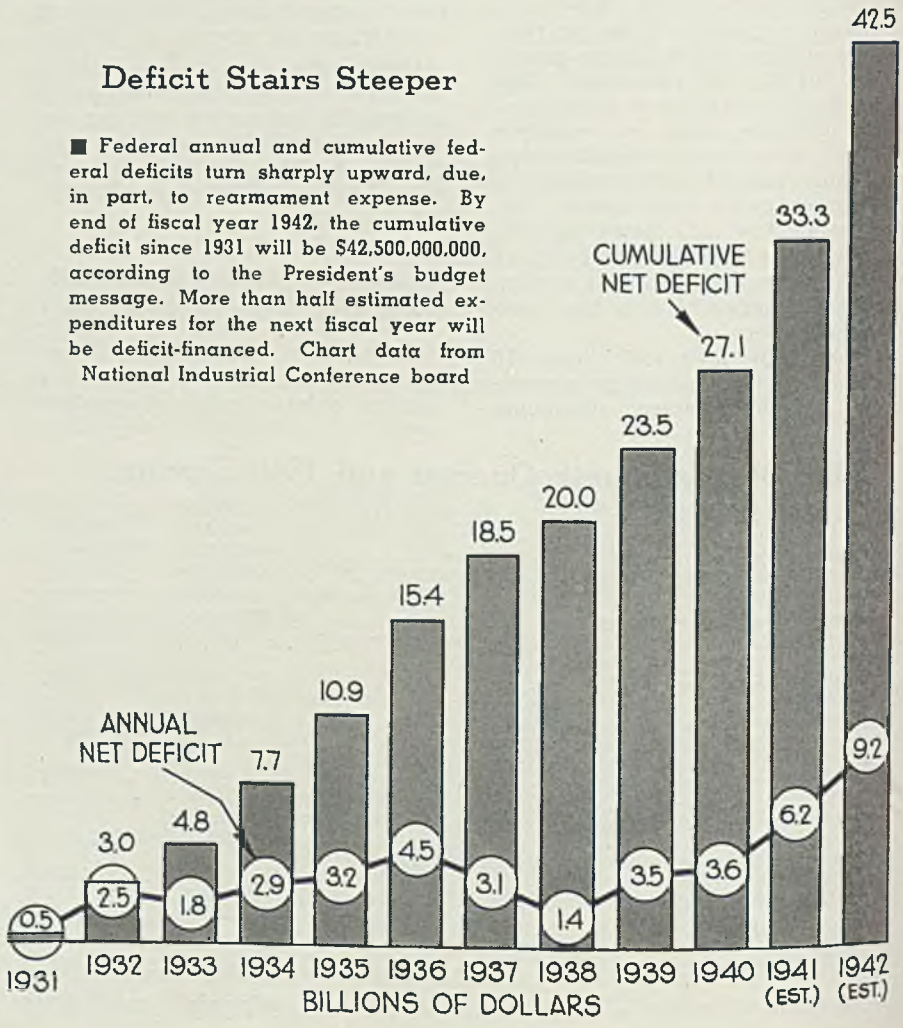
$15,066,341 Net Income Earned by National Steel Corp. in 1940

National Steel Corp., Pittsburgh, reports net income earned in fourth quarter, 1940, totaled $6,271,187. This was equal to $2.84 per share on the corporation's capital stock and compared with net profit of $3,827,311 or $1.74 per capital share earned in third quarter last year. Net profit in fourth quarter, 1939, was $5,292,331 or $2.40 per share.

Aggregate net income last year was $15,066,341, equal to $6.83 per share. Total net profit in 1939 was $12,581,636 or $5.71 per share. Excess profits tax provision last year was $2,045,974, equal to 93 cents per share.

Deficit Stairs Steeper

■ Federal annual and cumulative federal deficits turn sharply upward, due, in part, to rearmament expense. By end of fiscal year 1942, the cumulative deficit since 1931 will be $42,500,000,000, according to the President's budget message. More than half estimated expenditures for the next fiscal year will be deficit-financed. Chart data from National Industrial Conference board



$230,000,000 Road Building Program

"Essential to National Defense"

■ HIGHWAY construction as a factor in national defense occupied the principal attention of participants in the thirty-eighth annual convention of the American Road Builders' association, last week in Hotel Pennsylvania, New York.

Contrary to usual custom, the exposition of road building equipment which has been held in conjunction with this convention in the past was omitted this year. While this held the registered attendance to a little over 6000, large audiences were present for the various sessions.

A $230,000,000 road construction program has been certified as necessary to national defense by the war and navy departments and the advisory commission to the council of national defense, the convention was told in a message from John M. Carmody, administrator, federal works agency. The vital need, he said, is 4000 miles of road within and approaching military reservations and industrial sites. Access roads to camps and industrial sites represent more than half the mileage and about three-quarters of the total cost of urgent defense roads.

A secondary aspect of the program was described by Mr. Carmody in the case of the 75,000 miles of longer routes designated as "the strategic networks."

"These highways have many weaknesses," he stated. "Four thousand miles of them are less than 18 feet wide, 14,000 more are deficient in surface strength, 24,000 of their bridges are deficient in strength and 500 more bridges are not wide enough."

Building of highways should be considered as an investment rather than an expenditure, according to H. G. Sours, president of the association, and Ohio state director of highways. He urged that the financing of defense highways be considered a definite part of the entire defense program and should, therefore, not rest completely on the shoulders of the individual states. He explained that the federal government should assume a large part of expenditures for military needs.

Charles M. Upham, engineer-director of the association, pointed out that although the need for bringing 14,000 miles of public roads in the 75,000 miles of defense network up to standard has been known for six months, no additional road funds beyond the regular federal-aid allotments have been made available.

"It is inconceivable that billions are to be spent for defense without taking into consideration the fact that a considerable part of this expenditure will be far from 100 per cent effective unless something is done to the road system in areas where the battle ground is likely to lie," declared Arthur W. Brandt, superintendent of public works, Albany, N. Y.

Describing the important part roads have played in the current European war, he said that Germany, with only 300,000 motor vehicles, including military equipment, built highways that would have cost $2,000,000,000 to reproduce here. These roads were a vital factor in enabling Germany to move its war machine rapidly to attack points and in facilitating the transport of supplies. Allied forces, on the other hand, constantly were hampered by inadequate highways.

Proposes "Evacuation Roads"

A proposal to build "evacuation roads" from seaboard cities with a view to preventing civilian stampedes in event of invasion was presented by R. Getty Browning, chief engineer, North Carolina state highway department.

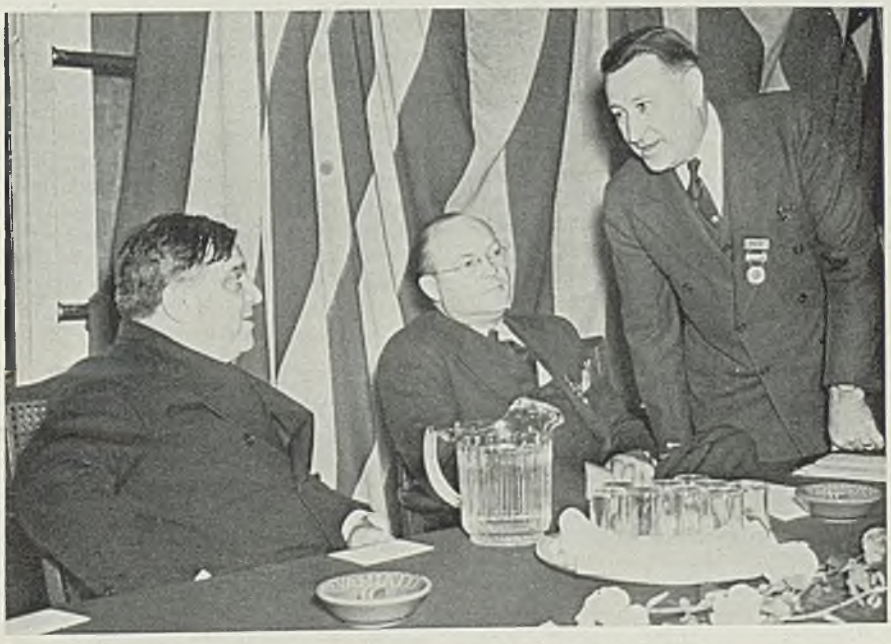
In welcoming delegates to the convention, Mayor La Guardia, New York, warned the association not to "try to pin normal road-building activities on to national defense."

A detailed study of the design and application of elevated highways was presented in the report of the committee on elevated highways, of which V. G. Iden, secretary, American Institute of Steel Construction, is chairman. This study was prepared by Ralph R. Leffler, chief structural engineer for the sanitary district of Chicago.

In brief, the problem as outlined by Mr. Leffler, is to determine the best pattern for adequate roadways for autos and buses from the outskirts of built-up areas to convenient parking in the inner parts of the central business district of a typical or near-typical "Big City."

His answer is: "Beautiful, streamlined elevated highways with bright, smooth, wide and long undersurfaces, supported on well-shaped columns amid playgrounds, parks and wooded areas in rights-of-ways over 300 feet wide. And, in the central business district, the same type of structure between the skyscrapers in the existing streets, with direct connections, at the second and third floor levels, to multi-storied garages and to the less rentable second to eighth stories of office buildings for parking." Sketches of typical installations accompanied the report.

Present officers of the association were re-elected for the coming year. In addition to H. G. Sours, president, these include: Vice presidents, Paul B. Reinhold, Reinhold & Co., Pittsburgh; John E. Ballenger, Ballenger Construction Co., Lakeland, Fla.; Lion Gardiner, Jaeger Machine Co., Columbus; Stanley Abel, supervisor, Kern county, Taft, Calif.; secretary, Charles M. Upham, engineer-director of the association, and treasurer, H. C. Whitehurst, director of highways, District of Columbia, Washington.



■ Mayor La Guardia of New York (left); H. G. Sours, director, Ohio department of highways and president, American Road Builders' association (center) and Charles M. Upham, engineer-director of the association, Washington, at thirty-eighth annual convention of the association in New York, Jan. 27-31

CIO Head Proposes Management-Labor Council To Operate Steel Industry

■ CREATION of an industry council consisting of an equal number of representatives of management and the Steel Workers Organizing committee, with a government representative as chairman, to co-ordinate the steel industry into "one great production unit" is proposed by Philip Murray, CIO president, in a survey of the steel industry released last week.

Mr. Murray's survey has been submitted to the President, cabinet members and national defense officials.

Second to his proposal for joint labor-management-government control of the industry, the most arresting statement contained in the survey is:

"In the United States a total of 5,920,195 net tons of steel melting and finishing capacity now idle can be brought into actual production in the year 1941, under the traditional 'business as usual' methods of operating the steel industry."

Steel's "Idle" Capacity

Mr. Murray summarizes this idle capacity as follows:

(1)—1,965,800 net tons of bessemer steel melting capacity is idle, while open hearth and electric steel facilities are operating at 99 per cent of capacity.

(Bessemer production has been increasing steadily in recent months. April, 1940. production was 176,335 net tons, or at a rate of 35.76 per cent of capacity. June output was 304,381 net tons. October production was 408,053 tons and November's 418,491 net tons, or at a rate of 84.86 per cent of bessemer capacity—The Editors)

(2)—Extension of use of the bessemer flame-control process developed by Jones & Laughlin Steel Corp., Pittsburgh, should raise bessemer steel output fully 1,000,000 net tons.

(Several leading producers already have been licensed to use this process and other companies now are negotiating for licenses. See STEEL, Jan. 27, p. 18.—The Editors)

(3)—Idle open hearth and finishing facilities represent 2,454,395 net tons of capacity which could be brought into production by operating facilities that are completely idle at present and by rounding out the melting and finishing facilities of certain of these firms.

(Trades to equalize capacity and to overcome a lack of balance in certain departments are fairly common practice. For example, Carnegie-Illinois Steel Corp. devotes a blast furnace to manufacturing pig iron for Jones & Laughlin—STEEL, Dec. 2, 1940, p. 22.—The Editors)

(4)—One-half million net tons of new billet steel capacity could be released for armament and other purposes by having the 16 small producers of rerolled concrete reinforcing bars bring their finishing facilities into capacity operations.

(Releasing new billet capacity by increasing output of the rerolling mills is normal practice during periods of high demand for steel. Recently producers of bars and other sections from rerolling rails obtained a preference through government channels for this type material. See STEEL, Jan. 20, p. 24.—The Editors)

Consensus in the steel industry was that Mr. Murray's survey gave wide publicity to a situation well realized by informed persons and which is being adjusted as far as possible.

The SWOC survey also finds the large steel companies are overloaded with orders, backlogs are running from two to four months, while smaller companies are operating their open hearth departments as little as 45 per cent of capacity.

Total employment of steel workers and salaried employes, the report states, is 26,106 below the peak of 603,106 reached in August, 1937.

Mr. Murray reported: "A diligent effort has been made in this survey to determine whether an over-all expansion of steel facilities is needed. Frankly, we do not know. The statements of government spokesmen that a large-scale steel expansion program is necessary, as well as the statements of industry spokesmen that present facilities are adequate to meet all steel needs are unconvincing. The heat should be taken out of the controversy. Management, organized labor, and government representatives should get together and ascertain the truth of the situation."

"Top Scheduling Clerk"

The CIO president's plan for a labor-management-government council would, he contends, "assure this country of an adequate supply of iron and steel for civilian and military needs."

The plan "proposes to obtain this steel in two ways: First, through the most efficient co-ordination and use of present steel producing facilities; and, second, through a well-reasoned, responsible program to expand steel melting and finishing capacities where necessary. . . .

"The plan . . . has its foundation in the creation of a 'top scheduling clerk' for the entire steel industry. Each mill and each company has a scheduling clerk to achieve the highest possible productive efficiency. . . . It is as practical to achieve this type of industry-wide co-ordination as it is to achieve mill-wide and company-wide co-ordination of steel orders with productive facilities."

Washington observers predicted the plan would receive consideration but would not be adopted. In fact, some observers believe the businessmen representatives in the defense setup are becoming a bit weary of the various "plans" submitted by labor leaders to speed defense production.

Steel Capacity at 84,152,000 Tons, Reaches Peak

■ STEEL producing capacity has reached a new peak, 84,152,000 net tons of ingots and castings per year, according to the American Iron and Steel institute's annual survey of productive capacity.

Present rated capacity represents a rise of more than 2,500,000 tons per year over the figure of 81,619,000 tons annual capacity rated Dec. 31, 1939, and is almost 40 per cent higher than capacity of 61,021,000 tons reported at the close of 1918.

Compared with steel capacity in 1929 of 72,985,000 tons, present figures show an advance of fully 15 per cent, nearly twice as much as the percentage increase in the nation's population since 1929.

Rated capacity figures compiled and published by the institute are based on actual operating experience of every steelmaking furnace in the industry.

In total rated capacity, as reported, generous allowance is made for time lost by periodic shutdowns of furnaces for repairs, relining, and so forth. If necessary, industry could produce up to 2.5 per cent more than rated capacity which would increase its maximum working capacity at the present time to as much as 86,250,000 tons.

Included in net increase of approximately 2,500,000 tons of annual capacity during 1940 are capacities of new furnaces installed during the year and added capacity created by modernization and enlargement of older furnaces.

In addition, certain steel companies have brought back into service some steelmaking equipment, both open-hearth furnaces and bes-

semer converters, which had been removed from the active list a year or so ago but which had not been dismantled. During 1940 the steel industry's annual capacity for producing ingots and castings by the open-hearth process rose from 73,722,000 to 74,566,000 tons.

Annual bessemer steel capacity rose from 6,010,000 tons at the close of 1939 to 6,997,000 at the end of 1940. Further additions to open-hearth capacity to come into production later in 1941 have already been announced by several companies but are not included in the above figures.

Capacity for producing steel in electric furnaces rose from 1,883,000 tons as of Dec. 31, 1939, to 2,586,000 tons as of Dec. 31, 1940. Nearly all of that increase came from the construction of new furnaces ordered during 1940 and completed before the year ended.

Other new electric furnaces now under construction are expected to increase that total capacity still further during the first half of 1941. The industry's capacity for producing crucible steel decreased during 1940 from 5400 tons annually to 3900.

Priorities on Machine Tools After Feb. 28

■ E. R. Stettinius, director of the priorities division, office of production management, announced Friday that all machine tool builders have been requested not to deliver machine tools to any customers after Feb. 28, unless customers have obtained priority ratings.

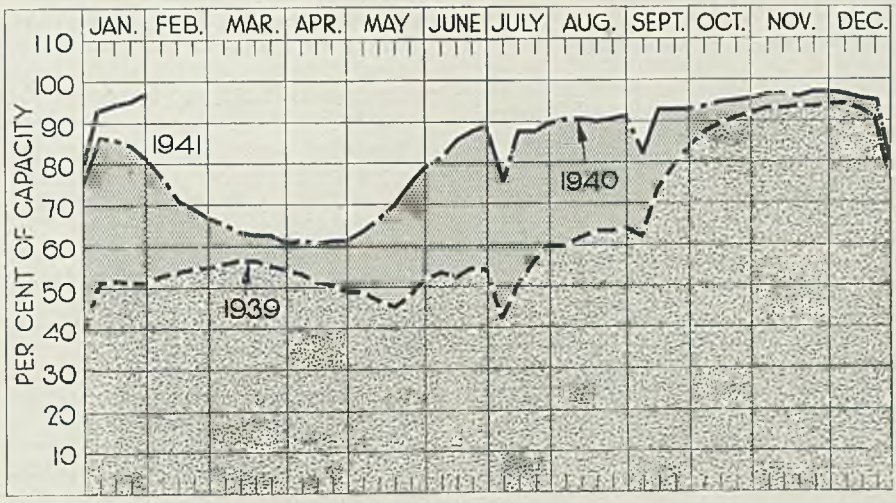
This request has been transmitted to all machine tool manufacturers in a letter sent out by Stettinius.

Effect of this action will be to give the defense program first call on total output of the machine tool industry.

Plant To Reduce Texas Ore by Natural Gas

■ Madaras Steel Corp. of Texas, O. H. Grissom, president, announces its first commercial plant will be located at Longview, Tex., using a process for reduction of iron ore by natural gas, developed by Julius D. Madaras, Detroit. A 220-acre site has been underwritten by Longview citizens, at a cost of $22,000, and will be presented to the corporation.

Construction of the plant will begin immediately, production to begin following installation of equipment and preliminary tests. Ore will be obtained from deposits extending through 23 East Texas counties.



PRODUCTION . . . . Up

■ STEELWORKS operations last week were estimated at 97 per cent of capacity, a gain of 1½ points from the revised figure for the preceding week, which has been adjusted on the basis of the new capacity figures as of Dec. 31, 1940, as announced by the American Iron and Steel institute. All January figures in the accompanying chart have been revised to the new basis. Production last week rose in five districts, dropped in two and remained stationary in five. A year ago the rate was 76½ per cent; two years ago it was 53 per cent.

Youngstown, O. — Advanced 1 point to 95 per cent, with 74 open hearths and three bessemers active. Republic Steel Corp. added one open hearth at Warren, O., Thursday, giving 75 active at the week end. Outlook for this week is for the same rate or possibly a further rise of 1 point. Republic will take off one open hearth at Warren for repairs but may add one at Youngstown.

Detroit — Drop of 3 points to 92 per cent resulted from furnace idleness because of repairs.

Birmingham, Ala. — Unchanged at 100 per cent, which has prevailed for five weeks.

St. Louis — Advanced 2½ points to 90 per cent, the highest since 1937. One steel company plans to add an open hearth idle since November, 1937.

Cincinnati — Continued at 90 per cent, two open hearths still being down for repair work.

Cleveland — Gained 2½ points to 86½ per cent, as one interest added further production units.

Chicago — Up 1½ points to 98 per cent as repairs were completed on some units.

Pittsburgh — Adjustments in production units increased ½-point to 96½ per cent.

Wheeling — Held at 100 per cent for the third consecutive week.

New England — Loss of two open hearths for repairs lowered production to 88 per cent, a drop of 12 points. Rebound is expected this week.

Central eastern seaboard — Steady at 96 per cent, for the third week, all available facilities being active.

Buffalo — Held at 93 per cent, with schedule for this week 2½ points higher as an open hearth is returned to service.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Feb. 1	Change	Same week 1940	Same week 1939
Pittsburgh	96.5	+ 0.5	73	46
Chicago	98	+ 1.5	85.5	48.5
Eastern Pa.	96	None	78	34
Youngstown	95	+ 1	51	42
Wheeling	100	None	82	64
Cleveland	86.5	+ 2.5	75	64
Buffalo	93	None	60.5	39.5
Birmingham	100	None	90	80
New England	88	—12	66	70
Cincinnati	90	None	64.5	55
St. Louis	90	+ 2.5	70	48.5
Detroit	92	— 3	93	92
Average	*97	+ 1.5	76.5	53

*On new capacity basis.

Blast Furnace Relining Completed in 60 Days

■ Unusual speed was achieved in relining a blast furnace by Wisconsin Steel Co., Chicago, subsidiary of International Harvester Co. Its No. 2 stack at South Chicago, Ill., was blown out Dec. 1 and blown in Jan. 30, completely relined and rehabilitated. The stack has capacity of 600 tons daily. Usually the work thus completed in 60 days requires 90 days.

Britain's Pig Iron Purchases Heaviest

■ DECEMBER pig iron exports were nearly triple those of November, 70,856 gross tons, valued at $1,857,231, against 27,838 tons. Of the total 4764 tons, valued at $138,093, went to Japan but the larger part moved to the United Kingdom, 57,917 tons, valued at $1,501,903. The Union of South Africa received 4758 tons, valued at $125,061.

Scrap exports in December were lower, 68,135 tons, valued at $1,208,110, compared with 73,809 tons, valued at $1,273,398, in November. The United Kingdom took 55,290 tons, valued at $1,014,829, Canada 9933 tons, value $150,231 and Mexico 2522 tons, value, $30,826.

Fabricated plates exported in December totaled 5364 tons, valued at $402,699, the United Kingdom taking 2494 tons, valued at $79,808, Panama 1452 tons, value $170,785 and British Indies 847 tons, value $99,628. Nonalloy plate exports totaled 37,378 tons, valued at $2,312,634, against 42,796 tons in November. Canada received 12,356 tons, valued at $840,268, United Kingdom 8084 tons, value $373,435, Netherlands Indies, 4173 tons, value $234,775.

Nonalloy bar exports in December were 28,636 tons, valued at $1,794,602, compared with 37,950 tons in November. Japan took 4081 tons, valued at $230,175, Canada 3412 tons, value $222,964, United Kingdom 3113 tons, value $181,033, Panama 3113 tons, value $159,080, Union of South Africa, 2018 tons, value $238,774.

December exports of plain structural shapes were 40,423 tons, valued at $1,927,031, in November, 36,524 tons. The United Kingdom took 24,585 tons, valued at $1,046,386 and Canada 7958 tons, value $427,615. Plate exports in December were 6160 tons, valued at $647,104, against 5587 tons in November, the United Kingdom receiving 1275 tons, valued at $154,292 and Panama 1458 tons, value $145,592.

Nonalloy ingots and blooms exported in December totaled 240,095 tons, valued at $9,338,482, compared with 226,437 tons in November. The United Kingdom took 177,001 tons, valued at $6,919,074, Japan 48,669 tons, valued $1,743,703 and Canada 7434 tons, value $358,829. Ingots and blooms exported in December totaled 17,979 tons, valued at $1,938,510, against 58,404 in November. The United Kingdom took 17,161 tons, value $1,920,410, Canada 812 tons, value $62,534.

Total exports of pig iron for 1940 were 555,471 tons, scrap 2,793,718 tons, nonalloy ingots and blooms 2,265,064 tons and alloy ingots and blooms 254,961 tons.

STEEL Index Is Ready

The index to Volume 107, STEEL, *for the last six months of* 1940, *now is ready for distribution. Copies will be sent to all subscribers requesting them.*

"Fear of Shortages, Not Prices, Motivates Buying"

■ Fear of shortages rather than higher prices causes buying of important materials three to six months ahead, according to the business survey committee, National Association of Purchasing Agents.

Only moderate price increases are for defense materials will become increasingly marked in 1941, and expected in 1941, because of the government's attitude. So far only advances thoroughly justified by rising costs have been tolerated, the survey states.

Practically no prices have declined, the majority have been stabilized and only in a few instances have they advanced far beyond reason based on costs, it continues.

"There is evident a race between defense program needs and demand for more ordinary commercial goods that enter consuming channels irrespective of the nation-wide urgency of government orders of every description."

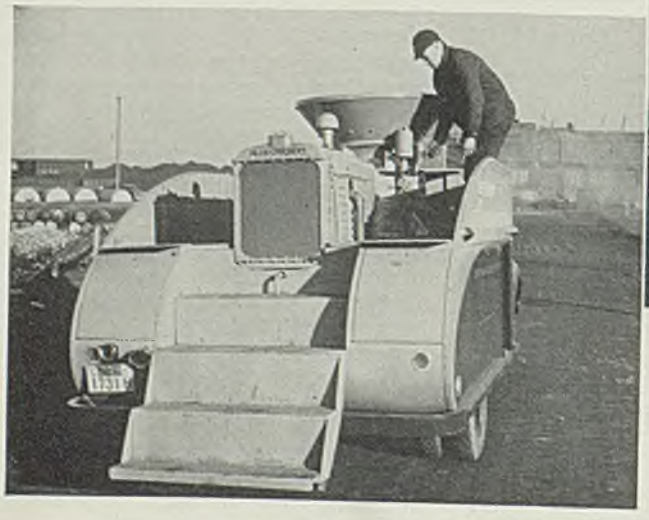
The survey predicts preferences "conditions will become more stringent rather than more flexible before many weeks have passed."

Inventories are being increased, but they have not been built up to the extent intended in many cases, because of increasing consumption. Makers of nondefense products in particular have been buying heavily.

"Many feel that everything is to be gained by maintaining supplies which have been accumulated. Prices are unlikely to work lower particularly in the materials related to the metal working industries, or goods that have to pass through machine operations."

■ Seventy-five millimeter shells are being roughed out 19 times faster today than they were during the last war, Fred C. Dull, vice president, Monarch Machine Tool Co., Sidney, O., told a group of engineers of the International Business Machines Corp., Endicott, N. Y., last week.

Streamlined Rock Crusher Touring Country



■ Rear and side views of the versatile new gyratory rock crusher with gasoline power unit, built by Allis-Chalmers Mfg. Co., Milwaukee, and mounted on this huge streamlined truck for a novel demonstration tour of the country. This unit will demonstrate the crusher's many unique features right at operators' plants, enabling them to test its efficiency on their own materials

Railroads and Defense Commission Agree on Scrap Steel, Rail Price

■ LEADING railroads of the country acting in co-operation with the national defense advisory commission have agreed virtually to limit the price of No. 1 heavy melting steel scrap to $21 per gross ton, Pittsburgh, a reduction of $1 per ton from January prices.

This was revealed Friday in a telegram from the Institute of Scrap Iron and Steel Inc., advising its members that the railroad list of offerings for prices in February would state:

"In conformity with our policy of co-operating with the advisory commission to the council of national defense, any prices out of line with the publicly expressed desire of the commission to prevent unduly high prices will be rejected."

The following telegram was sent to all members of the institute:

"We understand officially that railroads have agreed with the defense commission that prices of $21, Pittsburgh, per gross ton, No. 1 heavy melting steel scrap, on February railroad lists will not be considered unduly high. This compares with $22 price on January lists. We also understand that price of $26 per gross ton, Pittsburgh, on rerolling rails and $24 gross ton, Pittsburgh, on scrap rails, will not be considered unduly high on such February lists. The increase of $1 per ton on rerollers is to defray railroads additional cost in sorting them from scrap rails and that scrap rails are to be available for foundry purposes, according to defense commission instructions."

When seen at the office of the institute here, Louis J. Borinstein, president of the institute, and Edwin C. Barringer, executive secretary, stated that these prices had been given to them by C. A. Bishop, deputy administrator of the price stabilization commission, and Mr. Bishop was assured that everything possible would be done to comply with the wishes of the government.

The announcement that scrap rails are to be available for foundry purposes, according to defense commission instructions, indicates a closer co-operation with the foundries.

Routine maters were discussed at at an all-day session of the board of directors of the institute in Washington Jan. 30.

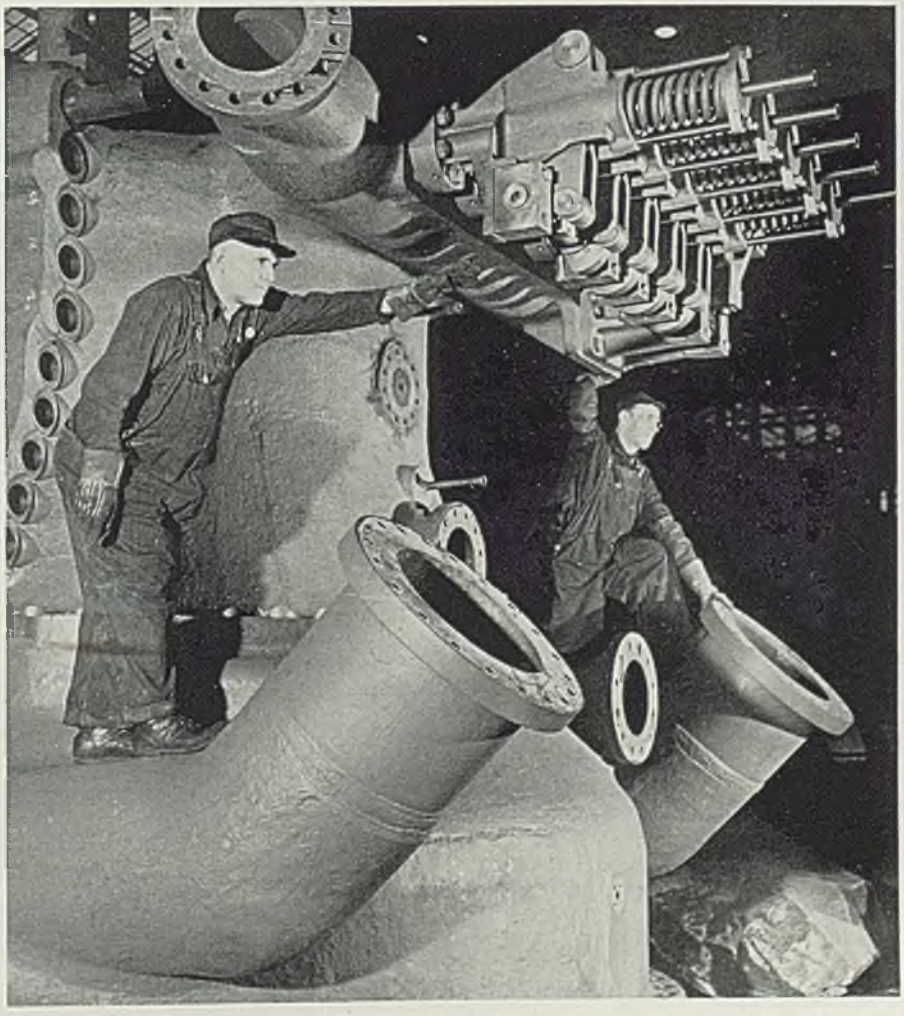
Oklahomans Donate Ten Cars of Scrap to Britain

■ An "iron for Britain" movement is being sponsored by Fred McDuff, oil equipment manufacturer of Seminole, Okla. The first results were ten car loads of scrap iron, title to which was accepted last week by a British representative. Mr. McDuff has termed it a nonprofit project in which the old metal will be cast into bars by American labor and shipped to England for use in armament manufacture.

♦

DIED:

■ FRED A. BIGELOW, 72, president, Carpenter Steel Co., Reading, Pa., in that city, Jan. 23. Born in Paxton, Mass., he was graduated from Worcester Polytechnic institute in 1891 and a year later went to Germany to pursue advanced studies in chemistry. Returning to this country, he joined Spaulding & Jennings Steel Co., Jersey City, N. J., as chemist; in 1904 was appointed salesman for Carpenter Steel in the New England territory and in 1910 became western sales manager, with headquarters in Cleveland. While there he was actively associated with the Cleveland Community fund, one of the first charitable organizations of its kind. Transferring to Reading in 1915 to become sales manager, he was elected vice president a year later, and president in 1920.



Spirit of 1941?

■ Not a new development of science in a combination machine gun and giant mortar, as it would appear from the picture, but the upper half of an 80,000-kilowatt turbine shell being built by General Electric Co., Schenectady, N. Y., for the Duke Power Co., in North Carolina. Instead of destructive projectiles, this mammoth machine will hurl kilowatts of useful electricity to keep the wheels of industry turning in grinding out the country's defense program. It will be installed in the Buck plant in Rowan county, N. C., making this the largest in the Duke power system

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

Employers' right to hire detectives for protection against sabotage, theft is undisputed . . . Opposition to federal antistrike legislation voiced by national chamber of commerce . . . Rapid, widespread extension of subcontracting for defense urged by industrial engineers . . . Congress to receive new tax program for defense financing before March 4 . . . Strategic, critical materials purchases total $376,724,200

WASHINGTON

■ NOTHING in federal labor statutes prohibits employment of detectives to protect industrial plants from sabotage, theft, or for any other legal purpose.

This is the opinion of lawyers representing the national labor relations board and employers' associations, questioned by STEEL.

Inquiry was prompted by a recent Washington news-letter comment indicating some misunderstanding on this point; reporting employers were complaining they could not protect their plants because of restrictions in the labor relations act.

In simple terms, it is unlawful for detectives, or others, to interfere with labor's rights as defined in the labor act. However, there is no question about employers' right to hire detectives to spot suspects in order to protect property.

In at least two cases federal circuit courts have held, in effect, that it is lawful for detectives to report labor union activities—although unlawful for an employer to use the information to interfere with legitimate labor organization.

Chamber of Commerce Committee Opposes Antistrike Legislation

Opposition to federal antistrike legislation as a means of preventing interruptions to work on national defense projects is expressed in a report of the committee on manufacture of the Chamber of Commerce of the United States.

Setting up the framework of a proposed national labor policy for the duration of the emergency, the committee states the following conclusion:

"Public policy is opposed to interference with defense.

"The interrelation of businesses makes it next to impossible to draw a line between defense and nondefense industries.

"The national chamber believes that antistrike laws will prove ineffective and that they will deny fundamental rights to our citizens. The chamber further believes that public interest will be best served by voluntary co-operation.

"To this end the chamber enlists the support of its member organizations in urging all employers to develop plans with their employes designed to promote the amicable and prompt adjustment of labor disputes which may arise; and, should these internal plans fail, recommends that existing conciliatory services now available be enlisted and used to facilitate prompt settlement of such disputes."

Stating its position in greater detail the committee adds:

"With full recognition of the importance of preventing interruptions in the defense program, we nevertheless have grave doubts as to the wisdom of urging federal legislation for this purpose, to apply to all industries participating in this program. Of necessity, such legislation, although ostensibly designed to provide a basis for maintaining peace in industry, will have as its main objective the development of a national labor policy for the emergency period. Accordingly, it not only will deal with unusual and emergency conditions but it must also be prepared and advanced under circumstances that preclude the full use of the deliberative process so essential to sound legislative procedure.

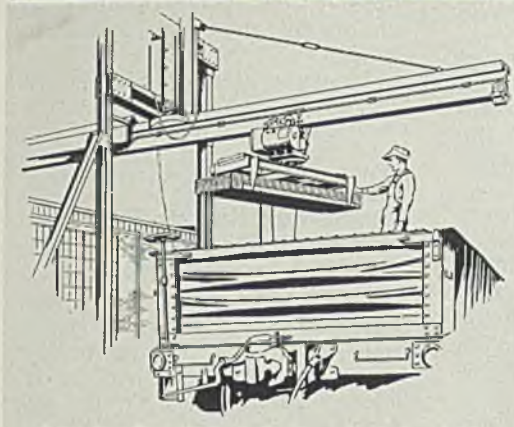
"Nor are we convinced that there is present need for additional federal legislation in the field of industrial relations. In particular, we refer to legislation of the 'antistrike' variety. Despite the occurrence of isolated instances of labor disagreements which appear to have received undue prominence in the press, there is every evidence of an increasing determination on the part of both management and workers to develop voluntary methods for the adjustment of labor difficulties and thus to prevent production stoppage. According to recent estimate, such voluntary methods will probably prove effective in 99 per cent of the defense industries.

"Subscribe to Congress' Views"

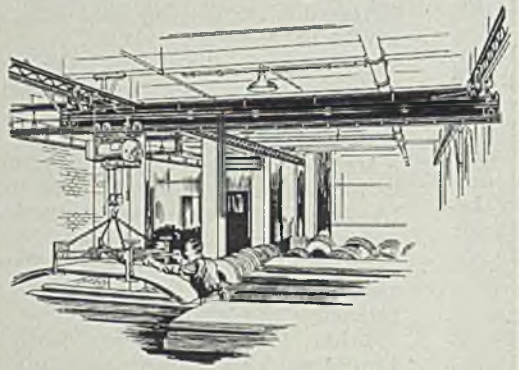
"In holding to this opinion we subscribe to the views expressed by the judiciary committee of the house of representatives of the 76th congress, following consideration of several measures designed to provide settlement of labor disputes in defense industries.

"After contacting interested agencies of the government and other advised sources, the committee expressed the belief that 'no recommendations at this time as to additional legislation would be in harmony with the public interest.' The committee added it felt justified in the expectation 'that there will be complete harmony among the agencies of government and of labor and capital and the people in keeping the machinery producing war materials in operation at capacity.' We are aware of no subsequent changes in conditions that would qualify the value of the soundness of these conclusions.

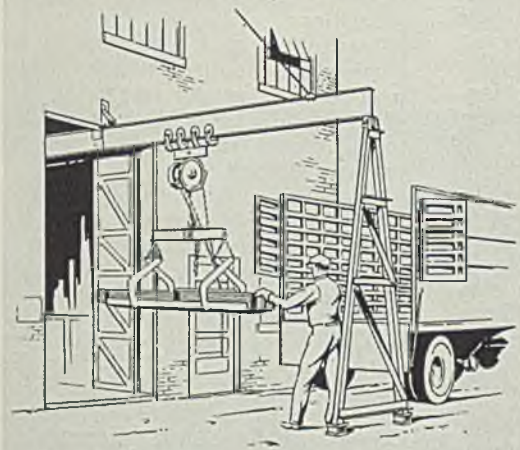
"Normal dictates of patriotism on the part of our citizens, employers



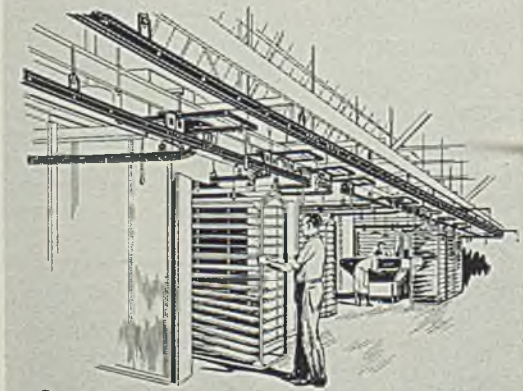
3-ton bundles of steel sheets unloaded quickly without damage.



Crane interlocks with spur tracks for safe movement of stock.



Retractible crane reduces cost of unloading steel from trucks.



Special racks eliminate rehandling of parts through baking process.

Save your Man-Power!

Skilled labor is expensive. Why waste it in handling operations. A simple overhead monorail system to perform the "lift" and "Carry" jobs will show an immediate return in saved man-power.

Standard parts assemble into complete systems to meet special requirements so that American MonoRail engineers are able to solve many problems without excessive cost. Let them survey your requirements at no obligation.

Write for copy of "Blue Book" showing hundreds of installations

AMERICAN MONORAIL

13102 Athens Avenue
CLEVELAND, OHIO

and employes alike, supplemented by the force of a steadily increasing public opinion against unnecessary interruptions to the defense program, are already exerting a strong influence in favor of voluntary settlement of labor grievances. Loss of man-hours due to strikes in 1940 was approximately one-half of the 1939 figure. While it can scarcely be asserted that this is solely due to improved methods adopted by employers and employes for handling labor relations problems, it is entirely conceivable that the imposition of further legislative restrictions may result in a definite reversal of the present trend."

Extension of Subcontracting for Defense Urged by Engineers

Morris L. Cooke, management engineer attached to the staff of Sidney Hillman, made public a statement issued by a conference of industrial engineers called here to consider problems concerned with "farming out" of defense contracts.

"As a nation engaged in a mighty effort," the statement said, "we are making far too little use of our secondary producing facilities. A great part, if not all, of the manufacturing machinery of the country, regardless of age, can be brought into defense production."

Engineers approved pioneer work by the labor division of the defense commission under direction of Mr. Cooke in surveying "ghost towns" and stimulating national recognition of the need for swinging idle manpower and idle machines into the defense program.

"The success and effectiveness of the principle of subcontracting or farming out has been demonstrated," the report says, "and the need for its rapid and widespread extension is vitally urgent."

In their statement the engineers placed blame for only partial use of the facilities of the nation's small firms on the fact that defense production is still in its preliminary stages, on "the failure of prime contractors to tap this large reservoir of latent productivity."

"Owners and managers of smaller plants have not appreciated the possibility that their facilities could and should be fully engaged in defense production."

The engineers recommended that each prime contractor set up a group within his own organization to specialize in the handling of subcontractors. "This implies," they added, "that a sound, well-knit and co-ordinated effort is necessary between the prime contractor and his subcontractors. It is not a part-time job."

Changes in Zinc Scrap Price Situation Recommended

An industry committee last week submitted recommendations for correcting the present price situation in zinc scrap and secondary zinc markets and an announcement of measures will be made shortly, according to Commissioner Leon Henderson. He emphasized that the report will be given careful consideration by the price stabilization division.

The committee, which represents zinc scrap dealers and secondary smelters, was appointed by Harry Goldstein, president, National Association of Waste Material Dealers.

Morgenthau Reports New Tax Program To Be Introduced Soon

Appearing before the house ways and means committee last week, Secretary of the Treasury Morgenthau said a new taxation program for defense financing will be laid before congress shortly after March 4.

Mr. Morgenthau urged an increase in the federal debt limit to $65,000,000,000, saying that ceiling would be satisfactory until July 1, 1942. However, he did not say the administration would seek a higher limit after that date. Present limit is $49,000,000,000.

Mr. Morgenthau counseled haste in increasing the limit, because the treasury has "borrowing authority sufficient only for the next four months, and even in that period we would be greatly restricted in our financing operations."

Other features of the financing program which the ways and means committee is considering are:

Elimination of the tax-exemption feature from future issues of federal securities.

Institution of a new class of security to be called "treasury savings certificates" for sale to the general public at small cost—similar to the World war liberty bonds and savings stamps.

John S. Sullivan, assistant secretary of the treasury, said when the returns are in March 15 congress "may have some desire" to amend the excess profits tax provisions of the existing revenue law. He intimated the treasury at that time would ask for a change in the revenue law.

Commerce Bureau To Serve Defense Officials First

National defense functions have been given absolute priority in the bureau of foreign and domestic commerce under instructions issued by Secretary of Commerce Jesse Jones.

The economic and business information, the services of government experts and all of the other facilities now existing in the bureau will be made available to other government departments and to industry and business in connection with the preparedness program.

Under this program, the bureau's efforts will be concentrated on whatever activities can best further the relationship between industrial producers and government in carrying out President Roosevelt's defense objectives.

Metals Reserve Co. Purchases Total $376,724,200

■ Jesse H. Jones, federal loan administrator, made a report to the congress last week in which he stated that purchases to date by the Metals Reserve Co., set up to acquire reserves of critical and strategic materials, are approximately as follows:

	Tons On Hand	Tons Afloat	Tons On Order	Amount
Antimony:				
Chinese	2,352	3,898	.....	$ 1,750,000
Domestic	....	....	3,000	780,000
Chrome Ore:				
South African	....	....	100,000	2,140,000
Philippine	....	....	100,000	1,800,000
Copper:				
Latin American	....	....	100,000	22,400,000
Graphite:				
Madagascar	411	....	.....	35,200
Manganese Ore:				
Far Eastern	34,237	54,860	447,040	15,434,000
Latin American	1,943	....	276,000	9,254,000
Domestic	....	....	1,335,000	46,256,000
Tungsten Trioxide:				
Domestic	....	....	1,250	2,875,000
Tin:				
Far Eastern	13,985	6,720	54,295*	84,000,000
Bolivian	....	....	90,000	100,000,000
Antimony, Wolframite and Tin—Chinese (respective quantities undetermined)	....	....	.....	90,000,000
				$376,724,200

*Includes 40,070 tons for which purchase contract is not yet executed.

Fullest Use of Small Manufacturing Plants Imperative, Says Trecker

■ AS TIME moves on, it becomes increasingly apparent that successful culmination of this country's multibillion-dollar defense program lies in the fullest use of the equipment and personnel of this country's 200,000 manufacturing plants, which are capable of executing phases of defense contracts. So far only 13,000 of these plants have been awarded contracts, according to Francis J. Trecker of Kearney & Trecker, Milwaukee machine tool builders, speaking at Lansing, Mich., last week. He is now serving as technical adviser to the office of production management in Washington.

Mr. Trecker explained that in getting the defense program under way, the government logically dealt with the larger manufacturing plants as primary contractors, depending upon them to farm portions of the work out to many of the smaller suppliers, in exactly the same way that the automotive industry subcontracts for a substantial portion of its requirements, whether they be castings, forgings, stampings, welded assemblies or whatnot.

One objection voiced by certain large manufacturers is that smaller plants cannot work to a high enough degree of accuracy to come within specification limits. Mr. Trecker exploded this belief by citing the case of Pratt & Whitney on aircraft motors, where more than 300 subcontractors are being used and over 60 per cent of the parts for the motors are "farmed out". Likewise the Sperry Co., making gyroscope equipment, automatic ship pilots, compasses and the like, is letting out nearly half the production work involved to subcontractors.

Seeks Plant Capacity Inventory

Mr. Trecker appeared at a gathering of 140 representatives of management, labor and trade associations, called by Gov. Murray D. Van Wagoner of Michigan who currently is seeking detailed information on production capacity of Michigan's industrial plants, large and small. As a start, the Michigan Manufacturers association, through its manager, John L. Lovett, has mailed 1600 questionnaires to member plants, only 40 per cent of which have thus far been returned. The governor is trying to improve this showing, to obtain as he says "an inventory of every plant's capacity down to the last lathe."

Outlining plans already established by the OPM to facilitate subcontracting, Mr. Trecker explained scheme will use facilities of federal reserve banks and branches, to each of which will be attached an industrial leader for the community serving at $1 a year, and a technical assistant serving at $5000 a year. The latter will clear blueprints and technical specification for aircraft, guns, tanks, shells and other material, from government agencies procuring them and will exhibit this material to subcontractors and register their capacity to produce parts in quantity. Banks will be prepared to assist the subcontractor in financial arrangements incident to raw material and payroll costs. This entire organization is expected to be completed in a month.

The OPM has estimated that at least 50 per cent of the country's machine capacity is standing idle or operating less than eight hours a day, a deficiency which the above plan is designed to correct.

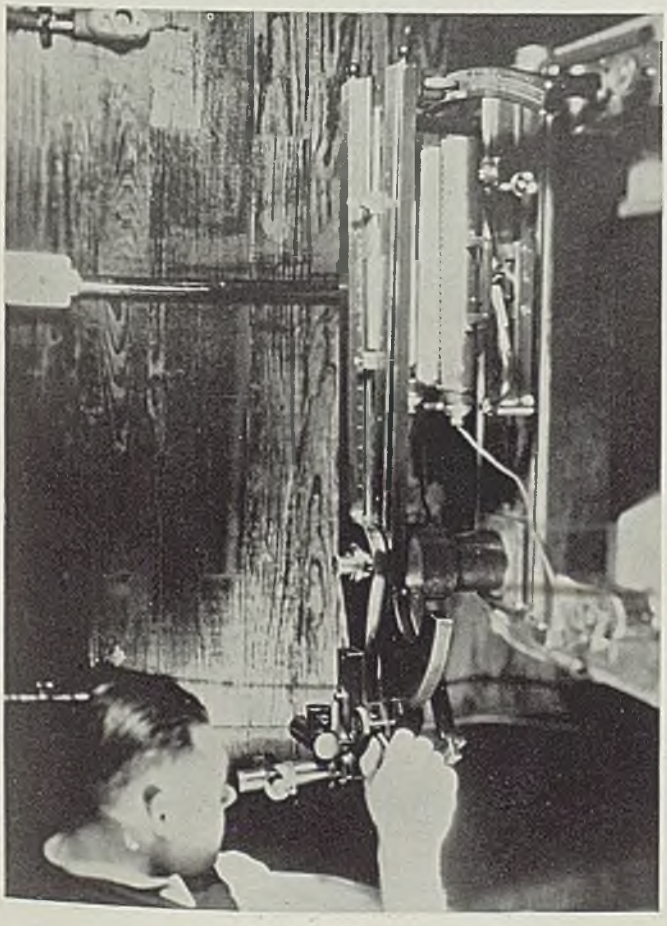
Industry leaders who contributed comments at the meeting included C. W. Avery, president, Murray Corp. of America, Detroit, who complained that constant changes in designs, particularly in aircraft, were holding up production operations. He said his company had been waiting since September for the "go-ahead" signal to start manufacturing inner wing panels for Douglas bombers.

On the difficulty of obtaining special tools, Mr. Avery said that 60 per cent of the $3,500,000 worth of tools needed for this wing contract were of special design, useful only for aircraft work, with virtually none available at present.

I. B. Babcock, president of the Yellow Truck & Coach division, Pontiac, Mich., and a member of the auto industry's committee for air defense, urged representatives of the auto industry to rely heavily on regular suppliers who are familiar with the definite sequence of assembly operations involved and who would promise shipment of no more quantities than they could deliver on schedule.

R. J. Thomas, president of the UAW-CIO, in attendance, took advantage of the occasion to launch his usual barrage against the Ford Motor Co., saying in part, "I intend to do all I can to stop production in Ford plants if he doesn't abide by the laws of this country."

Measures Half-Inch Divergence in Two Miles



■ Lines one-half inch off parallel in a distance of two miles are detected by this angle-measuring instrument used to maintain precision production of tapered roller bearings. Photo, courtesy Timken Roller Bearing Co., Canton, O.

A manufacturer of knuckle joints for directional oil well drilling makes interesting use of the versatility of Chromium-Molybdenum (SAE 4140) steel.

The ball socket calls for high hardness with adequate toughness. Bowl and cam service put particular emphasis on toughness and strength, somewhat less on hardness. SAE 4140, treated in one case to 40-42 Rockwell "C" and in the other to 32-34, meets all requirements economically and well.

Write for our free book, "Molybdenum in Steel."

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MOLY

Mirrors of MOTORDOM

By A. H. ALLEN
Detroit Editor, STEEL

Working model of hydraulically powered four-wheel turbine drive chassis being demonstrated in Detroit may presage new era of motor car design. No brakes, differential, driveshaft, transmission or clutch in novel assembly, said to eliminate 2500 parts used in conventional cars . . . Packard pushing work on streamlined model with pilot jobs completed . . . Zinc and aluminum supplies cause some concern. . . . 6500 tons of structurals erected in 70 days for tank arsenal

DETROIT

■ ENGINEERS are in general agreement that in the field of hydraulics is one of the most fertile areas for future trends in motor car design. Already hydraulic brakes and hydraulic couplings and torque converters have proved their practical worth. Just around the corner may be some version of a completely hydraulic drive.

In fact, if you look around this corner you can already find one design, worked out by a local engineer and inventor, Frank O. Emmitt, who has developed a working model of his idea and installed it in a Packard chassis.

What Emmitt has done is to combine principles of hydraulics and turbines to make a four-wheel drive, with no clutch, no transmission, no driveshaft, no rear axle or differential and no brakes, eliminating, according to his estimate, some 2500 parts used in conventional passenger cars.

Coupled directly to the crankshaft just back of the flywheel is one turbine which operates as a hydraulic motor inasmuch as the rotor is driven by the motor power. Welded steel hydraulic pressure and return lines lead from this pump to 6-inch diameter valve chambers, one on either side of the pump. From the valve chambers, similar pipes, about 2 inches in diameter branch out from a T connection to front and rear wheels.

To take care of wheel displacement in springing and steering, flexible metal lines are coupled on about 24 inches back of the wheels and are attached to turbines mounted on each wheel in place of conventional brake drums. These turbines are all alike and are identical in size and construction with the hydraulic pump previously mentioned. Pressure line is attached to one side of the turbine housing and the return line at the other.

The entire circuit is closed and pressure tight, being filled with about 5 gallons of a specially compounded oil which has nearly constant viscosity over a wide temperature range.

May Have Great Possibilities

The turbines are no ordinary types in the accepted sense of the word. Housing is cast manganese bronze and the outer rim has two manifolds, one pressure and one return. The rotor is carefully machined from heat treated tool steel, with tool steel fins welded into position. At the center are four idler gears which, in conjunction with properly positioned ports, permit positive action of the turbine, that is, the fluid does not rotate with the rotor but after 2½-inch movement thereof passes out a port and into the return line.

At full throttle of the 135-horsepower motor a pressure of 650 pounds per square inch is developed on the pressure side of the system and a vacuum of 28 inches of mercury in the return line, ample to drive the car at a speed of 75 miles per hour. If a greater pressure is built up in the system by wheel resistance, the motor will stall.

Two valve chambers, previously referred to, contain specially shaped pistons and X-shaped ports which permit a slow reversal of the direction of flow of the fluid in the system. If the pistons are moved to the half-way position, the fluid is completely by-passed and no power transmitted to the wheels. If moved all the way out, the pistons reverse the flow of power and the wheels are driven in reverse. It is even possible to drive the wheels on one side of the car in one direction and those on the other side in the opposite direction, an ideal arrangement for some such motive equipment as a tank, for example, where turning on a short radius is desired.

The valve chamber pistons are controlled by a brake pedal which serves as both brake and reverse control and, other than the accelerator, is the only control required to manipulate this unique car. To brake the car all that is necessary is to depress the pedal slowly to the half-way position when the car will be stopped. Further movement would provide even more severe braking action.

As a further control, a governor is provided to bypass the fluid below a certain slow engine speed, so that it will be possible to idle the engine while the car is standing still.

No differential is required for rounding turns, because the velocity of fluid flow is differentialed rather than pressure, so the only result of slowing up the inside wheels on a turn is the speeding up of the outside wheels, which is just what is desired.

Ratio of engine speed to wheel speed obviously is 4 to 1, since the pump is direct connected and supplies power through four equal-sized hydraulic lines.

No appreciable heat is generated in either the turbines, pump or fluid lines, probably because of the low pressures and low velocities involved. This suggests that the principle must be efficient since the only possible escape of motor power is in the form of heat. Turbines, of course, are known as one of the

most efficient forms of energy transfer, but the problem of adapting them to automobiles so far has proved a tough one.

Mr. Emmitt is the first to concede that there may be bugs in the system, that a thorough engineering study of the entire setup would have to precede any commercial introduction of the idea. But he has a model, has driven it over the streets of Detroit and as yet has failed to find any serious flaws. Sketches and blueprints of the proposal have been sent to the engineering department of a leading car builder but there has not been enough time yet for a report.

Regarding his work as an absorbing hobby, Mr. Emmitt is far from an inventive crackpot and labors under no delusions as to the ultimate acceptance or worth of his brain child. He, of course, has ample patent protection and makes no secret of the development. Brief inspection of the chassis and witnessing it in operation leads this writer to the conclusion the germ of a new idea in motor car operation has been incubated, and it may well have far-reaching implications.

Packard Will Concentrate On One Streamlined Model

■ ORIGINALLY planning two models in its new streamlined series, one apparently a deluxe version, Packard has eliminated this plan and will concentrate on one model. Briggs is supplying complete bodies and already has built up three pilot jobs. March 15 is the date being aimed at for a start on assemblies, but it appears doubtful if this deadline can be made.

Initial buys of parts were for 10,600 units which is roughly two months' production of all Packard models at the present rate. Inasmuch as production on the new model will be over and above present models, the conclusion is that the car to be introduced this spring, while essentially a late 1941 model, will be carried over into 1942. Carrying this reasoning a step further, it is likely that public reaction to the new series will determine the course of other Packard models.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1938	1939	1940
Jan.....	226,952	356,692	449,492
Feb.....	202,597	317,520	422,225
March...	238,447	389,495	440,232
April....	237,929	354,266	452,433
May.....	210,174	313,248	412,492
June....	189,402	324,253	362,566
July.....	150,450	218,494	246,171
Aug.....	96,946	103,343	89,866
Sept.....	89,623	192,678	284,583
Oct.....	215,286	324,688	514,374
Nov.....	390,405	368,541	510,973
11 mos...	2,248,211	3,263,600	4,185,407
Dec.....	406,960	469,120	.....
Year	2,655,171	3,732,608	.....

Estimated by Ward's Reports

Week ended:	1941	1940†
Jan. 4	76,690	87,510
Jan. 11	115,935	111,330
Jan. 18	124,025	108,545
Jan. 25	121,948	106,400
Feb. 1	124,400	101,240

†Comparable week.

Zinc, Aluminum Supplies Watched by Automakers

■ TIGHTNESS of the zinc situation, complicated by the possibilities of government priorities on zinc for use in brass ordered for armament, is sobering the outlook for die castings as far as automotive applications are concerned. Some switches back to steel stampings or to molded plastics can be expected if metal supplies are pre-empted from castings producers in the interest of defense manufacturing.

A somewhat similar situation prevails in the secondary aluminum market where rising prices have in some instances gotten out of hand because of the shortage of supplies. One reason may be that car builders using aluminum pistons have attempted to protect themselves on metal some distance ahead, with the result that secondary aluminum is being quoted as much as 4 or 5 cents over the market for virgin aluminum.

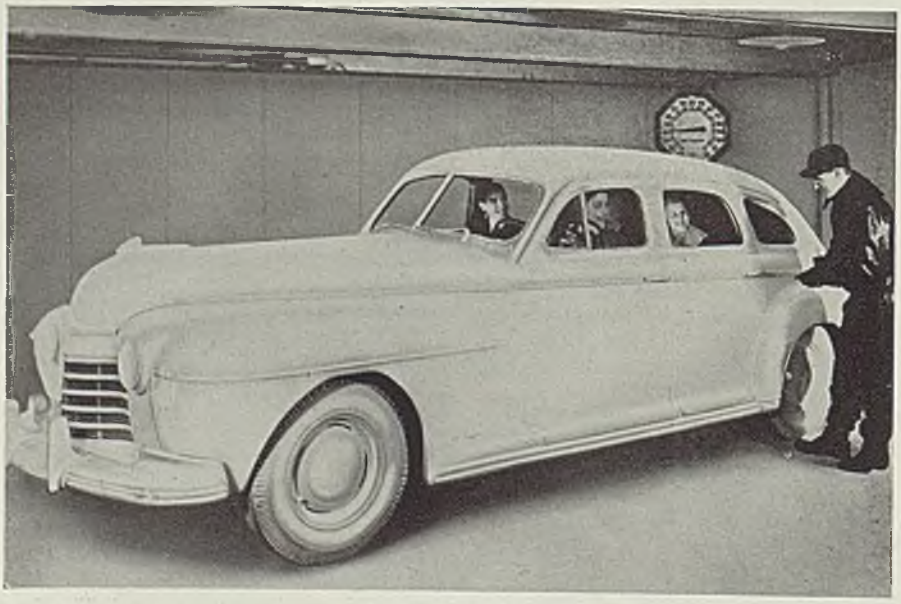
Armament Plant Construction Is Ahead of Schedule

■ FINAL structural steel members were riveted into place last week in both the Chrysler tank arsenal and the Ford airplane engine plant, both jobs being ahead of schedule. The Chrysler arsenal, a huge structure measuring 500 x 1380 feet in size, with 700,000 square feet of space, was begun Nov. 18 and the last of the 20,000 structural pieces was hammered home at 3:43 p. m. Jan. 28. The 6500 tons involved covered the range from 4-ton 80-foot trusses to 50-pound angle braces 2 feet long, requiring in all 170,000 nuts and bolts, 90,000 rivets, and a quarter of a million more rivets in subassemblies.

Eight cranes and 125 men worked through mud, snow and slush to get the job up on schedule. At present, one-third of the tank arsenal has been covered on three sides with glass and an artificial partition placed on the fourth side. Into this section heavy machinery is being moved and a steam locomotive supplies the heat. By Feb. 10 it is expected the concrete floor will have been poured and shortly thereafter steam heat will be available from the power plant on the site.

Records for speed in construction are being broken with monotonous regularity in this area. The sprawling Rolls-Royce plant which Packard is building has sprung up almost over night, the main section being bricked and glassed, while steel is up on the score or more of test sheds adjoining.

New All-Weather Automobile Air Conditioning Unit



■ Condition-Air, latest Oldsmobile innovation in automobile heating and ventilation, enables passengers to regulate inside temperature at all seasons. Illustrated is a 1941 "special series" sedan receiving the "cold room" test. Passengers enjoy living room temperature while outside is frigid. Setting automatic water temperature control for degree of warmth desired provides abundance of filtered, fresh air without drafts. Windows are said to remain clear

MEN of

L. A. Mullen

Guy T. Avery

■ **L. A. MULLEN** has been made manager of sales of tubular products, Pittsburgh Steel Co., Pittsburgh. He has been associated with the company since January, 1938, first as assistant district sales manager at New York, later as district sales manager at Chicago, and the past year as assistant manager of sales in Pittsburgh.

John R. Blair continues as assistant manager of sales, seamless steel tubes; **E. R. Smith** as assistant manager of sales, oil country tubular products, and **M. London** as assistant manager of sales, mechanical tubing.

♦

John M. Scott has been named manager of industrial sales, Republic Coal & Coke Co., Chicago. He was formerly associated with Walter Bledsoe & Co., Chicago.

♦

Officers and directors of the Minneapolis-Moline Power Implement Co., Minneapolis, were re-elected at the company's annual meeting of stockholders.

♦

George I. Bushfield and **Henry Bender,** of the New York office, and **Henry H. Haupt,** of the Minneapolis office, have been elected vice presidents, Batten, Barton, Durstine & Osborne Inc., advertising counsellors.

♦

H. N. Middleton has been relieved of sales duties, Camden, N. J., branch of B. F. Sturtevant Co., Boston, and has been appointed engineering consultant for the eastern division territory.

♦

C. S. Beaver and **Muir Rogers** were elected vice presidents, American-Marietta Co., Chicago, at a meeting of stockholders Jan. 24. **Grover M. Hermann Jr.,** son of American-Marietta's board chairman and president, was elected to the board.

Mr. Beaver is general manager of the company's operations at Marietta, O., and High Point, N. C., while Mr. Rogers is manager of the midwestern industrial finishes division.

♦

Guy T. Avery has been promoted to works manager, Riverdale plant, Acme Steel Co., Chicago. Identified with Acme Steel since February, 1920, he formerly was assistant works manager. A graduate of the University of Illinois, School of Engineering, Mr. Avery served with the United States navy as chief machinist mate during the last war, and preceding his association with Acme, was affiliated with a firm of consulting engineers.

♦

George A. Murphy Jr. has been appointed to the industrial sales division, American Steel Foundries, with headquarters at East Chicago, Ind. Mr. Murphy acquired his foundry experience under the direction of Dr. F. A. Fahrenwald, president, Fahralloy Co., Harvey, Ill.

♦

Francis C. Moran, 315 Grosse Pointe boulevard, Detroit, has been appointed district manager for southern Michigan and northwestern Ohio, by Reznor Mfg. Co., Mercer, Pa., maker of gas fired unit heaters and domestic furnaces.

Chester McClintock, Milan, Tenn., has been named district manager in the Tennessee territory.

♦

Elwood H. Koontz has been named district manager of the Minneapolis sales office recently established by Reliance Electric & Engineering Co., Cleveland. He joined Reliance in 1936, following graduation from Massachusetts Institute of Technology. **Wilmer K. Schlotterbeck** succeeds Mr. Koontz at Philadelphia.

♦

Percy Jenkins, associated with the Wickwire Spencer Steel Co., New York, over 15 years, has been appointed manager of the Boston branch of John A. Roebling's Sons Co., Trenton, N. J. Mr. Jenkins joined Wickwire in 1924 following graduation from Harvard university, working in the mills at Worcester, Mass. He then was transferred to the sales department in New York; in 1931 became assistant manager of sales, eastern district, and a year later was promoted to manager of eastern district. From 1934 until December, 1940, Mr. Jenkins was manager of sales, New England district, for Wickwire.

♦

J. H. Alger, director, vice president and secretary, Aluminium Ltd., Montreal, has been named vice president of Aluminum Co. of Canada Ltd., Montreal, succeeding the late O. M. Montgomery. **Dr. Early Blough,** director and president of Aluminium Laboratories Ltd., has been appointed to the vacancy on the board of Aluminum Co. of Canada. Dr. Blough is also a director and vice president of Aluminium Ltd.

♦

Thomas B. Collins has been placed in charge of the office recently established by Porcelain Enamel institute, Chicago, in the Chandler building, Washington. A graduate of Massachusetts Institute of Technol-

Thomas B. Collins

INDUSTRY

J. W. Gardner

F. L. Toy

ogy, Mr. Collins was formerly associated with Alliance Porcelain Products Co., Kohler Co., and Pierce Butler and Pierce.

♦

D. A. Samson has been appointed operating manager of the Warren avenue plant of Chrysler Corp., Detroit. Mr. Samson, formerly operating manager of the Dodge main factory, has been associated with Dodge Bros. and Chrysler since 1915 and has been active in management and construction work. The Warren avenue plant, recently leased from Graham-Paige Motors Corp., will be reconditioned and equipped to manufacture airplane parts for the defense program.

♦

N. T. Jacobs has been named manager of sales, Wood Shovel & Tool Co., Piqua, O., succeeding **C. L. Butts,** retired. Mr. Jacobs formerly was Chicago district manager for the company.

♦

Louis S. Taylor, vice president in charge of finance and accounting, Pullman Inc., has been promoted to executive vice president. He will continue his former duties. **Champ Carry,** vice president of Pullman Co., operating subsidiary, has been advanced to executive vice president, and he also will continue his former duties.

♦

H. H. Biggert, for 14 years vice president and a director, J. I. Case Co., Racine, Wis., farm machinery manufacturer, has resigned to devote his attention to personal business.

♦

Charles A. Simmons Sr., president, Simmons Machine Tool Corp., Albany, N. Y., has been named a member of the national defense advisory commission. He will be attached to the machine tools and heavy ordnance section of the defense commission.

♦

E. K. Lucas has become associated with Leyse Aluminum Co., Kewaunee, Wis., as sales manager. He formerly was advertising and sales manager, National Enameling & Stamping Co., Milwaukee.

♦

J. W. Gardner, chairman of the executive committee, board of directors, Gardner-Denver Co., Quincy, Ill., recently was presented with a miniature gold, diamond-set model of a steam governor, by his associates in recognition of his completion of 60 years' service.

♦

DeAlton J. Ridings and **Harvey L. Ramsay** have been promoted to general manager, and general sales manager, respectively, Porter-Cable Machine Co., Syracuse, N. Y.

♦

Jesse E. Hobson, associated with Westinghouse Electric & Mfg. Co., at Pittsburgh, was designated "the country's outstanding young engineer for 1940", and an award with that inscription was presented to him at a recent session of the American Institute of Electrical Engineers. Mr. Hobson, a graduate of Purdue university, is 29 years old.

♦

The following directors were reelected at the annual meeting of the J. M. & L. A. Osborn Co., Cleveland, Jan. 23: **A. W. Howe, C. A. Nenno, J. W. Harrison, J. T. Hagan, C. E. Caddy, W. B.. Osborn** and **G. F. Climo.** Elected to serve as officers for the ensuing year were: Mr. Howe, president; Mr. Nenno, executive vice president; Mr Harrison, secretary; and Mr. Climo, treasurer.

♦

R. L. Sullivan has been appointed assistant vice president, American Can Co., New York, with responsibilities in both packers' can and general line sales. **W. C. Stolk** has been named general manager of sales of the company's general line. Mr. Sullivan joined the company in 1904 and Mr. Stolk in 1916.

♦

F. L. Toy has been promoted to assistant to manager of technical development, Carnegie-Illinois Steel Corp., Pittsburgh. He has been with Carnegie-Illinois continuously since 1909, serving as metallurgist at the Homestead steelworks until 1920 when he became superintendent, open-hearth department of that plant. From 1933 to 1937, in addition to his open-hearth duties, Mr. Toy acted as management's representative in charge of all industrial relations, Homestead works, and in 1937 was made assistant general superintendent in charge of industrial relations.

♦

H. T. Worthington has been appointed New York district sales manager, Shaw-Box Crane & Hoist division, Manning, Maxwell & Moore Inc., Muskegon, Mich., with headquarters in the Chrysler building, New York.

John P. Leland has been named agency supervisor of Shaw-Box Crane & Hoist division. He will have headquarters in the Rockefeller building, Cleveland.

♦

C. G. Wollaeger, since 1934 assistant manager of Milcor Steel Co.'s fireproof and specialties division, Milwaukee, has been promoted to assistant general sales manager. He has been associated with Milcor 14 years, since graduating from the University of Wisconsin in 1926.

W. G. Baum, who has been handling fireproof sales for Milcor in the Chicago area, has been designated to take Mr. Wollaeger's place in the fireproof and specialties division. Mr. Baum has been succeeded at Chicago by **Paul Dunn,** heretofore salesman in Springfield, Ill., area.

♦

George J. Atwell Jr., recently elected a director of Thompson-Starrett Co. Inc., New York, STEEL, Jan. 27, p. 31, has been elected president. He succeeds H. B. Hackett, resigned. The past 35 years Mr. Atwell has been engaged in the foundation and heavy engineering construction industry.

Metalworking Industries To Require Additional 1,250,000 Skilled Men

■ EXPANSIONS in the metalworking industries in 1941, on top of an existing shortage of skilled labor, are creating a demand for approximately 1,250,000 more skilled men, a survey by the American Society of Tool Engineers reveals. Society's survey was made in connection with formulation of a plan for personnel training.

Survey indicated the metalworking industries need immediately 32,600 tool engineers, 128,000 tool and die makers and more than 400,000 skilled mechanics. Definitely planned expansions will create an additional need for 78,000 tool engineers, 281,000 tool and die makers and 332,000 skilled mechanics, a total of more than one and one quarter million men.

The society points out that if the estimated ratio wherein ten unskilled men are required for each skilled man the problem of obtaining the needed manpower becomes more complicated.

Only 30 per cent of all metalworking plants have some type of apprentice training program, while an additional 11 per cent have some arrangement for training men for their own particular requirements. Many plants with training programs are unable to cope with the rapidly developing need for trained men.

Survey showed 26 per cent of the plants covered need additional tool engineers, 52 per cent need more tool and die makers and 60 per cent are short on skilled mechanics. Wide variations in skilled labor shortages were found to exist between the several states.

On the basis of its survey the society concluded the shortage was so serious that an emergency training program, above and apart from a long range program, is essential. The group's educational committee has formulated a program for such training.

Committee decided training program to meet the indicated shortages falls into two classifications: (1) Training men with no experience; and (2) training men already employed to advance them to more skilled occupations.

Localized direction of training programs to meet the needs of a particular community is emphasized.

The society noted that one hindrance to effective training plans is a lack of co-ordination in the efforts of industry, local educational and federal authorities. To aid in overcoming this deficiency the society proposes establishing a chain of local committees acting in a purely advisory capacity, with the society providing a major service in the communities where it has chapters or members.

Specific training procedure for the various types of skills required is outlined by the society.

"Colossal Blunder To Put Key Mechanics in Army"

CINCINNATI

■ Machine tool manufacturers, appeal agents of draft boards here and Major Guy C. Mills, of the Ohio selective service organization, conferred recently on deferments for key men in tool shops.

Frederick V. Geier, president, Cincinnati Milling Machine Co., said it would be a "colossal blunder" to put in the army those skilled men who are in key jobs. He explained that his plea was not based on selfish interests, but was in line with the nation's urgent requests for more production.

Major Mills made two suggestions for avoiding misunderstandings. A man receiving a questionnaire should confer with his employer's personnel director and that the employer should fill out deferment requests completely and specifically.

Apparently there was no serious conflict in the conference on needs for deferments to maintain tool output.

✦

Steel Makes Skiing Easy

■ Ski hauls or lifts similar to this skimobile on Cranmore mountain, North Conway, N. H., are helping to promote New England and other northern regions as all-year playgrounds. The skimobile is operated by Cranmore Skimobile Inc. and uses 8990 feet of 7/8-inch, 6 x 19 (six strands, 19 wires per strand) rope, plow-steel grade, to transport the skiers up the 4350-foot slope. Photo, courtesy, Bethlehem Steel Co., Bethlehem, Pa.

Week's Defense Contracts $86,715,892; Quartermaster, Ordnance Awards Lead

■ DEFENSE contracts last week reported awarded by the departments of war and the navy aggregated $86,715,892.39. This was exclusive of several large awards for defense plant construction and operation mentioned in previous issues of STEEL when negotiations were reported. War department's aggregate has been consistently greater than the navy's. Latter's contracts last week totaled less than 10 per cent of the purchases.

Navy department reported contract with Union Switch & Signal Co., Swissvale, Pa., for acquisition, construction and installation of additional plant facilities at a total estimated cost of $1,243,000.

Award of a $47,997,000 cost plus fixed fee contract to E. I. duPont de Nemours & Co., Wilmington, Del., was reported by the war department. DuPont is to construct, equip and prepare for operation a smokeless powder plant at Childersburg, Ala. Cost of equipment is to be about $13,000,000; construction and preparation of the plant for operation is to cost about $34,997,000. Navy department is said to have agreed to pay approximately one-third the cost, since a like portion of output is to be for the navy.

Construction of a bag loading plant at Charlestown, Ind., was awarded to Winston Bros. Co., Minneapolis; C. F. Haglin & Sons Inc., Minneapolis; and Missouri Valley Bridge & Iron Co., Leavenworth, Kans., at $15,227,080 on a cost plus fixed fee basis. Goodyear Engineering Corp., Akron, O., will procure equipment and operate the plant.

War department also reported last week award of the following contracts for plant construction under Defense Plant Corp. agreements: Stewart-Warner Corp., Chicago, $4,000,000 for machinery and equipment to manufacture ordnance items; Omaha Steel Co., Omaha, Nebr., $483,875 for machinery and equipment to fabricate ordnance items; Wright Aeronautical Corp., East Paterson, N. J., $1,500,000 for additional plant facilities for manufacture of aircraft engines; and Studebaker Corp., South Bend, Ind., additional plant facilities for assembly, gear fabrication and manufacture of connecting rods and precision parts for Wright aeronautical engines. Machinery and equipment are to cost $10,045,313; plant construction, $39,740,036.

War department last week announced the following:

Ordnance Department Awards

American Brake Shoe & Casting Co., New York, castings, $9477.56.

American Brass Co., Waterbury, Conn., cartridge brass, $48,360.

American Locomotive Co., Railway Steel Spring division, New York, artillery materiel, $3795.

Anchor Post Fence Co., Baltimore, small arms materiel, $9157.78.

Bearings Co. of America, Lancaster, Pa., ball bearings, $3658.95.

Bendix Aviation Corp., Eclipse Machine division, Elmira, N. Y., artillery ammunition components, $38,400.

Blakeslee, G. S., & Co., Cicero, Ill., machines, $16,560.

Brown & Sharpe Mfg. Co., Providence, R. I., machines, $3972.

Budd Wheel Co., Detroit, wheel assemblies, $12,828.

Canister Co., Phillipsburg, N. J., machines, $14,260.21.

Caterpillar Tractor Co., Peoria, Ill., tractors, $19,482.28.

Cincinnati Milling Machine & Cincinnati Grinders Inc., Cincinnati, grinders, $2765.

Circular Tool Co. Inc., Providence, R. I., cutters, $2073.60.

Clark Equipment Co., Clark Tructractor division, Battle Creek, Mich., shop trucks, $2292.92.

Daniels, C. R., Inc., New York, small arms materiel, $1556.25.

Detroit Broach Co. Inc., Detroit, broaching fixtures, $2285.

Doehler Die Casting Co., Pottstown, Pa., artillery ammunition components, $1915.75.

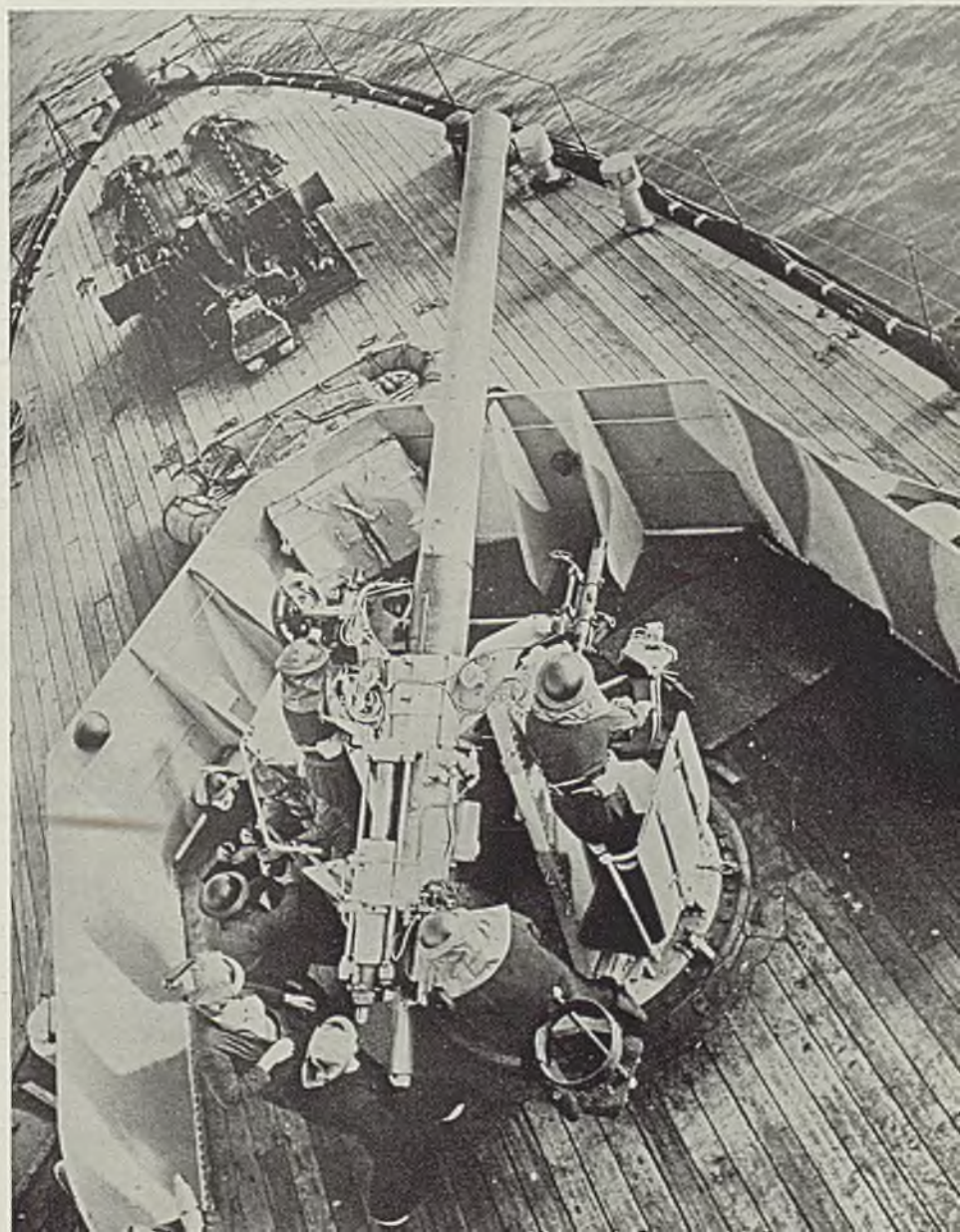
Exact Weight Scale Co., Columbus, O., scales, $206,584.70.

Globe Forge & Foundry Co., Syracuse, N. Y., forgings, $2614.50.

Greenfield Tap & Die Corp., Greenfield, Mass., countersinks, $2480.12.

Hanson-Van Winkle-Munning Co., Matawan, N. J., generators, $1626.50.

Hanson-Whitney Machine Co., Hartford,



■ Armorplate shields, as shown on this British destroyer, are being installed on battleships to protect crews of deck guns from flying splinters of shrapnel and aerial bombs. NEA photo

Conn., gages, $21,006.01.
Hydraulic Press Mfg. Co., Mt. Gilead, O., hydraulic presses, $27,990.
Keuffel & Esser Co., Hoboken, N. J., fire control equipment, $2720.
Killeen Machine Co., Worcester, Mass., inspection gages, $1063.
Krueger, H. R., & Co., Detroit, drilling and tapping machines, $5570.
Laminated Shim Co. Inc., Glenbrook, Conn., brass laminated shims, $1468.53.
Lees-Bradner Co., Cleveland, thread milling machines, $39,458.70.
Lincoln Park Tool & Gage Co., Lincoln Park, Mich., gages, $9639.24.
McKiernan-Terry Corp., Dover, N. J. staking machines, $128,846.
Monarch Machine Tool Co., Sidney, O., lathes, $16,584.
National Broach & Machine Co., Detroit, circular broaches, $1350.
National Cash Register Co., Dayton, O., artillery ammunition components, $119,948.
National Tool Co., Cleveland, countersinks, $1500.
Niles-Bement-Pond Co., Pratt & Whitney division, West Hartford, Conn., thread gages, gages, $44,951.79.
Norma-Hoffmann Bearings Corp., Stamford, Conn., ball bearings, $1144.50.
Otis Elevator Co., Buffalo, steel castings, $2152.65.
Phillips, Frank L., Co., Binghamton, N. Y., aluminum alloy castings, $6430.39.
Precise Tool & Mfg. Co., Farmington, Mich., gages, $48,211.
Precision Mfg. Co., Philadelphia, tools, $5289.
Proctor & Schwartz Inc., Philadelphia, automatic dryers, $1520.
Putnam Tool Co., Detroit, cutting tools, $1282.50.
Read Machinery Co. Inc., York, Pa., preheaters, $74,227.20.
Reska Spline Products Co., Detroit, gages, $21,887.
Ringel Bros., Newark, N. J., artillery ammunition components, $10,770.
Rudolph & West Co., Washington, drills, $3739.45.
Schiller, Nolan & Co. Inc., Philadelphia, artillery materiel, $2719.75.
Schwitzer-Cummins Co., Indianapolis, cartridge cases, $357,875.
Sheffield Gage Co., Dayton, O., gages, $1078.50.
Sipp-Eastwood Corp., Paterson, N. J., drilling machines, $24,375.
S. K. F. Industries Inc., Philadelphia, roller bearings, $1369.80.
Timken Roller Bearing Co., Canton, O., roller bearings, $8406.29.
Trackson Co., Milwaukee, small arms materiel, $100,791.44.
Union Twist Drill Co., Chicago, drills, $2007.
Veit & Young, Philadelphia, punch blanks, $1440.
Vinco Corp., Detroit, inspection gages, $1448.40.
Warner Electric Brake Mfg. Co., Beloit, Wis., artillery materiel, $2794.05.
Whitney Chain & Mfg. Co., Hartford, Conn., chain assemblies, $2699.55.
Yale & Towne Mfg. Co., Philadelphia, trucks, $17,117.

Chemical Warfare Service Awards

Atlas Can Corp., Brooklyn, N. Y., containers, $1768.80.
Atlas Powder Co., Philadelphia, machines, $1513.75.
Burke Electric Co., Erie, Pa., motors, $5530.
Dahlquist Mfg. Co. Inc., Boston, tanks and accessories, $1569.
Federal Press Co., Elkhart, Ind., presses, $2395.
Fischer & Porter Co., Philadelphia, rotameters, $1238.
Greene-Wolfe Co., Inc., Brooklyn, N. Y., durlron, $1206.78.
Gries Reproducer Corp., New York, apparatus, $24,650.
Mathews Conveyer Co., Ellwood City, Pa., racks and tables, $1406.62.
National Stamping Co., Detroit, angle-tubes, $114,975.
Pittsburgh Water Heater Corp., Pittsburgh, welding of burster tube plugs and wells, $4048.21.
Revere Copper & Brass Inc., Baltimore, brass, $5037.24.
United-Carr Fastener Corp., Cambridge, Mass., dies, holders, clips, $3697.15.
Vernon Co., New York, diaphragm spacers, $23,188.
Waterbury Buckle Co., Waterbury, Conn., buckles, $9758.

Quartermaster Corps Awards

Chris-Craft Corp., Algonac, Mich., gasoline engines for mine yawls, $15,576.
Fargo Motor Corp., Detroit, trucks, ambulances, $10,047,885.
Freeport Point Shipyard Inc., Freeport, N. Y., ambulance boat, $21,000.
McCloskey & Co., Philadelphia, construction of air base, Borinquen field, Puerto Rico, $4,763,750.
National Supply Co., Philadelphia, diesel engines for boats, $271,152.
Pacific Fence Co., Los Angeles, fence, Stockton airport, Stockton, Calif., $17,-387.
Padgitt Bros. Co., Dallas, Tex., trunk lockers $54,400.
Salt Lake Cabinet & Fixture Co. Inc., Salt Lake City, Utah, kitchen equipment and hospital furniture, Post hospital, Ft. Douglas, Utah, $5367.47.
Schwayder Bros. Inc., Denver, trunk lockers, $136,240.
Standard Construction Co., Tacoma, Wash., reinforced concrete water reservoirs, Ft. Lewis, Washington, $30,260.
Steinle-Wolfe Inc., Fremont, O., recreation building, Erie ordnance depot, LaCarne, O., $8989.
Stolte, F. O., Co., Pacific Grove, Calif., incinerator, Camp McQuaide, California, $10,450.
Texas Trunk Co. Inc., San Antonio, Tex., trunk lockers, $54,500.

Air Corps Awards

Allith-Prouty Inc., Danville, Ill., stand assemblies, $88,750.
American Gas Accumulator Co., Elizabeth, N. J., lamp assemblies, $255,420.
Bell & Howell Co., Chicago, printer assemblies, aircraft cameras, $204,529.28.
Blackhawk Mfg. Co., Milwaukee, airplane jack assemblies, $264,225.
Continental Motors Corp., Detroit, aeronautical engines and spare parts, $10,715,019.
DeVry Corp., Chicago, motion picture sound film projectors, $29,376.
General Electric Co., Schenectady, N. Y., generator assemblies, $31,980.
Independent Engineering Co. Inc., O'Fallon, Ill., helium purification laboratory, $124,840.
Kidde, Walter, & Co., New York, oxygen cylinder assemblies, $139,535.32.
Variety Aircraft Corp., Dayton, O., stand assemblies, $198,000.

Signal Corps Awards

Alden Products Co., Brockton, Mass., keys, $38,334.40.
American Lava Corp., Chattanooga, Tenn., aircraft parts, $11,141.50.
Baitinger Electric Co. Inc., New York, panels, $66,500.
Branch, L. S., Mfg. Corp., Newark, N. J., keys, $28,152.
Cardwell, Allen D., Mfg. Corp., Brooklyn, N. Y., telegraph sets, $8788.38.
Continental Electric Co. Inc., Newark, N. J., generators and spare parts, $58,275.
Cornelius, H. M., Co., New York, tool sets, $23,404.
Crannell, Nugent & Kranzer Inc., New York, connectors, $11,615.50.
Dicke Tool Co., Downers Grove, Ill., reel units, $146,646.50.
Dictaphone Corp., New York, code transmitters and recorders, $8625.
Ehrick, Fred, Inc., Brooklyn, N. Y., panels, $10,806.66.
Federal Telegraph Co., Newark, N. J., transmitting equipment for radio sets, $59,531.25.
Frolland Mfg. Co., Springfield, Mass., control units and coupling, $10,866.
General Cable Corp., New York, wire, $245,044.80.
Hallicrafters Inc., Chicago, components for radio sets, $9078.25.
Kellogg Switchboard & Supply Co., Chicago, microphones, $493,000.
Leich Electric Co., Genoa, Ill., cabinet rectifiers, $12,634.50.
Lundquist Tool & Mfg. Co., Worcester, Mass., parts for ground and hand radio sets, $106,388.25.
Murdock, Wm. J., Co., Chelsea, Mass., headsets, $36,408.90.
Parish Pressed Steel Co., Reading, Pa., reels, $8140.50.
Petroff, Peter A., New York, axles, $14,-008.80.
Phelps Dodge Copper Products Corp., Hablrshaw Cable & Wire division, New York, wire, $202,605.
Remler Co. Ltd., San Francisco, connectors, $11,328.
Stone, J. M., Receiver Operadio Mfg. Co., St. Charles, Ill., parts for interphone equipment, $26,186.93.
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., telephone parts, $85,-644.60.
Technical Appliance Corp., New York, antennas, guys, $70,404.25.
Ulmer, A. J., New York, cases, $46,812.
Universal Microphone Co. Ltd., Inglewood, Calif., microphones, $122,000.
Western Electric Co. Inc., New York, microphones, crystal units and cases for radio sets, $526,018.
Willows Mfg. Co., Brooklyn, N. Y., carriers, $13,123.08.
Wilson, W. S., Corp., New York, wrench sets, $12,211.68.

Medical Corps Awards

Aluminum Cooking Utensil Co., New Kensington, Pa., mess equipment, $18,075.89.
Buck X-Ograph Co., St. Louis, X-ray equipment, $17,402.25.
Cleveland Dental Mfg. Co., Cleveland, dental equipment, $10,458.
Foster Bros. Mfg. Co., Utica, N. Y., folding beds, $24,525.
General Electric X-Ray Corp., New York, X-ray equipment, $7036.88.
General Fireproofing Co., Youngstown, O., office equipment, $12,147.50.
Hard Mfg. Co., Buffalo, folding beds, $20,920.
Haslam, Fred, Co. Inc., Brooklyn, N. Y., surgical instruments, $62,075.
International Silver Co., Meriden, Conn., mess supplies, $32,379.
Legion Utensils Corp., Long Island, N. Y., mess equipment, $17,304.93.
Mueller, V., & Co., Chicago, forceps and surgical supplies, $23,516.83.
Ponsell Floor Machine Co., New York, electric polishing machines, $8972.27.
Robbins, Myers Inc., Springfield, O., electric fans, $16,015.
Scharmann, Gustav, New York, dental equipment, $5722.50.
Schultes, H. W., Brooklyn, N. Y., forceps, $5105.
Scrimgeour, William, Washington, serving trays, $58,000.
Sklar, J., Mfg. Co., Long Island City, N. Y., surgical instruments, $154,065.25.
Smith & Davis Mfg. Co., St. Louis, folding beds, $19,680.
Stanley, William W., Co., New York, field equipment, $24,758.
Star Dental Mfg. Co., Philadelphia, dental equipment, $17,499.29.
Taylor-Wharton Iron & Steel Co., High

(*Please turn to Page* 46)

■ R. B. Hays (right), vice president and secretary, Federal Reserve bank of Cleveland, explains to applicant how loans may be obtained from government for defense manufacture

Mr. Blue Goes to the Bank...

To See About Defense Work

Typical Small Plant Owner Looks Into Financing . . . How He Can Help Government and How Government Can Help Him

By HAROLD A. KNIGHT
Associate Editor

■ **It is estimated 175,000 organizations in the United States are capable of producing defense materials. As the defense program gains momentum more of these "potentials" will become "actuals." A defense manufacturer can serve either as a primary contractor or a subcontractor, his methods of borrowing from the government being much the same. If he wishes to borrow to expand plant area, or equip with machinery, he signs a Plant Facilities Contract. If his raw materials are to be financed by the government, then a Supplies Contract is used. Federal Reserve banks and branches are ready to give advise on financing problems**

■ R. W. BLUE ("Red, White and Blue," they call him at the Rotary club) is the fourth generation of Americans in the metal-working industry. His grandfather fought at Gettysburg, and R. W. was in uniform in the World War. He is too old now to don olive drab again, but he wants to contribute his share in overthrowing dictators.

R. W. Blue manufactures bicycles. He knows that bicycle manufacturers have turned out machine gun stands, so why can't he? Though bicycle business recently has been the best since the gay nineties, Mr. Blue hardly feels financially able to build a plant addition equal to about one-third of his present plant area, which would be needed for the extra work. He must not let down on his regular line, either, as experience in Europe, where populations have turned to bicycles in the absence of automobiles and gasoline, give him the impression that his peace-time product will continue in demand.

But why should he try to finance the expansion himself? He can contribute his full share of patriotic endeavor by merely manufacturing. Let the government do the financing.

Located in northern Ohio, he takes a trip to Cleveland. There, the public library, business information bureau, contains a bulletin board to which are attached sample literature to inform him. Here is a digest of pamphlets, entitled "The National Defense Program—How to Comply with It."

A few pamphlets listed are: "National Defense Loans—Assignment of Claims under Government Contracts as Security for Bank Loans," bulletin 82, published by American Bankers association, New York; "Emergency Plant Facilities Contract"; "Army Purchase Information Bulletin 1940," issued by the office of the assistant secretary, war department, Washington; "Machine Tool Expansion for National Defense," published by the National Machine Tool Builders' association; "Selling to the Navy," prepared by the navy department, bureau of supplies and accounts.

From the library, it is a short step

to the Federal Reserve bank of Cleveland where R. B. Hays, vice president and secretary, is prepared to give him information, to answer questions on any phase of defense work, and to counsel with him concerning financial problems which may arise in defense work.

He learns that, at the request of the national defense advisory commission, the board of governors of the Federal Reserve system has designated an officer at each of the 12 Federal Reserve banks and their 24 branches, to serve as the field representative of the director of small business activities and the board of governors.

Robert L. Mehornay is in charge of the office of small business activities, Washington, which centralizes all small business activity under the supervision of Donald M. Nelson, director of small business activities, for the national defense advisory commission.

Mr. Blue is told that 175,000 organizations in the United States are potential producers of defense supplies. A breakdown of a list of 10,000 eligible organizations shows that 5000 have less than 100 employes; of these 5000, 70 per cent have less than 50 employes. Mr. Blue already feels at home among these small-timers.

R. W. learns, furthermore, that there are two kinds of defense contracts, direct and subcontracts. If he is to be a direct defense manufacturer, he will go to the *local* procurement officer (army or navy; more generally army) who would normally buy his proposed machine gun stands.

If he feels he is more capable of assisting in the defense program as a subcontractor he might make known his facilities to the *chief of service* of the particular division which would use his product.

Nine Chief Army Agencies

At this time, however, relationships between primary contractors and subcontractors on defense work are much the same as between corporations buying and selling to each other. The problem of a subcontractor is largely one of salesmanship to corporations which have received direct government contracts.

There are nine chief procurement planning agencies in the army: Air corps, chemical warfare, engineer, medical, ordnance, quartermaster, signal corps, remounts (horses and mules), and construction.

In addition, local purchases at army posts, covering requirements of the post, are made by the respective officer and certain articles used by all branches of the service are purchased by the procurement division, treasury department, and drawn against by various federal agencies or divisions as needed.

Mr. Hays tells Mr. Blue there are three general ways of financing plant expansion necessitated by defense contracts.

The first is known as the arsenal plan. It is used in connection with needed facilities which probably have no commercial value or in which the government desires to have a permanent interest. In this case the government finances the building of the plant by a private manufacturer and then leases that plant to the manufacturer for $1 a year and pays him a fixed fee to operate it. The government pays for the plant either through the Defense Plant Corp., or with funds appropriated for plant expansion by the army or the navy. Plants for the manufacture of ordnance, including shell and powder, are a good example, and the government has title to such plants at all times.

Adds Cost to Sales Price

The second way in which plant expansion is financed, and the most ordinary method, is the regular procurement plan. In this case a manufacturer builds an addition with his own money, adding the cost of the expansion to the selling price of the product. A company may finance such expansion as it chooses, by using internal funds, bank loans, new financing, loans from the Reconstruction Finance Corp., or funds obtained through advance payment by the United States treasurer, not exceeding 30 per cent of the current value. For tax purposes, a corporation may obtain certification that such plant expansion is necessary for defense work, and thereby amortize cost of plant addition in five years. When this is done, however, the price of the product to the government will not include an abnormal allowance for amortization. Title to plant additions of this sort rests with the manufacturer at all times.

The third plan might be designated as the plant option plan. It may be used where additional facilities are needed to produce defense material, but such facilities might or might not have a future commercial use. The company finances and constructs the facilities and is repaid by the government for cost of construction in 60 equal monthly installments.

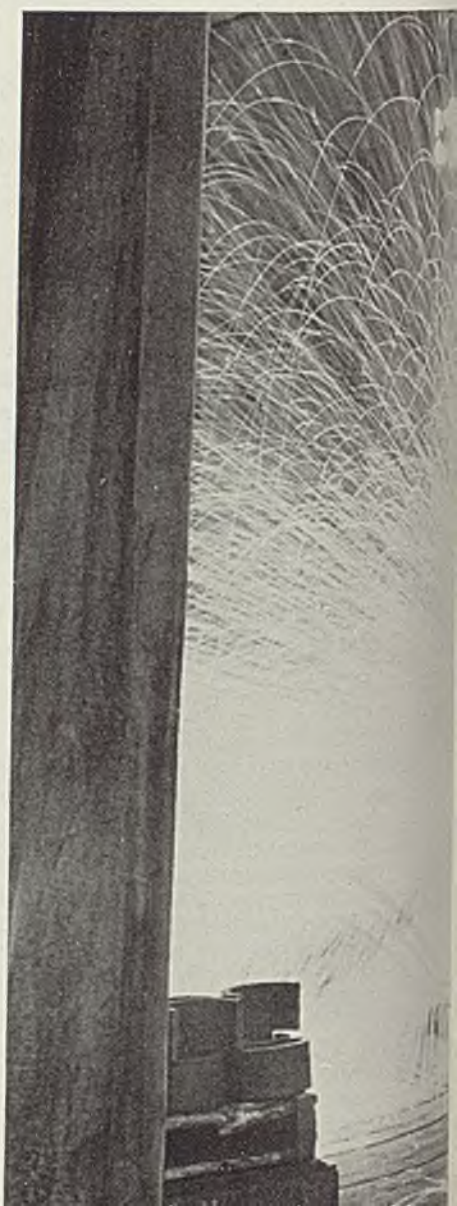
It was in connection with this plan that the form of contract providing for assignment of claims against the government was developed. Such a claim may be used as collateral for a loan from a bank or any lending agency. At the end of five years, such plant or plant addition financed in this way actually belongs to the government, but the manufacturer may retain the use of the facilities if he indicates he will pay the government for them at a price representing original cost, less depreciation at a rate fixed in the contract.

If this price is felt to be too high, he may offer less and negotiate with the government, but it is free to reject any offer. In so doing, the government binds itself to use the plant for war purposes only.

The small manufacturer who plans to expand his operations because of defense work is being encouraged to apply to his local banker for any necessary financial aid, if it is a matter of working capital. If, for any reason, funds cannot be obtained from ordinary banking connections for purchasing raw materials or hiring extra labor representatives of the reserve banks are glad to counsel with manufacturers regarding financial problems.

Financing of plant expansion or purchase of equipment, even for defense needs, is not always possible through bank loans, although if an assignable Emergency Plant Facilities Contract is obtained banks may advance the necessary funds.

Plant expansion also may be financed, as pointed out, by obtain-



ing funds from the R. F. C., or through direct advances from the government. But in all cases considerable investigation and numerous certificates are required before financing of expansion is accomplished in these ways. The foregoing applies to expansion necessary for completion of direct as well as subcontract work.

R. W. Blue, who has a college professor method of investigating a subject thoroughly, also learns several interesting facts in addition to those required in making a decision about his own bicycle plant expansion. Before a defense loan is granted, convincing evidence must be furnished that the would-be borrower has personal integrity, financial responsibility, production ability, has knowledge of costs, and has taken proper insurance safeguards.

One would suppose that production ability, as proved by experience, would be an invariable rule. A contrary situation, however, is not unusual. Take the case of a worker in a rubber plant whose hobby is photography. He invented a gadget for aerial photography which the army greatly needed and for which it has placed a large order. The inventor had no plant in which to manufacture, nor money to build the same, nor manufacturing experience. However, it is quite certain that governmental financial aid will be forthcoming.

Neither will the government set up R. W. Blue with his bicycle plant addition if there already exists capacity which might produce machine gun stands, particularly if such capacity is in Mr. Blue's district. The chances are that machine gun stand capacity, being purely a war-time requirement, is not already overbuilt and that Mr. Blue's contribution is needed.

Main and Subcontracts Similar

Mr. Blue, in deciding whether he is able to aid the defense program as a main contractor or a subcontractor, will also learn that to act in either capacity the steps necessary for him to take differ widely. So far as any plant expansion is concerned, provisions under an emergency plant facilities contract for subcontractors or direct contractors are not greatly different. In both cases, certification by some branch of the service as to necessity is required. Subcontract defense work, under most conditions, is no different from subcontract work in ordinary commercial business. As previously stated, for the subcontractor it is chiefly a problem of selling goods or services.

From the pamphlet "National Defense Loans, Bulletin No. 82," Mr. Blue learns that "The emergency plant facilities contract, with appropriate modification of certain clauses, may also be used by subcontractors." He reads further that "The great volume of bank loans resulting from the defense program will arise out of supplies contracts." (When this booklet was published last December, supplies contracts, as then being drawn, contained no standardized provisions. However, such clauses were in process of being drafted and will probably contain the so-called "bankable provisions" similar to those in the emergency plant facilities contract.)

Rates charged for government loans vary with the nature of the loan and credit worthiness of the borrower. Varying degrees of risk would seem to call for varying interest rates, ranging from 1½ to 5 per cent.

In Bulletin No. 82 is a clause which particularly catches Mr. Blue's attention: "It is possible that some manufacturers will endeavor to produce for the government products with which they have not had previous production experience. The ability of the individual manufacturer to switch over to a new product is a matter of determination in each case."

Several Natural Adaptations

On this score Mr. Blue is pretty sure he will pass the test. After all, machine gun stands and bicycle frames are related closely. When attending conventions of the National Association of Manufacturers, Mr. Blue has met many factory men who have made changes just as radical as this. A refrigerator plant now turns out airplane parts and cartridge cases; vacuum cleaner companies make gas mask parts; a business machine manufacturer is planning to produce automatic pistols, bomb fuses and artillery shells; air conditioning plants have blue prints for bomb bodies; washer and iron makers have in mind artillery ammunition components; postal meter companies make bomb mechanisms; printing equipment concerns manufacture fire control equipment, artillery equipment and machine tools; steel office furniture makers are taking on bomb containers.

Sometimes a person who would be

■ Not a Fourth of July display, but one which may well tie in with the national defense program. The huge fan of flying sparks is caused by flash welding, as two semi-circular pieces of steel are fused into a magnet-frame for a direct current electric motor. Asbestos curtains hanging from 30 feet above the floor restrict the sideward flight of the sparks shooting from the welder. Photo, General Electric Co.

least expected to contribute to national defense is admirably fitted for such work. For example, the owner of a garage with a small machine shop approached Mr. Hays, pointing out that his workers could assemble such products as carburetors and magnetos. He was given a list of manufacturers who sell directly to the government and who possibly could use assembled parts.

So Mr. Blue returns home. He writes a letter to the proper army procurement officer, explaining why expanded plant facilities for his bicycle plant are needed, the type of plant and machines desired, the general type of construction contemplated, estimated costs and much other pertinent information, and requests an Emergency Plant Facilities Contract.

Because there is an advisor such as Mr. Hays, in many federal reserve cities, potential contractors and subcontractors are saved many trips to Washington. Mr. Hays "knows most of the answers," and when he is in doubt he can ask the Federal Reserve Board of Governors.

Mr. Hays has acted as a broker or middleman, without compensation, among various defense manufacturers in his district. The day Mr. Blue called on him, Mr. Hays was arranging a deal whereby surplus automatic screw machines in hands of one manufacturer, were being transferred to a defense manufacturer who needed them.

It is estimated that the fourth federal reserve district, in which Cleveland is located, can add about 16 per cent to the value of the nation's total manufactured products. Up to Dec. 31, 1940, only 7 per cent of such contracts had been placed, largely direct defense army and navy contracts, other than ships and airplanes. The difference between the 16 and 7 per cents will logically be furnished by subcontractors.

The federal reserve bank of Cleveland has received from 610 manufacturers answers to questionnaires asking for data on defense facilities available at plants not now on army and navy bidding lists.

Government Defense Awards for Week

(*Concluded from Page* 42)

Bridge, N. J., cylinders, $101,292.50.
Union Dental Instrument Mfg. Corp., Philadelphia, dental equipment, $23,034.
Will Corp., New York, electric centrifuges, $25,671.36.

Navy department last week announced the following:

Bureau of Supplies and Accounts Awards

Acme Machine Tool Co., Cincinnati, turret lathes, $68,346.60.
Alemite Co. of Maryland, Baltimore, gun fittings, $7459.
Allis-Chalmers Mfg. Co., Milwaukee, switchboard, $31,594.
American Car & Foundry Co., New York, plug cocks, $25,299.
American Cyanamid & Chemical Corp., New York, manganese resinate, $6250.
Anaconda Sales Co., New York, slab zinc, $8250.
Babcock & Wilcox Tube Co., Beaver Falls,

PURCHASES UNDER

(In Week Ended Jan. 18)

Iron and Steel Products	Commodity	Amount
Adams, S. G., Co., St. Louis	Mess trays	$33,708.50
Air Associates Inc., Bendix, N. J.	Bolts	12,537.09
Airtherm Mfg. Co., St. Louis	Buoys	11,025.00
American Bridge Co., Pittsburgh	Towers, structural steel	739,114.60
American Car & Foundry Co., New York	Armor plates	63,196.80
American Chain & Cable Co. Inc., Bridgeport, Conn.	Cores, steel triangles	72,894.70
American Fork & Hoe Co., Cleveland	Adzes and hammers	39,084.61
American Locomotive Co., New York	Springs	11,167.00
American Rolling Mill Co., Middletown, O.	Sheet steel	82,335.00
Anchor Post Fence Co. of Calif., San Francisco	Fencing wire	10,350.00
Anthracite Bridge Co., Scranton, Pa.	Bridge	17,775.00
Bethlehem Foundry & Machine Co., Bethlehem, Pa.	Supports	24,825.00
Bethlehem Steel Export Corp., New York	Barge hull	246,770.00
Billings & Spencer Co., Hartford, Conn.	Clamps	11,363.71
Boston & Lockport Block Co., New York	Steel blocks	15,750.00
Budd Wheel Co., Detroit	Burster casings	8,224,140.00
Carnegie-Illinois Steel Corp., Pittsburgh	Steel	39,419.99
Chicago Bridge & Iron Co., Birmingham, Ala.	Storage spheres	20,900.00
Cincinnati Tool Co., Cincinnati	Clamps	10,269.05
Colorado Fuel & Iron Corp., Denver	Forgings	4,536,000.00
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.	Pistols	246,037.20
Consolidated Steel Corp. Ltd., Los Angeles	Doors for hangars	136,893.00
Crane Co., Chicago	Valves	11,790.00
Crucible Steel Co. of America, New York	Steel	16,412.17
Dahlstrom Metallic Door Co., Jamestown, N. Y.	Ammunition boxes	41,360.00
Delaware Tool Steel Corp., Wilmington, Del.	Chisels	28,568.16
Dicke Tool Co. Inc., Downers Grove, Ill.	Reels	11,087.00
Dienelt & Eisenhardt Inc., Philadelphia	Projectiles	16,920.00
Duplex Mfg. Corp., Sherman, N. Y.	Chests	12,185.10
Eureka Vacuum Cleaner Co., Detroit	Dies and tools	10,276.31
G. M. Mfg. Co. Inc., Long Island City, N. Y.	Shells	84,900.00
Gary Steel Products Corp., Norfolk, Va.	Barrels	102,975.00
General Motors Corp., Detroit	Shells	9,505,600.00
Goodrich, B. F., Co., Akron, O.	Electroplating tanks	25,920.00
Goodyear Tire & Rubber Co. Inc., Akron, O.	Electroplating tanks	14,690.50
Gorsuch, James A., Jr., Jeffersonville, Ind.	Grates	70,000.00
Gray & Dudley Co., Nashville, Tenn.	Griddles	54,210.00
Grinnell Co. Inc., Atlanta, Ga.	Piping	299,435.00
Hardesty, R., Mfg. Co., Denver	Pipes, fittings	47,494.28
Hayes Mfg. Corp., Grand Rapids, Mich.	Shells	42,189.20
Hercules Food Service Equipment Inc., New York	Pans	37,999.62
Isaacson Iron Works, Seattle	Structural steel	22,518.90
Kahne, Roy, Brooklyn, N. Y.	Graters	10,720.00
Kiefaber, W.H., Co., Dayton, O.	Taps	35,863.98
Kilby Steel Co., Anniston, Ala.	Mosquito bar rods and cutters	292,193.90
Klein, J., & Son, Chicago	Pipe	370,390.24
Lalance & Grosjean Mfg. Co., Long Island, N. Y.	Ladles	33,840.00
Maclane Hardware Co., New York	Bits, saws	10,729.17
Malleable Steel Range Mfg. Co., South Bend, Ind.	Ranges	18,810.00
McCulloch Mfg. Co., South Boston, Mass.	Rifle parts	20,033.84
Midvale Co., Philadelphia	Racks and pinions	255,360.00
Mosher Steel Co., Houston, Tex.	Structural steel	26,500.00
Narragansett Machine Co., Providence, R. I.	Rifle parts	26,586.70
National Electrical Machine Shops Inc., Washington	Bearing circles	17,460.30
North & Judd Mfg. Co., New Britain, Conn.	Buckles	15,676.00
Peco Mfg. Corp., Philadelphia	Fuse bodies	360,000.00
Peerless Pacific Co., Portland, Oreg.	Steel pipe	10,749.45
Philips & Davies Inc., Kenton, O.	Gates and guides	35,800.00
Pittsburgh Des Moines Steel Co., Pittsburgh	Training equipment	49,677.00
Plumb, Fayette R., Inc., Philadelphia	Axes and hammers	11,494.15
Polarizing Instrument Co., New York	Tubes	12,412.50
Poor & Co., Canton Forge & Axle Works, Canton, O.	Forgings	16,870.40
Pullman Standard Car Mfg. Co., Butler, Pa.	Forgings	1,134,000.00
Raybestos-Manhattan Inc., Manhattan Rubber Mfg. division, Passaic, N. J.	Electroplating tanks	11,000.00
Rex Body Corp., Canastota, N. Y.	Chests	17,325.00
Rockford Screw Products Co., Rockford, Ill.	Bolts	13,050.42
Scheu Products Co., Upland, Calif.	Grate bases	24,200.00
Scrimgeour, William, Washington	Knives	14,304.00
Shuler Axle Co. Inc., Louisville, Ky.	Drop forgings	20,679.30
Snap-On Tools Corp., Kenosha, Wis.	Wrenches	39,314.60
Standard Dry Kiln Co., Indianapolis	Dry-kilns	10,155.00
Stanley Works, New Britain, Conn.	Planes	12,316.38
Stevens Walden Inc., Worcester, Mass.	Cartridge holders	47,808.00
Swartzbaugh Mfg. Co., Toledo, O.	Frames	34,669.40
Thompson, Henry G., & Son Co., New Haven, Conn.	Hacksaw blades	66,374.89
Thorrez & Maes Mfg. Co., Jackson, Mich.	Steel bodies	216,383.00
United States Gypsum Co., Chicago	Expanded metal	16,416.39
United States Steel Export Co., New York	Scows, lock gages	1,686,721.00
Wallace, R., & Sons Mfg. Co., Wallingford, Conn.	Knives	10,587.56
Whitehead & Kales Co., Detroit	Gate anchorages	27,350.00

WALSH-HEALEY ACT

Iron and Steel Products	Commodity	Amount
Wire Rope Corp. of America, New Haven, Conn.	Wire rope	$10,896.00
Wood, John, Mfg. Co. Inc., Conshohocken, Pa.	Barrels	171,864.00
Youngstown Sheet & Tube Co., Youngstown, O.	Steel	18,848.50
Nonferrous Metals and Alloys		
Aluminum Co. of America, Pittsburgh	Aluminum and aluminum alloy	$120,193.46
Aluminum Cooking Utensil Co., New Kensington, Pa.	Cans, pots	56,311.50
Aluminum Goods Mfg. Co., Manitowoc, Wis.	Kettles, pans, aluminum	81,320.00
American Brass Co., Waterbury, Conn.	Flexible conduits, cartridge discs, bronze	246,949.57
American Button Co., Rochester, N. Y.	Buttons	12,850.00
Badger Fire Extinguisher Co., Boston	Fire extinguishers	11,310.00
Bridgeport Brass Co., Bridgeport, Conn.	Brass tubes, cartridge cases	98,110.00
C-O-Two Fire Equipment Co., Newark, N. J.	Fire extinguishing systems	67,883.55
Chase Brass & Copper Co. Inc., Waterbury, Conn.	Cartridge discs, pipe, brass	*731,931.93
Hudson Smelting & Refining Co., Newark, N. J.	Lead	36,288.00
International Nickel Co. Inc., New York	Nickel-copper	99,700.42
New Jersey Zinc Sales Co. Inc., New York	Zinc	43,258.50
Pacific Marine Supply Co., Seattle	Fire extinguishers	11,370.00
Phosphor Bronze Smelting Co., Philadelphia	Bronze	21,112.27
Revere Copper & Brass Inc., Baltimore	Brass, cartridge cups, brass rod, copper tubing	456,450.84
Waterbury Button Co., Waterbury, Conn.	Buttons	10,727.50
Welker Mfg. Co. Inc., Cromwell, Conn.	Buckles	23,038.83
Machinery and Other Equipment		
Allis-Chalmers Mfg. Co., Milwaukee	Tractors, transport assemblies	$63,016.85
Austin-Hastings Co. Inc., Cambridge, Mass.	Drilling machines	19,283.00
Barco Mfg. Co., Chicago	Gasoline hammers	394,542.00
Bay City Shovels Inc., Bay City, Mich.	Crawler shovel	15,900.00
Bertsch & Co. Inc., Cambridge City, Ind.	Straightening rolls	14,535.00
Brown & Sharpe Mfg. Co., Providence, R. I.	Milling machines	32,790.00
Busch Sulzer Bros., Diesel Engine Co., St. Louis	Engine parts	16,761.61
Cincinnati Milling Machine & Cincinnati Grinders Inc., Cincinnati	Milling machines	105,613.50
Davenport Besler Corp., Davenport, Iowa	Locomotives	90,285.00
Dravo Corp., Pittsburgh	Piping system	99,981.00
Enterprise Tool & Gear Corp., Detroit	Gears	10,920.00
Eversman Mfg. Co., Denver	Levelers	18,700.00
Farquhar, Lynd, Co., Boston	Milling machines	20,860.00
Florida Weathermakers Inc., Jacksonville, Fla.	Refrigerators	233,069.00
Foote-Burt Co., Cleveland	Drill presses	11,305.00
General Electric Co., Schenectady, N. Y.	Locomotives	135,225.00
Gisholt Machine Co., Madison, Wis.	Lathes	33,034.00
Gosiger, C. H., Machine Co., Dayton, O.	Lathes	60,359.00
Heald Machine Co., Worcester, Mass.	Grinders	79,080.00
Hercules Powder Co., Wilmington, Del.	Fuse cutters	24,539.00
Jones & Lamson Machine Co., Springfield, Vt.	Grinding machine, lathe equipment	29,929.50
Kennedy-Van Saun Mfg. & Engineering Corp., New York	Crusher	19,404.00
Landis Tool Co., Waynesboro, Pa.	Grinders	17,905.41
Link-Belt Co., Chicago	Water screens	12,307.00
Lloyd & Arms Inc., Philadelphia	Honing, lapping, vertical machines	51,190.00
Lodge & Shipley Machine Tool Co., Cincinnati	Lathes	13,521.00
Maxson, W. L., Corp., New York	Computing machines	24,500.00
Monarch Machine Tool Co., Sidney, O.	Lathes	33,128.00
Mueller Brass Co., Port Huron, Mich.	Engine parts	12,987.26
National Supply Co., Philadelphia	Engine parts	13,165.65
Niles-Bement-Pond Co., Pratt & Whitney division, West Hartford, Conn.	Drills, lathes, profiler, shaper	179,855.70
Northern Pump Co., Minneapolis	Pumps	186,977.00
Pennsylvania Flexible Metallic Tubing Co., Philadelphia	Engine parts	14,959.60
Prentiss, Henry, & Co. Inc., New York	Lathes	39,228.00
Riordan Machine Co., Detroit	Milling machines	31,348.00
Singer Sewing Machine Co., New York	Sewing machines	20,959.00
St. Joe Machines Inc., St. Joseph, Mich.	Laundry presses	24,010.00
Stedfast & Roulston Inc., Boston	Boring mills	61,454.80
Swind Machinery Co., Philadelphia	Boring machines	52,641.00
Vulcan Iron Works, Wilkes-Barre, Pa.	Locomotives	61,100.00
Warner & Swasey Co., Cleveland	Lathes	182,123.50
Whitcomb Locomotive Co., Rochelle, Ill.	Locomotives	61,460.00

*Estimated.

Pa., steel tubing, $12,401.58.
Baldt Anchor, Chain & Forge Corp., Chester, Pa., stockless anchors, $6440.
Bendix Aviation Corp., Pioneer Instrument division, Bendix, N. J., navigation instruments, $9500.
Bogue Electric Co., Paterson, N. J., motor generator sets, $159,000.
Bullard Co., Bridgeport, Conn., boring mills, $50,917.15.
Carey Machinery & Supply Co., Baltimore, lathes, $11,995.10.
Carnegie-Illinois Steel Corp., Pittsburgh, nickel steel bars, $47,058.
Chase Brass & Copper Co. Inc., Waterbury, Conn., copper tubing, $14,806.61.
Chicago Pneumatic Tool Co., Philadelphia, pneumatic drills, wrenches, bores, grinders, hammers, $75,070.35.
Cincinnati Bickford Tool Co., Cincinnati, drills, $38,609.85.
Cincinnati Milling Machine & Grinders Inc., Cincinnati, milling and grinding machine, $27,628.
Continental Machines Inc., Minneapolis, combination machines, $16,794.
Crucible Steel Co. of America, New York, nickel steel bars, $9257.60.
Ex-Cell-O Corp., Detroit, thread grinding machine, $6265.
Florence Pipe Foundry & Machine Co., Philadelphia, bending machine, $10,512.
Foster Wheeler Corp., New York, brass pipe, $114,956.
Gallmeyer & Livingston Co., Grand Rapids, Mich., hydraulic grinders, $11,483.25.
General Motors Sales Corp., Hyatt Bearings division, Harrison, N. J., roller bearings, $21,445.92.
Gisholt Machine Co., Madison, Wis., turret lathes, $58,417.50.
Hardie-Tynes Mfg. Co., Birmingham, Ala., air compressors, $86,186.
Heintz Mfg. Co., Philadelphia, doors, hatches and scuttles, $894,374.67.
Henney Motor Co., Freeport, Ill., ambulances, $7140.
Ingersoll Rand Co., New York, pneumatic drills, air compressors, $169,443.
Insinger Machine Co., Philadelphia, dishwashing machines, $6496.
Lewin Mathes Co., East St. Louis, Ill., copper tubing, $16,040.
Link Aviation Devices Inc., Binghamton, N. Y., wheel type trainers, $50,450.10.
Lloyd & Arms Inc., Philadelphia, aircraft cylinder honing machines, $59,263.43.
Monarch Machine Tool Co., Sidney, O., toolroom lathes, $27,667.20.
NePage Electric Co., Seattle, distribution panels, $24,679.60.
New Jersey Zinc Sales Co. Inc., New York, slab zinc, $8250.
Niles-Bement-Pond Co., Pratt & Whitney division, West Hartford, Conn., jigboring machines, $16,723.20.
Oliver Machinery Co., New York, heavy duty band saws, tilting arbor saws, $24,857.
Pittsburgh Steel Co., Pittsburgh, steel tubing, $21,704.38.
Prentiss, Henry, & Co. Inc., New York, turret lathes, $60,048.
Republic Steel Corp., Cleveland, steel bolts and nuts, corrosion-resisting steel, $16,854.21.
Revere Copper & Brass Inc., Baltimore, copper nickel condenser tubes, $50,347.72.
Rockford Machine Tool Co., Rockford, Ill., openside planer, $12,942.
Swind Machinery Co., Philadelphia, horizontal boring and drilling machines, jig boring machines, $91,780.
Tidewater Supply Co. Inc., Norfolk, Va., universal shapers and turret lathes, $49,337.30.
Ward LaFrance Truck Corp., Elmira Heights, N. Y., pumping fire engine, $8315.
Warner & Swasey Co., Cleveland, turret lathes, $39,245.
Williams, White & Co., Moline, Ill., plate bending roll, $9100.
Worthington Pump & Machinery Corp., Harrison, N. J., air compressors, $49,122.
York Ice Machinery Corp., Philadelphia, refrigerating plants, $45,633.42.

Bureau of Yards and Docks Awards

Worthington Pump & Machinery Corp., Los Angeles, engine generator auxiliary power unit at eleventh naval district radio station, Chollas Heights, San Diego, Calif., $52,515.

Understanding Other Man's Viewpoint Will Promote Unity

■ AS WE advance deeper into the problems of defense, the need of tolerance and understanding among individuals and groups of individuals will increase. Those who can develop a liberal spirit of give and take and can see both sides of a question will be contributing importantly to the attainment of national objectives.

The merit of understanding the other man's viewpoint is well illustrated by a situation that has developed in connection with the administration of the selective service act.

♦ ♦ ♦

Instances have been reported from widely scattered sections of the country wherein men urgently needed on jobs in defense industries have been denied deferment of their military training period by local draft boards.

On the basis of the information provided by the drafted men who have been denied deferment or by their employers, some of these cases seem incredible. It would appear that the draft authorities are unconscious of the importance of certain key men to industry.

♦ ♦ ♦

But while some draft officials unquestionably have made mistakes, there is another side to this deferment problem.

On the whole, the personnel of local draft boards is of high caliber. Many industrialists sit on the boards of appeal. They are conscientious in performing this voluntary service.

Some of these industrialists declare that sometimes industrial employes called up for military training and who should be given a deferred rating are denied deferment because their employers fail to present the facts properly to the draft boards.

For instance, hundreds of letters from employers asking that John Jones be put on the deferred list are signed by men having no titles. These letters sound as if John Jones went to his foreman and said, "Can't you get me out of this?"—and the foreman obligingly wrote the letter.

If an employer really wants a valued employe deferred and will take the trouble to have an executive officer of the company write a convincing letter over his signature and title, he probably will succeed in obtaining a deferred rating for his employe.

♦ ♦ ♦

The foregoing is so typical that it deserves emphasis. It is so easy to believe that public officials are deficient in common sense and so hard to believe that one's own private organization can be at fault.

Under the stress of emergency the temptation to think ill of public officials will increase. However, we should remember that "the government" will consist more and more of dollar-a-year men—from our own ranks—and less and less of professional politicians.

The more we try to see and understand their side of every question, the more we will be promoting national unity.

E. L. Shaner

EDITOR-IN-CHIEF

The *BUSINESS TREND*

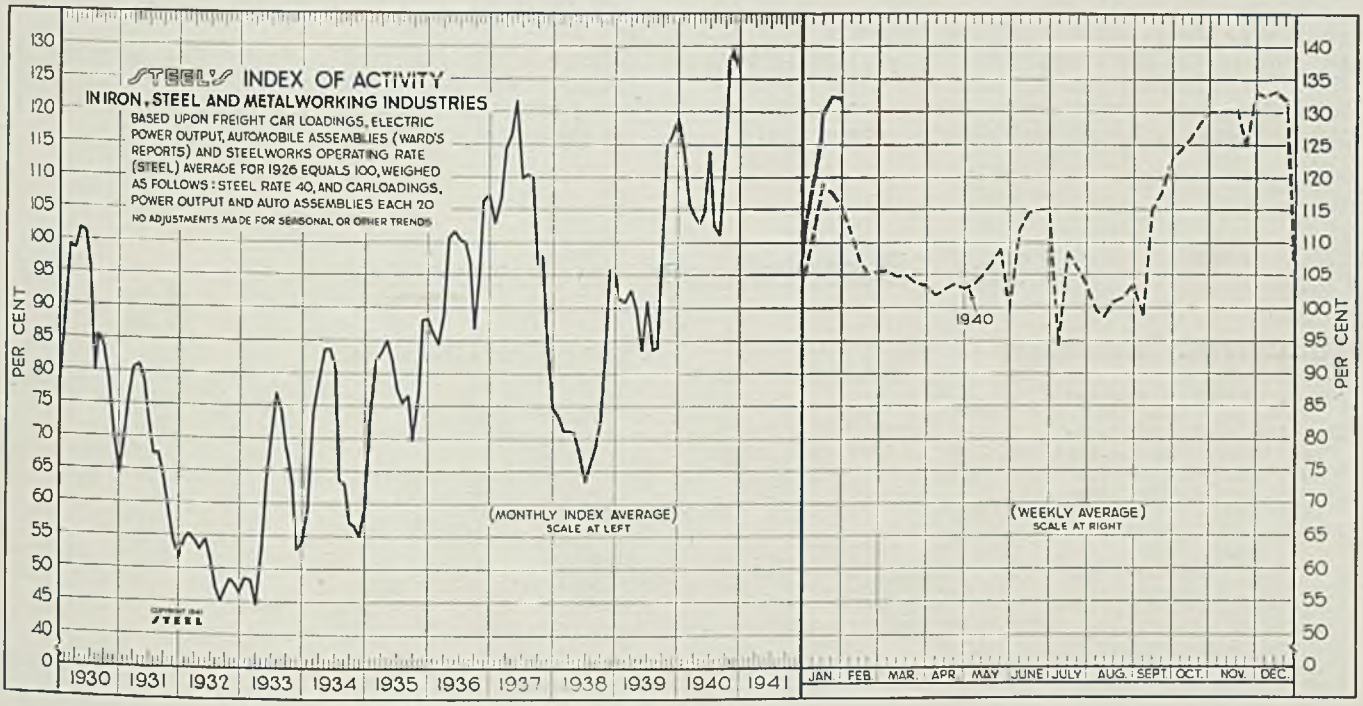
Order Backlogs Remain At Near Peak Levels

■ LITTLE progress has been made toward reducing the large order backlogs accumulated in recent months despite the capacity operations in most industrial lines. This is particularly evident in those industries directly related to the defense program.

Following the unprecedented buying movement of last fall a letup in new orders would normally be expected at this time, but this has not occurred in most instances. Many buyers are seeking protection as far ahead as the third quarter and in some instances, as in certain types of machine tools, deliveries cannot be had until the spring of 1942. Most of this forward buying originates from miscellaneous consumers not directly involved in the defense program.

Major industries reporting orders in excess of production include steel, aircraft, machine tools, construction, automobiles, copper and lumber.

Reflecting the expansion in employment and steady improvement in purchasing power over the past few months, the upward trend of production in many consumer goods lines is gathering increased momentum. Real weekly earnings have advanced from the index figure to 106.6 in August, 1939, to 160.8 in October, 1940, the latest official figures reported by the National



STEEL'S index of activity declined 0.1 *point to* 132.2 *in the week ended Jan.* 25:

Week Ended	1940	1939
Nov. 23	124.7	111.4
Nov. 30	132.6	117.9
Dec. 7	132.5	123.9
Dec. 14	132.6	124.2
Dec. 21	132.4	123.4
Dec. 28	107.5	104.0
Week Ended	**1941**	**1940**
Jan. 4	115.7	110.3
Jan. 11	129.9	119.2
Jan. 18	132.3	117.3
Jan. 25	132.2	115.4

Mo. Data	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	104.1	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	127.8	114.9	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	126.3	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

Industrial Conference board. Further improvement is indicated from recent preliminary estimates.

The rising trend in consumption has offset to a considerable extent the attempt to build up inventories with the result that despite the exceptionally heavy buying since early last fall inventories are not considered out of line with the current expanded operations and prospects are further improvement.

During the week ended Jan. 25, STEEL's index of activity eased to 132.2, substantially unchanged from the previous week's index figure of 132.3. In the comparable weeks of 1940, 1939 and 1938 the index stood at 115.4, 92.9 and 74.7.

Steelmaking operations advanced to 99 per cent during the week ended Jan. 25, based on ingot capacity as of Dec. 31, 1939. This represents a gain of one point over the previous week and compares with 81.5 per cent in the like 1940 period. On the new capacity basis recently published by American Iron and Steel institute, which takes into consideration increased facilities in both open hearth and electric furnace steel production, the national steel rate is currently at the 97 per cent level. Steel producers report a steady inflow of orders. Total bookings last month are estimated to have exceeded that of December by a substantial margin. This is particularly significant in view of the unprecedented buying during the closing months of last year.

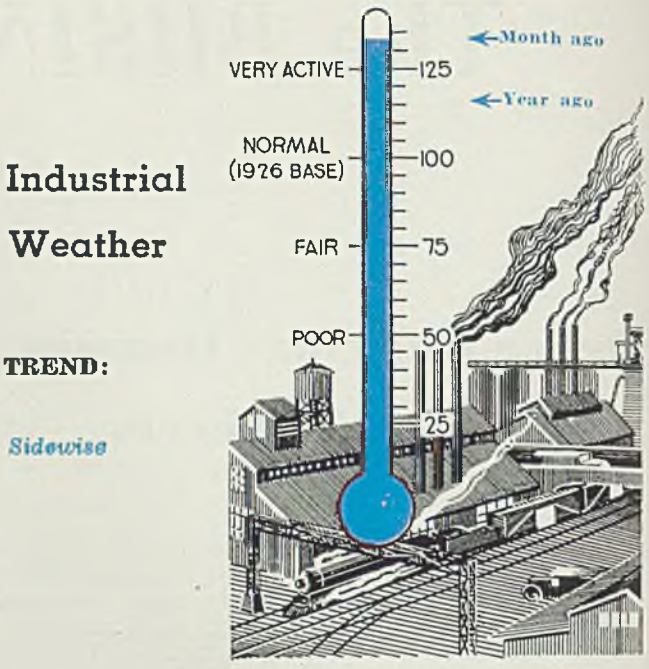
Revenue freight traffic during the latest period gained more than seasonally to 710,752 cars, compared with 703,497 the previous week and 649,488 during the corresponding week a year ago.

Where Business Stands

Monthly Averages, 1939 = 100

	Dec., 1940	Nov., 1940	Dec., 1939
Steel Ingot Output	145.1	149.0	134.0
Pig Iron Output	151.5	151.5	140.7
Building Construction	154.2	128.5	119.7
Auto Output	158.8*	160.8	150.8
Freight Movement	103.8	114.0	98.2
Wholesale Prices	103.5*	102.9	102.7

*Preliminary.



The Barometer of Business

Industrial Indicators

	Dec., 1940	Nov., 1940	Dec., 1939
Pig iron output (daily average, tons)	146,544	146,589	136,119
Iron and steel scrap consumption (tons)	3,922,000	4,233,000	3,858,000
Gear Sales Index	173	216	126
Foundry equipment new order index	257.8	254.2	124.5
Finished steel shipments (Net tons)	1,544,623	1,425,353	1,443,969
Ingot output (average weekly; net tons)	1,425,513	1,464,528	1,317,198
Dodge bldg. awards in 37 states ($ Valuation)	$456,189,000	$380,347,000	$354,098,000
Automobile output	494,000*	510,973	469,120
Coal output, tons	40,000,000*	40,012,000	38,066,000
Business failures; number	1,086	1,024	1,153
Business failures; liabilities	$13,309,000	$16,572,000	$13,243,000
Cement production,† bbls.	12,689,000	13,935,000	11,053,000
Cotton consumption, bales	775,472	744,088	650,123
Car loadings (weekly av.)	680,099	746,407	643,380

Commodity Prices

	Dec., 1940	Nov., 1940	Dec., 1939
STEEL's composite average of 25 iron and steel prices	$38.30	$38.08	$37.18
U. S. Bureau of Labor's index	79.8*	79.3	79.2
Babson monthly prices:			
Wheat, cash (bushel)†	$0.85	$0.85	$0.985
Corn, cash (bushel)†	$0.713	$0.683	$0.628

†November, October and November respectively.
*Preliminary.

Financial Indicators

	Dec., 1940	Nov., 1940	Dec., 1939
30 Industrial Stocks‡	131.2	134.4	148.4
20 Rail stocks‡	28.1	29.3	31.6
15 Utilities‡	19.8	23.3	25.3
B'k clear'gs† (000 omitted)	$25,224,000	$25,289,000	$22,807,000
Commercial paper rate (N. Y., per cent)	½	½	½–¾
*Com'l. loans† (000 omitted)	$9,083,000	$8,852,000	$8,573,000
Federal Reserve ratio (per cent)	90.8	90.6	86.7
Capital flotations (000 omitted)			
New Capital	$189,899	$263,094	$98,671
Refunding	$415,893	$176,032	$236,640
Federal Gross debt (mil. of dol.)	$45,025	$42,128	$41,961
Railroad earnings	$71,098,917	$86,988,444	$70,414,616
Stock sales, New York stock exchange	18,397,158	20,887,311	15,991,105

†November, October and November respectively.
*Leading member banks Federal Reserve System.
‡Dow-Jones Averages.

Foreign Trade

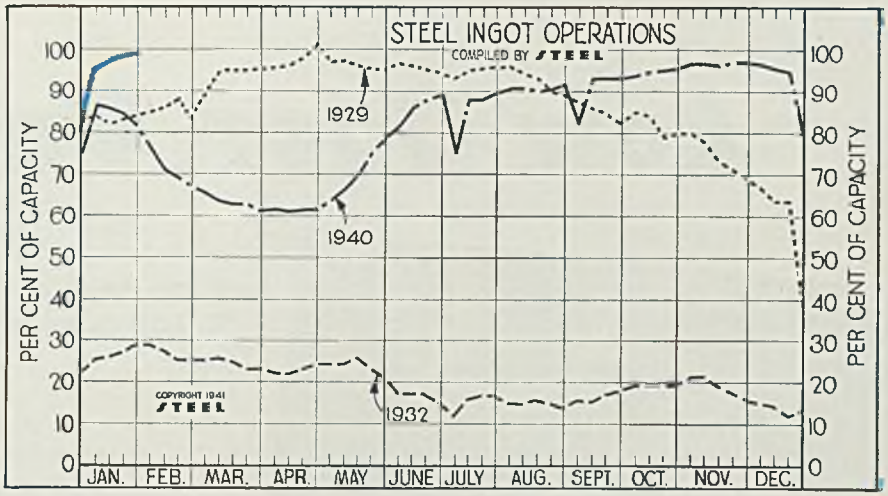
	Nov., 1940	Oct., 1940	Nov., 1939
Exports	$327,685,000	$343,485,000	$292,582,000
Imports	$223,430,000	$207,141,000	$235,402,000
Gold exports	$6,000	$17,000	$10,000
Gold imports	$330,113,000	$325,981,000	$167,991,000

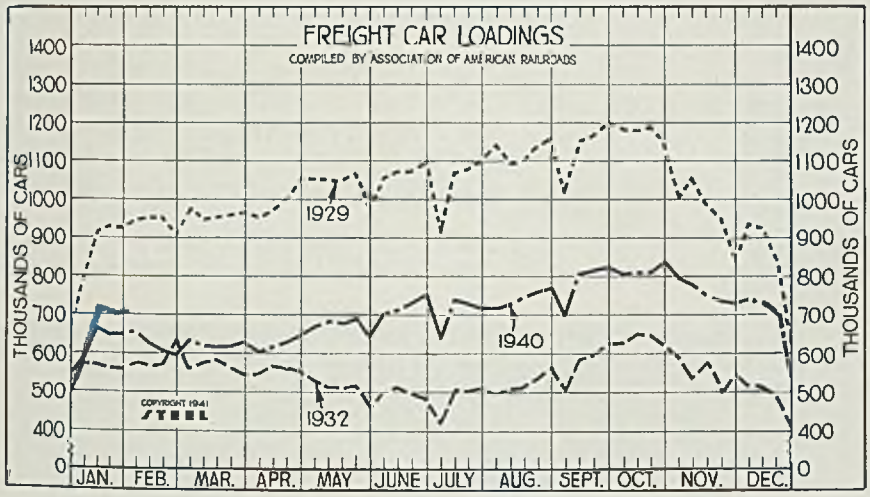
Steel Ingot Operations

(Per Cent)

Week ended	1940	1939	1938	1937
Oct. 12....	94.5	89.5	51.5	63.0
Oct. 19....	95.0	91.0	51.5	53.0
Oct. 26....	95.5	92.0	54.5	51.0
Nov. 2....	96.5	93.0	57.5	47.0
Nov. 9....	96.5	93.0	61.5	39.0
Nov. 16....	96.0	93.5	63.0	35.0
Nov. 23....	97.0	93.5	62.0	31.5
Nov. 30....	97.0	94.0	61.0	30.5
Dec. 7....	96.5	94.0	61.0	27.0
Dec. 14....	95.5	92.5	58.0	27.0
Dec. 21....	95.0	90.5	52.0	23.0
Dec. 28....	80.0	75.5	40.0	21.0

Week ended	1941	1940	1939	1938
Jan. 4....	95.5	86.5	51.5	21.0
Jan. 11....	97.0	86.0	52.0	26.0
Jan. 18....	98.0	84.5	51.5	29.0
Jan. 25....	99.0	81.5	51.5	30.5





Freight Car Loadings

(1000 Cars)

Week ended	1940	1939	1938	1937
Oct. 19.....	814	861	706	773
Oct. 26.....	838	834	709	772
Nov. 2.....	795	806	673	732
Nov. 9.....	778	786	637	690
Nov. 16.....	745	771	657	647
Nov. 23.....	733	677	562	559
Nov. 30.....	729	689	649	623
Dec. 7.....	739	687	619	622
Dec. 14.....	736	681	606	603
Dec. 21.....	700	655	574	460
Dec. 28.....	545	550	500	457

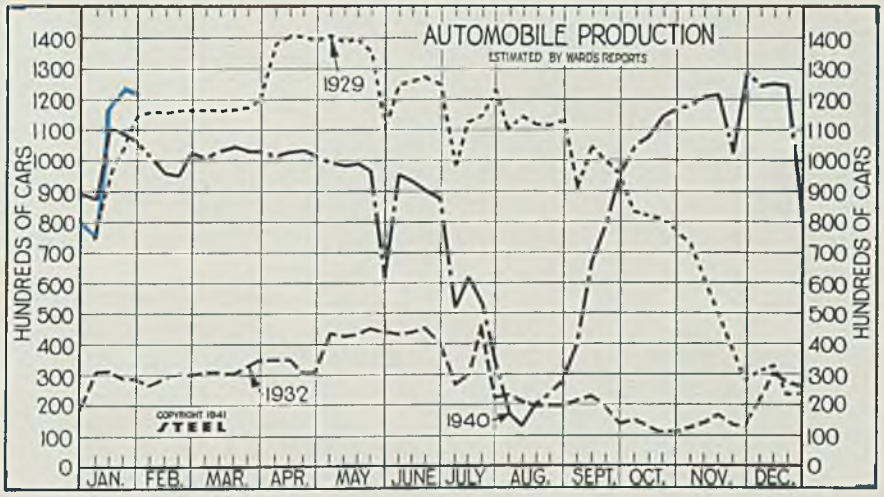
Week ended	1941	1940	1939	1938
Jan. 4.....	614	592	531	457
Jan. 11.....	712	668	587	552
Jan. 18.....	703	646	590	581
Jan. 25.....	711	649	594	570

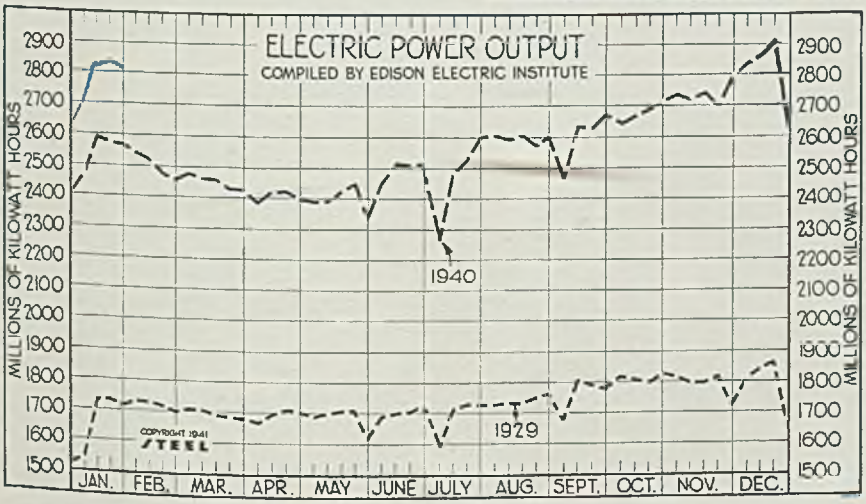
Auto Production

(1000 Units)

Week ended	1940	1939	1938	1937
Oct. 19....	114.7	70.1	68.4	91.9
Oct. 26....	117.1	78.2	73.3	90.2
Nov. 2....	118.1	82.7	80.0	89.8
Nov. 9....	120.9	86.2	86.3	85.3
Nov. 16....	121.9	86.7	96.7	85.8
Nov. 23....	102.3	72.5	84.9	59.0
Nov. 30....	128.8	93.6	97.8	86.2
Dec. 7....	124.8	115.5	100.7	85.8
Dec. 14....	125.6	118.4	102.9	82.0
Dec. 21....	125.3	117.7	92.9	67.2
Dec. 28....	81.3	89.4	75.2	49.6

Week ended	1941	1940	1939	1938
Jan. 4....	76.7	87.5	76.7	49.6
Jan. 11....	115.9	111.3	86.9	54.1
Jan. 18....	124.0	108.5	90.2	65.7
Jan. 25....	121.9	106.4	89.2	65.4





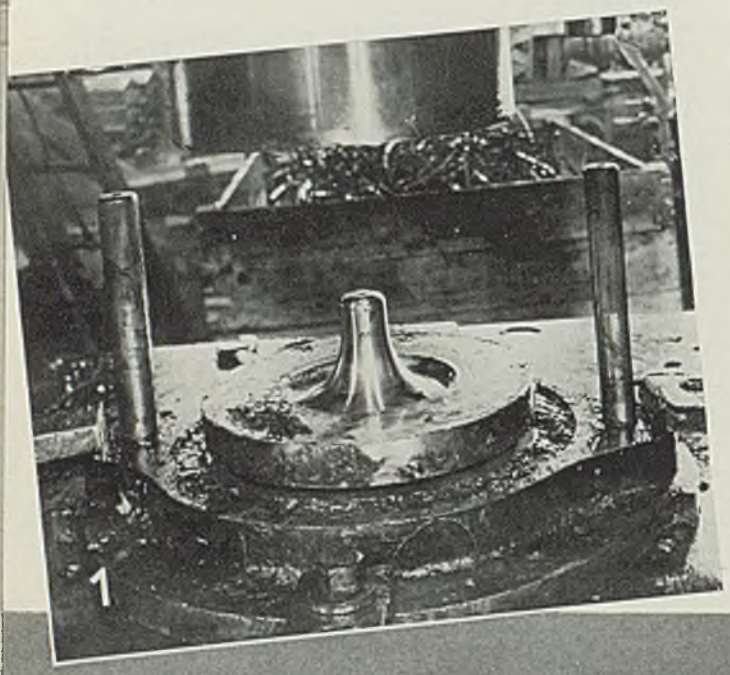
Electric Power Output

(Million KWH)

Week ended	1940	1939	1938	1937
Oct. 19...	2,687	2,494	2,214	2,282
Oct. 26...	2,711	2,539	2,226	2,255
Nov. 2...	2,734	2,537	2,207	2,202
Nov. 9...	2,720	2,514	2,209	2,176
Nov. 16...	2,752	2,514	2,270	2,224
Nov. 23...	2,695	2,482	2,184	2,065
Nov. 30...	2,796	2,539	2,285	2,153
Dec. 7...	2,838	2,586	2,319	2,196
Dec. 14...	2,862	2,605	2,333	2,202
Dec. 21...	2,911	2,641	2,363	2,085
Dec. 28...	2,623	2,404	2,121	1,998

Week ended	1941	1940	1939	1938
Jan. 4...	2,705	2,473	2,169	1,998
Jan. 11...	2,835	2,593	2,270	2,140
Jan. 18...	2,844	2,572	2,290	2,115
Jan. 25...	2,830	2,566	2,293	2,109

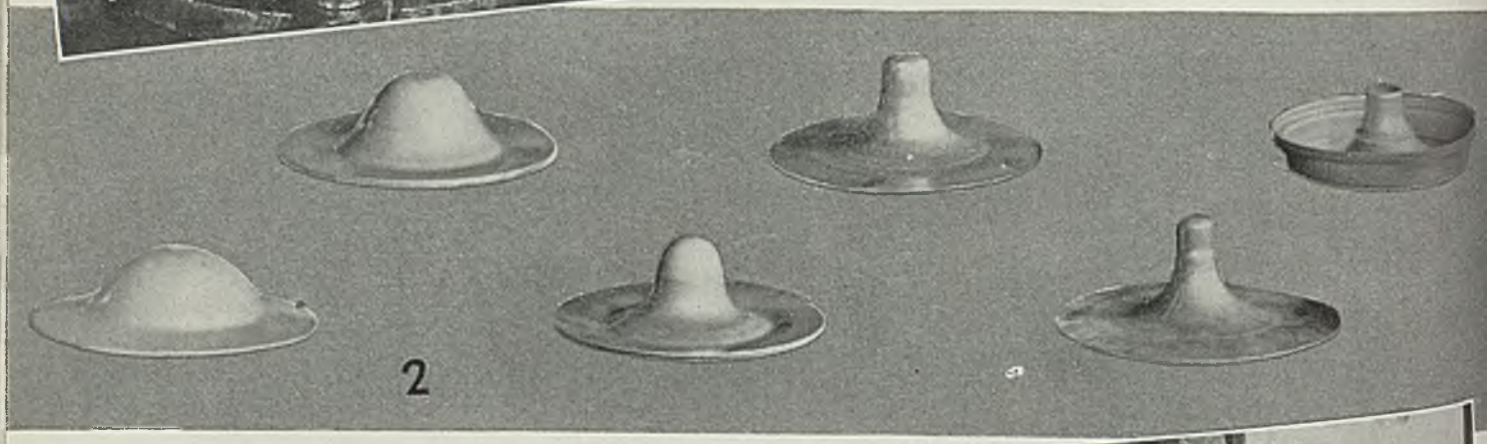
Low Cost Drawing Of

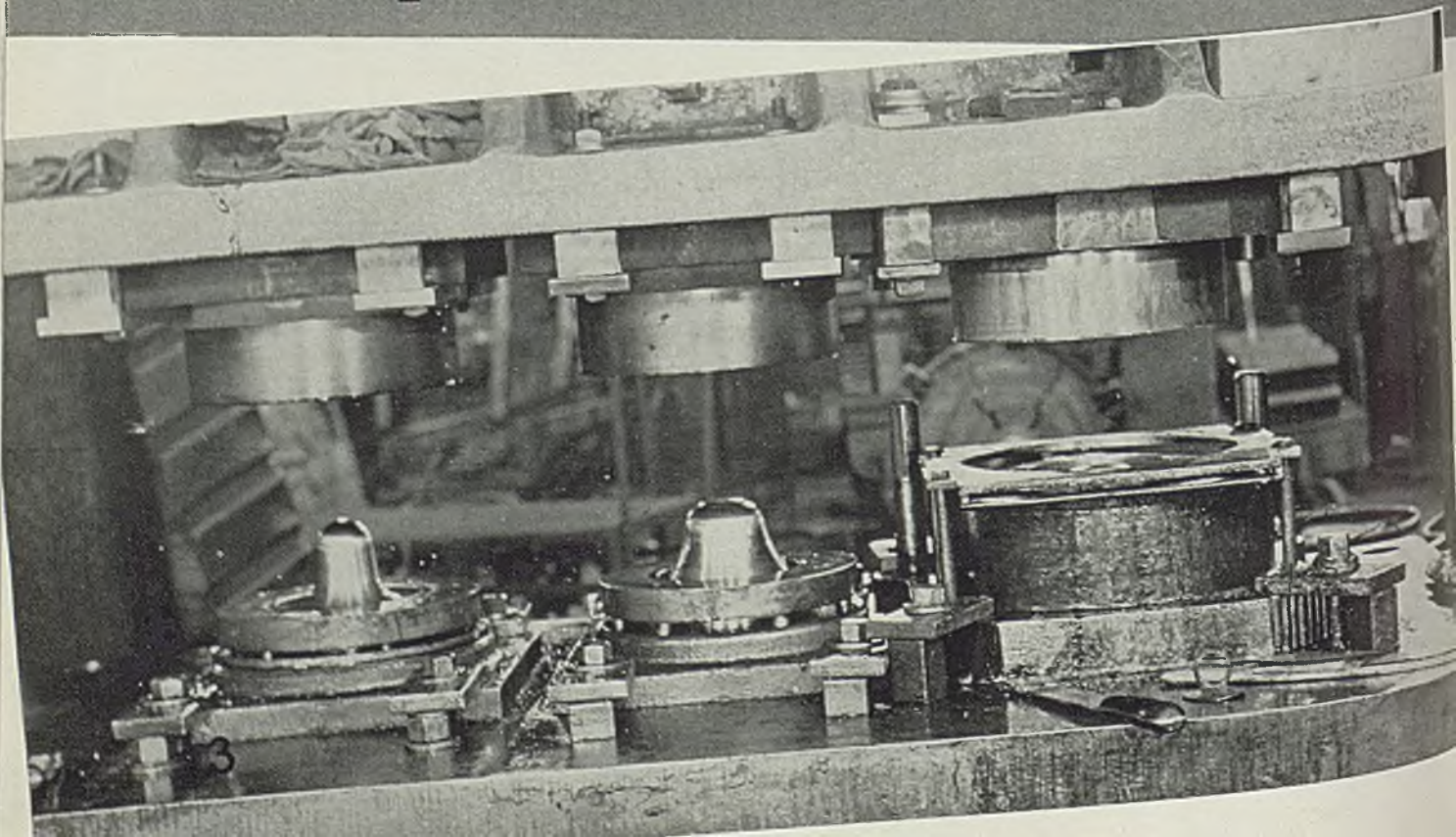


Wheel design is such that a few dies can make more than 10 different styles and shapes of wheels. Tubular rivets aid assembly of units

■ IN QUANTITY manufacture of pneumatic tired wheels for wheelbarrows and various other equipment at plant of the Geneva Metal Wheel Co., Geneva, O., the design of the side disk—two to each wheel—is standardized so that only a few dies are needed to make the deep drawings to shape the stock for more than 10 different styles and shapes of wheels. Thus a minimum number of drawing dies are necessary. Steps followed in making steel disks 11 inches in diameter from 14-gage low-carbon sheet steel are shown and described here.

In Fig. 3 is a 150-ton Bliss double-crank press arranged for the first three drawing operations. This press has a





WHEEL PARTS

6-inch shaft and a 72-inch clearance between the housing posts. At the right in this illustration is shown the blanking and forming die for the first operation. The stock, strip steel 12 inches wide, is fed under a stripper plate as in ordinary practice. The stamping formed in this operation, seen at left in Fig. 2, roughly resembles a trench hat. From left to right in Fig. 2 are shown results of successive drawing operations which produce the 11-inch diameter shape at extreme right. The first three steps are handled in the press setup in Fig. 3.

A typical redrawing die is shown in Fig. 1. This arrangement is the reverse of that often used as the punch is the lower and the die the upper member. This pillar-die design preserves alignment indefinitely. In setting up the die, the pillars locate the upper member accurately.

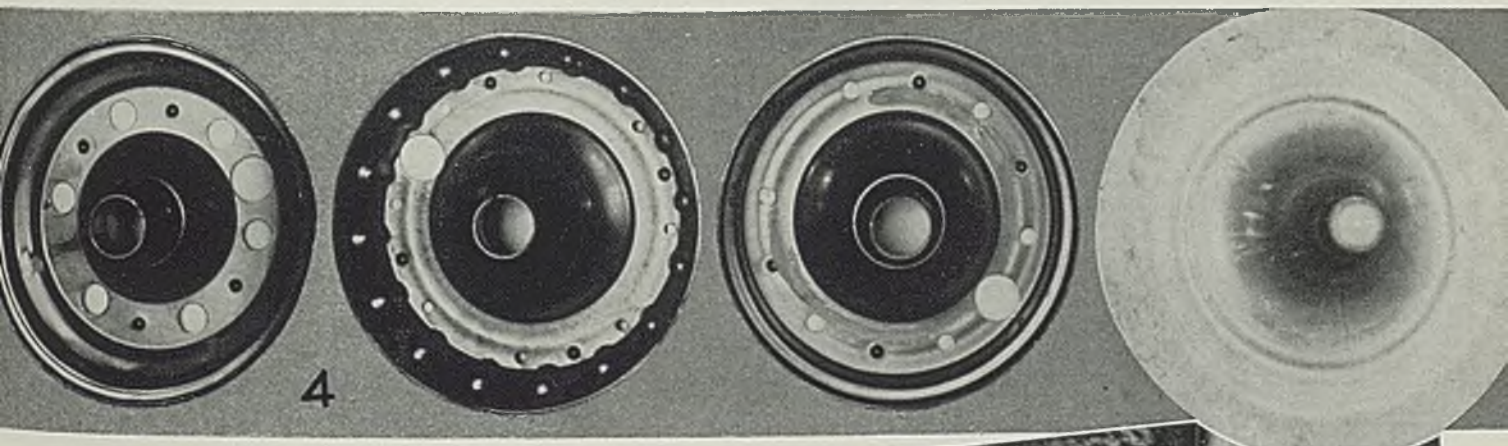
In Fig. 4 are three types of wheel disks redrawn from the flange shown at the extreme right in Fig. 2. The unit at the extreme right, Fig. 4, is a complete wheel and tire assembly.

Several methods are used to fasten the side members together to form a wheel. In some instances, they are held by large tubular rivets approximately an inch in diameter. In other cases they are bolted or welded. In some instances a tube is forced through the center of the assembly and then it accommodates the roller or ball bearings with which the wheel is provided.

The wheel disks are attractively finished in enamel of various colors. See details in STEEL, Aug. 26, 1940, p. 38.

Anyone conversant with moderately deep sheet metal drawing realizes that the initial cost of the dies is heavy, but with proper care the life of the die can be extended greatly. For example, the dies are never brought together in a setting up operation without placing a metal stamping of that operation between them.

While the foregoing is devoted to the steps followed in making wheels for pneumatic tires, the company also makes a large number of small wheels fitted with solid tires. In some cases, a special design is used to prevent the tire from creeping. A punch and die for such design is shown in Fig. 5. This die is provided with lugs and the punch with recesses to form lugs on the wheel disks to fit the corresponding lugs molded on the inner surface of the rubber tire. An idea of the size of this punch and die can be had from the fact that the die shoe is 18 inches square. A die of this type is quite expensive since it must be worked out of solid steel using a large amount of hand work, especially in finishing the lugs and the depressions in which they fit.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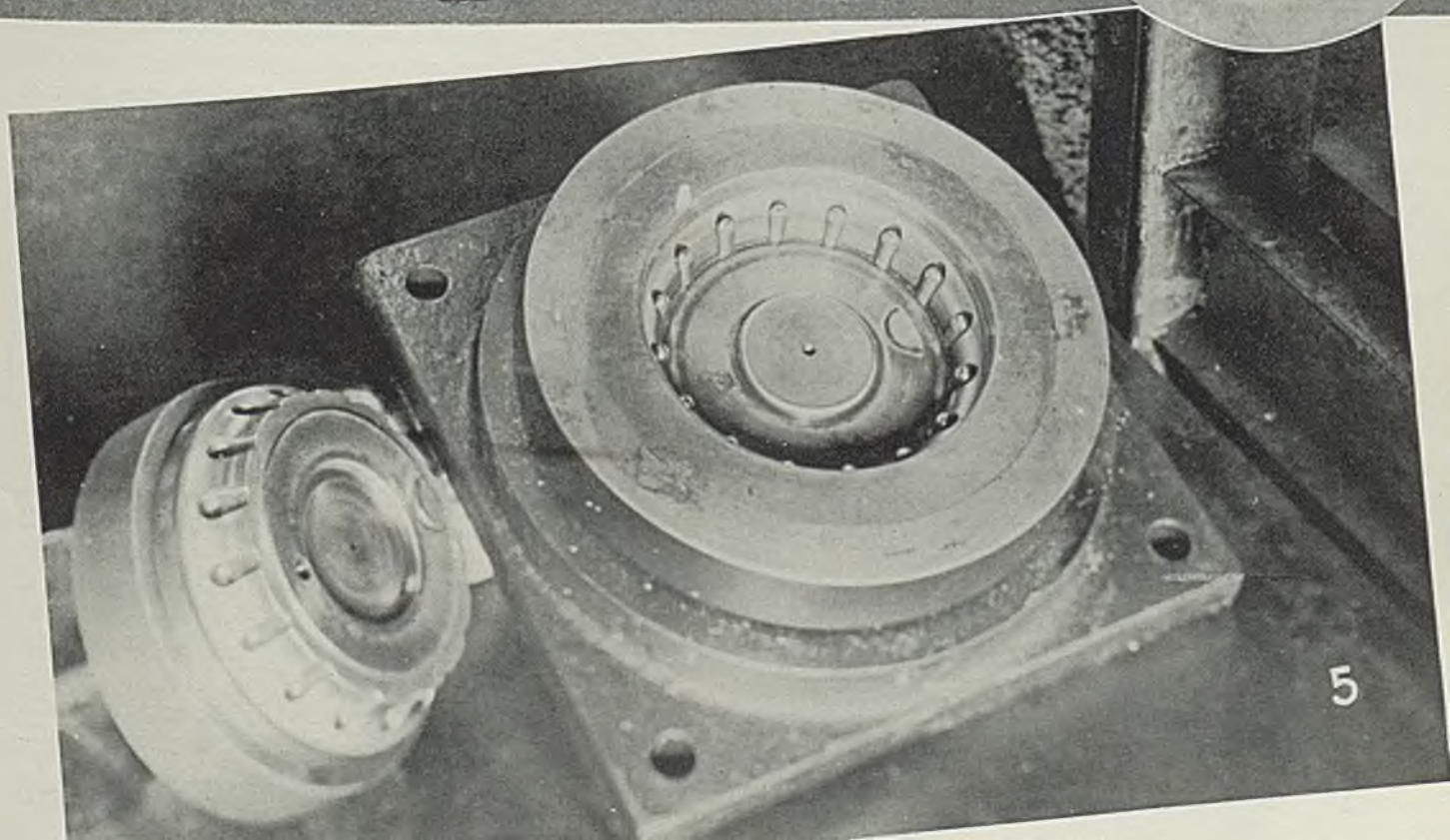
5

Composition, Metallurgy and Other Considerations Influencing The Manufacture of High-Explosive

Do you know why an armor-piercing shell has a soft nose cap, why there is no one best way to make shell, how a projectile is cast with a hard point and soft body? These and many other points of interest about shell and shell manufacture are related by Professor Macconochie in this second article in his series on shell making. Next week, he will present a discussion on heating billets for forging and will describe details of methods and equipment used by several prominent and highly successful shell manufacturers

■ EVEN AFTER 100 years of development since the first rifled cannon made its appearance, there is still no general agreement as to the ONE BEST WAY to make shell. One reason is that shell can be made successfully by a number of different methods.

Further, the shell itself is the product of essential compromises among a number of partially conflicting considerations. The artillery or infantry, as the case may be, desire a shell which is safe to fire, accurate in flight and of maximum efficiency at the target. The shell machiner would like forgings uniform as to dimensions and hardness, easy to machine and with the minimum of metal to be removed. The forger demands sound billets, easy to forge, with the largest tolerances and greatest permissible amount of excess metal in the carcass. The steel maker, on his part, does not desire his specifications to be tied so closely that he suffers lost heats. He dreams of a production efficiency of 100 per cent. Added to these conflicting wants, to complicate further the situation, is the possibility of a shortage in that essential raw material of the steel industry—manganese.

Shell Types: Before considering how these various ends may be attained, let us examine the various purposes to which shell are applied. High-explosive shell may be divided into two categories—shell which pierce before detonation, known as armor piercers, and those which burst on impact or as a result of the action of a time fuse. During the war between the states, the best attack on armor was thought to be to pierce it with a solid shot and spread death and destruction by means of splinters in the region behind the armor. This concept was gradually abandoned, the use of solid shot persisting until about 1895. With development of high explosive, the notion that demolition could be accomplished by exploding a heavy charge against the side of an armored vessel was held until experiments conclusively proved that, while the upper works of the vessel could be smashed by this means, the only effective procedure against an armored vessel was the use of a projectile which would pierce first and explode after entry into the ship.

For land operations the shrapnel type has given way in large measure before the need for smashing attack on earthworks and concrete fortifications; while the coming of the airplane has called for high explosive to the virtual exclusion of almost every other mode of attack from the ground. The small size of a plane, its speed, together with the fact that it operates in three dimensions, call for estimates of rates of change of range, elevation and deflection of a high-velocity target. This makes the task of the gunner exceedingly difficult. Shell for this purpose must fragment successfully and be fitted with a highly accurate fuse relatively unaffected by atmospheric conditions.

Making Armor Piercers: The earliest development of armor piercers was the Palliser chilled-iron projectile, introduced in England in 1866. This was an iron casting, poured with the point down, the lower part of the mold being an iron chill. Thus the carbon was held in combination to produce an exceedingly hard point, while the body of the shell, being cast in sand, was somewhat tougher and softer. Economy of production may have been a governing consideration in the continued use of this projectile, for it continued in service until the introduction of steel armor, despite the fact that Whitworth had patented a case-hardened heat-treated mild-steel projectile in 1862. About 1878 a forged high-carbon nickel-chromium crucible-steel armor piercer made its appearance in France, marking definitely the commencement of the era of the alloy-steel armor-piercing shell.

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University of Virginia
University Station, Va.

Shell

It will thus be apparent that the major requirements of these two classes of shell are essentially distinct. The armor piercer must have sufficient strength and density to penetrate a considerable thickness of hard-faced steel plate in order to release its explosive energy where it will do the most good, while the high-explosive shell commonly used in land operations should carry the maximum charge consistent with the ability of the steel body to resist the high stresses of rotation and setup in the gun, especially the latter. Nothing but the finest alloy steel will serve the first purpose, while for the latter a strong and tough steel which will secure successful fragmentation will answer. While heat treatment cannot be avoided in the case of the armor-piercing projectile, the specifications for modern high-explosive shell for other purposes often are so drawn that heat treatment, with its extra cost, is avoided. We might, therefore, expect that the methods of manufacture would differ to some extent.

Up until a few years ago, armor piercers were always made from crucible steel but in the late nineties open-hearth steel came into use. In Woolwich arsenal during 1914-18, semiarmor-piercing shell were made from bessemer steel in a battery of Tropenas (side-blown) converters using low-phosphorus and low-sulphur pig. Alloying elements were added after the blow, and the steel was poured into individual molds with conical risers. Thereafter some 38 per cent was cut off in a parting machine and the billet heated to forging temperature in stationary-hearth producer-gas-fired furnaces.

The hydraulic press then was used in a combination upsetting and extrusion operation series. After preliminary machining operations, the carcass was hardened by a quench in an oil bath. Thereafter the shell bodies were mounted on a series of branching

Many coast fortifications include heavy armament such as this 14-inch railroad gun firing at a target 26 miles at sea. Their projectiles must pierce the heavy armor of battleships if their fire is to prove effective. This requirement involves many important metallurgical considerations. This article discusses many of these. Acme photo

pipes like an old fashioned chandelier and lowered into a lead bath with points protruding above the surface of the bath. Before the heat had time to run to the nose, the shells were removed and placed point down in a water trough with a space between the heated body and the cool point so as to avoid a sharp line between the toughened body and the hard point.

In this country, perhaps on account of the difficulty of securing pig of the necessary high quality, open hearth steels—acid, basic and electric furnace—were and are used for armor-piercing shell, melting procedures being watched with particular care. The ingots are cast nose-down in a chill to prevent piping and segregation, a matter of the first consequence in all high-explosive shell manufacture. For instance, in the case of artillery shell there is a definite preference in some quarters for "big-end up" pouring of the ingot in the manufacture of bar stock for high-capacity projectiles, to avoid the possibility of "secondary piping." Such a pipe, if not removed by cutting-off at the mill, eventually appears as a defect in that portion of the shell where a defect is least desirable on account of the danger of gas penetration, namely, in the base. Such basal weakness is generally ascribed to piping, but the view is advanced that methods of forging may have a bearing on the problem. This will be referred to subsequently.

The forging of high-carbon nickel-chromium steel billets for armor-piercing shell may be accomplished by drawing down and boring out, or by upsetting and piercing, the latter being accompanied by some extrusion. The rough forgings then are annealed and rough finished to a little above that of final finish dimensions.

As might be imagined, the composition and heat treatment of naval shell is a matter of the first consequence, since the fate of empires may rest upon its ability to penetrate the enemy's armor and send his ships to Davy Jones' locker. It might also be guessed that the complete story is not a matter of public record.

Metallurgy of Armor Piercers: However, we may say that armor-piercing projectiles frequently contain in the neighborhood of 0.35 per cent carbon, 4 per cent nickel and 2 per cent chromium, the nickel dissolving in the iron (gamma or alpha) while the chromium combines with the carbon. These carbides of chromium may be dissolved in the gamma iron already holding nickel in solution and may be retained in solution at room temperature in gamma iron giving us an austenitic steel or, if the iron assumes the alpha form as a result of composition or heat-treatment control, or both, we have a martensitic steel. Finally, they may be rejected from solution with the formation of pearlite or sorbite. By control of composition—that is, by increasing the proportions of carbon, nickel and chromium—these chromium-nickel steels, at first pearlitic, become martensitic, then austenitic and finally cementitic.

Other Ordnance Articles

This is another of STEEL'S series of articles on ordnance manufacture. For others already published, see issue of Jan. 27, 1941, p. 44, for Background Information on Shell Making and p. 42 of same issue for Tooling for Machining Torpedo Parts; March 11, 1940, p. 38, for Design and Modern Methods of Making Shrapnel Shell; Dec. 2, 1940, p. 50, for Operation and Construction of Bofors Anti-aircraft Guns; Oct. 14, 1940, p. 160 and Jan. 6, 1941, p. 219, for How Technical Progress Aids Defense; Jan. 13, 1941, p. 48, for Some Typical Shell Forging Methods; Jan. 20, 1941, p. 54, for Recommendations on Heating Billets for Forging Into Shells; Dec. 30, 1940, p. 38, for Naval Torpedoes; Nov. 11, 1940, p. 46, for Design and Construction of Mobile Repair Shops for the Army; Jan. 20, 1941, p. 74, for Making Cylinders for Packard V-12 Torpedo-Boat Engines

If the duty required of an armor-piercing shell be considered, it will be observed that the point should be as hard and shock resistant as it is possible to make it. But the body, especially because of the possibility of oblique impact and the resultant violent bending moment on the cross section as the shell enters the armor and inertia forces tend to wrench it free, must be tough and strong. In practice, heating for hardening is begun at the point, usually in a lead bath, followed by a complete quench in an agitated bath of cold water. Thereafter, following the practice already described, the base of the shell is heated to a somewhat lower temperature than that used for the quench and upon withdrawal from the bath or furnace, is suspended nose-down up to the bourrelet in agitated cold water. The successful practice of the art involves, among other factors, the avoidance of any sharp line of structural change between the excessively hard nose and the tougher and more resilient rear of the shell.

Among the principal reasons for the selection of chromium-nickel steel for naval shell is the increase in hardening power and depth of the hardened layer conferred on nickel steels by the addition of chromium. In hardening ordinary carbon steel we are confronted with the purely physical problem of withdrawing heat rapidly from all parts of the forging, if we desire a high degree of hardness in the interior.

A rather frequent result of the addition of special elements to steel is a slowing down of the transformation rate while the metal passes through the critical range. Chromium appears to possess this property in an unusual degree, permitting deep penetration of the hardened layer. But chromium-nickel steels are also highly resistant to shock, a characteristic which is intensified by a series of heatings and quenchings to which the shell forging is subjected, prior to hardening. This greatly refines the structure, the process being sometimes referred to as "fibering."

The finish turning of armor-piercing shell is accomplished between grain refinement and hardening, allowance being made for the fitting of the base plug and the finishing of the band score and bourrelet. After hardening of the point, the projectile is sand blasted, the band score finished, the band pressed on and cap and wind shield fitted. Finally the bourrelet is ground, the band turned to size and the base plug fitted.

Caps for Projectiles: The cap of a naval projectile is rather an interesting feature. Some 60 years or more ago, tests were made in Europe of the effectiveness of hard-pointed projectiles on compound armor. The same projectiles which smashed to pieces on the face of the armor completely penetrated when the plate was reversed. A thin wrought iron plate was then placed in front of the armor, with very beneficial results. Thus was born the idea of placing a "cap" on the nose of the shell, the invention being generally ascribed to Colonel Inglis of the British ordnance committee who proposed soft steel caps in 1883.

Caps of modern armor-piercing shell are made of the same steel as the body of the shell but of a somewhat lower alloy content. Manufacture follows similar lines to that of the shell itself, a gradation in hardness being secured in the same way. No one seems to know exactly why more successful penetration is obtained by the use of a cap. One can readily imagine that the severe initial shock of hard shell point against face-hardened armor would be lessened and power circumferential support offered as the action proceeds. Then, perhaps, the crushing effect of impact strains the armor, breaking down its initial strength and presenting a region of strained metal to the punching action of the shell. It can also be


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In all—even with the head start we had from our data—over six different alloys and numerous tempers, comprising thirty possible combinations had to be tested, before the right alloy, with the right sound, at the right price, was selected.
There has long been a need for someone to amass the multitude of data on copper and copper base alloys; and to use this mass of knowledge as the springboard for practical research to solve a myriad of today's defense, industrial and manufacturing problems.
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readily understood why there would be less tendency to deliver a glancing blow, without penetration—in other words why we would have an increase in the "biting angle" of impact.

High-Explosive Shell: By contrast with the problems, principally of a metallurgical character, with which the manufacturer of naval and other armor-piercing shell is faced, the manufacturer of high-explosive shell for anti-aircraft work or ordinary land operations (such as our 75, 90, 105-millimeter) is mainly concerned with *production.* Of course metallurgical considerations enter the picture as these affect strength, fragmentation and machining characteristics and the like. But the chemical analyses of steel suitable for high-explosive shell for the army ordnance department are now well established, and whereas heat treatment is a high art as far as the naval shell is concerned, steel specifications for high-explosive shell are so drawn as to avoid this costly and time-consuming operation.

Further, consideration for the task of the steelmaker teaches us to avoid demand for a laboratory product which might give the last word in fragmentation but at the same time tend to hold up production. In other words, remembering the program ahead of us involving the manufacture of tens of millions of shell for the use of our growing army, account must be taken of the familiar practice of the average mill, even if some small sacrifice of efficiency of fire must be made.

Shellmaking Improved: By closer control of melting practice and ingot yield from the mill, however, the forger gains in sounder and better billets. If, on his part, the forger makes his contribution in the form of concentric carcasses with a minimum of excess metal and with fine machining qualities, the worries of the machiner are over. The advance in the art of forging shell to close limits since 1914-18 has been quite remarkable. This, together with the improvement in machining qualities arising from the use of a high-sulphur-manganese steel offers a brighter prospect to the shellmaker than he could contemplate 25 years ago.

For the 75 to 155-millimeter shell we are using (with one exception) in this country the X 1335-40 series of high-sulphur-manganese steels, with yield points running from 40,000 to 60,000 pounds per square inch. Canadians prefer a somewhat higher carbon content of around 0.52 per cent with about 0.82 per cent manganese. The well known effect of sulphur in steel when present in quantities above the usual small amounts, is to produce a fibrous structure resulting in free machining properties.

Experiments conducted as far back as 1914-15 both in this country and England tend to show that sulphur, when accompanied by a sufficient amount of manganese, is not as undesirable a constituent as it was formerly supposed to be. As a matter of fact, the effect of this element upon the tenacity and ductility of steel, at least up to 0.1 per cent, is so slight that it may be disregarded. When in the form of ferrous sulphide, FeS, it is capable of doing great harm to steel by causing red-shortness. But when neutralized with manganese in sufficient amount, it may be comparatively harmless, even when present in amounts greater than 0.1 per cent.

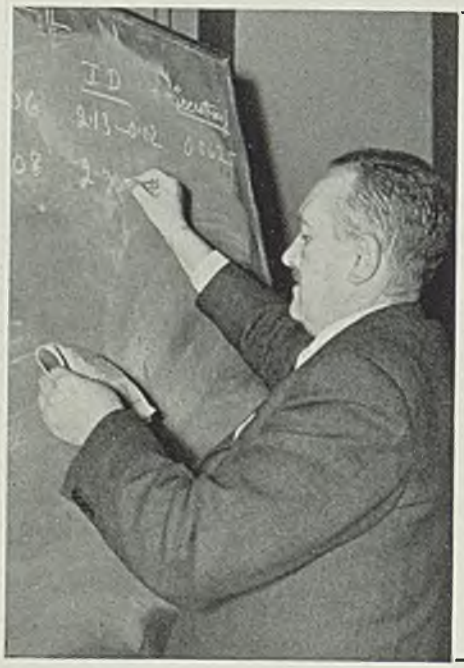
The usual explanation offered for this peculiarity of behavior is that the iron sulphide forms films or cell walls about the crystalline grains of the metal. Since these sulphide films fuse at a red heat, the continuity of the metal is interrupted and the metal is said to be "hot short". Manganese sulphide, on the other hand, instead of forming envelopes of membranes about the crystalline grains of the metals, collects or segregates into globules at temperatures near that of the metal on solidifying, upon which the main body of the metal then contracts.

Fusion Point Much Higher

Further, manganese sulphide has a much higher fusion point than ferrous sulphide and thus does not melt at a forging heat but becomes plastic like the main body of the metal. In this form it rolls out into fibers, giving the metal almost the appearance of wrought iron when present in sufficient amount. This is the explanation of the fibrous structure of high-sulphur-manganese steels and which gives it its free machining properties. To get best results from the presence of manganese, we should have about three times the amount theoretically necessary for the formation of the sulphide—about five times as much manganese as sulphur.

As far as the influence of the manganese itself is concerned, since all the alloys used for high-explosive shell manufacture fall within the pearlitic range, its effect with moderate rates of cooling is to increase the strength and hardness of the steel. In the past, the manufacture of manganese pearlitic steels has been somewhat neglected, partly because of a belief that such steels were brittle. This belief in the brittleness of manganese steels stems from Hadfield's statement concerning them. But on closer examination, this was seen to be true only in the case of the rather high carbon manganese steels when cooled relatively quickly. The low-carbon pearlitic manganese steels are not brittle when cooled at moderate rates. Quenching in water may produce cracks, so rapid cooling should be avoided.

Thus by suitable metallurgical control, the problem of manufacturing high-explosive shell is simplified in at least two important directions—the elimination of any special heat treatment and ease of machining. It will be our purpose in succeeding articles to consider the mechanical aspects of shell manufacture from the point where the steel leaves the mill after the usual tests, both physical and chemical, visual inspec-



Prof. Macconochie "In Action"

■ As detailed in STEEL of Jan. 27, 1941, p. 45, Professor Macconochie is one of the country's outstanding authorities on shell design and manufacture. The list of his activities given there will serve to explain his detailed knowledge of the subject

BROWN & SHARPE TOOLS

tion and examination of etched specimens from bloom and bar, to the lacquered and finished case ready for the filling factory. Whether to nick and break the bar, or saw or cut with the torch? Whether to forge in a mechanical forging machine, or pierce and draw with the hydraulic press?

And what of these newcomers in the shell manufacturing business, the Witter crossroll and the "one-shot" forging machine? Then there is the question of machining. Will the single purpose shell-turning machine crowd the multispindle automatic? Our urgent need suggests that perhaps all of these procedures will find their place in the national defense picture.

How terribly urgent our situation is, grows daily more apparent. As far back as last September, General Wesson, chief of ordnance, in a message transmitted to the Pittsburgh meeting of the American Society of Mechanical Engineers on the manufacture of high-explosive shell, observed that complete equipment for an army of 1,200,000 men and the critical needs of an additional 800,000 would have to be provided. As compared with the last war, many more anti-aircraft weapons, more tanks, more mortars, bigger guns and more aircraft equipment are needed *per unit of man power*.

The sizes in which the army is particularly interested include the 60-millimeter and 81-millimeter mortar shell, the 3-inch and 90-millimeter antiaircraft shell and the 75, 105 and 155-millimeter shell, both high-explosive and chemical types. The 3-inch anti-aircraft may be made from tubing, and an alternative method of making the 60-millimeter mortar shell by casting has been approved. However, about two-thirds of all shell made for the army will be forgings. The largest quantity of any one item is the 105-millimeter shell.

One of the bottlenecks in shell production is the provision of forging presses and machine tools for the job. Much may be done by utilizing equipment already available, but many units will have to be assembled. Another choke point is gages. Rapid improvisation will be necessary in the early stages at least of the shell manufacturing program, and every effort to put those plants which already have a large part of the necessary equipment into production. Perhaps more than any other part of the ordnance program, shell manufacture will be widely spread throughout the industry of the nation. Every ounce of Yankee ingenuity will be required to overcome inherent difficulties in the manufacture of what will be a new product for many companies.

New System Valuable Aid

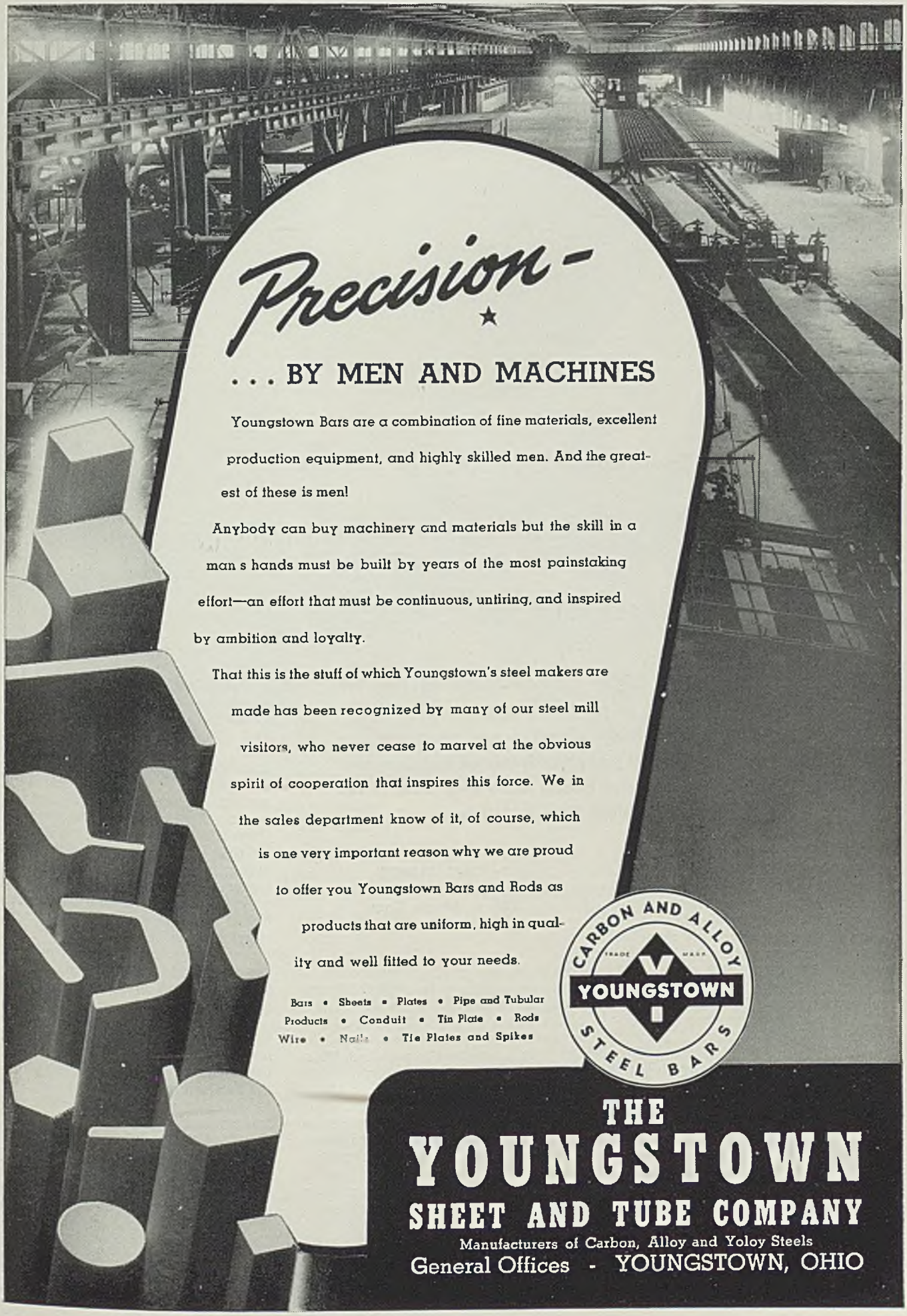
It is appropriate to mention the part played by the ordnance department in laying the ground work of the rearmament program and, more particularly, of the shell-manufacturing program. One of the most important lessons learned from the last war was the necessity for decentralizing the task of supervising the procurement, production and inspection of material. The ordnance department, therefore, perfected the present system of district offices, thirteen of which have been at work in peace time, training reserve officers, surveying the manufacturing plants in their neighborhoods, preparing estimates of the volume of ordnance production that could be handled, administering educational orders and making production studies. During the last two years, inspection of ordnance produced in these various areas under contracts let by the various ordnance arsenals has been undertaken. The advantages to the shell manufacturer of doing business with conveniently located government representatives in whom he has confidence, need hardly be stressed.

Supplementing the official efforts of the ordnance department is the work of the Army Ordnance association which in its own words is an "organization of American citizens pledged to industrial preparedness for war as our nation's strongest guaranty of peace." The purpose of the association is to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. In event a "shooting" war develops, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. There will be no time for careful study or long preparation.

The Army Ordnance association believes that the solution of this problem, based on experience, lies in an active organization at all times co-operating with the government. The principal objective of the association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an active and authentic knowledge of ordnance.

A Mechanical "Giant" Goes to Work

■ Capable of cutting 14 miles of shavings from a 500-ton piece of steel per hour, this giant boring mill went to work recently at the East Pittsburgh division of Westinghouse Electric & Mfg. Co. to speed up production of power equipment required for defense work. Shown here while yet under construction, it supports work on an 88-ton turntable, and despite its mass of 350 tons, has an accuracy of four thousandths of an inch. The foundation of the machine required a pit 50 feet wide, 60 feet long and 12 feet deep, utilizing 120 steel piles filled with concrete. The foundation proper required 350 yards of concrete and more than a mile of reinforcing bar. The mill's 30-foot steel turntable has a maximum speed of 5½ revolutions per minute, giving about 500 surface feet per minute at the periphery of the table. Thirty-four electric motors are required to drive and control this huge mechanical giant. Although normally work 40 feet in diameter is handled, the mill can be adjusted to handle much larger work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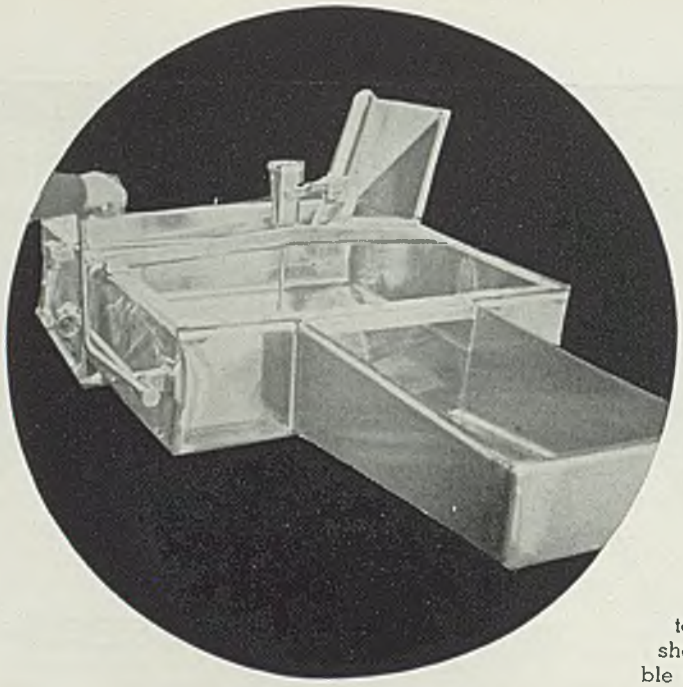


Fig. 1—Typical piece of dairy equipment made of arc welded stainless steel. Joints take same high polish as the sheet itself—are almost impossible to locate on the finished work

JOINING WELDING

How To Produce . . . . .

Mirror-Finish Arc Welds In Stainless Steel

Mr. Ulrich describes a highly successful method that his company has developed to produce arc welds in stainless steel—welds that easily take almost a perfect mirror finish. There is no reason why any fabricator of stainless cannot obtain the same excellent results in his own plant if the procedure detailed here is followed

By CARL ULRICH
Superintendent
Rice & Adams Corp.
Buffalo

■ MAKING welded stainless steel dairy equipment is particularly exacting because of the severe sanitary requirements involved. All interior and exterior surfaces must be perfectly smooth with a high polish to help in keeping them clean. All corners and joints must be rounded and given an equally high polish.

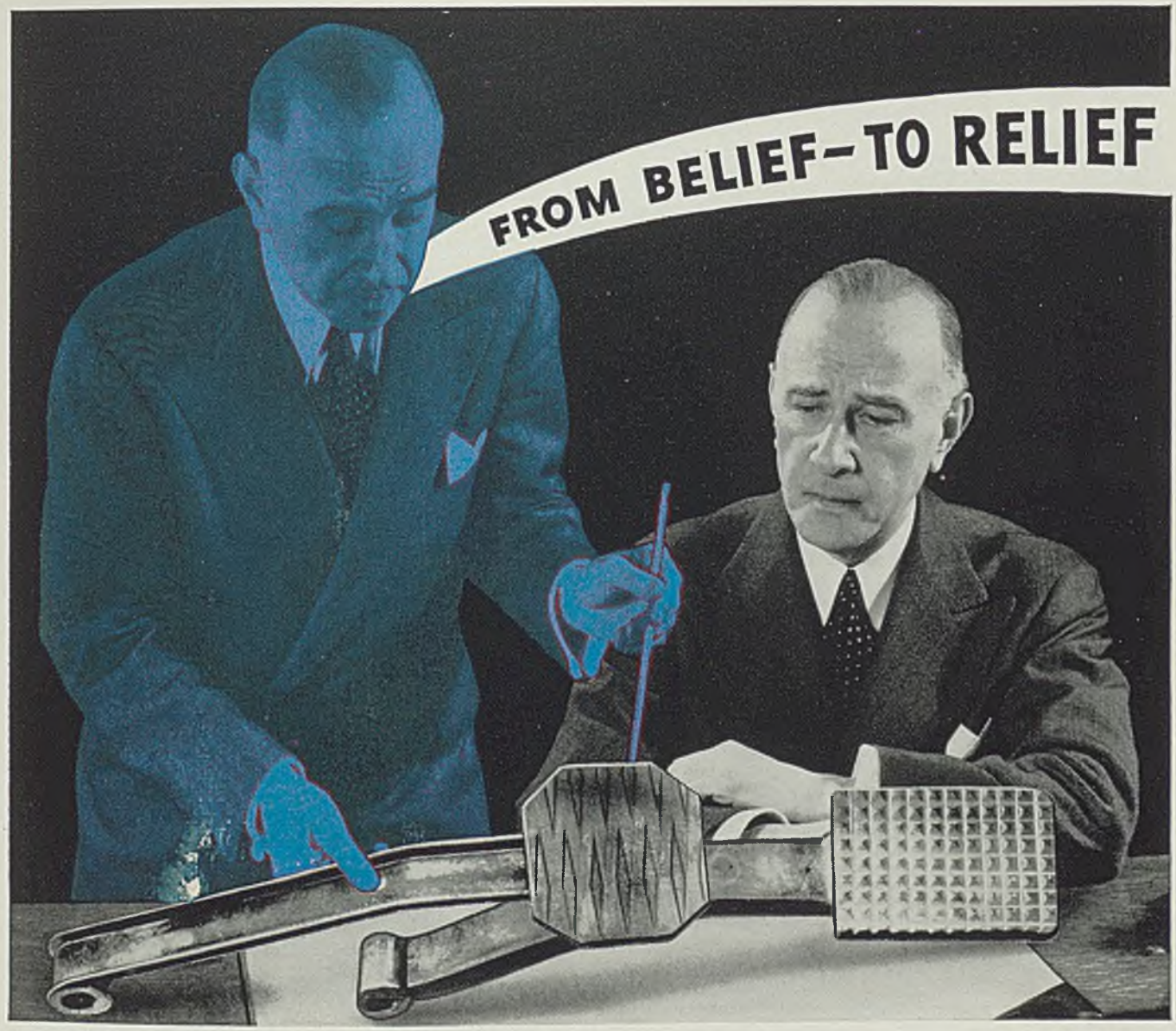
The manufacturing procedure developed at plant of Rice & Adams Corp., Buffalo, in producing arc welded stainless steel dairy equipment results in outstanding equipment that easily meets the most critical standards for high-quality workmanship. Thus the methods developed are of particular interest.

Material used is largely 18-8 stainless steel in thickness varying from No. 14 gage to ⅝-inch. In addition, considerable nickel-clad and stainless-clad material is employed. All stainless is given a No. 7 polish inside and a No. 4 polish outside. This includes all welds. What it means to put a No. 7 polish on a stainless weld can be realized from a consideration of the finish grades. No. 1 finish is pickled sheet, No. 2 is pickled and cold rolled, No. 4 is the first grade that is polished. This grade is the standard polish finish widely used in commercial practice. Abrasive marks are just visible on this surface. No. 6 finish sheet is given a tampico brush treatment which removes all visible abrasive marks. No. 7 finish is a bright, high luster. No. 8 finish is a mirror finish, the highest polish obtainable commercially. Details of how the No. 7 polish is obtained on the weld joints will be found in the latter part of this article.

Those fabrications to include a No. 7 finish on inside surfaces are of course made from sheet received at the plant with a No. 7 finish. The first problem is to retain this high finish throughout fabricating operations. This is done by applying 1/32-inch sheet asbestos to the metal surface before even laying out the work. Accompanying illustrations show the sheet surfaces protected by this asbestos covering. The asbestos sheet is applied with paperhanger's paste. Sheets are stacked on edge to dry for one day before being fabricated. Some of these sheets are to be seen in Fig. 2. The largest stainless sheet employed measures 84 x 82 inches, and of course a good many sheets are of smaller size.

Not much stainless steel equipment is standardized so little stainless is kept in stock, most of it being ordered of correct size to permit minimum waste. Sheet sizes for only about six different tanks are stocked.

Before the stainless steel sheet is cut, the exact shape is marked on the asbestos paper surface by means of a stencil. This is followed by scratching through the asbestos to mark the stainless steel surface. Then the asbestos paper outside the portion to be used in the completed fabrication is removed. Two sheets marked for cutting with the excess



Welded Lever Cost 73c. No waiting for delivery.

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ALTER EGO: Literally "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

ALTER EGO: According to you we must wait 'till production slacks up before we can take on the economies of arc welding.

Right! We simply can't change over while we're so busy.

ALTER EGO: That's not your *real* belief . . . it's just what you *like* to believe—your excuse. You know that welding is NOT an overnight grab—it's a series of nibbling operations—a changeover of one simple part this week . . . another one next week.

Just as we did with this foot treadle?

ALTER EGO: Sure! We bent a piece of channel—shear-cut a piece of checkered floor plate—made two short welds—and presto!—we've saved 45 cents on every single one—right during the big rush, with no time-out.

And what a time-saver for our present jam. No waiting for parts. I believe we've found that much-sought RELIEF for pent-up production.

• •

LINCOLN SUGGESTS: It takes only a few hours to change over a simple lever, bracket, cover or other part. This gives you the arc welding "feel" so that a series of parts can be changed over, one at a time, without a single interruption in production. In due time the entire product is changed over—changed over to the strength, rigidity, light-weight, economy and pleasing appearance of welded construction. A good example, with full discussion of five possible welded designs, is given in Machine Design Sheet No. 72. Want a free copy?

LINCOLN "SHIELD-ARC" WELDING

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Fig. 2—Bending brake used to form many parts. Also seen stacked around are stainless sheets with the protective covering pasted in place, ready for cutting to shape and forming

paper removed are seen in the lower center of Fig. 2. The asbestos paper provides ample protection during fabricating operations, including cutting and forming. The paper is removed after the joints have been welded and polished simply by soaking with water.

Marked sheets are cut either on a circular shear, a square shear or a unishear. Possibly the latter is more commonly known as a nibbler. This unit is shown in operation in Fig. 3. It permits rapid cutting of irregular shapes.

Much of the forming is done on a regular bending brake such as the unit shown in Fig. 2. For certain shapes and for making flanges on covers and other parts, wooden forms are used and the sheets bent to shape as shown in Fig. 4 because practically none of this work could be classed as mass production manufacturing. All units are built to order, none stocked. The sheet in Fig. 4 has been clamped between upper and lower forms of wood and is being worked into shape with a wooden mallet.

In designing the parts, joints are laid out wherever possible so they do not occur in corners in the vessels. This permits most welds to be standard butt welds and eliminates difficult welds in corners which might involve some trouble in welding as well as in grinding and polishing to the necessary high finish. The corners are kept to a minimum radius of ½-inch—a specification necessary to facilitate cleaning the vessels. Joints seldom are made on radii—the work being designed so the joints come on the flat sections wherever possible. About the only exception to this is on the elliptical weigh tanks shown in Figs. 6 and 7. Here the joints are made on the corner.

After forming, parts are assembled by blocking up on wood jigs. See Fig. 5. After the main section has been blocked up so it is true, all edges are ground to exact size so they are sharp and square as well as perfectly straight or uniformly curved, as the case may be. Then as other parts are assembled into the jig and tack welded, their edges are ground exactly to fit. Edges must butt perfectly on all joints—an aid in keeping down porosity. This, of course, involves some hand fitting and grinding to get joints to butt exactly. Elimination of gaps is essential as this prevents burning through at the joint and helps avoid formation of slag and impurities in the weld.

As parts are assembled into the jig, a tack weld is placed about every 1½ inches. Subsequently, all joints are arc welded using stainless steel columbium-bearing rod. For standard 14-gage stainless sheet, 3/32-inch rod is employed with an extruded coating. A current of about 40 amperes, with 28 volts at the arc, reversed polarity, is ordinarily used for this work.

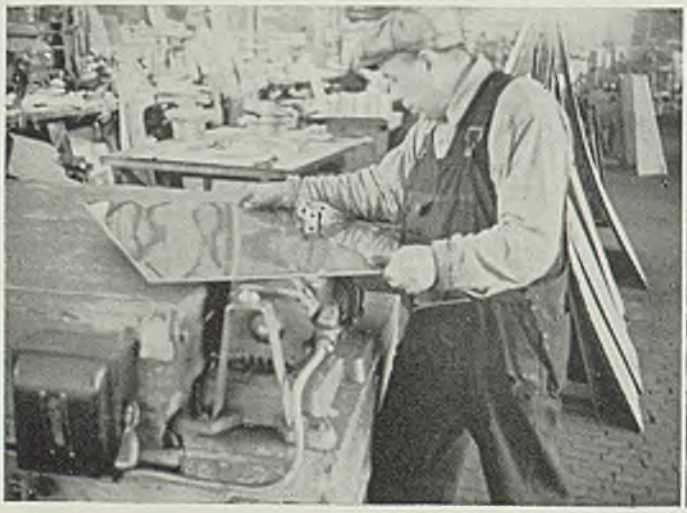
After tack welding, the assembly is placed in a positioner such as that shown in Figs. 6 and 7. This is a tubular frame which revolves on rollers.

With the spot welds on the outside and work removed from the forms, the parts are hammered together for the weld using a dolly inside. By having the templets cut so the joints abutt exactly, and by flattening the sheets after spot welding so they come exactly in line, it is possible to obtain good welded joints even in rather thin material. By avoiding any openings in the joint before welding, porosity is kept down to absolute minimum.

The first continuous weld is

Fig. 3—This nibbler is one of the handiest pieces of equipment in the shop. It permits almost any outline to be cut quickly and easily. Since no mass production is involved, few blanking dies and presses are warranted

Fig. 4—Forming in three dimensions cannot be handled on the bending brake so wooden forms are used for certain parts as shown here at right below



*An open message to Johns-Manville Employees**

by LEWIS H. BROWN, *President, Johns-Manville Corp.*

AS THIS NEW YEAR BEGINS, I am glad to have this opportunity to discuss with you the big job facing all of us during 1941.

Because of the demands placed on every business and every citizen by our nation's need for an adequate defense, our work is clearly cut out for us. We must contribute to the utmost of our ability to the defense building program.

Already, one-third of all J-M production is demanded for defense requirements. And this demand is growing daily. Some of it has been due to the increased need for J-M products for direct government projects. Some of it is the result of sales to expanding industries which use our products and are themselves working at top speed to fill government orders.

* * *

With every increased demand Johns-Manville has stepped up production to meet it. Many departments of our seventeen mines and plants have been affected by the defense needs and are now operating seven days a week, 24 hours a day. The working day is divided into three shifts of eight hours. At many locations, four shifts of employees work 40 hours each week to assure full production of the machines 7 days a week. Thus, work on Saturdays and Sundays is distributed fairly among everybody affected.

As the defense program develops we will necessarily have to step up our production more and more. This means we will have to find all the "bottlenecks" and increase the productivity of every machine.

Of course, most of us would prefer that industry's policy could be "business as usual." But these are not normal times. Business cannot be conducted "as usual" in an emergency. Defense comes first.

* * *

As a company, J-M is not going to let anything or anybody stand in the way of expediting the government's efforts to complete the defense program. This means co-operation by all of us, by management and by employees.

Naturally we shall all be called upon to make sacrifices. Taxes will be heavier. Raw material and manufacturing costs will probably rise. We shall all have to bear the burden.

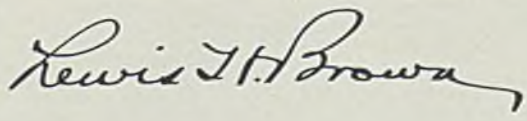
Under these circumstances we shall have to redouble our efforts to reduce waste and increase efficiency so that we not only will be able to deliver quality goods in record time, but keep prices in check. By doing this we shall be helping to keep the costs of the defense program down. As taxpayers we shall indirectly benefit through this economy, for all of us must pay our share of the enormous defense bill.

* * *

There is no doubt in my mind that J-M jobholders can be relied upon to do their part. You have already shown the spirit of real co-operation and patriotism which is so necessary. For your co-operation I want to thank you.

I know that I can count upon your continued support and loyalty in our common effort to help keep this land of ours safe and free.

May I take this opportunity to wish for all of you health and happiness during this new year?



**Although not directly engaged in the manufacture of munitions or armaments, Johns-Manville manufactures many products essential to the operation of industries so engaged. This message, stating Johns-Manville's policy in support of the nation's defense program, originally appeared in the January, 1941, issue of the* News Pictorial, *J-M employee magazine.*

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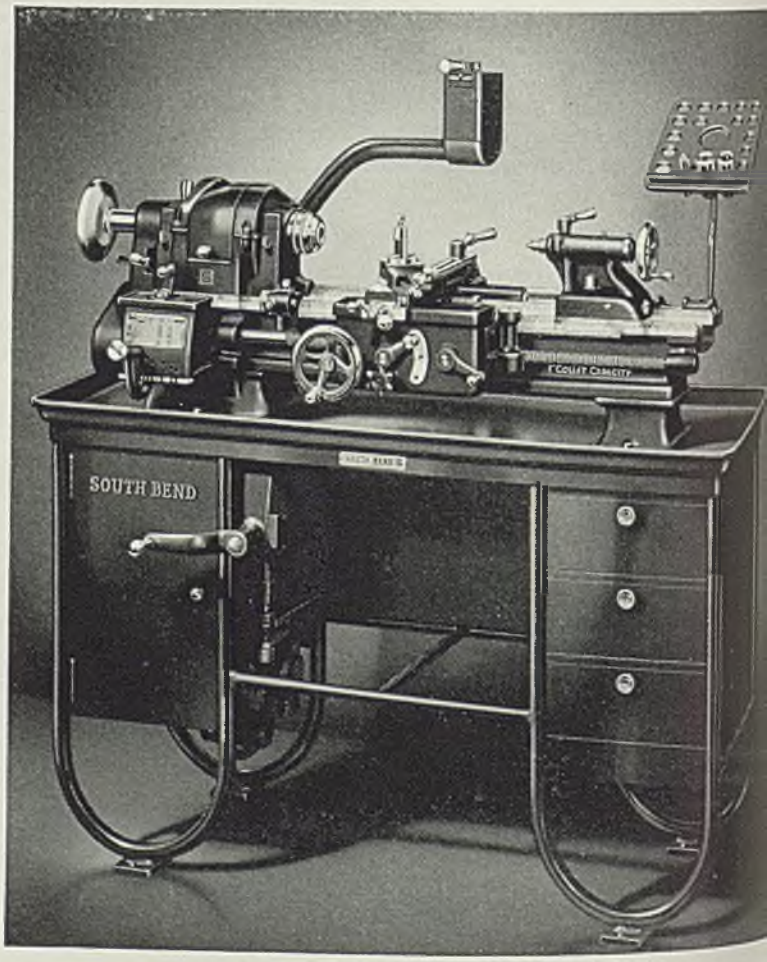
At right—10" Swing, 1" Collet Capacity South Bend Tool Room Precision Bench Lathe. This lathe has nine spindle speeds ranging from 50 to 1357 R. P. M., 1⅜" hole through spindle, 1" maximum collet capacity, 48 power longitudinal carriage feeds, 48 power cross feeds, and cuts 48 different pitches of screw threads.



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10"	3' to 4½'	15¾" to 33¾"
13"	4' to 7'	16" to 52"
14½"	5' to 10'	24½" to 84½"
16"	6' to 12'	33½" to 105½"

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placed on the inside of the vessel, care being taken to deposit a very flat head with minimum weld metal to remove. This latter simplifies finishing the weld. The bead is laid well up on top of the metal for ease in grinding, but at the same time the weld goes clear through the sheet at the joint. The skip weld method is employed, welding a couple of inches and skipping when the bead sinks in too far. See Fig. 6.

Secret of successfully fabricating stainless vessels such as these lies in designing the work so the joints come at places where the welding operator can work them easily and so the grinder can finish them off with the least difficulty.

After the complete bead has been deposited on the inside of all joints, the tack welds on the outside are ground off and the outside bead deposited. Welding conditions are similar to those specified for the inside bead.

Grinding First Step

Finishing the weld starts by rough grinding with a 36-grit rubber-bonded wheel, 6 inches in diameter with a 1-inch face, running at about 5600 revolutions per minute. With this wheel, excess weld metal is removed and any distortion resulting from welding is removed by grinding the surface smooth. No steel jigs or backup plates are employed in the arc welding, but use of low current values and careful manipulation of the arc help keep down distortion. What little distortion does result is removed by grinding.

Next step in finishing off the joints is to grind with a 60-grit rubber-bonded 4-inch diameter wheel running at 5600 revolutions per minute. In corners and flanges, a cloth wheel may be used as this is more flexible and permits better operation in corners.

Third step is to use an 80-grit cloth wheel followed by a 120-grit built up cloth wheel. This in turn is followed by using a greased 120-grit wheel.

The final polishing is done with a flannel wheel using a grease stick.

All grinding and polishing wheels are driven by high-cycle motors fed 180-cycle current from a special motor-generator set. About six of these units are used in the shop—some of them having angle heads to get into corners more readily.

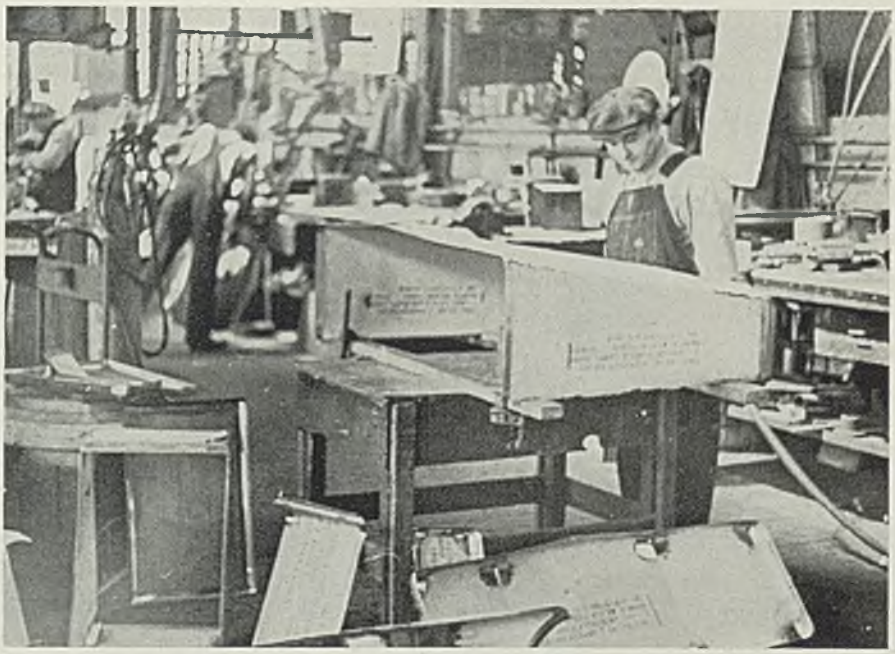


Fig. 5—Blocking this work to exact position is done to be sure that edges to be butted together for welding are square, with no space between and even. This is done by hand grinding and fitting the edges

Final finish produced by the above sequence of operations is equivalent to a No. 7 standard finish. This is such a high polish that it approaches a mirror finish. It is almost impossible to detect where the weld has been made as the polished surface here is fully as smooth and bright as anyplace else on the sheet.

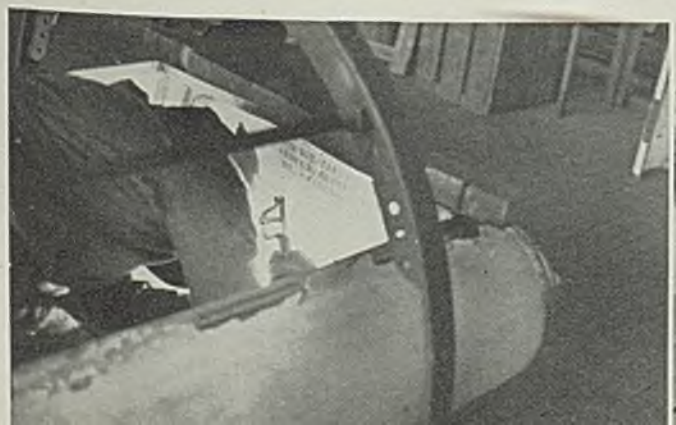
The high finish produced by the method described above is well illustrated in Fig. 1. As with any other new process, when welding of stainless was first begun in this plant, a certain amount of difficulty was encountered. To obtain the high surface finish desired, it is necessary that all weld imperfections such as slag inclusions and porous sections be avoided 100 per cent. The slightest impurity or pore shows up in polishing so the weld metal must be perfectly solid.

The most important factor entering into this portion of the work was found to be the amount of gap between the two butting edges which are to be welded together. It is for this reason that careful hand fitting and grinding of all butting edges is given so much attention. All butting edges are ground precisely so they are sharp, square and fit with no gaps whatever. This hand fitting, while increasing the cost, does help to obtain perfect welds.

If the factors explained above are followed, there is no reason why any fabricator cannot work stainless and make welds which will take a mirror finish.

Fig. 6—After preparing edges to butt properly, joints are tack welded on outside of joint while still blocked in position. This is followed by laying the first bead on the inside of the joint, using skip welding technique. Operator, at left, below, is working inside weigh tank while it is clamped in positioner

Fig. 7—Next, outside tack welds are ground off and outside bead deposited as shown here at right below



You may get some ideas for your own operation from these

"Shortcuts" in Assembling Sewing Machines

Several interesting fixtures and methods are developed by a manufacturer of precision machines to keep handling operations during assembly down to bare essentials. A good number of the shortcuts described here may be found equally valuable as a means of reducing the amount of handling work in many other assembling procedures

By FRED B. JACOBS

A MODERN electrically operated sewing machine is a rather complicated mechanism embodying several hundred separate parts—many of which involve precision to insure exact fits. Otherwise, the machine would be noisy in operation and would fail to function properly after a short period of service. This matter of dependability is of great importance because sewing machines often are used in places far remote from repair facilities. However, no matter how carefully its various components are made, a sewing machine can be ruined easily through faulty assembly.

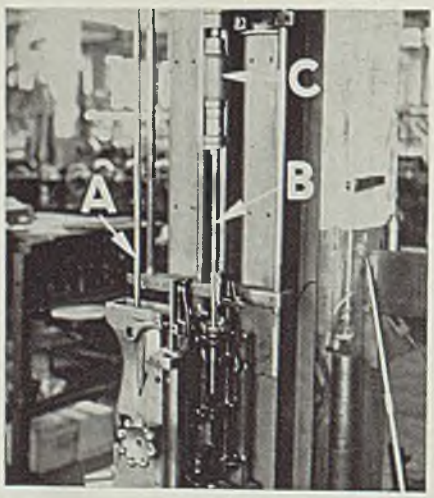
Therefore, care must be taken at every stage of assembly. To insure correct and rapid assembly of sewing machines at the plant of the White Sewing Machine Co., Cleveland, an interesting array of special fixtures is employed. Several of these are illustrated and described here. Note particularly how handling operations are simplified and made more efficient by the use of these devices and methods.

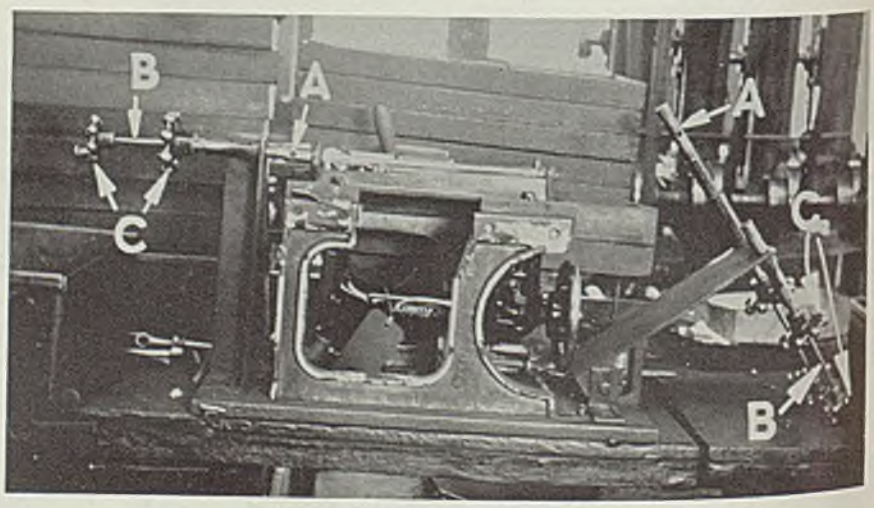
Sewing machine assembly operations are divided roughly into several stages: Assembly of the heads; various subassemblies which in turn are built up into units; the latter finally being incorporated into the general assembly.

The initial assembly operation on a sewing machine head consists of forcing in a bushing at each end. These bushings carry the upper or main shaft. After that the shuttle race is located and screws for setting the rock shaft are put in place. The next important operation is to line ream the holes for both the upper and lower shafts. This operation is shown in Fig. 1.

Note that the head is located in a

Fig. 1—Special fixture, left, for reaming holes for upper and lower shafts. A and B are the reamers, C is a rubber housing over a universal joint. Fig. 2—Special fixture for assembling rocker shafts. A and A are socket wrenches, B and B are screw drivers that work through these hollow wrenches. Both have handwheels, the screw drivers having spinners C and C, too, for rapid manipulation





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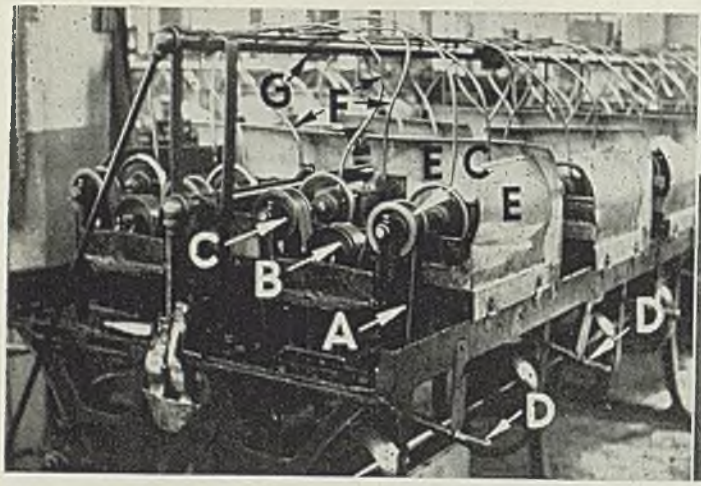


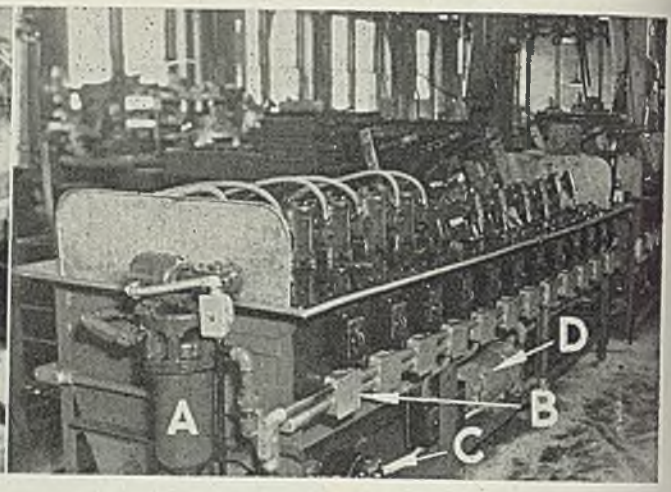


Fig. 3—Run-in jack, left: Two machines are driven by each belt

Fig. 4—Improved run-in jack for special work. Machines are driven by individual motors. A is oil filter; B, individual outlet boxes; C, oil filter pump; D, oil circulating pump. Run-in completed in 1/12th the time required in Fig. 3

special fixture mounted on the platen of an upright reaming machine constructed for this purpose. Each reamer has four steps, the increase from one size to the next being about 0.003-inch. Thus each step has only to remove this small amount of metal, thus assuring a smooth straight hole. In Fig. 1 the reamers are indicated by letters A and B. The detail indicated by C is a rubber housing over a universal joint. Each reamer is driven through a universal joint so all tendency toward cramping is eliminated. In connection with this setup, the holes also are counterbored.

The next operation is that of reaming the shuttle race, following which the rock shaft is placed in position. Then the upper shaft, feed connection, hand wheel and rock shaft are set in place. The upper shaft is finished by precision grinding within limits of plus or minus 0.0001-inch so it will go in place in its accurately reamed holes without supplementary fitting.

Fig. 2 depicts a special fixture used for setting the rock shaft in place. This fixture is mounted on a bench and the head is held in it in an upside-down position. One end of this fixture swings away to facilitate loading and unloading. At A and A are socket wrenches for setting up checknuts on the rockshaft connections. At B and B are screw drivers that work through these socket wrenches.

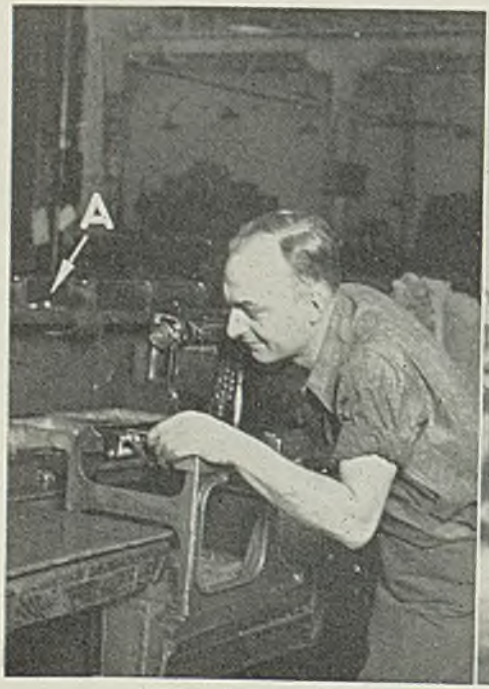
Socket wrenches and screw drivers both are fitted with hand wheels C so the assembler loses no time in setting up the screws and nuts. Each screw is positioned correctly and then the socket wrench given a few turns to set the check nut securely in place. It really is necessary to see this fixture in actual operation to realize fully the vast saving of time over setting up screws with an ordinary screw driver and tightening nuts with an S-wrench.

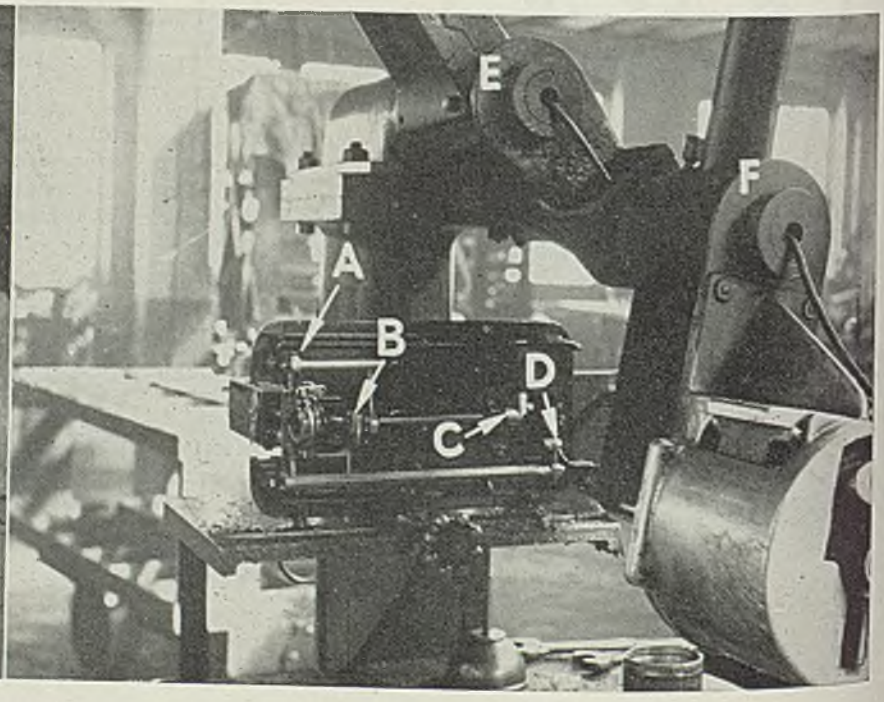
An interesting and important operation in sewing machine building is "running in" parts after they are assembled. For example, the head is given a slow run-in at a speed of 80 to 100 revolutions per minute. Then the main connection between the upper shaft and the shuttle shaft is put in place—followed by a run-in at 1000 revolutions per minute.

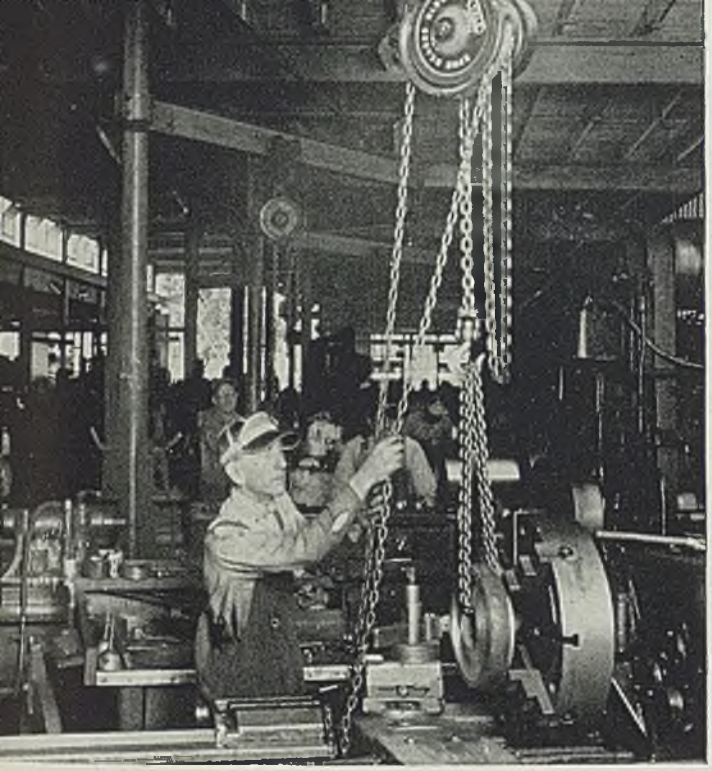
One type of run-in jack used at the White Sewing Machine Co. is shown in Fig. 3. The machines are placed so that two units can be driven by a single belt A which runs

Fig. 5—Sewing machine being given a "sound" test, left

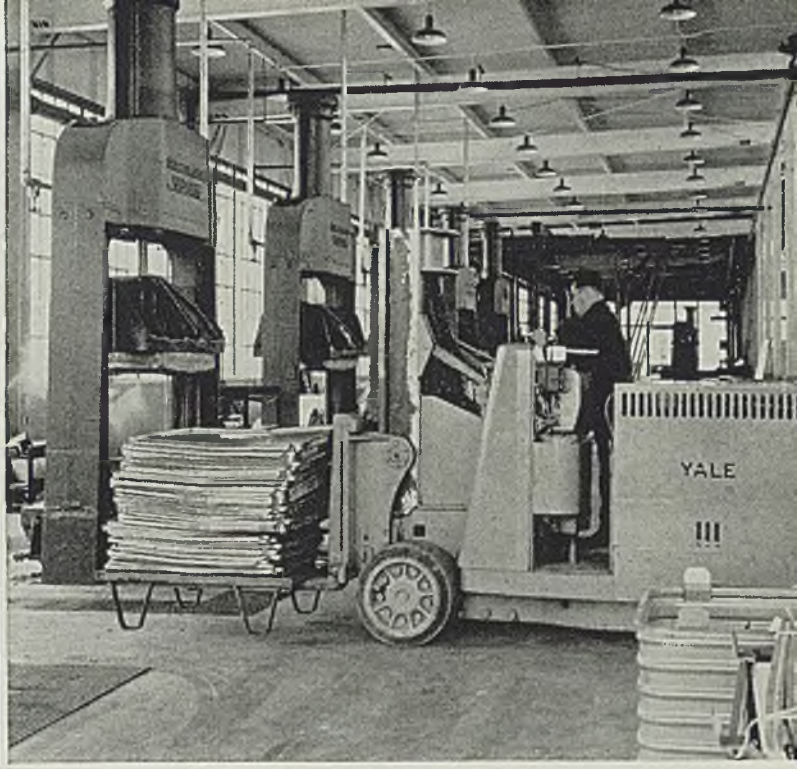
Fig. 6—Special machine for drilling holes at A, B, C, and D with a No. 42 drill, illustration at right, below







HAND CHAIN HOISTS Ball-Bearing Spur-Geared Hoists of this type are available in capacities from 300 lbs to 40 tons



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CONTROLLED Materials Handling brings lowered costs to Metal-Working Plants

EVERY plant today has a two-fold job to do: producing normal goods and services, and supplying materials for our national defense. As this task is executed, it's amazing to see how materials handling affects plant operations.

In studying problems of production, executives find that the key to lowered costs frequently lies in the control exercised over materials handling operations.

Materials handling is a broad term. But actually it resolves itself into the problem of lift and shift.

On this page we present four different types of modern materials handling equipment. While each is different in form and function, each is the ultimate in the efficient application of mechanized control over lift and shift. Each is a study of how to eliminate wasted time and effort, and to increase plant productivity.

Hand and electric hoists, hand lift trucks, and electric industrial trucks bring to handling jobs increased efficiency, reduced costs, minimum maintenance, maximum flexibility and availability, plus increased speed, greater safety and a continuous flow of the materials in production.

For specific details regarding any of this equipment, or for information concerning any materials handling problem, get in touch with, or write to, The Yale & Towne Manufacturing Company, Philadelphia Division, Philadelphia, Pa.

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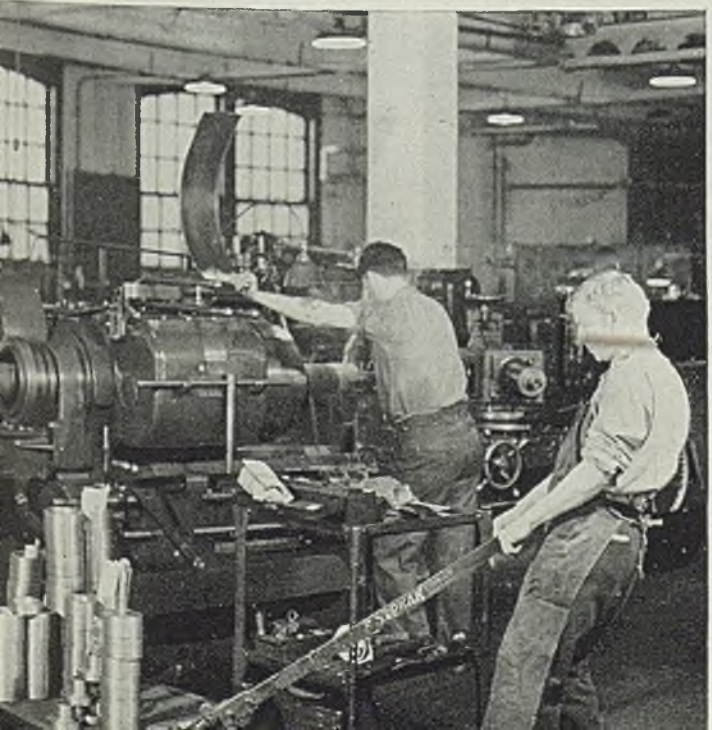

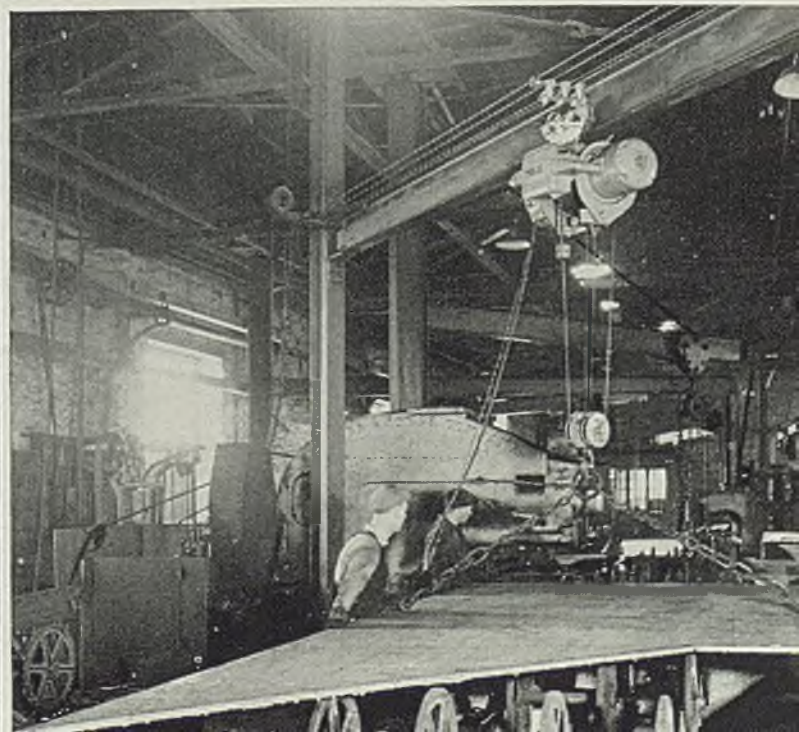

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Model—M" Lathe
Material—S.A.E. 1020
Cutting Speed—
M.
Depth of Cut—⅝"
Feed per revolution—0.25"
Cutting Lubricant—1 part
Sunoco to 10 parts water
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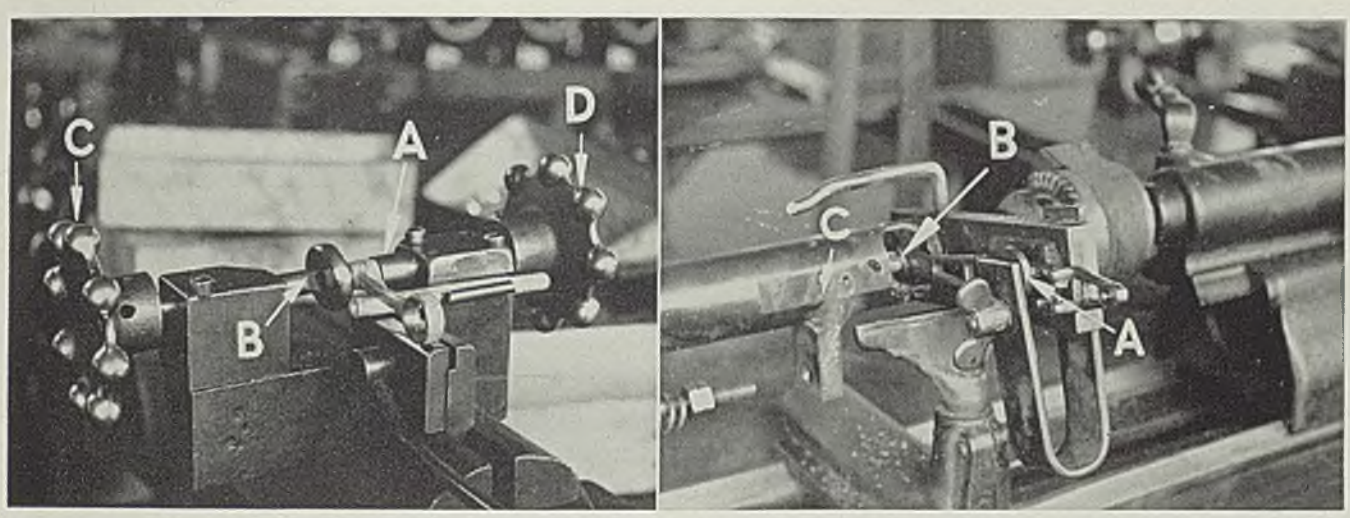


Fig. 7—Special fixture for attaching a lever to a rocker shaft with minimum handling effort, left

Fig. 8—Fixture for counterboring the main connection is used in a speed lathe to combine accuracy with high output as shown at right, above

under the idler B. This belt is wrapped around the two pulleys C by which the machines are driven. Levers D are for the purpose of pulling down the idlers to tighten the driving belts. The details indicated by E are sheet metal guards to prevent oil splashing the machines during this operation being under forced lubrication supplied through flexible piping F which runs to the main oil line G.

The foregoing method of running in sewing machines has given satisfaction for many years and it certainly is a great improvement over the practice followed in the early days of the industry when oil was squirted into the bearings occasionally, through the oil holes. However, in constantly seeking to improve their methods the White engineers recently developed the running-in apparatus shown in Fig. 4, which is a special unit designed for a specific purpose.

Referring to Fig. 4, it is shown that the device consists of a large steel tank of oil in which the machines are immersed in a vertical position. The tank accommodates 12 machines and in Fig. 4, six machines are shown at the right, ready to be immersed while at the left six machines are in the oil. Here each machine is driven by an individual motor. In Fig. 4 at A is shown the filter with its driving motor at the top, while the electrical control switch box is in the foreground. Electrical connection for each individual motor is shown at B. Control switches are located directly above the electrical connections. At C is the motor that drives the pump which conveys the oil to the filter, while D is a pump for circulating the oil. The oil from the filter is pumped into the tank through a fishbone outlet pipe so it reaches all parts of the tank area simultaneously. The filter pump takes the oil from the bottom of the tank, which is inclined, and conveys the oil to the filter.

By this arrangement the oil is being circulated and filtered constantly so all grit is removed by the filter before the oil goes into circulation again. The apparatus saves considerable running-in time. With the type of running-in jack shown in Fig. 3, the running time was six hours. By the use of the new appliance the time has been reduced to one half hour.

In Fig. 5 a sewing machine is shown mounted on a special stand for its "sound test." The skilled workman is whirling the flywheel by hand while he listens for any undue kind or amount of sound. Through long practice he can detect and identify almost instantly any sound that indicates some part in the assembly is not working properly. In such a case the machine must go back to be corrected. However, if the machine passes this inspection, it is placed on one of the racks at A, Fig. 5, by means of which the machines are moved from one bench to the next—thus eliminating trucking.

To work correctly, any sewing machine must be timed precisely so certain parts come into action exactly in relation to certain other parts. This pertains to the feed, takeup, shuttle action, etc. To assure permanently correct timing, various levers and other parts are locked in place with serrated pins—commonly called "whisker pins"— which are driven into holes drilled with a No. 42 drill.

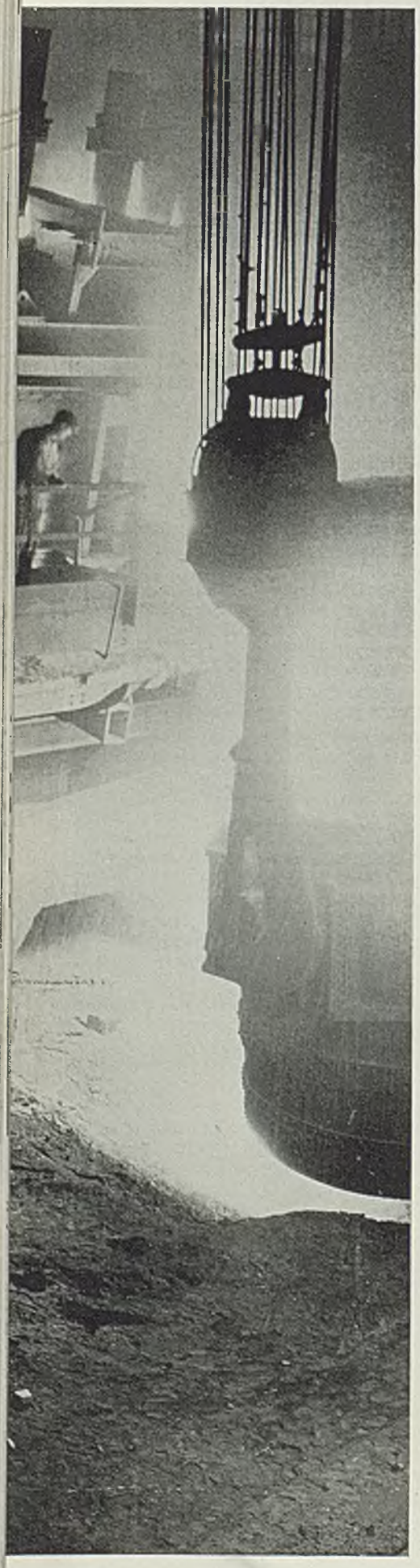
Drilling for these pins is depicted by Fig. 6, which shows the special machine designed and constructed for this purpose at this plant. The sewing machine is set on its side in this special machine so the operator can see what he is about at all times. Holes are drilled at A, B, C and D, the drill being driven by an electric motor mounted on a double arm that swings on bearings E and F so the drill can be positioned correctly.

Formerly, a large number of drills were broken in this operation, but this was overcome through adoption of a novel plan. Each operator is supposed to drill a certain number of holes with one drill. Thus a quota of drills is established for his day's production and he is paid a premium for every drill he does not use under this quota. Since adoption of this plan, drill breakage has been reduced greatly.

Another interesting assembly fixture is shown by Fig. 7. This is used for attaching a lever to a rocker shaft. The two parts are held together by a slotted stud. Letter A indicates a socket to accommodate the check nut, while at B is a screwdriver located to meet the slot in the stud. It is obvious that by manipulating handles C and D, the parts can be assembled much more rapidly.

Fig. 8 illustrates the fixture used for counterboring the main connection, the seat of which must be flat and square. The work is shown at A and the counterbore B works through support C. This support is exactly square with the seat on which the work rests. The fixture is used in a speed lathe, but this simple machine tool is not relied on to generate the necessary accuracy. That is taken care of by the fixture itself. In other words, the speed lathe is used as a unit to rotate the tool.

It will be evident that the use of such special fixtures not only expedites assembly operations greatly, but at the same time assures far more satisfactory mechanisms than could be put together through unaided manual operations. Also an important reduction in materials handling operations is obtained. As several hundred sewing machines are assembled daily at the White factory, the assembly workers have developed amazing skill and dexterity in the handling of these fixtures.



FURNACE BOTTOM REFRACTORY

By H. N. BARRETT
Basic-Dolomite Inc.
Cleveland

Clinker, known as Ramix, was originally designed for electric furnace hearths but since has been used by open-hearth operators for making quick and monolithic repairs of banks, walls and bottoms. This article tells of recent developments in the application of the refractory including sloping and semisloping backwalls of open hearths, and for pipe, heating and soaking pit furnaces

■ A MAGNESITIC ramming mixture containing chemical bonds which give an air set when the refractory is mixed with water was introduced to the steel industry in this country in commercial quantities about 2 years ago. The refractory known as Ramix, is burned at a high temperature to insure a minimum of shrinkage under temperature. This clinker because of its composition has a resistance to hydration or slaking which is much greater than that of the usual dead-burned magnesites. The bonds have been selected to give adequate strengths throughout the rammed structure at all temperatures, and the grain sizing of the refractory is one which was found to ram rapidly yielding a dense, strong structure.

The refractory was originally designed for electric furnace hearths. Electric furnace operators found that by cold ramming their hearths they could obtain at the outset a monolithic bottom of the desired contour and of uniformly high magnesia content. The practice saved time, power and electrodes; extended roof and sidewall life and sacrificed nothing in the way of strength or density. The slaking resistance of the material was important to electric furnace operators since their operation was often set up for weekend shutdowns, night operations, etc. The decreased possibility of contamination in changing from one type of steel to another, resulting from the density of the rammed hearth, was also an advantage to the electric furnace operator. No protective surface of sintered material is used over the Ramix hearth in an electric furnace.

Electric furnace operators also use the material for hot and cold bank repairs, hot and cold patching of old hearths, and for cold patching the wall, back of the center electrode.

Use of Material Widens

A total of 25 hearths made of this refractory was installed in basic electric furnaces, exclusive of the Pacific coast, up to Sept. 1, 1940. Today approximately 60 original Ramix hearths are now in service throughout the American and Canadian basic electric steel industry. A few large electric furnaces in this country have had around 1000 heats from hearths made of this refractory. Approximately 62 per cent of the rated basic electric furnace capacity in this country is now regularly using this material.

Open-hearth operators first used this refractory to speed up rebuilt jobs. After removing any section of the bank, wall or bottom, showing marked penetration of metal or slag, the clinker is tamped into the cleaned cavity. The most irregular holes can be quickly repaired by this method thus eliminating time for brick fitting and "burning in" of granular material. After the furnace is brought up to temperature a few inches of magnesite or dead burned dolomite is burned over the repair job. The density and stability of such a monolithic repair makes it

From a paper presented before the Pittsburgh section, National Open-Hearth committee, American Institute of Mining and Metallurgical Engineers, bureau of mines auditorium, Pittsburgh.

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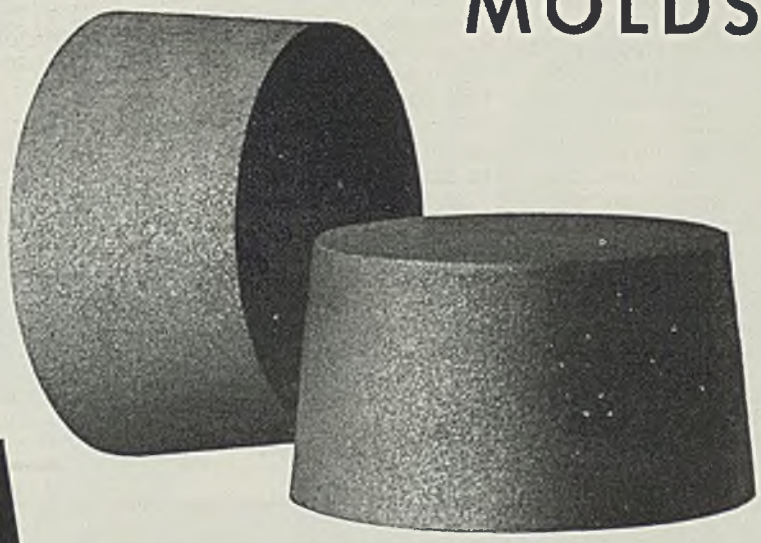

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the equivalent of the original bottom.

Open-hearth operators suggest the use of the refractory for hot repairs to deep holes. If used wet the material sets immediately, shows little tendency to "float out" and maintains a high magnesia content in the bottom because it is installed without the adulteration of slag or scale. While repairs of this sort have been successful, one of the main virtues of this refractory—its density on ramming—is necessarily lost in this application.

Use of this material for rammed subhearths has effected substantial savings by shortening the time of installation and reducing the thickness of the fused hearth above the clinker. It is suited for this type of construction since it is cheaper than basic brick per volume, can be installed quickly by ordinary labor, is monolithic, and has about the same magnesia content as the finished fused hearth. A number of subhearths of this material are in service, and some operators claim that this type of construction has prevented serious bottom trouble.

A recent development along this line is a hearth in a 75-ton open-hearth in Canada which has only 1½ inches of magnesite on top of the subhearth. In several shops the port slopes have been surfaced with this monolithic layer which protects the chill box, burner arch and uptakes from the cutting action of foamy slags.

Just recently this refractory has been applied to sloping and semi-sloping backwalls. In one case an entire backwall was constructed of 1½ inches of insulation, 9 inches of clay brick and 9 inches of Ramix. This furnace has only run for 35 heats, but the backwall to date is in good shape and shows little wear.

Several plants have rammed doors with this clinker using a stud construction. The results have been fairly good, but more experience is necessary to indicate whether this application is sound from a cost angle.

Several heating furnace installations have been made and all but one of these have been satisfactory, although the oldest hearth has not been in service a year. However, a consideration of the composition, strength, density and cost indicates that it is well suited for heating furnace hearths.

The material has stood up well in the hearth of the discharge end of a Fretz-Moon pipe furnace. Its main virtue here apparently has been its ability to withstand the penetration of iron oxide and the ease with which the accumulation of scale can be removed.

A bridgewall made of this refractory and installed in a Salem circular soaking pit has just completed a full year's run and is still in service with no sign of failure.

At least one open-hearth shop has had satisfactory results from monkey walls laid up with scrap pipe into which this refractory has been tamped.

While there has been a rapid extension of the application of this ramming material, it is by no means a "cure-all." Consequently, before making untried application, the soundness of the use of this type of material for that particular job should be considered carefully.

♦

New Arch Bead Bends to Any Shape

■ An Arch Bead which creates a rigid, plumb-line vertical or horizontal corner, yet can be easily bent around corners or formed by hand into curves of any shape is

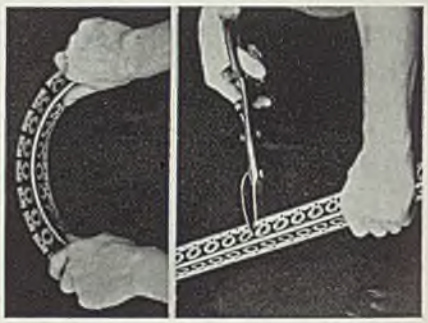


Illustration shows how to cut and bend the arch bead

announced by Milcor Steel Co., South Forty-first West Burnham street, Milwaukee. It can be used straight or formed right on the job, without the need for special tools or equipment.

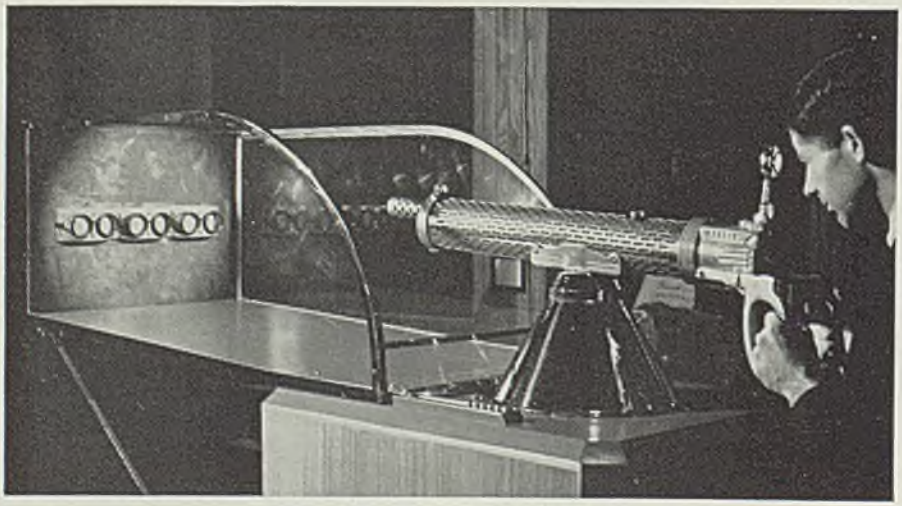
To prepare the bead for bending, it is only necessary to cut through the outside edge of one or both of the flanges to spread open under the bending action. The curve then is easily produced by hand.

Publishes Story on Medieval Armor Makers

■ The October *Bulletin of the Business Historical Society,* published by Baker library, Boston, carried an interesting account of the armor business in the Middle Ages. Written by its editor, Henrietta M. Larson, with the help of John W. Higgins, president, Worcester Pressed Steel Co., the story touches on the development, design, methods of joining plates and methods once used in making the armor lighter for the wearer.

Because the business of the armorer is known only in fragments, the writer states that many questions raised by those impressed by the works of these medieval masters cannot be answered. She believes, however, the drive behind the industry was the almost constant state of war or need of defense. The story also gives some background on some of the famous armor makers of the period, including some of their business dealings.

"Armor" for Workmen's Eyes



■ Because the average compensation and medical cost for eye accidents in industry is such a large item, technologists of Bausch & Lomb Optical Co., Rochester, N. Y., have devoted much attention to the development of hardened lenses which will withstand or break the shock of flying missiles. The industrial goggle lenses now made will stand up indefinitely under a barrage of ⅝-inch steel balls weighing 0.57 ounces fired at a range of 40 inches under a pressure of 28 pounds of compressed air. The new machine gun test shown above supplements the older drop test and simulates the effect of flying chips. The process of hardening lenses also enables a workman's prescription to be ground into them

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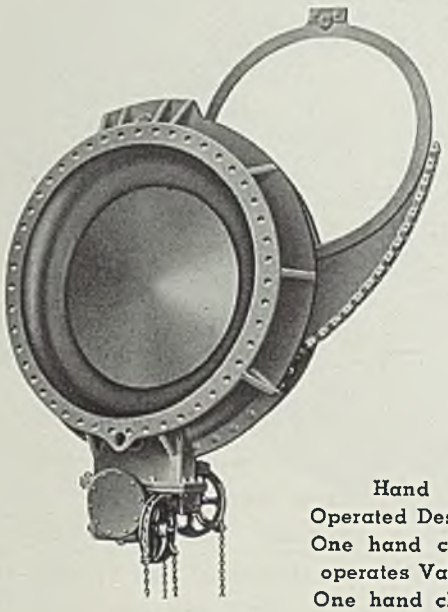
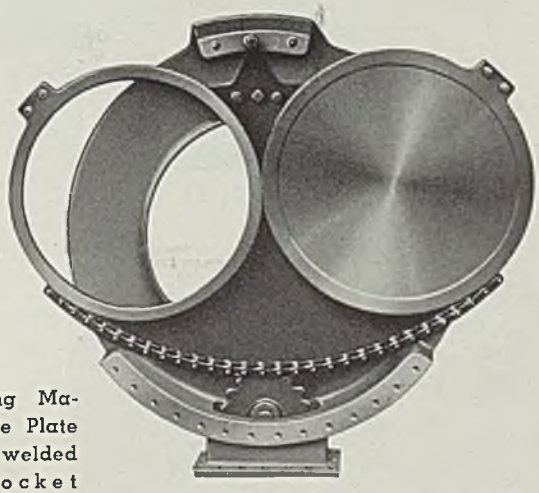
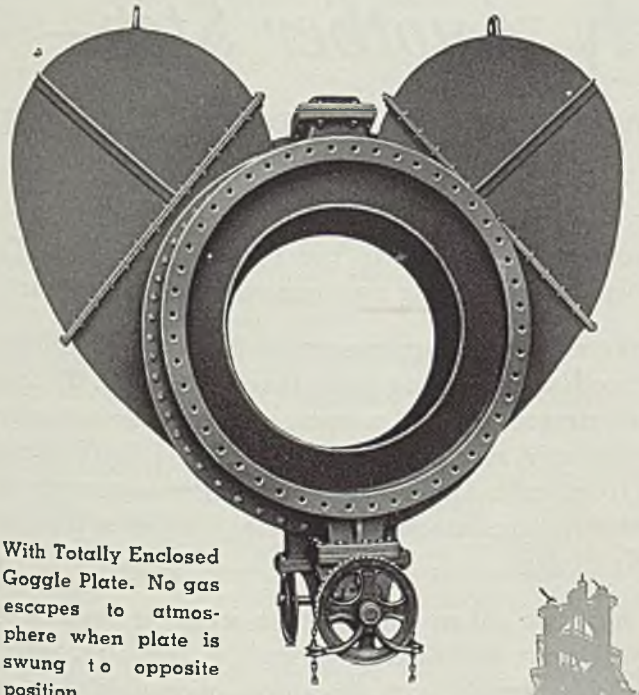


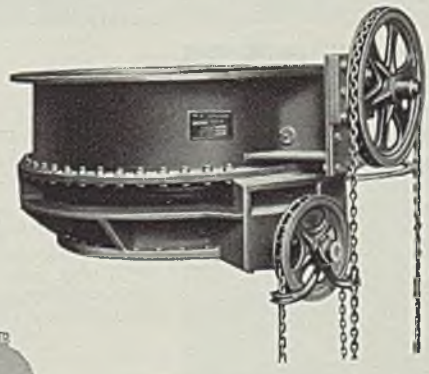
Hand Operated Design. One hand chain operates Valve. One hand chain swings plate.



View—Showing Machined Goggle Plate with Chain welded thereon. Sprocket Wheel engaging with chain also cleans the chain if this becomes clogged with dust.



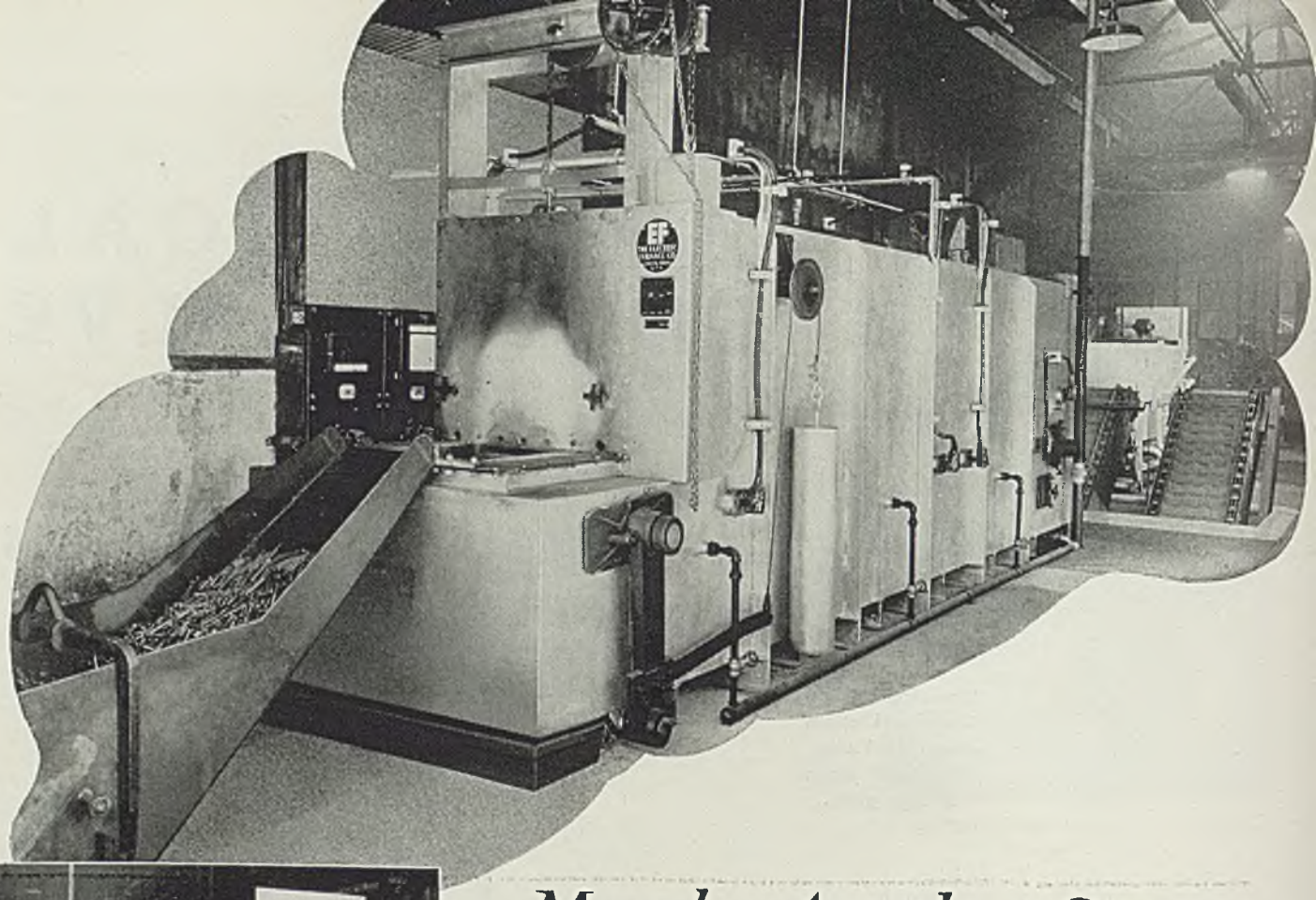
With Totally Enclosed Goggle Plate. No gas escapes to atmosphere when plate is swung to opposite position.

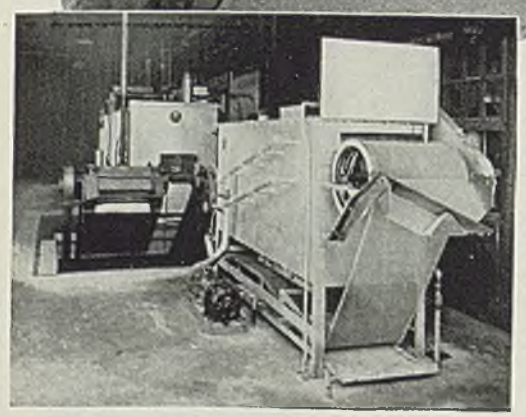


A 24" x 20" Valve as installed in Vertical Gas Main to Blast Furnace Stove Burners.

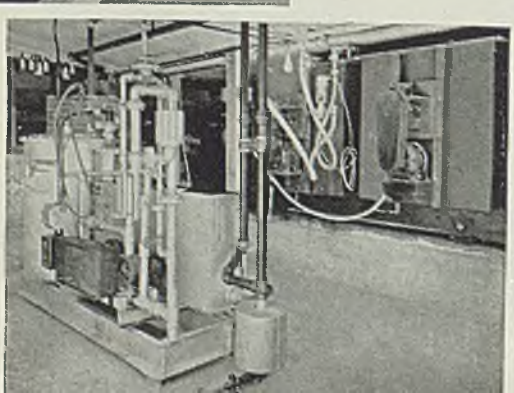
WILLIAM M. BAILEY COMPANY . . . *Engineers*

PITTSBURGH PENNSYLVANIA





ABOVE: *front and rear view of heat treating furnace.*
AT LEFT: *view of electrical control panel.*
BELOW: *basement installation beneath furnace showing tanks and apparatus for controlling oil, water and atmospheric conditions.*



Merely Another Step—

TOWARD PREPAREDNESS

Another of the new installations made by RB&W during the past year is this addition to the Port Chester Heat Treating Department shown in the accompanying photographs.

Here is the very latest equipment for heat treating high carbon or alloy products requiring great tensile strength. By accurately controlled atmosphere and temperature, a better surface results, greater accuracy as to size is obtained and there is complete freedom from scale. This is merely one more reason why RB&W bolts and nuts have smoother, cleaner, harder surface and are absolutely to size.

RB&W has also taken many other steps in preparation for meeting the increased fastening needs of industry. Since 1845, EMPIRE has stood for improved production as well as product —and has always meant service and quality regardless of rushed business conditions.

RUSSELL, BURDSALL & WARD
BOLT AND NUT COMPANY

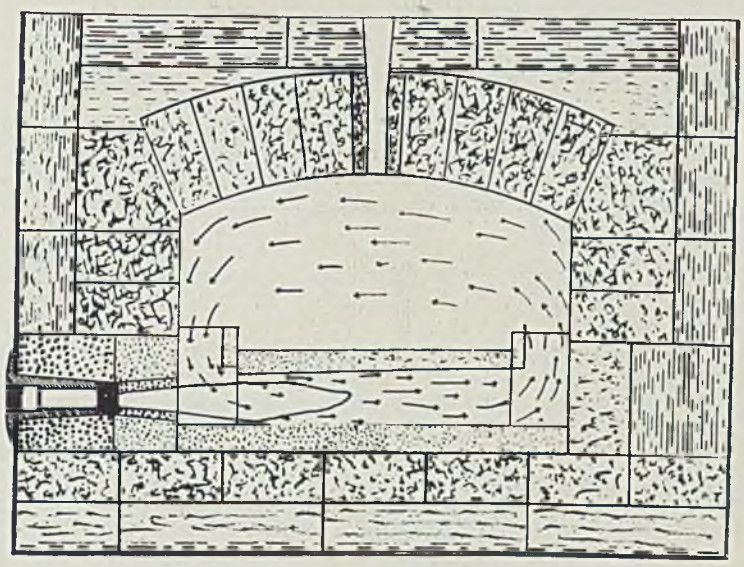
PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

BOLTS EMPIRE NUTS-RIVETS

Alloy Drop Forgings Are Normalized at Low Cost

By REGINALD TRAUTSCHOLD
Consultant

Exacting heat-treating cycles are handled automatically on a high-production basis in a 3-zone furnace where all factors are held uniform by automatic controls. Work is advanced through unit intermittently. Net work loads average 1200 to 1400 pounds per hour, normalized at a gas consumption of only 1.3 cubic feet per pound, including all losses



Cross sectional view of National Gas Furnace Co. unit depicting circulation of hot products of combustion, which afford high heating efficiency

■ NORMALIZING miscellaneous alloy steel parts for a popular automobile—one of the leaders in the low-price field, where costs have to be held at unparalleled lows and the conditioning effected without sacrifice in quality of product—and the annealing of spanner wrenches and like articles for a great mail order house, with no less exacting requirements, are unquestionably undertakings that call for heat-treating standards of a distinctly high order. When such tasks are actually performed day in and day out to meet strict specifications with virtually no rejects or subnormal work, it is an achievement.

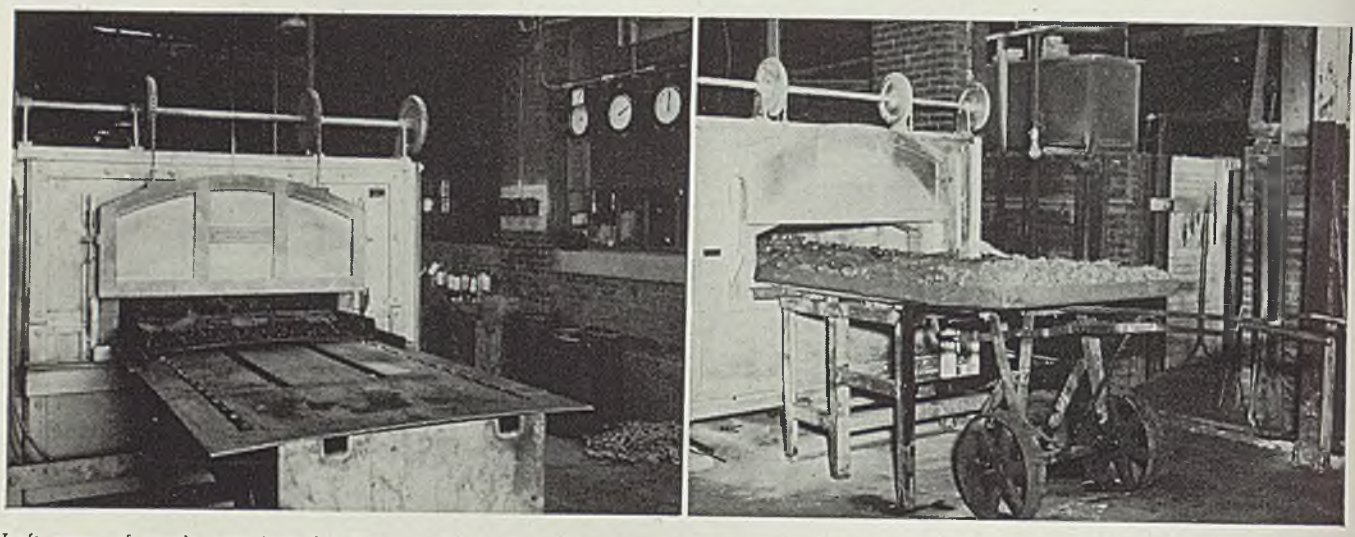
At the Chicopee Falls, Mass., plant of the Moore Drop Forgings Co. this highly desirable attainment has been realized—realized moreover, with standard modern furnace and control equipment now readily procurable—plus, needless to say, skillful manipulation of these essential tools. Processing operations are performed automatically with all possible dispatch and under closely controlled predetermined operating conditions.

Furnace Equipment: The normalizing furnace, a gas fired unit with alloy steel roller hearth and pusher mechanism, was built by the National Gas Furnace Co., Providence, R. I., and has an average net hourly output of from 1200 to 1400 pounds of work. It consumes ordinarily about 1.3 cubic feet of manufactured gas (530 B.t.u. per cubic foot) for each pound of work normalized, such gas consumption covering all furnace and thermal losses incident to heating the work chamber and the pans upon which the work is progressively carried through the several heating zones of the furnace as well as the net heat absorption per pound of work. Actually, between 750 and 800 pounds of steel parts are normalized per hour for each 1000 cubic feet of gas consumption.

This efficient accomplishment is attributed primarily to the distinctive construction of the circulating oven furnace in which the pronounced turbulence and circulation of the products of combustion effect efficient and uniform heating of the work. The furnace is roughly 20 feet long, 6 feet wide and 6 feet high. Due to the rapid circulation of the gases, the insulating brick in the furnace walls absorbs only a relatively small proportion of the heat liberated by the burning gases, enabling the furnace to attain temperature quickly and normalize the work charge rapidly.

The furnace "tray," through which the side burners of the furnace fire and the products of combustion circulate, is made up of individual—readily replaceable—blocks of molded fire brick of inverted U-shape section that form transverse, arched and slightly tapered tunnels for the passage of the gases. This distinctive construction, by which three separate heating zones are set up, not only diffuses the furnace heat thoroughly but also helps prevent damage to firing chamber linings and burner ports.

Normalizing Procedure: During operation, pans containing the parts to be heat treated are placed upon the loading table extension of the furnace's roller hearth and a motorized pusher mechanism feeds the successive pans into the first of the furnace's heating zones. The advance of the pans is intermittent and is accurately timed so each loaded pan remains in each successive zone for the exact time interval wanted. As each loaded pan is fed into the furnace, it pushes the other pans forward—discharging one



Left, pan of work entering the furnace from the roller hearth loading extension. Note pyrometer controllers and relays mounted on wall at upper right in this view. Pans of work in illustration at right pass from discharge platform to buggy transport, which allows easy removal of the work from the platform

pan at the far end. Upon issuing from the rear of the furnace, the pans rest for an interval upon a discharge platform and the next issuing pan shoves the leading pan onto a buggy transporting table used to remove the pans of cooling work.

Ordinarily, the gross loads at the Chicopee plant run from 1800 to 2200 pounds per hour, including pans, the net work load ranging from 1200 to 1400 pounds. In passing through the furnace, work attains preset temperatures in progressive stages of anywhere from 700 degrees Fahr. to as high as 1825 degrees, depending upon the nature of the loads. In all cases, exact temperatures are predetermined, controllers automatically holding the desired valves. A typical cycle might require a furnace temperature of 1000 degrees Fahr. in the first or charging zone; a point somewhere between 1200 and 1400 degrees in the middle or soaking zone; and perhaps another point, between 1500 and 1800 degrees, in the final zone.

Automatic Control: With such a cycle, holding proper preset temperatures in each heating zone is, obviously, an essential requirement —if the inherent efficiency of the furnace is to be developed fully and uniformity maintained. The exact temperatures in the respective heating zones for any given work charge have to be ascertained empirically, it is true, but once the best thermal cycle has been established, uniformity of results is dependent upon holding the temperatures as per schedule.

This exacting task is performed here automatically and accurately by three Bristol Pyromaster controllers acting through Unitact relays that manipulate Minneapolis-Honeywell valves serving the furnace gas burners. While these controllers are extremely sensitive, they are unaffected by vibrations and require no lubrication whatever—the actuating mechanisms operating only when changing zone temperatures, as detected by quick-acting thermocouples located in the respective heating sections of the normalizing furnace, indicate an adjustment is necessary.

Controllers for the charging end and the middle or soaking chamber are of the indicating variety, showing the zone temperatures clearly upon large circular dials. The controller for the discharging end of the furnace is a recording unit, constantly posting the existing temperature in the form of a closely timed graph, with a supplementary indicating scale that shows the instantaneous temperature at a glance.

Control Operation: Should the temperature in any zone rise or fall, causing even a slight deflection of one of the indicating pointers of a controller, the relay of the controller at which the disturbance takes place is instantly energized and the gas supply to the burner responsible then adjusted. If more heat is required, the opening of the gas valve controlling the fuel supply and the air needed for combustion, furnished by a 20-ounce turbo-compressor, is increased. If heat is excessive, deflection of the controller pointer energizing the relay of the disturbed controller brings about an instant throttling of the fuel and air supply to the burner.

With this quick-acting control system, the high efficiency of the annealing furnace and the wide experience of the Moore Drop Forging Co. in approved heat-treating practice are capitalized upon to the end that enviable standards for quality forgings are maintained.

Substantial operating economies are also realized for wastes of all kinds —of materials, operating media and time—are held at a minimum consistent with commercial production in jobbing output.

♦

Physicist, Metallurgist To Be Thrown Together

■ A noteworthy trend in fundamental science during 1941 will be the increasing closeness of association of the physicist and the metallurgist, according to Dr. E. U. Condon, associate director of Westinghouse research laboratories, East Pittsburgh, Pa. Physics, he says, now understands the structure of the atom so well that it can give a complete and detailed account of the origin of the thousands of different wave-lengths of lights which are revealed in the spectroscope. With this knowledge has come a deeper understanding of the forces holding atoms together in a metal which are responsible for its mechanical strength, ductility, etc.

As a result, he states, research on the production of new alloys for special uses is becoming much less of a "cut-and-try" process than in former years. Not only metals but other solid bodies are now better understood as a result of basic advance in theoretical knowledge.

In this connection, an example is the interesting researches of Prof. E. Guth of Notre Dame university on what kind of molecular changes are involved in the stretching of rubber.

Obviously it will be a great help in trying to produce synthetic rubber to have a correct idea of just why rubber is so "stretchy."

Another example is the application of modern atomic theory to analysis of behavior of light in fluorescing crystals which makes better fluorescent lamps and brighter television screens.

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All types of wood patterns can be produced for individual castings or for production work.

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Facilities for machining are available within the limitations of production demands.

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Completely equipped with modern research and testing equipment, these departments safeguard the uniform production of Sumet Products.

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A staff of experienced metallurgists and engineers are available to make recommendations on casting design and composition, and bearings made of Sumet Lead Bronze.

BETWEEN HEATS

WITH *Shorty*

Say Fellers:

Met an old-time blast furnaceman the other day in a little town near Pittsburgh—a man in his late seventies. His mind is still keen 'n y' don't have to put his memory on a grind stone to sharpen 'er up, for he can recall instances that'll make you stare.

"Stop in at the house tonight, Shorty," he sez, " 'n we'll 'ave a fireside chat. 'Course I don't 'ave a fireplace as big as the president's but the ol' chimney has a good draft jus' the same."

So that night we sat in front of a log fire in 'is livin' room 'n talked pig iron makin' until a whistle at a blast furnace plant in 'is town blew for the 11 o'clock cast. Here 's a story he told me that'll catch your fancy, I'll betcha.

"Long 'fore your time, Shorty, I was blowin' an ol' hand-filled blast furnace at the Edgar Thomson works of Carnegie Steel Co. Ltd. Michael Killeen was the assistant superintendent. All the boys 'round the plant called 'im Mike for short. We used to 'ave a lotta trouble skimmin' the slag from the molten iron when we cast the furnace," he sez as he stopped to light 'is corn cob pipe.

"How's that?" I asked.

'N tossin' the burned match in the fireplace, he sez: "Them days we used to 'ave to drill through the iron notch by hand. 'N when the iron 'd start comin' she'd flow from the tap hole into a short metal trough. At the end of this trough we had another one which the boys made out of sand. They'd pack 'er down right hard and bank 'er up pretty high on both sides. Then they'd make a dam at the far end 'n jus' in front of this they'd place a barrier, or as the boys called it, a skimmer."

"How didja work 'er?" I interrupted.

"O, for a long time we'd jus' take an iron plate, stand 'er on edge across the runner and drive 'er down in the sand to 'bout the level of the top of the dam. 'N then when the slag 'd come from the tap hole floating on top of the iron she'd hit the skimmer plate and be diverted into a trough leadin' to the granulatin' pit. Iron 'd flow beneath the skimmer plate 'n over the dam down the main runner 'n into the sand pig molds."

"Would she take the slag off in good shape?" I asked.

'N lightin' 'is pipe again, he sez: "Sure, she did the trick alright but we had to have a lotta skilled men around. 'Course every once in awhile we'd get a boil 'n then . . ."

Interrupting 'im, I sez: "Lotta fireworks, huh?"

"Yea," he sez. Then he'd let go with a laugh 'n the expression on 'is face 'd make a jack-o-lantern blush with shame. "When the boys would make up the sand runner," he sez, "sometimes they wouldn't get 'er thoroughly dried, 'n when the iron 'd come from the furnace 'n hit the wet sand—well it 'd be jus' too bad. The iron 'd start boilin 'n then pretty soon she'd explode. Away 'd go the dam and 'fore y' know it, the iron and slag 'd be all over the pig beds."

"Some mess, huh?"

"Yea—we'd have to get the stockhouse crew to come up in the cast house 'n then we'd go after 'er for a quick cleanup. At the place where the boil started we'd find a big chunk of iron buried in the sand. We didn't 'ave a crane, so we'd bring up a tripod made of heavy timbers 'n with a chain block we'd get the skull up high enough to get a narrow gage truck beneath 'n then take 'er out of the way so the boys could make up a new sand runner, skimmer and dam for the next cast."

"Not a bad day's work, Ol' timer?" sez I.

"Naw—'course sometimes we'd get a sudden rush of iron when we were castin' the furnace and away 'd go the walls of the sand runner and we'd get a mess jus' as sure as y' live."

"Musta required skill to make up the skimmer trough and branch runners," I sez.

Gets a Brainstorm

"Yea, plenty," he sez. "But one day Mike Killeen, the assistant super came 'round the furnace when we were cleanin' up after a boil. He sez to me, 'I gotta idea how we can stop makin' these messes 'n in a few days I'll have some patterns sent over and we'll cast a skimmer trough outta iron.' In the course of time the pattern arrived and we molded an iron trough somethin' like this."

The ol' timer took his pencil and sketched on a piece of paper a Killeen skimmer, somethin' like appears on this page.

"How'd she work out?" I asked.

"Like a dandy," he sez. "Fact is she worked so well that we made more of 'em 'n equipped the other furnaces at the plant with 'em. 'N then when patent papers were issued other blast furnaces began to install them, 'n today every blast furnace in the United States uses the Killeen skimmer."

"Suppose the company paid Mike a royalty on his skimmer."

"Never heard," the ol' timer replied. "But there's an interesting sidelight on the Killeen skimmer I wonder if you've ever heard."

"Naw, can't say I have," I sez.

"T'was like this. One day the superintendent, Harry King, called Mike into his office and he sez, 'Mike, we gotta get our costs down and I want y' to drop some men in the stockhouse cuz I think we can keep the furnaces filled with the fewer men.' "

" 'Can't do it, Boss,' Mike replied, 'We're usin' 22 men in the stockhouse on each 12-hour turn per furnace 'n we can't get along with less.'

" 'Y' gotta do it,' sez the super.

" 'I'm tellin' y' I can't do it, Boss,' sez Mike.

"One word led to another. Sparks began to fly. 'N finally Harry King spoke up and he sez to Mike, 'Your

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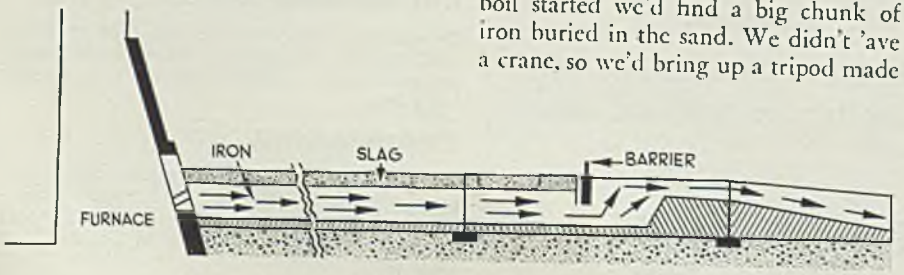

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For many years McKee men have worked together as an organization. The coordination of effort born of this long experience enables us to take advantage of all short cuts in construction time.

Each phase of engineering and construction progresses smoothly within *one* organization.

The McKee Method places undivided responsibility on this organization. This method not only produces more efficient and more economical construction, but results in completion earlier than by any other method.

Entrance of the new McKee Building at 2300 Chester Avenue, Cleveland, Ohio.

This modern, fireproof building, containing 34,000 square feet of floor space is completely air-conditioned for winter and summer . . . Designed to create ideal working conditions, it is spacious and unusually well lighted.

The modern facilities and conditions provided in our new headquarters place us in a position to serve you more efficiently than ever before.

Arthur G. McKee & Company

★ *Engineers and Contractors* ★

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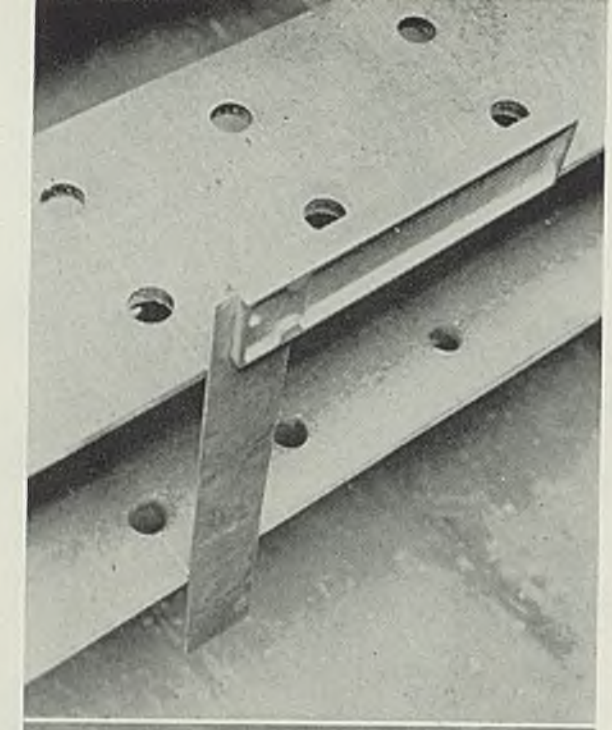

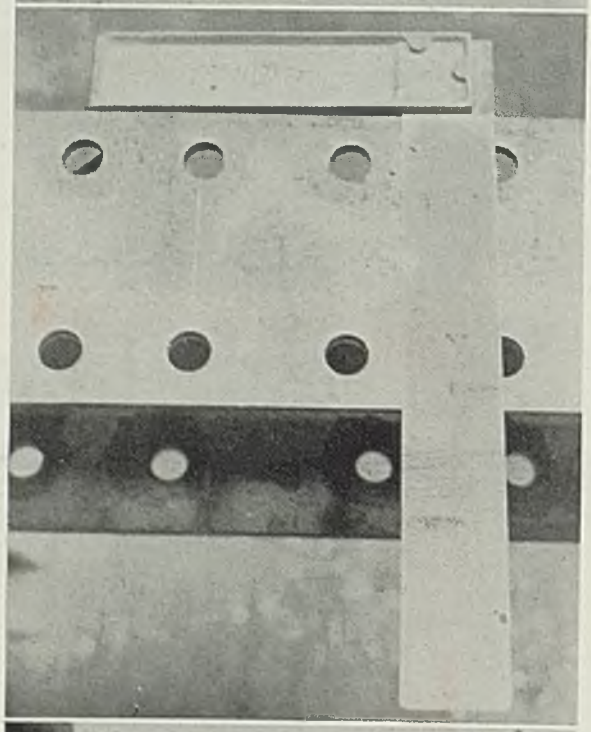

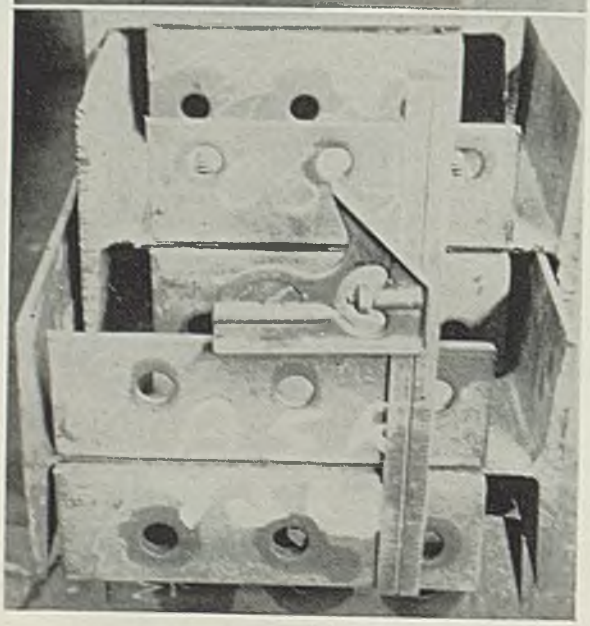

How to Inspec

■ JUST to get started off "on the right foot," let's see what an inspector is supposed to do. In the first place, no inspector should attempt to clarify or modify engineers' specifications without specific information or instruction from such engineer. It is the inspector's duty to report deviation from plans and specifications and he has the power to stop work pending opinion of the engineer. Advice or direction of the inspector is not binding on the engineer and does not release the contractor.

Where inspection shows they are needed, obtain approval of the engineer for additional fillers, inserts or reinforcements not shown on original plans or approved details. The inspector should be guided by the purpose of any detail from the standpoint of strength, permanence and appearance before reaching a decision to reject work and delay fabrication.

Never, under any circumstance, should he attempt to regulate or remonstrate with fabrication or erection crews; go directly to the one in charge.

The inspector must see that sections of the proper size and weight are used as called for on the original plans or approved revisions. Watch for substitution of foreign material for domestic. On American steel the name of the mill, in full or abbreviated, is rolled in the webs of beams and columns, in the inside web of channels (between the flanges) and on the inside wide leg of angles. Any material not bearing these roll marks and showing abrasion marks indicative of grinding at regular intervals of from 5 to 10 feet should be liable to suspicion.

Do not check with a cheap tape and expect close tolerance. All tape manufacturers make a low-priced tape that is "off" as much as 3/16 to 5/16-inch in 50 feet. A steel tape quickly acquires the temperature of the steel it lies on, and so, since it has approximately the same coefficient of expansion, no allowance need be made for temperature differentials.

When checking dimensions, take overall dimension first, then dimensions in between. In this manner, erroneous in-between dimensions will not be overlooked. When the layer out duplicates angles by stacking and squaring them from a templet angle, see that no portion of the stack sags for this will produce layouts varying from the templet.

Structural sections subject to stress should be re-

Left, top, shows recommended method of checking alignment of flange holes while at center the square is being used to see that holes are at right angles to the gage line. Of course, centers of connection holes should line up and the bottom view shows one method of checking them.

Structural Steel

By S. Rosenthal

While the duties of an inspector of structural steelwork are more or less well defined, no complete presentation of them appears available. To meet this need, STEEL here presents the picture as one authority sees it—a practical man who has seen 16 years in steel construction work. To many building inspectors and engineers with little experience in this type of work, the accompanying material will serve as a basis of procedure and will help acquaint them with certain of the fundamental requirements so they will "know what it's all about" and have sufficient self-confidence to attempt more than a mere cursory examination

jected if pipes or laminations are present. Heavy beam sections are invariably cambered. See that this camber is arched up. Excessive camber in beams or channels must be removed.

Erection marks should always be legible and understandable. Where material is to be stored for some time or subject to rough handling, it is well to place these marks with a steel stamp or center-punch.

Plates that are to be bent to a greater angle than 1½ inches in 12 inches should be bent hot. To prevent fracture, bend all plates across the grain. Guard anchors, expansion joint anchors and the like may be formed cold but stress relieve by heating to a cherry red and allow to cool in the air. Reject material that is pocked from overheating. Where bent plates must have the bend reduced, do not permit it to be done cold for the plate will crack on the inside of the bend.

Watch for oversize punches and dies and insist that holes be proper size. Check on the drill man occasionally. A drill that has its point ground off-center will drill an oversize hole.

See that holes for rivets and unfinished bolts are made 1/16-inch larger than the nominal diameter of the rivet or bolt. Holes for turned bolts or pins should be drilled or subpunched and reamed to 1/50-

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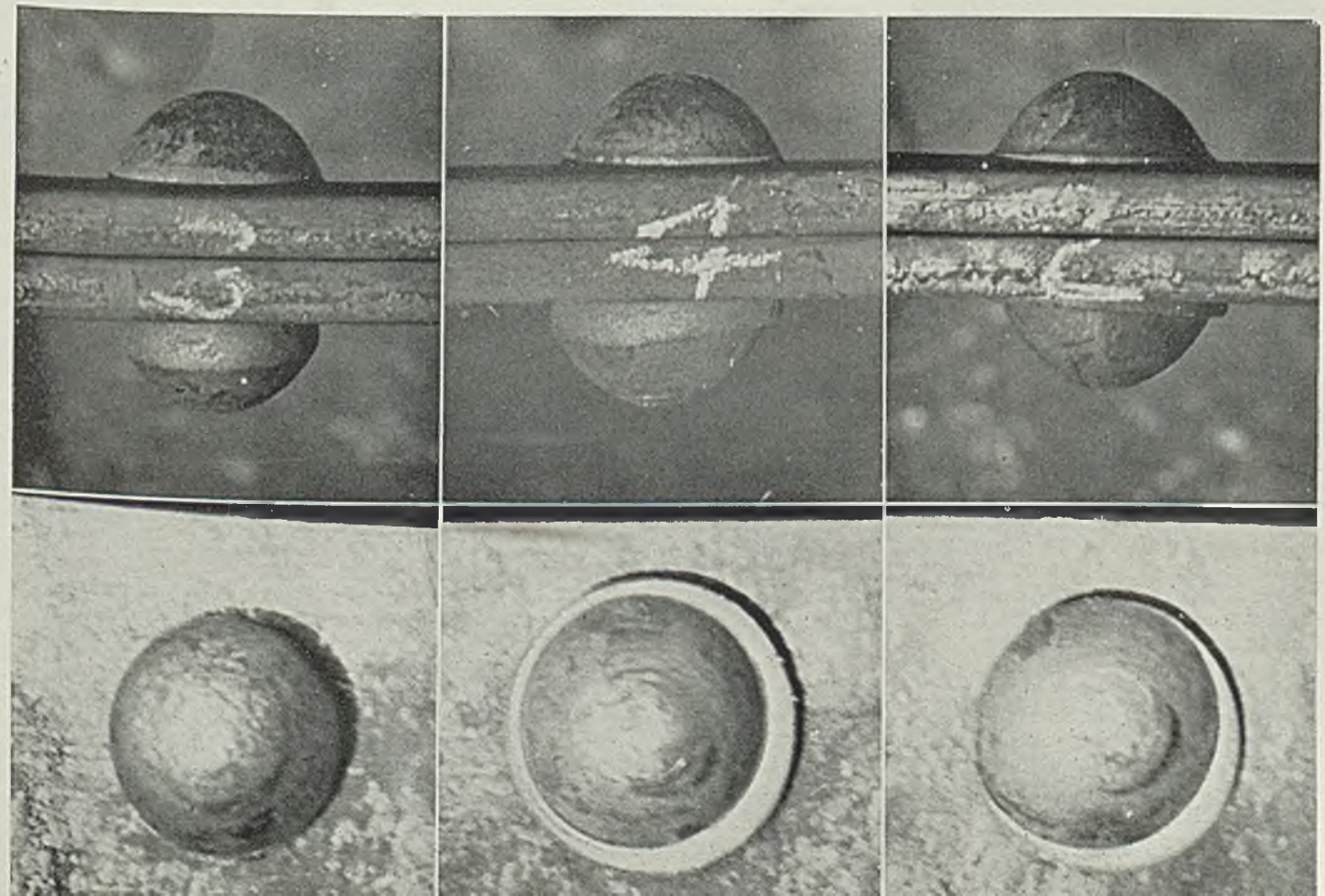
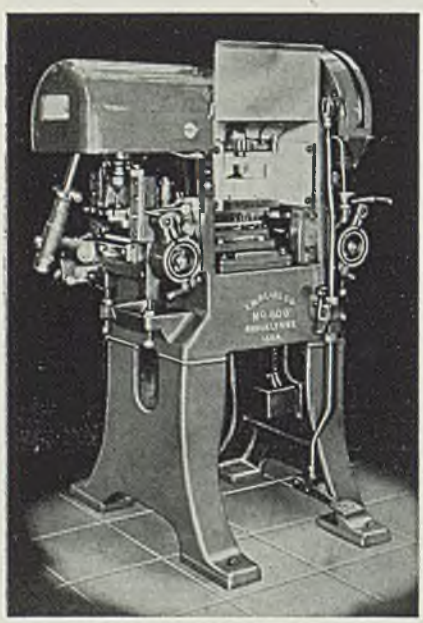


These are side and top views of various types of defective riveting practice. Left to right are shown results of having the rivet too cold, rivet too long, dies of riveting machine not in line giving an effect called "soldier caps"

Industrial Equipment

High Production Press

■ E. W. Bliss Co., Fifty-third street and Second avenue, Brooklyn, N. Y., announces a new No. 608 high production press capable of speeds up to 1200 strokes per minute. Its heavy one-piece frame together with the light cast steel slide enables it to run at these high speeds. Two steel connections and bronze lined gibbing of generous length combine to help maintain alignment of the slide. Electric detectors can be em-



ployed in connection with an electric protective trip. The distance of the press bed to the slide with adjustment up is 7 inches. The unit's standard stroke is ¼-inch. Its capacity is 8 tons.

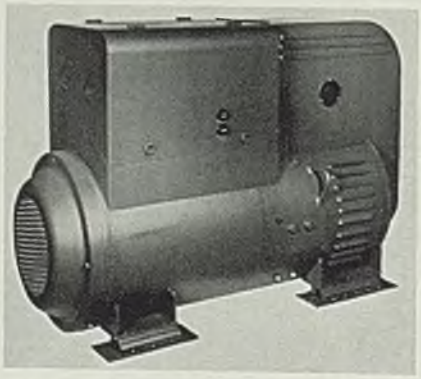
By-Pass Tilter

■ Logan Co., Louisville, Ky., has introduced for steel mill use, a new type steel coil by-pass tilter with dual discharge positions. One of these is shown here at the discharge end of a 60-inch pickling line. The unusual pivoting arrangement is due to the fact that the bed of tilter when in normal position serves the upper conveyor line at an elevation of 4 feet 8 inches whereas the conveyor line in the foreground, which it also serves, is at 13 inches elevation. Coils destined for the cold mill travel to the mill on the upper line (bed of tilter when in normal position is in line with same). Coils which are not cold rolled are by-passed by the tilter to the lower line which takes hot

rolled coils to storage or shipment, in the opposite direction from cold mill line. In like manner, other tilters located in the upper line handle coils from 48 and 36-inch pickling lines.

Adjustable Drives

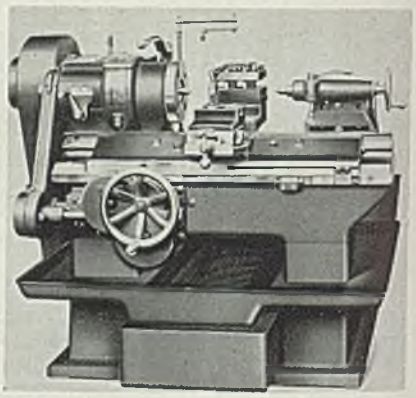
■ Reliance Electric & Engineering Co., 1088 Ivanhoe road, Cleveland, has placed on the market three additional V*S all-electric alternating-current adjustable-speed drives in sizes of 20, 25 and 30 horsepower suited for larger applications, particularly in the printing, textile and machine tool fields. It is mounted horizontally instead of vertically, the mounting brackets containing special longitudinal rubber shock pads to insure quiet operation. Three wires from the 3-phase 60-cycle alternating current power source (which may be 220, 440 or 550 volts) are connected to the control unit exactly as in case with any motor and control. From the control unit, secondary circuits are run to the other three elements of the "drive"—the driving motor, speed adjuster, and start-stop-push button station. Both the speed adjuster and the buttons for starting and stopping the driving motor can be located any-



where on the machine convenient to the operator. The driving motor is a type T designed for adjustable-speed service. It can be supplied in a variety of types, including enclosed fan-cooled, splash-proof and explosion-proof. Gearmotors also may be used. Connection to the machine is by any one of the methods regularly used for direct motor drives. The motor can be started and stopped without interfering with the speed setting. Moreover, the speed can be changed while the motor is in operation. Quick stopping is obtained by regenerative braking.

Multicut Lathes

■ R. K. LeBlond Machine Tool Co., 2694 Madison road, Cincinnati, announces two new Multi-Cut lathes—a 6-inch and a 9-inch machine for easy setup of separate tools for turning, facing, necking and grooving cuts. Operation of each is automatic from the time the work is put into the lathe. At the end of the cycle of cuts the handwheel is used to return the tools preparatory for the next part to be turned. The variation in feed for the turning and facing sides is obtained by change



gears applied to the feed bracket and worm box. The feeds read in "thousandths per revolution of spindle". A simple, direct reading, work diagram shows the change gear combinations and the resulting feeds. The relationship between the slides is adjusted quickly by the setting of the movable profile swivel plate. As the facing or forming tools approach the end of the cut the feed is retarded and stops as the roller slides on the land of the profile guide plate.

Versatile Clamp

■ Detroit Stamping Co., 3445 West Fort street, Detroit, has introduced a new C clamp featuring a quick acting toggle movement which enables it to be used for more types of work. It has two holding rods instead of one, and when released the entire lower half swings clear of the work. This enables the operator to get around obstructions in fixtures, and to take in and clamp such pieces as angle or T-shaped iron. The 2-rod adjustment permits holding the work exactly at the right spot. The clamp is made in two models. One has two threaded rods

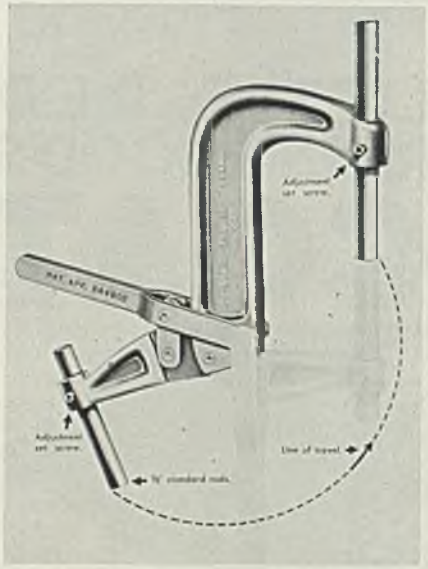
THOUGHTS ON POPULAR COATS NO. 9 *By Hanlon-Gregory Galvanizing Co.*

LITTLE RED RIDING HOOD'S COAT

A point notably overlooked by most of those who have heard the story of Little Red Riding Hood is the fact that nobody knows her real name, nor the name of her grandmother, nor the name of anybody in the story. She was famous for her red coat, but we don't know all the facts about her. If a newspaper reporter covered the story he would boil it down to this: "Miss Dolly Dumpling, 8 years old and pretty, daughter of Mr. and Mrs. Dan Dumpling, 1511 Belmar Rd., was rescued early this afternoon from a timber wolf at the home of her grandmother, Mrs. Dorothy Dumpling, R.F.D. No. 7, Hinkley, by the timely intervention of Elmer Whosis, C.C.C. worker at Camp Avery, Company 2525, Fifth Corps Area. After slaying the beast with an axe, Mr. Whosis performed a hasty autopsy on the creature and extracted Miss Dumpling, who was none the worse for her experience." Now, there is a story filled with facts. When we speak about the protective coating obtained by the HANLON-GREGORY HOT DIP GALVANIZING PROCESS we like to fill in additional facts, too, and they are these: HOT DIP GALVANIZING makes the zinc coating an inseparable part of the base metal; it renders the ferrous metal impervious to corrosion for generations; it is the best way yet devised to combat rust.

HANLON-GREGORY GALVANIZING CO.
PITTSBURGH **PENNA.**

which facilitate adjustment and the other has two smooth rods which are set-screw adjusted, making it



especially suited to arc welding work. The clamp itself is of malleable iron, the rods of steel and the toggle handles of case-hardened steel. It is said that it is impossible to permanently damage or distort the C clamps up to a pressure of 1000 pounds.

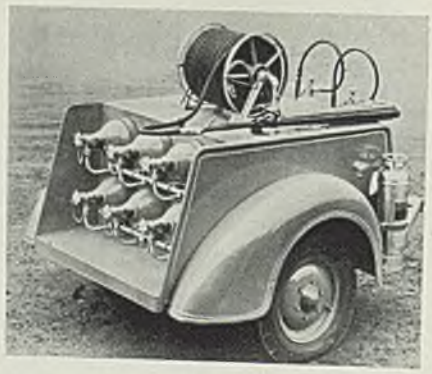
X-Rays Map Human Eye

■ Westinghouse X-Ray Co., East Pittsburgh, Pa., announces X-ray equipment for mapping the human eye. With it splinters of glass and metal embedded in the eye can be located while the patient wears a special curved contact lens over the injured eyeball. The contact lens has four lead dots on its surface. X-rays passing through the eyeball and the lens reveal these dots as white spots on the negative. The

foreign body is then charted by comparing its position on the film with the white spots. The new X-ray device is an L-shaped head rest which holds the X-ray film. Frontal views of the eye are made by placing the X-ray tube on a horizontal plane and aiming it at the back of the patient's head from a distance of 3 feet. For profile views the X-ray tube is suspended over the patient's head and pointed downward. Lines are drawn on the completed picture to show the relationship of the foreign body to the four lead dots. Measurements are then transferred to a prepared eye map.

Fire Fighting Unit

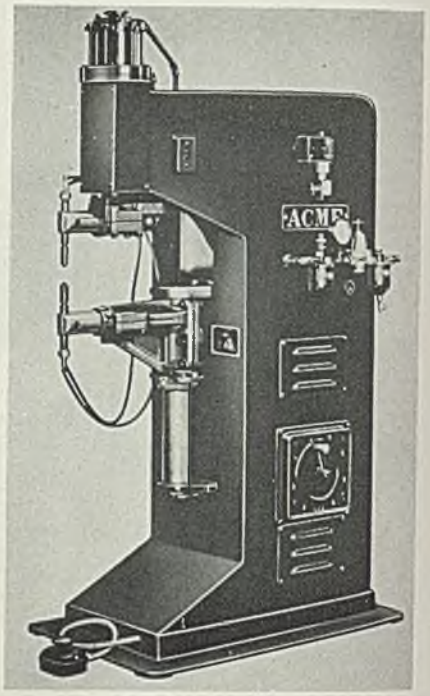
■ Walter Kidde & Co. Inc., Bloomfield, N. J., has placed on the market a compact and versatile fire fighting weapon designed to be hooked up as a trailer for emergency use. It carries a heavy armament against fire, being equipped with a battery of six 50-pound carbon dioxide cylinders, a hosereel and nozzle. The cylinders are manifolded together and are individually operated by valves. Carbon dioxide gas is discharged onto the fire through 100 feet of ½-inch hose, fed through a trunnion manifold. Allowance is made for control of the discharge at the "business end" of the extinguisher, through use of a shut-off valve on the nozzle handle. For smaller fires, two portable carbon dioxide extinguishers of 15 pounds capacity are carried on the front platform of the trailer, in addition to two 2½-gallon pure-water extinguishers which operate on the



principle of a syphon bottle. They contain a small cartridge of carbon dioxide which is released when the extinguisher is inverted, and which propels a water stream to an effective distance of 30 to 40 feet. The new trailer is especially useful for industrial plant fire brigades for use as "first aid" fire extinguishing equipment. The trailer unit is primarily designed for use on large fires in flammable liquids and electrical equipment.

Spot Welders

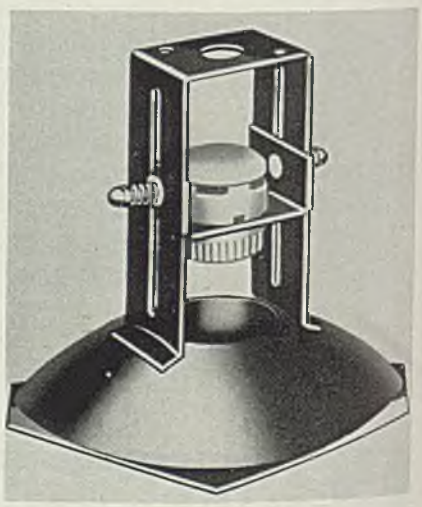
■ Acme Electric Welder Co., 5621 Pacific boulevard, Huntington Park, Calif., has introduced a complete line of direct-action air-operated press-type spot and projection welders. The welders are manufactured in transformer capacities from 30 to 150 kilovolt amperes. In the smaller capacity, their throat depths are available from 12 to 30 inches and in the larger capacities, from 12 to 48 inches. Eight steps of heat regulation are standard on each, but up



to 32 steps can be supplied on special order. The all-welded fabricated steel construction of the welder bases provide extreme rigidity and sturdiness. Other features include watercooling of secondary, column and electrodes, universal double end reversible horns, positive locking type heat regulating switch, piston packed mirror ground air cylinder cushioned on both up and down stroke and complete air equipment including air filter.

Reflector

■ Fostoria Pressed Steel Corp., Fostoria, O., has placed on the market a new reflector which eliminates much loss of heat in infra-red baking tunnels. Known as model QR,



it is hexagonal in shape, making it possible to obtain an enclosed type

Greater switching and haulage service on

BUDGETED HORSEPOWER

In mills and plants all over the country, WHITCOMB Diesel locomotives, such as the one pictured above, are demonstrating through actual service how they cut costs on maintenance and improve operations at the same time. Budgeted horsepower solves the economic angle; that is why these uncomplicated, inexpensively produced locomotives are finding their way in increasing numbers into large American plants. WHITCOMB locomotives come in various types: there is one to meet the demands in YOUR plant. We will be happy to send you a copy of our book dealing with WHITCOMB Diesel locomotives. This book has been well received by industrial executives: have you sent for your copy yet?

BLW THE BALDWIN GROUP

THE WHITCOMB LOCOMOTIVE CO.

ROCHELLE, ILL.

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

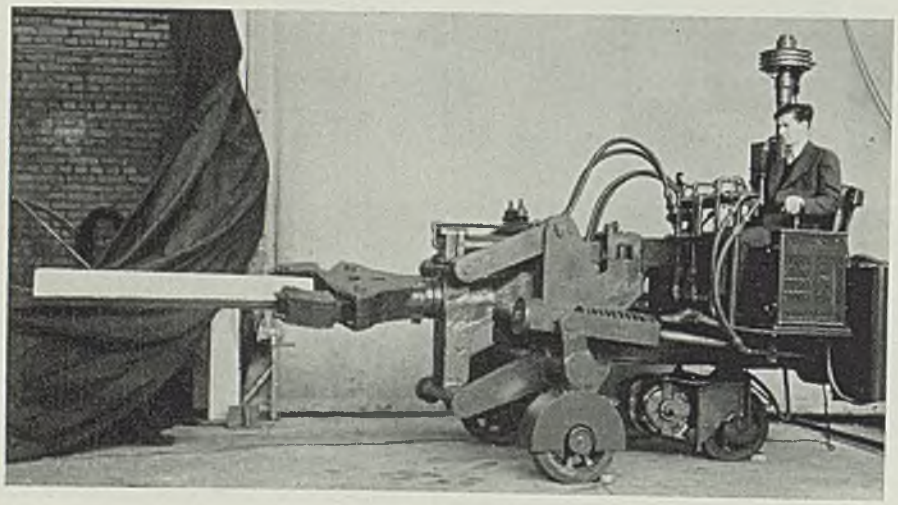
of near infra-red tunnel. Because it is possible to "nest" hexagonal shapes closely, an almost solid reflecting surface is obtained in a multiple assembly installation. The reflector measures 10¼ inches in diameter and is available in single units or in multiple assemblies. A smaller size, model QM, measures 7¾ inches in diameter, and is similar in appearance.

Oil-Immersed Starter

■ General Electric Co., Schenectady, N. Y., has introduced a new combination oil-immersed A-C starter for use in corrosive or hazardous gas locations. It is available in two forms—with or without a circuit breaker. To facilitate installation, a one-piece cast-iron head, used in both forms, permits conduit entrance from five directions. Stainless steel and Monel metal are used for all exposed parts—a copper-bearing steel tank and the cast-iron head provide additional protection. Reversible tips prolong contact life and protection against overloads is supplied by an isothermic induction-temperature relay immersed in the oil.

For explosion-proof control, the device is furnished with an extra deep tank. The oil level can be easily ascertained by a heavy bull's-eye located in the front of the tank.

Where other provisions have been made for short-circuit protection and disconnecting, a circuit breaker is not included. Where such protection is needed, however, the breaker supplied is a new type, rated at 10,000 amperes interrupting capacity and designed for operation under oil. For extra safety, the circuit breaker handle is interlocked with the tank so that the breaker must be open before the tank can be lowered.



2000 lb. Capacity Auto Floor Manipulator

Milling Machine

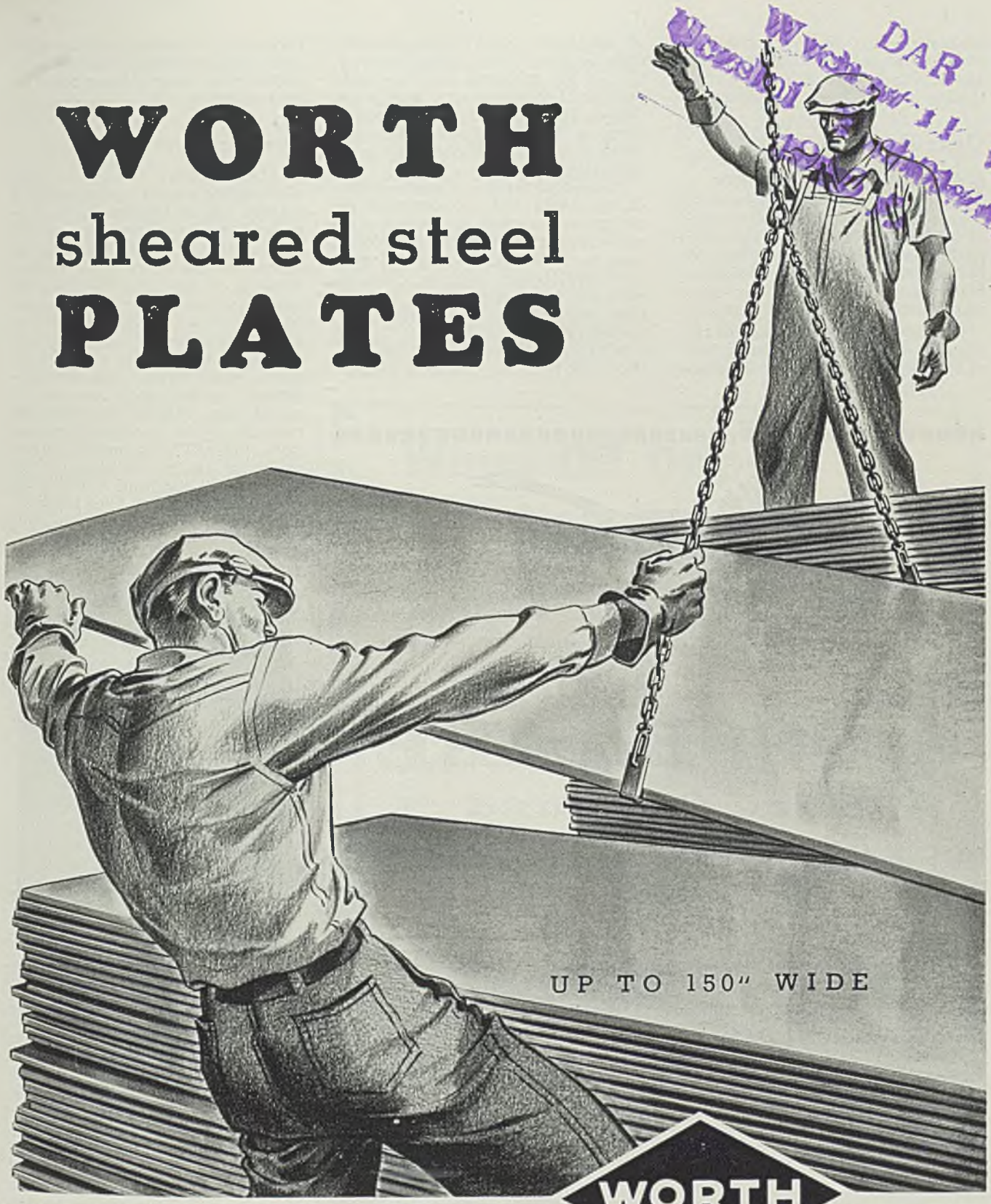
■ Atlas Press Co., Dept. 7, Kalamazoo, Mich., has placed on the market a new milling machine which handles the full range of milling operations from heavy slabbing and facing to light end milling, keyways, finishing and layout work. It features three types of table controls—standard screw feed, rapid-production lever feed, and the new Changeomatic for instant selection of automatic table feeds. A wide range of spindle speeds provides surface speeds for all types of work

and cutters. A swivel vise, rotary index table and coolant system also are available along with indexing centers. The working surface of the table measures 4½ x 18 inches and the longitudinal table travel is 12 inches (10 inches with Changeomatic). The vertical table travel is 6 inches. The arbor is ⅞-inch in diameter.

Grinding Attachment

■ Industrial Engineering Co. Inc., Pence building, Minneapolis, announces a new Quick Way twist drill grinding attachment suitable for use on Black & Decker and Van Dorn bench machines. It grinds drills like new and provides lips of equal length and angles (59 degrees). It also provides the proper clearance to allow the drill to cut easy. Drills up to 1½ inch in

WORTH
sheared steel
PLATES



Quality controlled from ingot to finished plate. Service assured by efficient set-up for prompt shipment by rail or water.

WORTH STEEL COMPANY
CLAYMONT, DELAWARE

CALL THE NEAREST REPRESENTATIVE • New York, N. Y., Wm. C. Dickey • Pittsburgh, Pa., McKee-Oliver, Inc. • St. Louis, Mo., Hubbell & Co. • San Francisco, Calif., W. S. Hanford • Houston, Texas, The Corbett-Wallace Corp. • Cleveland, Ohio, E. F. Bond • Detroit, Mich., H. L. Sevin • Los Angeles, Calif., Ducommun Metals & Supply Co. • Seattle, Wash., Barde Steel Company • Portland, Oregon, Barde Steel Company • Montreal and Toronto, Can., Drummond, McCall & Co. Ltd.

diameter may be accommodated. The attachment comes ready to use and is attached to either a 6, 7 or 10-inch grinder in a few seconds.

Gear Rougher

■ Gleason Works, Rochester, N. Y., announced a No. 7 straight bevel gear rougher for the roughcutting of straight bevel gears up to 14-inch pitch diameter and 6:1 ratio in large or medium quantities. It features high-rate of production, the speed and ease of set-up and operation.

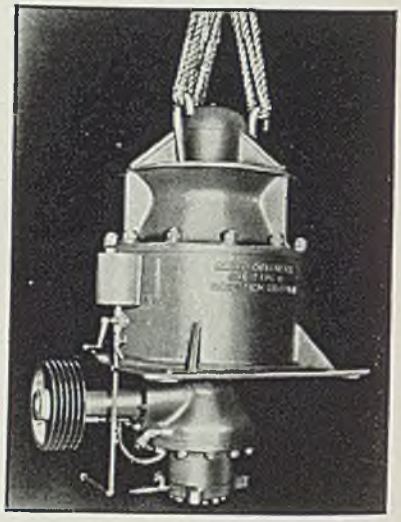
The outstanding advantage of this machine is the close roughing both as to the taper and the profile shape of the tooth. Fast cutting is possible because of the rigid construction of the machine and the small number of moving parts. Both a hydraulic chuck and hydraulic movement of the work head add to the speed as well as the convenience of operation.

The proper taper and profile shape of the tooth slot are obtained by the combined effect of the shape of the cutter blades and a horizontal motion of the cutter spindle. A disk cutter with blades extending radially outward from the cutter body is used, and is mounted to rotate in a horizontal plane.

A hydraulic control lever operates the work head for changing blanks, including chucking, movement of head and clamping of head. Indexing of the work spindle is controlled by change gears.

Ore Crusher

■ Allis-Chalmers Mfg. Co., Milwaukee, has placed on the market a No. 636 type R Crusher, having a 6-inch width of feed opening and a 36-inch diameter crushing head. It operates at higher speeds than other crushers of the gyratory type, and has a crushing stroke for a high capacity, cubically shaped product. It also is suitable for handling large tonnages of stone or ore. Of all-steel construction, the crusher's spider and top shell are cast integral, and readily removable for replacing of its one-piece steel concave ring and head mantle. Adjustment for taking up wear on this liner and on the head mantle is accomplished by an oil filled hydraulic jack which supports the main shaft



and is located on the bottom plate of the crusher. The jack, under normal operation, holds the head and shaft firmly in position for maintaining a uniform product, but the arrangement also readily provides adjustment for product size. A safety feature permits automatic relief for tramp iron. The crusher is driven by high speed cut steel gears, located in the bottom shell and operated in a bath of oil. The oil is cooled in an external cooling tank. The counter shaft is driven by flat-belt or Texrope drive. Dust seals keep the working parts of the crusher clean.

Barrel and Drum Tipper

■ Palmer-Shile Co., 7100 West Jefferson avenue, Detroit, has introduced a new barrel and drum truck that handles loads up to 1000 pounds with ease.

Weighing only 85 pounds, it is of all-welded steel construction. The

truck is narrower than the standard drum, so a barrel or drum can be taken from a row, or back-in-among-others, as easily as when it stands alone.

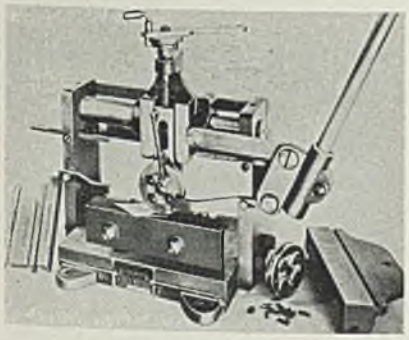
Steel Pallets

■ Truscon Steel Co., Youngstown, O., has introduced single, double and semi-double face steel pallets for handling materials. They are formed from proper gage steel into which deep stiffening ribs are pressed. Through a method of forming the corners, additional reinforcement is provided to give pallets the greatest possible strength. An additional feature at each end is the enclosed wire rod, which extends completely around the opening, increasing rigidity at these points.

Sharp edges and projections have been eliminated. The top and bottom side corners of the pallet are rounded, and the metal at the ends is wrapped around the reinforcing rod and welded.

Marking Machine

■ H. O. Bates, (The Acromark Co.) 251 North Broad street, Elizabeth, N. J., announces a new No. 9 marking machine for marking both round and flat parts including tapered articles. It is adaptable to marking names, specification numbers and other information into a variety of shapes and sizes. The marking area is sufficient to take parts up to 10



x 4 inches. Round pieces are rolled as a flat die impresses the mark, whereas flat parts are marked with a roller die. Holders will take steel type or solid lettering dies and both are quickly interchangeable for any marking. Suitable holding fixtures can be made to suit requirements.

Water Drain

■ DeVilbiss Co., Toledo, O., has placed on the market a new automatic water drain for use in compressed air lines. Known as type HOD, it is available with four convenient fitting assemblies.

Its job is to prevent water from being carried into the tool being used, and is especially desirable in the spray painting industries.

The water drain is operated automatically by a slight fluctuation of the main line air pressure. A variation of as little as five pounds is sufficient for its operation. A manual drain is provided for use in periods when the main air line is not in use.

Lamp Starter

■ Hygrade Sylvania Corp., Salem, Mass., announces a new Mirastat fluorescent lamp starter available in three sizes. Mirastat No. 2 is for use with 15 and 20-watt fluorescent lamps; No. 4 is for use with 30 and 40-watt lamps; and the No. 6 is for use with 100-watt lamps.

Improvements embodied in the starter include elimination of "sputtering," retardment of blackening at the lamp ends, longer lamp life and definite, accurately-timed starting and restarting. These units consume approximately ¼-watt and operate with fluorescent lamps on either direct or alternating current. The starter circuit includes a condenser which minimizes radio interference. Compensation also is made for temperature, so that the starter operates satisfactorily over a wide range of surrounding temperature conditions. The new unit is inter-

changeable with glow relay types of starters as it uses the same type of socket.

Unit Heater

■ Autovent Fan & Blower Co., 1805 North Kostner avenue, Chicago, announces a redesigned line of steam unit heaters which provide efficient heating at any steam pressure from 2 to 150 pounds. Strength and durability have been stressed in the casing design of each heater to give added protection to the heating element.

The vanes or deflectors have been recessed for appearance and are individually adjustable in order to direct heat accurately to working areas. These units employ the 31 Series nonoverloading fan wheels. Their coils are tested at 500 pounds hydrostatic pressure. The heaters also are capable of stopping drafts and holding back cold air seepage on unprotected walls.

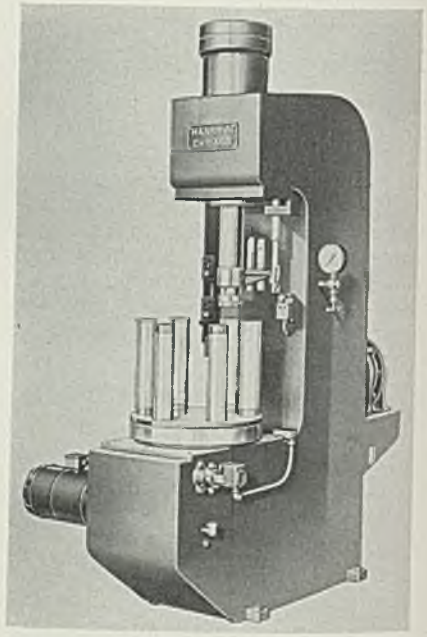
Sight Feed Oiler

■ S. F. Bowser & Co. Inc., Fort Wayne, Ind., has placed on the market a Figure 817 pressure sight feed oiler for lubricating elevated or out-of-the-way bearings. By installing it at eye level height from the operating floor or catwalk, the machine operator can, at a glance, tell when oil is flowing to a bearing, and by noting the position of the plunger can tell the approximate amount.

Its body is of wrought steel finished in black enamel with polished, nickel plated trimmings. It has a needle valve adjustment and capacity of ¼ pint to 1 quart per minute. Equipped with adjustable snap rings for indicating amount of oil flow, it is available with ¼ or ⅜-inch tapped connections and maximum working pressure of 50 pounds.

Shell Marking Press

■ Hannifin Mfg. Co., 621 South Kolmar avenue, Chicago, has introduced a new 20-ton hydraulic shell marking press for marking 75 millimeter shell casings. It operates with a rapid, automatic cycle of approximately 4 seconds. Its ram is fitted with a marking die, and when



once started, operates continuously, with automatic reversal at the top of the stroke, and automatic reversal governed by maximum pressure at the bottom. The pressure governed reversal at the end of each working stroke insures uniform maximum pressure being exerted on the die. Both the pressure and stroke of ram are adjustable. An electrical control actuated by the ram on the return stroke operates the indexing table. The circular table is equipped with six mandrels. Indexing mechanism of the table is driven by a ¾-horsepower motor, and an electric brake controls automatically the advance of the table one position with each return stroke of the ram. The press operates at a maximum rate of 15 cycles per minute. A 10-ton model of same design also is available.

Structural Inspection

(*Concluded from Page 85*)

inch larger than the external diameter of the bolt or pin. Where holes are to be fitted to rolled-body bolts, check them with a bolt taken at random from the actual shipment of bolts to be used and do not check with any stray bolt that happens to be lying around. Such stray bolts may easily be over or undersize.

Be sure all material is thoroughly straightened before assembly by methods that will not cause injury to the metal. After assembly, all parts should lie close against each other and show no open joints. Contact surfaces should have burrs and scarfs removed.

Do not allow drifting to enlarge unfair holes because the metal adjacent to the hole is then upset and the thickness of the stressed side of the hole is increased causing separation of the contact surfaces. Holes that must be enlarged to admit rivets should be drilled or reamed. Poor matching of holes is a cause for rejection. Any enlarging of holes after punching must be done by reaming or drilling, taking care that the holes are concentric and normal to the surface of the member. Do not permit blind holes to be burned full size; burn a small hole and ream to correct size.

Keep Surfaces Clean

If oil or grease is used as a lubricant when reaming or drilling, it should be applied so as not to soil surfaces that are to be painted. Object to lubricant on work skids as it adheres to steel and prevents bonding of paint and embalment.

Where heavy hammering is necessary to line up members, insist upon the use of a flatter to avoid nicking. See that all slivers are removed. They are dangerous to everyone on the job. All burrs are to be removed carefully from the edges of drilled or reamed holes before rivets are inserted.

Be sure that compression joints depending upon contact bearing have the bearing surfaces truly machined to a common plane. Stiffener connections must truly bear if they are to function properly.

Watch heels of angles on truss chords and girder flanges and see that they are true to line and free from twists, bends and open joints. Web and gusset plates should not project, especially at bearing points. Trusses and girders must rest level while being riveted or they will take a permanent set.

Rivets must be heated uniformly and to a temperature not exceeding 1950 degrees Fahr. with sufficient time allowed for soaking. Do not allow them to be driven after their temperature is below 1000 degrees Fahr. See that rivets which "run," emit sparks or "spit" are not driven.

Rivets heated to excessive temperatures are subject to abnormal opposing strains of compression and tension—compression by riveting forces, tension by transmission of excessive heat to gripped surfaces causing abnormal expansion of these parts. This alternate compression and expansion may easily cause heads of rivets to pop off in driving.

The heads of rivets should be formed with the right amount of stock to avoid collars and undersizes. See accompanying illustrations for typical unsatisfactory riveting samples.

Be sure any loose, burned or otherwise defective rivets are cut out and replaced, but care must be taken not to injure adjoining material in so doing. Loose but neat appearing stitch rivets in tension members need not be removed.

A loose rivet may be discovered by striking the rivet head a sharp blow with a light hammer specially made for the purpose. An experienced inspector can detect loose rivets by the jar on the hand and the sound produced, even when no movement can be seen. Sometimes at-

tempts are made to deceive inspectors by caulking the heads of loose rivets or by giving them several sharp blows with the riveting machines.

When it is found necessary to cut out rivets, the inspector should strike the rivet with a sharp pointed hammer to so injure the rivet that it must be replaced. This avoids argument which is sometimes encountered when chalk is used.

Material to be painted should be cool enough to handle with the bare hand. Excessive temperatures prevent uniform drying and cause discolorations as well. In the case of leaded paints, the protective elements may even be melted or vaporized off. The surfaces of the metal should be clean and dry before painting. Any oil or grease should be removed prior to sandblasting, and sandblasted material should be painted immediately.

Two tests for linseed oil are: Odor unlike any other oil; mineral oil produces iridescence when few drops are deposited on water.

A test for lead paint is simply to heat a small quantity. Any lead present will show up as metallic lead.

Sliding contacts must not be painted, but should be protected from rusting by white lead and tallow, or by greasing. Where paint has to be removed from these surfaces it is preferable to scrape it off as burning it off may affect surfaces inaccessible for retouching.

The inspector will do well to familiarize himself with the appearances of good and bad welds and their causes as shown in any good welding handbook. A good reading of the qualification requirements specified by the American Welding society likewise is recommended.

Design of New Nut Follows Cotter Idea

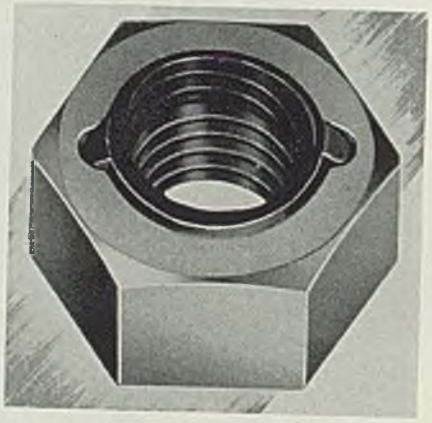
■ In its efforts to supply nuts which would give the user the same security at the thread end as at the head end of bolts, Security Metals Inc., Kalamazoo, Mich., has hit upon a design which is said to defy vibration and does not loosen, even if the bolt elongates or the parts it is holding, shrink.

Tradenamed the Security Nut this development is patterned after the Cotter principle — using the main nut to carry the bolt load and a retainer to keep it from turning on the bolt.

Referring to the illustration, the vibration-proof retainer is nested securely in the special counterbored section of the main nut. The protruding lugs prevent independent rotation of the parts. Thus the retainer follows the nut as it is wrenched to position on the bolt. The retainer itself is milled from special alloy steel. First tapped to a free thread fit, it is next distorted to an elliptical shape—after which it is heat-treated or spring-tempered.

The pressure resulting from the retainer's resilience and elliptical shape holds it firmly in the counterbored section of the main nut. Hence, as long as it is not assembled to a bolt, it remains part of the main nut. Also, when assembled to a bolt, it grips the bolt from opposite sides. It readily adapts itself to thread-pitch diameter variations.

Vibration has the effect of "seating" the surfaces and increasing the grip of the retainer.



Protruding retainer lugs of this newly designed nut prevent independent rotation of parts

When the new nut is fully assembled on a bolt, the retainer is partially brought back to its original round shape and, being no longer part of the nut, is now part of the bolt. Upon removal from the bolt, however, it resumes its elliptical shape and again becomes part of the nut — thus providing one-piece simplicity and making subsequent application easy.

The nut gives all the security of the ordinary cotter-key type of nut. It eliminates drilling of bolts—saves time and, more important, it can be left just where it ought to be.

Between Heats

(*Concluded from Page 82*)

fired 'n y' can clear out at the end of the month.' "

" 'That so,' sez Mike. 'Who gave y' authority to fire me?'

" 'N finally it came to a showdown 'n both of 'em landed in the office of Andrew Carnegie. Here the battle was renewed. The conversation waxed hotter 'n then King spoke up 'n he sez, 'Mr. Carnegie, one of us has got to leave. Who will it be, Mike or myself?'

"Mr. Carnegie leaned back in his chair, endeavored to effect a settlement and sensing that a favorable conclusion couldn't be reached gave 'is decision. Harry King was through the last of the month—Mike Killeen moved into 'is office. But the story doesn't end here.

"Harry King left as requested. Years passed. 'N then blast furnacemen began to inquire about a young feller at a certain plant in this country by the name of Harry King who was turnin' accepted operating methods upside down. His records of production, charging methods, pig iron costs—all were changed to more favorable grounds. That was 25 years ago and many blast furnacemen in this country today can trace their start to the efforts of a feller who lost out because of an important development."

"Lottsa times," I sez, "it takes an upset to bring out the best that 's in a feller. Sortava kick in the pants, as they say."

Well, fellers, so t'was in King's case. He got into difficulty, he broke it open, and its power enlisted on his side.

So long, fellers, I'll be seein' ya.

"Shorty" Long

Changes Brand Names Of Its Fire Brick

■ Building Materials division, Armstrong Cork Co., Lancaster, Pa., announces a change in brand names of its insulating fire brick and the use of different color spots at the end of each brick for easy identification of the various types. The changes are effective as of Jan. 1, 1941 and are as follows:

N-16, light-duty brick becomes A-16, and is identified by a red-brown color. N-20, the light-duty brick for use with temperatures up to 2000 degrees Fahr. will be known as A-20. It is identified by a blue color spot. A-25, for use with temperatures up to 2500 degrees Fahr., remains unchanged, but is identified by an orange color spot. EF-23 becomes A-23, and is identified by a green color spot. EF-26, for use with temperatures up to 2600 degrees Fahr., on the hot face, is changed to A-26 and is identified by a red spot.

Officials state that the change is made solely for simplification with no change in the formulation or method of manufacture.

Advertisement

FEBRUARY, 1941

COPPER ALLOY BULLETIN

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

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

Bridgeport Phosphor Bronze Betters Lock Washer Performance

The lasting resiliency of Bridgeport Phosphor Bronze is a special advantage in the manufacture of parts such as lock washers, which must retain their spring qualities for long periods of time. Bridgeport Phosphor Bronze is rolled from large castings under carefully controlled conditions. Use of larger castings and special processing with the most modern rolling mill equipment aid in retaining the springiness characteristic of the best quality phosphor bronze.

Fabricators of phosphor bronze parts requiring lasting resiliency are invited to discuss their problems with Bridgeport.

Typical of the lastingly springy parts that can be fabricated from Bridgeport Phosphor Bronze are these washers produced by SHAKEPROOF Lock-washer Company.

1940 Bulletin Index

The annual COPPER ALLOY BULLETIN index for 1940 is now in preparation and will be ready for distribution soon. Index will include reference to items in the Developments Column and will be thoroughly cross-indexed to simplify its use. Copies of the index may be reserved by writing to Bridgeport.

Machining Process Gives High Accuracy

Extreme dimensional precision is claimed for a machining process that is said to be suitable for boring, reaming, facing, milling, and other machining operations where a high degree of accuracy is desired. The value of the process, it is reported, has been demonstrated by long production service in many types of plants.

Brass, bronze, and copper, it is claimed, can be precision bored, turned, faced, grooved, and chamfered by this method. Tungsten carbide tools, it is said, are employed with high surface speeds and relatively light cuts to make possible improved finish and accuracy.

Correct Selection of Lubricants is Essential in Brass Fabrication

Lubricant Must Maintain Film Under Heavy Pressure; Choice of Specific Type Depends on Several Factors

Fabrication of brass goods, consisting of making articles from flat sheets or coils, requires that the metal be blanked, drawn or formed in dies where tremendous friction and pressures are developed.

To reduce friction to the minimum, and prevent metal-to-metal contact, a lubricant is used. Without some medium between the metal being formed and the dies, the metal would soon build up on the tools and dies and would either render the pieces totally unsatisfactory for further fabrication, or involve very high costs to remove scratches.

Factors Influencing Choice

To be truly effective, the lubricant used must maintain a film between the tools and the metal being worked. In order to do that, it must first "wet" and cover the entire metal surface and have sufficient body to remain in place under forming pressures. When applied, it must be capable of easy removal and should not produce staining of the metal. Choice of lubricants depends on:

(a) Type and severity of cold working
(b) Type of metal working equipment
(c) Quantity of work required
(d) Means of applying lubricant
(e) Comparative cost of lubricants

Below are listed various common types of lubricating materials. In general a thick-bodied lubricant is required for severe reductions while a thin or light-bodied lubricant is best for lighter operations.

Soap or Soap Pastes—animal or vegetable oil soaps containing tallow or palm oil or similar oils plus special bodied mineral oils.
Lard Oils.
Lard Oil and Tallow Mixtures.
Lard Oil and Mineral Oil Mixtures.
Vegetable Oils—rapeseed, cottonseed, castor, etc.
Various Mineral Oils.

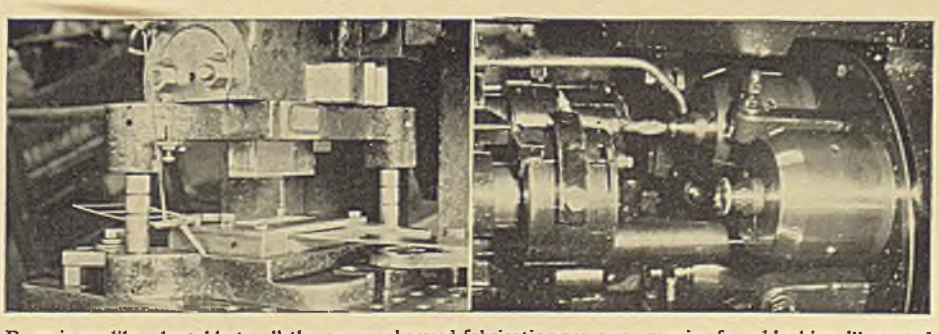
The soaps are usually diluted with water, in ratios from one part compound to four of water, to as high as one part compound to 20 of water. In blanking and cupping operations a heavier-bodied lubricant is necessary, and therefore if compounds are used, they should be in more concentrated form. The soap or soap paste compounds can be obtained from any of the large manufacturers of this class of lubricant. These lubricants diluted with water are probably the most economical to use if they work. The method of applying, whether the material is coated before working, sprayed or pumped on when going through the machine, dipped in the tank at the machine, or swabbed on, helps to determine the kind of lubricant to use. Ease of removing lubricants after cold working operation and prior to annealing is essential. Washing or degreasing, depending upon the type of lubricant, before annealing or further processing, is advisable when possible, particularly to avoid red stains.

Drawing and Forming

After blanking, cupping and annealing, some pieces require one or more drawing and annealing operations to bring the metal to the desired finished shape. In these operations more dilute lubricants are preferred.

The lard oils are considered among the best lubricants for brass working, but they are more expensive than soaps. Lard oil, if rancid, may cause objectionable red stains

(*Continued on page 2 col. 2*)



Brass is readily adaptable to all the commonly used fabricating processes, ranging from blanking, illustrated at the left, to screw machine work, illustrated at the right. Correct selection of lubricant for specific jobs aids in economical production, often allowing higher speeds and reducing finishing costs.

ALLOYS OF COPPER

This is the twentieth of a series of articles on the properties and applications of copper alloys, and continues the subject of modifications of the copper-zinc alloys.

ADDITION OF ARSENIC, ANTIMONY AND PHOSPHORUS

The effect of aluminum additions in increasing the resistance of condenser tubes to impingement failure under conditions of high water speeds was discussed in last month's column.

In Admiralty condenser tubes, failure may occur by dezincification. In this type of attack, the alloy is dissolved and the copper redeposited, while the dissolved zinc is carried away in solution. In many cases this type of attack may occur locally at a rapid rate and produce failure by the formation of porous copper plugs through the wall of the tube. While the presence of the tin in the Admiralty metal decreases the tendency toward this type of failure, it has been found that other additions to the alloy are even more effective.

Various Elements Found Helpful

The importance of the problem of corrosion resistance in condenser tubes has led to a large amount of study, and as a result, a number of elements have been suggested as additions to decrease the tendency to dezincification. Numerous patents have been granted covering the effect of these additions, and each patent emphasizes the importance of the particular addition which it covers. It would appear that each of the added elements is helpful.

The added elements mentioned are arsenic, antimony, and phosphorus. Of this group, arsenic has long been known to have a beneficial result on resistance to dezincification. Various theories have been presented to account for the decided effects that accompany the addition of .02-.04% arsenic to Admiralty. As far as is known, however, there is no general theory which might account for the effectiveness of each of the different elements, and it is probable that the mechanism may be different in each case. There is also some question as to the effectiveness of the various additions under differing corrosive conditions. These modified alloys are being supplied commercially, and experience data as to their respective merits should become increasingly available.

A. S. T. M. Specification B111-40T covers Admiralty and Aluminum Brass containing each of these added elements, and also the alloys without additions.

Lubricant Selection

(*Continued from page 1 col. 3*)

which appear after annealing and cleaning, especially if the lubricant is allowed to remain on the work for a considerable time.

Tallow, palm oil, or vegetable soaps or mineral oils are often used and possess sufficient lubricating properties. The soaps are diluted with water. For some work as little as one pound of soap compound to ten gallons of water is sufficient. Such dilute soap solutions are easily dissolved by washing in warm water.

Trimming, Drilling or Tapping

Straight lard oil, mixtures of animal or vegetable oils, or a combination of them, as well as water-soap mixtures and soluble oils, can be used for trimming, drilling or tapping, depending upon equipment and nature of cut or trimming required.

In screw machine work a lubricant is necessary to remove the heat generated at the tools, and enough lubricant to prevent picking up of the brass. The minimum amount of lubricant is used when the work receives no further cleaning or handling.

This article briefly indicates some of the lubricants used when working or fabricating brass. The correct lubricant may mean the difference between high and low production speeds and enters into the cost of the finished article through increased tool life and better appearance of parts, which often results in lower final finishing costs. Next month's issue of the COPPER ALLOY BULLETIN will discuss methods of avoiding some of the more common lubricant troubles.

Memos on Brass—No. 18

When production volume does not justify expensive tooling, parts can be economically produced by spinning. Brass is admirably adapted to the spinning process as well as to the more widely used methods of fabrication.

Tarnish-Resistant Finish

A new coating for protecting brass hardware and other parts from tarnishing is described as practically invisible, exceptionally hard, and resistant to heat, moisture, and discoloration by light.

The coating, which is patented, is said to have a much longer effective life than previous types of lacquers, and hence to give much longer protection against tarnishing.

NEW DEVELOPMENTS

A metal cleaner is said to be especially suitable for removing buffing compounds, grease, and other foreign matter. According to the manufacturer, the cleaner may be used with 7 to 12 parts of kerosene or other mineral solvent. (No. 160)

A punch press of the hand-operated type is said to be adaptable to blanking or punching small stampings or punching along the edges of large sheets. It is reported that the press gives positive alignment of dies and punches, and that it is suitable for work not practical for power press application. (No. 161)

An annealing furnace of the gas-fired type is designed for copper and copper alloy parts, such as shells or stampings, it is reported. Work travels in baskets in continuous passage through the furnace, it is said. According to the manufacturer, furnace has capacity for heating 1,100 pounds of work per hour to 1,050 degrees F. (No. 162)

Bore inspection of tubular parts is simplified by a new telescope which provides an enlarged view of inner walls, it is claimed. The instrument is said to be adaptable to tubes from 1 to 4 inches in diameter and to lengths up to 20 feet when extensions are used. (No. 163)

New lock nuts for sheet metal assemblies are provided with knurled shanks, it is said. The shank is pressed through a hole in the sheet and then clinched, while the knurls prevent turning, it is reported. Nut employs a fiber collar that grips screw threads to prevent backing off until a wrench is applied, it is claimed. Brass nuts are carried in stock in ¼, 5/16, and ⅜ inch sizes. (No. 164)

Screw machine cams can be milled automatically by means of a duplicator controlling a standard milling machine, it is reported. It is said that the process makes possible substantial savings in time and results in a high degree of accuracy. (No. 165)

A riveting machine is said to feed rivets in multiple to perforated work. Rivets, according to the manufacturer, are fed from raceways, and the work is positioned over pins on an anvil. Slight downward pressure on the work, it is said, actuates a switch that trips the machine. (No. 166)

A buffing wheel rake is said to aid in maintaining buffs in proper condition. It is reported to rake evenly to a depth of 3/16 inch, without danger of damaging the buff. (No. 167)

A lift truck is especially designed for handling stacks of loose sheet metal, according to the maker. Sheets are prevented from spilling by a clamping mechanism, which operates to maintain a pressure proportional to the load, it is claimed. Rating of the truck is 4,000 pounds, it is reported. (No. 168)

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.

January Steel Sales Surpassed December

Increase is due to more defense orders, apprehension of civilians and seasonal influences. Production efficiency is greater.

MARKET IN TABLOID ★

Demand
Active.

Prices
Strong.

Production
Up 1½ points to 97.

■ STEEL sales in January were generally larger than in December, comparing for some makers with October which had been best in 1940. In exceptional cases an improvement of 50 per cent is noted. Gains were due to more defense orders, greater civilian purchasing for fear of priorities or scarcity and to the season, needs for spring and summer outdoor work being anticipated.

Each week which passes without shutdowns or curtailment of consumers' plants for lack of steel gives confidence towards the future. Though the delivery situation becomes ever tenser, steelmakers and users, paradoxically perhaps are more confident that in the long run there will be an abundance.

New methods, devices and shortcuts are being adopted to expedite manufacture and delivery. Thus mills take less pains in cutting to pattern, consumers being satisfied to receive the cruder material. Again, more standardization is evolving, resulting in greater production. Furnaces and mills are often operating above rated capacities, too. More rolling mills are turning out related products, such as sheet mills producing plates, and tin plate mills sheets. Some companies farm out to others certain production. Greater localization of business adds to economies.

Estimates of the percentage of defense orders vary widely. Thus makers and mill representatives at Cleveland, a typical district, estimate that from 3 to 30 per cent are defense orders, direct and indirect, though it is admitted that indirect are difficult to identify. If, as generally estimated, orders for American defense and British aid will require 20,000,000 tons yearly, this would figure about 25 per cent.

Veteran steel salesmen state that one reason for confusion in recent months is that the average purchasing agent has had but ten years' experience and has seen few, if any, sellers' markets. Flurries, such as in 1937 and 1939, have not compared with now. As purchasers become more seasoned they co-operate better with sellers, with more harmony resulting.

Many high officials of large steelmaking companies are being pestered by crackpots who claim to have the solution of proper production and distribution. One such plan was to abandon all production of structural steel to concentrate on plates, this "savior" of the industry being blissfully ignorant that structurals are needed in shipbuilding and that new defense plants must have walls and roofs.

Neither does the industry take kindly to the proposal of Philip Murray, CIO head, for a joint management-labor operation of the steel industry, and it takes vigorous exception to some of his statements, such as "smaller steel firms are operating their open-hearth departments as little as 45 per cent of capacity."

Emergencies of the past several months have taught many purchasers to distribute their orders more widely since producers are disposed to serve only regular customers at this time. This policy of distributing orders may hold over into more normal times.

Warehouses are making progress in replenishing stocks, huge orders of a few months ago now reaching delivery stage. The greatest shortage is in plates, but prospects even here are better. Some mills that have withdrawn on sheared plates will take universals.

On the great majority of orders placed last fall deliveries are being made on time and in full tonnage. Where deliveries are disrupted unexpected defense orders have interfered. In such cases deliveries are usually not more than three weeks off schedule.

Railroad purchasing has been most conspicuous for several weeks. Orders include 18,900 tons of rails, 52 locomotives and 3728 cars, with good new inquiry.

British steel purchases here fell off sharply in January, pending the outcome of the lease-lend bill.

Automobile production for the week ended Feb. 1 is estimated at 124,400 units, up 2452 for the week.

Steel ingot production last week advanced 1½ points to 97 per cent of capacity, figures for the two past weeks having been revised to conform to the revised estimate of national capacity. Gains last week took place as follows: Pittsburgh ½ point to 96½, Chicago 1½ points to 98, Cleveland 2½ points to 86½, St. Louis 2½ points to 90 and Youngstown up 1 point to 95. Declines were: New England, 12 points to 88 and Detroit 3 points to 92. Unchanged were eastern Pennsylvania at 96, Buffalo at 93, Birmingham at 100, Wheeling at 100 and Cincinnati at 90.

STEEL's composite price of iron and steel sagged 2 cents to $38.22. Steelworks scrap fell 33 cents to $20.09. Finished steel was same at $56.60.

COMPOSITE MARKET AVERAGES

	Feb. 1	Jan. 25	Jan. 18	One Month Ago Jan., 1941	Three Months Ago Nov., 1940	One Year Ago Feb., 1940	Five Years Ago Feb., 1936
Iron and Steel....	$38.22	$38.24	$38.33	$38.38	$38.08	$37.21	$33.48
Finished Steel	56.60	56.60	56.60	56.60	56.60	56.50	53.70
Steelworks Scrap..	20.09	20.42	20.50	20.88	20.72	16.98	13.83

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

COMPARISON OF PRICES

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

Finished Material

	Feb. 1, 1941	Jan. 1941	Nov. 1940	Feb. 1940
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Iron bars, Chicago	2.25	2.25	2.25	2.15
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	2.17	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to 9/32-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Feb. 1, 1941	Jan. 1941	Nov. 1940	Feb. 1940
Bessemer, del. Pittsburgh	$25.34	$25.34	$24.34	$24.34
Basic, Valley	23.50	23.50	22.50	22.50
Basic, eastern, del. Philadelphia	25.34	25.34	24.34	24.34
No. 2 foundry, Pittsburgh	25.21	25.21	24.21	24.21
No. 2 foundry, Chicago	24.00	24.00	23.00	23.00
Southern No. 2, Birmingham	19.38	19.38	19.38	19.38
Southern No. 2, del. Cincinnati	23.06	23.06	23.06	23.06
No. 2X, del. Phila. (differ. av.)	26.215	26.215	25.215	25.215
Malleable, Valley	24.00	24.00	23.00	23.00
Malleable, Chicago	24.00	24.00	23.00	23.00
Lake Sup., charcoal, del. Chicago	30.34	30.34	30.34	30.34
Gray forge, del. Pittsburgh	24.17	24.17	23.17	23.17
Ferromanganese, del. Pittsburgh	125.33	125.33	125.33	105.33

Scrap

Heavy melt. steel, Pitts.	$20.75	$22.15	$21.50	$17.75
Heavy melt, steel, No. 2, E. Pa.	18.50	19.30	19.75	16.30
Heavy melting steel, Chicago	19.75	20.25	20.25	15.75
Rails for rolling, Chicago	23.25	24.70	24.55	18.25
Railroad steel specialties, Chicago	23.50	24.05	23.25	18.50

Coke

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

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

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

Sheet Steel

Hot Rolled

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

Cold Rolled

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

Galvanized No. 24

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

Black Plate, No. 29 and Lighter

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

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.55c

Enameling Sheets

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

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

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

Straight Chromes

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

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29-2.44c
Philadelphia, del.	2.15c-2.30c
Boston, delivered	2.43c-2.57c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c-2.25c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast ports	2.65c

Steel Floor Plates

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

Structural Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast ports	2.75c

Tin and Terne Plate

Tin Plate, Coke (base box)

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

Mfg. Terne Plate (base box)

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

Bars

Soft Steel

(Base, 20 tons or over)

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

Rail Steel

(Base, 5 tons or over)

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

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

Iron

Chicago	2.25c
Philadelphia, del.	2.37c
Pittsburgh, refined	.3.50-3.00c
Terre Haute, Ind.	2.15c

Reinforcing

New Billet Bars, Base

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

Rail Steel Bars, Base

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

Wire Products

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

Standard and cement coated wire nails	$2.55

(Per Pound)

Polished fence staples	2.55c
Annealed fence wire	3.05c
Galv. fence wire	3.40c
Woven wire fencing (base C. L. column)	67
Single loop bale ties, (base C.L. column)	56
Galv. barbed wire, 80-rod spools, base column	70
Twisted barbless wire, column	70

To Manufacturing Trade

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

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

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

Cut Nails

Carload, Pittsburgh, keg..$3.85

Cold-Finished Bars

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

*Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

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

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.70	3300	3.80
2500	2.55	3400	3.20

4100 0.15 to 0.25 Mo. 0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni. 1.20
5100 0.80-1.10 Cr. 0.45
5100 Cr spring flats 0.15
6100 bars 1.20
6100 spring flats 0.85
Cr. N., Van. 1.50
Carbon Van. 0.85
9200 spring flats 0.15
9200 spring rounds, squares 0.40
Electric furnace up 50 cents.

Alloy Plates (Hot)

Pittsburgh, Chicago, Coatesville, Pa. .3.50

Strip and Hoops

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

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.10c
Detroit, del.	2.20c
Philadelphia, del.	2.42c
New York, del.	2.46c
Pacific Coast ports	2.75c
Cooperage hoop, Young., Pitts.; Chicago, Birm.	2.20c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

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

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

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

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

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

Cents per pound

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

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

Bolts and Nuts

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

Carriage and Machine

½ x 6 and smaller	68 off
Do., ⅜ and ⅝ x 6-in. and shorter	66 off
Do., ¾ to 1 x 6-in. and shorter	64 off
1⅛ and larger, all lengths	62 off
All diameters, over 6-in. long	62 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts separate 73-10 off; with nuts attached 73 off; bulk 81 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Plow bolts	68.5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
½-inch and less	66	70
⅝-1-inch	63	65
1⅛-1½-inch	61	62
1⅝ and larger	60	..

Hexagon Cap Screws

Upset 1-in., smaller ....68 off

Square Head Set Screws

Upset, 1-in., smaller ....74.0 off
Headless set screws ....64.0 off

Piling

Pitts., Chgo., Buffalo 2.40c

Rivets, Washers

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

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

Welded Iron, Steel Pipe

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

Butt Weld

Steel

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

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½

Iron

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

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64

Iron

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

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, 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—Pet Net Ton

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

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

Semifinished Steel

Rerolling Billets, Slabs
(Gross Tons)

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

Forging Quality Billets

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

Sheet Bars

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

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl. (per 100 lbs.)	$2.00
Do., over ⅜ to 41/64-in. incl.	2.15

Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.50.

Skelp

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

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$5.00- 5.75
Connellsville, fdry.	5.25- 6.00
Connell, prem. fdry	6.00- 6.60
New River fdry.	6.50- 7.00
Wise county fdry	5.50- 6.50
Wise county fur.	5.00- 5.25

By-Product Foundry

Newark, N. J., del.	11.85-12.30
Chicago, outside del.	11.00
Chicago, delivered	11.75
Terre Haute, del.	11.25
Milwaukee, ovens	11.75
New England, del.	12.50
St Louis, del.	11.75
Birmingham, ovens	7.50
Indianapolis, del.	11.25
Cincinnati, del.	11.00
Cleveland, del.	11.55
Buffalo, del.	11.75
Detroit, del.	11.50
Philadelphia, del.	11.63

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	14.00c
Toluol, two degree	27.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c

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

Phenol (less than 1000 lbs.)	13.75c
Do. (1000 lbs. or over)	12.75c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	7.00c

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

Sulphate of ammonia	$30.00

Pig Iron

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

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birmingham, Ala.‡	19.38	.....	18.38	24.00
Birdsboro, Pa.	25.00	25.50	24.50	26.00
Buffalo	24.00	24.50	23.00	25.00
Chicago	24.00	24.00	23.50	24.50
Cleveland	24.00	24.00	23.50	24.50
Detroit	24.00	24.00	23.50	24.50
Duluth	24.50	24.50	.....	25.00
Erie, Pa.	24.00	24.50	23.50	25.00
Everett, Mass.	25.00	25.50	24.50	26.00
Granite City, Ill.	24.00	24.00	23.50	24.50
Hamilton, O.	24.00	24.00	23.50	.....
Neville Island, Pa.	24.00	24.00	23.50	24.50
Provo, Utah	22.00	.	.	.
Sharpsville, Pa.	24.00	24.00	23.50	24.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	25.00	25.50	24.50	26.00
Toledo, O.	24.00	24.00	23.50	24.50
Youngstown, O.	24.00	24.00	23.50	24.50

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

Delivered from Basing Points:

Akron, O., from Cleveland	25.39	25.39	24.89	25.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.	.	.
Boston from Everett, Mass.	25.50	26.00	25.00	26.50
Boston from Buffalo	25.50	26.00	25.00	26.50
Brookyln, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	25.39	25.39	24.89	25.89
Chicago from Birmingham	†24.22	.....	.....	.....
Cincinnati from Hamilton, O.	24.44	25.11	24.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	25.94	25.94	25.44	25.44
Milwaukee from Chicago	25.10	25.10	24.60	25.60
Muskegon, Mich., from Chicago, Toledo or Detroit	27.19	27.19	26.69	27.69
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.	25.84	26.34	25.34	.....
Pittsburgh district from Neville Island	} Neville base, plus 69c, 84c and $1.24 freight.			
Saginaw, Mich., from Detroit	26.31	26.31	25.81	26.81
St. Louis, northern	24.50	24.50	24.00	.....
St. Louis from Birmingham	†23.12	.....	22.62	.
St. Paul from Duluth	26.63	26.63	.....	27.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50, base; $30.74 delivered Philadelphia.

Gray Forge

Valley furnace $23.50
Pitts. dist. fur. 23.50

Charcoal

Lake Superior fur. $27.00
do., del. Chicago 30.34
Lyles, Tenn. 26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $29.50; 6.51-7—$30.00; 7-7.50—$30.50; 7.51-8—$31.00; 8-8.50—$31.50; 8.51-9—$32.00; 9-9.50—$32.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

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

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

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

Refractories

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

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $60.80

First Quality

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

Second Quality

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

Ohio

First quality 39.90
Intermediate 36.10
Second quality 31.35

Malleable Bung Brick

All bases $56.05

Silica Brick

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

Ladle Brick

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

Dry press $28.00
Wire cut 26.00

Magnesite

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

Basic Brick

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

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

Fluorspar

Washed gravel, duty pd., tide, net ton. $25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail. 20.00-21.00
Do. barge 20.00
No. 2 lump 20.00-21.00

Ferroalloy Prices

Ferromanganese, 78-82%, carlots, duty pd. $120.00
Ton lots 130.00
Less ton lots 133.50
Less 200 lb. lots 138.00
Do., carlots del. Pitts. 125.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot .. 36.00

Ferrosilicon, 50%, freight allowed, c.l. 74.50
Do., ton lot 87.00
Do., 75 per cent 135.00
Do., ton lots 151.00
Spot, $5 a ton higher.

Silicomanganese, c.l., 3 per cent carbon 113.00
2½% carbon 118.00
2% carbon, 123.00; 1%, 133.00
Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.90-2.00

Ferrovanadium, 35 to 40%, lb., cont. .. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electric furn., per ton, c. l., 23-26% f.o.b. Mt. Pleasant, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c
Do., ton lots 11.75c
Do., less-ton lots 12.00c
less than 200 lb. lots. 12.25c

67-72% low carbon:

	Carloads	Ton lots	Less ton
2% carb.	17.50c	18.25c	18.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots ... $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do., less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls ... $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% mo- lybdenum, 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, con- tract, freight allowed, lb. carlots, bulk 7.00c
Do., ton lots 7.50c
Do., less-ton lots 7.75c
Do., less 200 lbs. 8.00c
Spot, ¼c higher.

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do., spot 1.15

Chromium Metal, 98% cr., contract, lb. con. chrome, ton lots 80.00c
Do., spot 85.00c

98% chrome, cont. tons. 79.00c
Do., spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.50c
Do., 2% 13.00c
Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $74.50
Ton lots 84.50
Less-ton lots, lb. 4.00c
Less 200 lb. lots, lb. .. 4.25c
Spot ¼-cent higher.

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.50c
Ton lots 6.00c
Less-ton lots 6.25c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton 102.50
Do., ton 108.00

35-40%, contract, carloads, lb., alloy 14.00c
Do., ton lots 15.00c
Do., less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do., 100-200 lb. lots .. 2.75
Do., under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% mo- lybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: S.A.E. 2300	Cold Drawn Bars: S.A.E. 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.48	5.11	3.46	4.13	8.88	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.40	5.00	3.51	4.09	8.84	7.19
Philadelphia	3.85	3.95	4.45	3.55	3.55	5.25	3.55	4.05	4.65	3.31	4.06	8.56	7.16
Baltimore	3.85	4.00	4.35	3.70	3.70	5.25	3.50	....	5.05	....	4.05	..	..
Norfolk, Va.	4.00	4.10	....	4.05	4.05	5.45	3.85	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.25	4.30	4.75	3.22	3.75	8.40	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.65	....	3.65	8.40	6.75
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.62	3.20	3.75	8.40	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.30	4.84	3.20	3.80	8.70	7.05
Omaha	3.90	4.00	4.00	3.95	3.95	5.55	3.65	....	5.25	....	4.42	..	....
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.62	4.00	4.92	3.47	4.00	8.75	7.10
Chicago	3.50	3.40	3.40	3.55	3.55	5.15	3.25	4.10	4.60	3.30	3.75	8.40	6.75
Twin Cities	3.75	3.65	3.65	3.80	3.80	5.40	3.50	4.35	4.75	3.83	4.34	9.09	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.18	4.23	4.73	3.54	3.88	8.38	6.88
St. Louis	3.64	3.74	3.74	3.69	3.69	5.29	3.39	4.12	4.87	3.61	4.02	8.77	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	..
Indianapolis	3.60	3.55	3.55	3.70	3.70	5.30	3.45	....	4.76	....	3.97	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.68	3.70	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.34	4.34	4.49	4.49	6.09	4.19	....	5.54	....	4.69	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.88	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.	3.50	5.95	5.95	3.85	3.85	5.50	4.20	....	5.25	....	6.60	....	....
Seattle	4.00	4.00	5.20	4.00	4.00	5.75	4.00	6.50	5.00	....	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	4.60	6.45	4.15	4.15	6.40	4.30	6.50	5.25	....	6.60	10.55	9.80
San Francisco	3.50	4.00	6.00	3.50	3.50	5.60	3.40	6.40	5.15	....	6.80	10.65	9.80

	S.A.E. Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.28	7.75	6.05	5.80	7.90
New York (Met.)	4.04	7.60	5.90	5.65	
Philadelphia	4.10	7.56	5.86	5.61	8.56
Baltimore	4.45	..	..	..	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.35	5.65	5.40	7.50
Pittsburgh	3.40	7.45	5.75	5.50	7.60
Cleveland	3.30	7.55	5.85	5.85	7.70
Detroit	3.48	7.67	5.97	5.72	7.19
Cincinnati	3.65	7.69	5.99	5.74	7.84
Chicago	3.70	7.35	5.65	5.40	7.50
Twin Cities	3.95	7.70	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.84	7.72	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 750-4999 in San Francisco; 300-4999 in Portland, Oreg.; any quantity in Twin Cities; 300-1999 in Los Angeles.

Galvanized Sheets: Base, 150-1499 pounds, New York; 150-1499 in Cleveland, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 200-4999 in Portland, Seattle; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit Indianapolis, Milwaukee, Omaha, St. Louis, Tulsa; 1500 and over in Chattanooga; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis; 25 to 49 bundles in Philadelphia; 750-4999 in San Francisco.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at $4.02½ per Pound Sterling

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	BRITISH Gross Tons f.o.b. U.K. Ports	£ s d
Merchant bars, 3-inch and over	$66.50	16 10 0
Merchant bars, small, under 3-inch, re-rolled	3.60c	20 0 0
Structural shapes	2.79c	15 10 0
Ship plates	2.90c	16 2 6
Boiler plates	3.17c	17 12 6
Sheets black, 24 gage	4.00c	22 5 0
Sheets, galvanized, corrugated, 24 gage	4.61c	25 12 6
Tin plate, base box, 20 x 14, 108 pounds	$ 6 29	1 11 4

British ferromanganese $120.00 delivered Atlantic seaboard duty-paid.

Domestic Prices Delivered at Works or Furnace—

		£ s d
Foundry No. 3 Pig Iron, Silicon 2.50—3.00	$25.79	6 8 0(a)
Basic pig iron	24.28	6 0 6(a)
Furnace coke, f.o.t. ovens	7.15	1 15 6
Billets, basic soft, 100-ton lots and over	49.37	12 5 0
Standard rails, 60 lbs. per yard, 500-ton lots & over	2.61c	14 10 6
Merchant bars, rounds and squares, under 3-inch	3.17c	17 12 0††
Shapes	2.77c	15 8 0††
Ship plates	2.91c	16 3 0††
Boiler plates	3.06c	17 0 6††
Sheets, black, 24 gage, 4-ton lots and over	4.10c	22 15 0
Sheets, galvanized 24 gage, corrugated, 4-ton lots & over	4.70c	26 2 6
Plain wire, mild drawn, catch weight coils, 2-ton lots and over	4.28c	23 15 0
Bands and strips, hot-rolled	3.30c	18 7 0††

(a) del. Middlesbrough 5s rebate to approved customers. ††Rebate of 15s on certain conditions.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1.	18.00
Bos. dock No. 1 exp.	16.50-17.00
New Eng. del. No. 1	17.25
Buffalo, No. 1.....	20.50-21.00
Buffalo, No. 2.....	18.50-19.00
Chicago, No. 1.....	19.50-20.00
Chicago, auto, no alloy	18.50-19.00
Cincinnati, dealers .	18.25-18.75
Cleveland, No. 1....	20.50-21.00
Cleveland, No. 2....	19.50-20.00
Detroit, No. 1.....†	16.50-17.00
Detroit, No. 2.....†	15.50-16.00
Eastern Pa., No. 1..	20.00
Eastern Pa., No. 2..	18.50
Federal, Ill., No. 2	16.50-17.00
Granite City, R. R. No. 1	17.50-18.00
Granite City, No. 2	16.50-17.00
Los Ang., No. 1 net	14.50-15.00
Los Ang., No. 2 net	13.50-14.00
N. Y. dock No. 1 exp.	†17.00
Pitts., No. 1 (R. R.)	20.50-21.00
Pittsburgh, No. 1...	20.50-21.00
Pittsburgh, No. 2...	19.50-20.00
St. Louis, No. 1....	17.50-18.00
St. Louis, No. 2 ..	16.50-17.00
San Fran., No. 1 net	15.00-15.50
San Fran., No. 2 net	14.00-14.50
Seattle, No. 1.	15.00
Toronto, dlrs., No. 1	11.00-11.25
Valleys, No. 1.....	21.00-21.50

COMPRESSED SHEETS

Buffalo	18.50-19.00
Chicago, factory ...	19.00-19.50
Chicago, dealers ...	17.50-18.00
Cincinnati, dealers .	17.00-17.50
Cleveland	20.00-20.50
Detroit .....†	17.75-18.25
E. Pa., new mat...	20.00
E. Pa., old mat. ...	17.00
Los Angeles, net...	12.50-13.00
Pittsburgh	20.50-21.00
St. Louis	14.00-14.50
San Francisco, net..	13.00-13.50
Valleys	20.50-21.00

BUNDLED SHEETS

Buffalo, No. 1.....	18.50-19.00
Buffalo, No. 2.....	17.00-17.50
Cleveland	15.00-15.50
Pittsburgh	19.50-20.00
St. Louis	13.00-13.50
Toronto, dealers....	9.75

SHEET CLIPPINGS, LOOSE

Chicago	13.50-14.00
Cincinnati, dealers..	12.50-13.00
Detroit .....†	14.00-14.50
St. Louis	12.00-12.50
Toronto, dealers...	9.00

BUSHELING

Birmingham, No. 1.	16.00
Buffalo, No. 1.....	18.50-19.00
Chicago, No. 1	18.50-19.00
Cincin., No. 1 deal..	14.25-14.75
Cincin., No. 2 deal..	7.75- 8.25
Cleveland, No. 2...	14.50-15.00
Detroit, No. 1 new.†	17.00-17.50
Valleys, new, No. 1	20.50-21.00
Toronto, deniers....	5.50- 6.00

MACHINE TURNINGS (Long)

Birmingham	9.50
Buffalo	14.00-14.50
Chicago	13.75-14.25
Cincinnati, dealers .	10.00-10.50
Cleveland, no alloy.	13.50-14.00
Detroit .....†	11.50-12.00
Eastern Pa.	14.50
Los Angeles	4.00- 5.00
New York .....†	10.50-11.00
Pittsburgh	15.00-15.50
St. Louis	11.50-12.00
San Francisco	5.00
Toronto, dealers....	†7.75- 8.00
Valleys	15.50-16.00

SHOVELING TURNINGS

Buffalo	15.50-16.00
Cleveland	14.50-15.00
Chicago	14.25-14.75
Chicago, spcl, anal..	15.50-16.00
Detroit .....†	12.00-12.50
Pitts., alloy-free ...	17.00-17.50

BORINGS AND TURNINGS
For Blast Furnace Use

Boston district	†8.00- 8.50
Buffalo	14.50-15.00
Cincinnati, dealers..	9.25- 9.75
Cleveland	14.50-15.00
Eastern Pa.	14.00
Detroit .....†	12.00-12.50
New York .....†	10.00-10.50
Pittsburgh	15.00-15.50
Toronto, dealers....	†7.75- 8.00

AXLE TURNINGS

Buffalo	16.50-17.00
Boston district.....†	12.50-13.00
Chicago, elec. fur...	20.00-20.50
East. Pa. elec. fur..	19.50-20.00
St. Louis	13.50-14.00
Toronto	†7.75- 8.00

CAST IRON BORINGS

Birmingham	8.50
Boston dist. chem...†	10.50-10.75
Buffalo	14.50-15.00
Chicago	13.75-14.25
Cincinnati, dealers .	9.25- 9.75
Cleveland	14.50-15.00
Detroit .....†	12.00-12.50
E. Pa., chemical....	15.50-16.00
New York .....†	11.50-12.00
St. Louis	11.00-11.50
Toronto, dealers....	†7.75- 8.00

RAILROAD SPECIALTIES

Chicago	23.25-23.75

ANGLE BARS—STEEL

Chicago	21.25-21.75
St. Louis	21.25-21.75

SPRINGS

Buffalo	25.00-25.50
Chicago, coil	24.50-25.00
Chicago, leaf	24.00-24.50
Eastern Pa.	26.00-26.50
Pittsburgh	26.50-27.00
St. Louis	22.50-23.00

STEEL, RAILS, SHORT

Birmingham	20.00
Buffalo	26.00-26.50
Chicago (3 ft.)....	23.50-24.00
Chicago (2 ft.)....	24.00-24.50
Cincinnati, dealers..	25.25-25.75
Detroit .....†	22.50-23.00
Pitts., 2 ft. and less	26.00-26.50
St. L. 2 ft. & less .	24.00-24.50

STEEL RAILS, SCRAP

Birmingham	18.00
Boston district.....†	15.75-16.00
Buffalo	22.00-22.50
Chicago	19.50-20.00
Cleveland	24.00-24.50
Pittsburgh	23.00-23.50
St. Louis	20.50-21.00
Seattle	18.00-18.50

PIPE AND FLUES

Chicago, net	14.00-14.50
Cincinnati, dealers .	13.25-13.75

RAILROAD GRATE BARS

Buffalo	14.50-15.00
Chicago, net	13.75-14.25
Cincinnati, dealers .	12.75-13.25
Eastern Pa.	19.00-19.50
New York .....†	13.00-13.50
St. Louis	14.00-14.50

RAILROAD WROUGHT

Birmingham	16.00
Boston district ....†	11.75-12.25
Eastern Pa., No. 1..	20.50-21.00
St. Louis, No. 1....	14.25-14.75
St. Louis, No. 2....	16.50-17.00

FORGE FLASHINGS

Boston district .....†	13.25-13.50
Buffalo	18.50-19.00
Cleveland	18.50-19.00
Detroit .....†	17.00-17.50
Pittsburgh	20.00-20.50

FORGE SCRAP

Boston district ....†	12.75-13.00
Chicago, heavy	24.00-24.50

LOW PHOSPHORUS

Buffalo, plates	26.50-27.00
Cleveland, crops ...	26.00-26.50
Eastern Pa., crops..	25.50-26.00
Pitts., billet, bloom slab crops	27.00-27.50

LOW PHOS. PUNCHINGS

Buffalo	25.50-26.00
Chicago	23.25-23.75
Cleveland	22.00-22.50
Detroit .....†	18.75-19.25
Eastern Pa.	25.50-26.00
Pittsburgh	26.00-26.50
Seattle	15.00

RAILS FOR ROLLING
3 feet and over

Birmingham	19.00
Boston .....†	18.50-19.00
Chicago	23.00-23.50
New York .....†	19.50-20.00
Eastern Pa.	26.00-26.50
St. Louis	22.50-23.00

STEEL CAR AXLES

Birmingham	18.00
Boston district ....†	20.00-21.00
Chicago, net	24.75-25.25
Eastern Pa.	27.50-28.00
St. Louis	25.00-25.50

LOCOMOTIVE TIRES

Chicago (cut)	24.00-24.50
St. Louis, No. 1....	19.50-20.00

SHAFTING

Boston district ....†	19.50-19.75
New York .....†	21.00-21.50
Eastern Pa.	25.00-25.50
St. Louis, 1¼-3¾"...	19.75-20.25

CAR WHEELS

Birmingham iron ..	18.00
Boston dist., iron...†	16.50-17.00
Buffalo, steel	25.00-25.50
Chicago, iron	20.50-21.00
Chicago, rolled steel	23.25-23.75
Cincin., iron deal...	19.50-20.00
Eastern Pa., iron...	23.00-23.50
Eastern Pa., steel...	26.00-26.50
Pittsburgh, iron ...	22.00-22.50
Pittsburgh, steel...	26.50-27.00
St. Louis, iron	21.00-21.50
St. Louis, steel	21.50-22.00

NO. 1 CAST SCRAP

Birmingham	18.50
Boston, No. 1 mach.†	17.50-18.00
N. Eng., del. No. 2..	18.25-18.75
N. Eng. del. textile	22.00-23.00
Buffalo, cupola	20.00-20.50
Buffalo, mach.	21.50-22.00
Chicago, agri. net..	16.00-16.50
Chicago, auto net..	18.50-19.00
Chicago, railr'd net.	17.50-18.00
Chicago, mach. net.	18.50-19.00
Cincin., mach. deal..	21.50-22.00
Cleveland, mach. ..	24.00-24.50
Detroit, cupola, net.†	17.50-18.00
Eastern Pa., cupola.	24.00-24.50
E. Pa., No. 2	20.00
E. Pa., yard fdry...	20.50
Los Angeles	16.50-17.00
Pittsburgh, cupola .	21.50-22.00
San Francisco	14.50-15.00
Seattle	14.00-15.00
St. L., agri. mach...	20.00-20.50
St. L., No. 1 mach...	20.50-21.00
Toronto, No. 1 mach., net dealers	†19.75-20.00

HEAVY CAST

Boston dist. break..†	16.50-16.75
New England, del...	20.00-20.50
Buffalo, break.	18.00-18.50
Cleveland, break, net	18.50-19.00
Detroit, auto net...†	18.00-18.50
Detroit, break. ....†	16.00-16.50
Eastern Pa.	22.50
Los Ang., auto, net.	13.00-14.00
New York break...	†17.00

STOVE PLATE

Birmingham	13.50
Boston district ....†	14.50-15.00
Buffalo	16.50-17.00
Chicago, net	13.50-14.00
Cincinnati, dealers .	13.00-13.50
Detroit, net .....†	11.00-11.50
Eastern Pa.	19.00-19.50
New York fdry. ....†	14.00-14.50
St. Louis	15.00-15.50
Toronto dealers, net	†13.75-14.00

MALLEABLE

New England, del...	22.00-23.00
Buffalo	23.00-23.50
Chicago, R. R.	23.50-24.00
Cincin. agri., deal..	18.00-18.50
Cleveland, rail	25.00-25.50
Eastern Pa., R. R. ..	23.00-23.50
Los Angeles	12.50
Pittsburgh, rail	25.50-26.00
St. Louis, R. R.....	22.00-22.50

Ores

Lake Superior Iron Ore

Gross ton, 51½ %

Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer .	4.60

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract 10.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos	nom
Spanish, No. African basic, 50 to 60%	nom.
Chinese wolframite, net ton, duty pd.	$23.50-24.00
Brazil iron ore, 68-69%, ord.....	7.50c
Low phos. (.02 max.)	8.00c

F.O.B. Rio Janeiro.

Scheelite, imp.	23.50-24.00
Chrome ore, Indian 48% gross ton, clf.	$36.00-37.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%.	...
So. African, 48%...	57.00-60.00
Indian, 49-50%....	60.00-63.00
Brazilian, 46%	53.00-54.00
Cuban, 50-51%, duty free	67.50

Molybdenum

Sulphide conc., lb., Mo. cont., mines .	$0.75

Sheets, Strip

Sheet & Strip Prices, Pages 100, 101

Pittsburgh—Sheet and strip production is at virtual capacity. Some small units, mostly obsolete, remain idle, which keeps the rate relatively low when compared with ingot output. Galvanized sheet production is off 1 point to 80 per cent of capacity.

Cleveland — Orders in January were usually better than in December, some comparing them with last October, the best month of 1940. Many classes of consumers are purchasing, often in excess of needs because of fear of stricter rationing.

Chicago — New sheet and strip business has not expanded as rapidly as it has for some other products, but still aggregates substantial totals. Deliveries on sheets are essentially unchanged, but have lengthened about two weeks for wider sizes of strip. Situation for galvanized sheets is particularly tight, because of the inadequacy of zinc supplies. It is estimated that galvanized production is only about 75 per cent of capacity for this reason.

Boston—Still heavier than shipments, incoming orders for narrow cold strip are maintained. Mill backlogs Feb. 1 were larger than on Jan. 1. Deliveries are further extended with re-rolling schedules more confused by incoming defense tonnage, which is being given preference. Current orders are for second quarter shipment at open prices.

New York—Most leading sheet sellers here report an increase in specifications in January, with deliveries becoming more extended. In general little tonnage is now available before the latter part of April, this applying to hot and cold-rolled and galvanized sheets.

Philadelphia — Sheet buying is particularly active by consumers not identified with defense work. Such users seek to enlarge stocks in anticipation of supply shortage soon. Principal buyers already have entered specifications covering shipments through June, with some orders for third and fourth quarter offered. January bookings which were largely for second quarter showed moderate gain over December.

Buffalo—Leading producers report a growing wave of protective forward buying in the sheet and strip market has resulted in solid bookings through better than half of second quarter. Due to steel being diverted to other departments in line with priority system, strip rolling schedules were a shade lighter during the past two weeks.

Cincinnati—Second quarter sheet tonnage on books is steadily increasing. Orders are being accepted only after scrutiny in an effort to curb

speculation and buying beyond actual needs. Rolling facilities are being pushed on first quarter bookings.

St. Louis—The sheet and strip situation is increasingly tight. Mills have virtually nothing to offer for first quarter, but some tonnage for second quarter is being booked at prices then prevailing. There has been a notably increased demand for galvanized, mainly from the South.

Birmingham, Ala.—Virtual capacity production of sheets continues, with orders well abreast of shipments. The strip mill is operating on a comfortable schedule, but not at exceptional rate.

Plates

Plate Prices, Page 100

Cleveland—It becomes increasingly difficult to buy plates for delivery within the next few months. Some small platemaking companies which sell into this district are out of the market on sheared, though they can sell universals. Increasing shipbuilding on the Great Lakes accounts for larger consumption, while a new demand is for army trucks, scout cars and tanks.

Pittsburgh — There has been no change in delivery, backlogs remaining high, production at peak. Carnegie-Illinois Steel Corp. last week announced further expansion of facilities for production of light and heavy armor plate and shafts at its Homestead works.

Chicago—Plate tonnage is swelling to substantial totals and mills are hard pressed to keep orders in hand. Heavy backlogs are expanding. Heavy construction industries are operating at capacity and pressing for material.

Boston—Strong demand for steel plates, deliveries on which are further extended on more widths and finishes, is accompanied by a better than normal volume of floor plate buying, with shipments on the latter around four weeks, less in some cases. Specifications for shipbuilding are heavy and increasing. With at least six smaller yards about to start construction of numerous auxiliary craft, no lessening in plate requirements for ships is in sight.

New York—Plate shipments are becoming the most extended. While some mills can offer universal plates in 10 weeks and in some cases can still handle a limited amount of sheared plates in 12 and 13 weeks, these instances are fast becoming the exception. A number of sellers are booked up almost solidly into late May and on the wide sizes, well beyond that as a general rule. That the situation will be worse is indicated by heavy pending ship releases. By the middle of February initial releases against the 200 navy ships awarded last September are expected to be issued.

Philadelphia—Plate orders show moderate increase over December, with deliveries somewhat further extended. Buyers seek to anticipate needs further ahead but mills insist on definite specifications. While pressure for delivery is still strong no instances are reported of actual interference with consumers' operations through lack of material. Some producers see growing possibility of more stringent priorities.

Birmingham, Ala.—Although current buying is less output is heavy. Backlogs are high, due to specifications from shipbuilders, and there is sufficient volume for continued high output indefinitely.

Toronto, Ont.—Orders for plates for Canada's enlarged shipbuilding program appeared in the market during the week, and inquiries also were prominent for special alloy plates for war tanks and other war vehicles and ships. Canadian production will be fully contracted for at least two years, even under increased programs which will go into effect in March.

Plate Contracts Placed

635 tons, two 82,000-barrel tanks, Shell Oil Co., Fall River, Mass., to Bethlehem Steel Co., Bethlehem, Pa.

600 tons, estimated, six welded steel oil barges, 196 x 35 x 10½ feet, for Inland Waterways Corp., New Orleans, to Consolidated Steel Corp., Orange, Tex. $39,598 each; bids Jan. 11.

395 tons, 18 tanks, Shell Oil Co., Wood River, Ill., to Graver Tank & Mfg. Co. Inc., East Chicago, Ind.

Unstated tonnage, 250,000-gallon steel water tank, New Reservation, N. H., to Pittsburgh-Des Moines Steel Co., Pittsburgh; bids Jan. 7, U. S. engineer, Boston, Pro. 28.

Plate Contracts Pending

3791 tons, fabricated steel plates, bolts and accessories, Panama, schedule 4762; bids Feb. 10, Washington.

Bars

Bar Prices, Page 100

Pittsburgh — With incoming orders showing no indications of leveling off, producers are increasing the time allotment to merchant bars on their mills and are consequently decreasing allotments to reinforcing bars and wire rods. Nonintegrated producers have voiced some complaints on the available supply of semifinished material. Merchant bar market has been quite active, with tonnage releases from automotive sources heavy, miscellaneous buying in good volume, and deliveries extending farther into the future.

Cleveland — Bars are among the items on which deliveries are most extended on new business. Sales are largely for second and third quarters, first quarter being booked solid. Price announcements for second quarter are expected in a month, no change being looked for.

Chicago—Bar orders and inquiries are in larger volume, and deliveries are more deferred. Quotations on new business are for May and June delivery. Alloy grades are in greatest demand. Business is well diversified as to consuming industries, although a sizable proportion is going to national defense.

Boston — Alloy bar demand is relatively more active than carbon, although protective buying on practically all grades and finishes continues in substantial volume with most current orders for second quarter delivery and booked at open prices. Deliveries lag, but an increasing volume of alloy tonnage is for defense needs with unofficial priorities effective. In no case have consumers actually been forced to curtail because of lack of steel.

New York—Bar delivery schedules have appeared fairly stable. Some leading sellers report that there has been little variation in more than a fortnight and in this

the situation differs from most other leading products, particularly plates, on which shipments are becoming increasingly extended. Hot carbon bars range around 10 to 12 weeks; cold-finished carbon bars around 12 to 13 weeks. Alloy bar schedules are more difficult to define, but they appear to be no more extended than recently. However, this apparent stability is believed to be only temporary, for heavy work is pending.

Philadelphia—Bar orders are sustained or heavier than a month ago as buyers steadily increase length of forward buying. Consumption is gaining in some directions with requirements in armament manufacture expected to increase further by spring.

Toronto, Ont.—Despite heavy orders for merchant bars which have featured the local market for some time past, there is no falling off in demand and a number of consumers state that plant operations have been held up owing to restricted deliveries. Producers are now offering delivery as far ahead as June, with little available before that time.

Tin Plate

Tin Plate Prices, Page 100

Pittsburgh—Production is estimated this week at 56 per cent of capacity and moving upward at a relatively rapid rate as the heavy season shows signs of getting underway earlier than last year. Activity is principally on cold reduction mills, with several units running at more than 100 per cent of rated capacity.

Pipe

Pipe Prices, Page 101

Pittsburgh—Shipments on standard pipe continue high and may set new records this month. Oil country business has begun to show seasonal improvement. Shipments are slightly better, although production is still below other tubular goods.

Cleveland—Merchant pipe is one of the most active steel items, with leading producers unable to promise deliveries before May. Shipments are in larger volume than December, which had been an all-time record. In line pipe, inquiries which would normally appear in the spring are current now as consumers anticipate. A large share of pipe buying generally is for the government.

Boston—Decline in demand for cast pipe for training camp facilities is offset by improved municipal buying. While there is a seasonal drop in merchant steel pipe demand, industrial and miscellaneous construction requirements will be heavier than normal later this quarter. Resale pipe prices continue to firm in line with mill quotations, but shading has not disappeared.

New York — Steel pipe deliveries are about normal, except in the case of mechanical tubing, which continues in heavy demand by manufacturers of machine tools and other equipment. Deliveries on boiler tubing are extended a trifle, but considering the heavy amount of ship work, the situation is not bad. Incidentally, much tubing is being required in the reclaiming of old ships which are now being pressed into service.

Birmingham, Ala.—Pipe output is well sustained. Most plants are on a five day schedule. Inquiries are numerous and considerable business is pending.

Seattle—Small tonnages are moving out of stock, no large projects being immediately up for figures. Tumwater, Wash., has $42,969 WPA funds for a $60,000 expansion involving about four miles of 3 to 6-inch cast iron pipe, bids soon.

San Francisco—Demand for small lots of cast iron pipe remains strong, though few new inquiries of size have developed recently. Awards totaled 5759 tons and brought the aggregate for the year to 5759 tons, compared with 1027

tons for the same period a year ago.

Cast Pipe Placed

400 tons, 4 to 12-inch, Bishop, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

370 tons, 6 and 8-inch, Newton, Mass., to Warren Pipe Co., Everett, Mass.

210 tons, 8-inch, Great Northern Paper Co., Millinocket, Me., to Warren Pipe Co., Everett, Mass.

158 tons, 3 to 10-inch, United States engineer office, Los Angeles, for Muroc Lake, to United States Pipe & Foundry Co., Burlington, N. J.

105 tons, small sizes, Panama, schedule 4679, to American Cast Iron Pipe Co., Birmingham, Ala., bids Jan. 9.

Cast Pipe Pending

220 tons, 12-inch, Bangor, Me.; bids in.

Rails, Cars

Track Material Prices, Page 101

Car and locomotive buying continues on a fairly large scale but rail tonnage is small. Last week 3728 cars were placed, three roads awarding 1000 or more units. Locomotive orders in the same period numbered 52 units, including lots of 12, 15 and 18. The Virginian placed 18,900 tons of steel rails.

Car Orders Placed

Chesapeake & Ohio, 1000 allsteel 50-ton box cars, 250 each to American Car & Foundry Co., St. Louis; General American Transportation Corp., East Chicago, Ind.; Pullman-Standard Car Mfg. Co., Chicago; Mount Vernon Car & Mfg. Co., Mount Vernon, Ill.; 50 allsteel 50-ton flat cars, to Bethlehem Steel Co., Bethlehem, Pa.

Chicago & North Western, 1000 gondolas, 750 to General American Transportation Corp., Chicago, and 250 to American Car & Foundry Co., New York; orders for 500 fifty-ton box cars and 200 seventy-ton ore cars and 25 miscellaneous coaches are pending.

Chicago, Rock Island & Pacific, three lightweight passenger cars to Edward G. Budd Mfg. Co., Philadelphia.

Linde Air Products Co., twenty 70-ton box cars to Pressed Steel Car Co., Pittsburgh.

Memphis Street Railways, Memphis, Tenn., five trolley coaches to Pullman-Standard Car Mfg. Co., Chicago.

Missouri Pacific, 1273 cars; 400 steel hopper cars each to American Car & Foundry Co., New York, Mount Vernon Car & Mfg. Co., Mount Vernon, Ill., and Bethlehem Steel Co., Bethlehem, Pa.; Mount Vernon Car & Mfg. Co., 70 cement cars; American Car & Foundry Co., two steel well flat cars and one streamlined rail-motor car.

Pere Marquette, 40 allsteel caboose cars, to St. Louis Car Co., St. Louis.

Tennessee Coal, Iron & Railroad Co., twenty 70-ton flat cars, twenty 70-ton gondola cars and six 70-ton hot hole cars, to the Pullman-Standard Car Mfg. Co., Chicago; ninety 70-ton ore cars still pending.

Toronto, Hamilton & Buffalo Railway, seventy-five 75-ton low side drop end mill type gondolas, to National Steel Car Corp., Hamilton, Ont.

Union Pacific, 300 fifty-ton flat cars and 50 seventy-ton mill-type gondolas, to Pullman-Standard Car Mfg. Co., Chicago.

United Electric Railways, Providence, R. I., 15 trolley coaches to Pullman-Standard Car Mfg. Co., Chicago.

Car Orders Pending

Ann Arbor, twenty-five 55-ton hopper cars, bids asked.

Canadian National, 725 freight cars, comprising 250 seventy-ton hopper cars, 200 flat cars, 150 ballast cars and 125 seventy-ton ore cars, bids asked; in addition to 200 seventy-ton gondolas and 100 seventy-ton flat cars recently noted and which are for the Grand Trunk Western, a subsidiary.

New York, New Haven & Hartford, 1000 box cars, 25 cabooses and five grill cars.

Union Pacific, ten to thirty 80-foot baggage cars, ten to twenty 80-foot mail-baggage cars and 10 to 30 chair cars, all of lightweight construction, bids asked.

Locomotives Placed

Chesapeake & Ohio, two passenger engines, to Lima Locomotive Works, Lima, O.

Denver & Rio Grande Western, five 4-6-6-4 type locomotives, to Baldwin Locomotive Works, Eddystone, Pa.

Missouri Pacific, 18 diesel-electric switching locomotives; four to Electro-Motive Co., La Grange, Ill.; two to Baldwin Locomotive Co., Philadelphia; one to American Locomotive Co., New

York; five to General Electric Co., Schenectady, N. Y.; three to Whitcomb Locomotive Co., Philadelphia; three to Davenport-Besler Corp., Davenport, Iowa.

Pere Marquette, 12 passenger engines, to Lima Locomotive Works, Lima, O.

Southern Pacific, 15 diesel-electric locomotives, divided among Electro-motive Corp., LaGrange, Ill., Baldwin Locomotive Works, Philadelphia, and American Locomotive Co., New York.

Locomotives Pending

Maine Central, one 600-horsepower and one 300-horsepower diesel-electric switch engine.

New York, New Haven & Hartford, five electric locomotives and ten diesel switchers.

Rail Orders Placed

Virginian, 18,900 tons of rail, 15,900 tons to Bethlehem Steel Co., Bethlehem, Pa., and 3000 tons to Carnegie-Illinois Steel Corp., Pittsburgh.

Buses Booked

A. c. f. Motors Co., New York: Ten motor coaches for Boston Elevated Railway Co., Boston; ten for United Electric Railways Co., Providence, R. I.; five air-conditioned for Arkansas Motor Coaches, Little Rock, Ark.; four air conditioned for Southeastern Greyhound Lines, Lexington, Ky.

Wire

Wire Prices, Page 101

Pittsburgh—Buyers are receiving promises no earlier than second quarter on virtually all wire products. Merchant market is active, with jobber buying heavy. Releases from manufacturers were more active during January than in December and backlogs have shown little change.

Cleveland—January sales exceeded December by a positive margin. Wire rods continue scarce. Some attractive rope tonnages have been sold to the government, one use being for built-in tow ropes for army trucks and other rolling stock.

Chicago—A tight situation for wire prevails, with orders and inquiries constantly expanding. Chief delay is in manufacturer's wire, as merchant wire and wire products are considerably easier. Mills have heavy order books and production is restricted by inability to obtain adequate supplies of wire rods. Deliveries are extended well into second quarter.

Boston — Only in spots is wire production capacity available for first quarter shipment on orders now being taken. Incoming tonnage, widely diversified, continues heavier than shipments with operating schedules at capacity in most departments; some are hampered by lack of rods. One producer normally selling part of its rod output remains out of the market. Most orders now being booked are for second quarter shipment at open prices.

Birmingham, Ala.—Wire specifications are active. New business is steady in virtually all items, and mills are fairly well sold for the current quarter. Manufacturers' wire is active.

Navy Takes Bids on Welding Electrodes

Boston — Contracts are being placed by the navy for 3535 tons of steel welding electrodes, including large quantities of stainless, on which Page Steel & Wire division, American Chain & Cable Co., Monessen, Pa., and Reid Avery Co., Baltimore, are low.

Ferroalloys

Ferroalloy Prices, Page 102

New York—Shipments of ferroalloys are limited largely by producers' ability to meet demands. The movement in January was exceedingly heavy, but inasmuch as producers have not had the backlog of stocks that they had some months ago, shipments have been smaller than in June and July of last year,

about the time prices underwent a general advance. Ferromanganese is holding at $120, duty paid, Atlantic and Gulf ports, and spiegeleisen, 19 to 21 per cent, at $36, Palmerton, Pa.

Shapes

Structural Shape Prices, Page 100

Pittsburgh—New projects are reported having some difficulty in finding takers with reasonable delivery, both because the engineering departments of fabricators are loaded and structural deliveries have extended well into second half, particularly on heavy sections.

Cleveland—A lull in purchasing and inquiry is noted, but that this is only temporary is indicated by much work in architects' hands. Four months' delivery is about the promptest promised by most fabricators. Ordnance plant at Ravenna, O., is the most consistent outlet here, though the latest current inquiry involves reinforcing bars. A warehouse inquiry for Patterson field, Dayton, O., has been postponed as to bids opening from Jan. 29 to Feb. 18.

Chicago — Structural fabricators continue to book substantial tonnages, but orders are not in the volume attained within recent weeks. At the same time, inquiries have declined. Most business now is for national defense plants and expansions of industrial concerns undertaking armament contracts.

Boston—Fabricating shops have the largest backlogs in recent years as a rule, although only a relatively small part of the aggregate volume of structural tonnage developing in New England is being fabricated in the district. Plain material deliveries range from eight to 10 weeks, nearer the latter.

New York—American Institute of Steel Construction reports the fabricating industry booked 1,748,144 tons in 1940, compared with 1,305,049 tons in 1939. Shipments in 1940 totaled 1,515,543 tons, compared with 1,440,054 tons in 1939. December bookings were 203,124 tons, against 141,945 tons in November and 84,383 tons in December, 1939. December shipments were 155,526 tons, against 146,992 tons in November and 116,166 in December, 1939. Tonnage on books for future fabrication Jan. 1 totaled 684,786 tons.

Philadelphia — Inquiries and awards for structurals are moderate but demand is sustained and planned construction promises heavy future needs. No relief is appearing in the limited supply of some sections. Deliveries on standard sizes are also extended into second quarter.

Toronto, Ont. — While there has been minor slowing in demand for government war projects since the first of the year, announcements now made indicate that work of this nature will be carried to much greater lengths in the immediate future. New plant construction in Canada for British industrial concerns are planned on a broad scale and Canadian mills will be called upon to supply the steel.

Shape Awards Compared

	Tons
Week ended Feb. 1.	24,081
Week ended Jan. 25	98,582
Week ended Jan. 18	53,548
This week, 1940	7,415
Weekly average, 1941	51,215
Weekly average, 1940	28,414
Weekly average, Dec.	31,516
Total to date, 1940	63,167
Total to date, 1941	256,073

Includes awards of 100 tons or more.

Shape Contracts Placed

3500 tons, airplane engine parts plant, Studebaker Corp., South Bend, Ind., Giffels & Vallet Inc., Detroit, architects, to R. C. Mahon Co., Detroit; bids Jan. 21.

2600 tons, airplane engine parts plant, Studebaker Corp., Chicago, Giffels & Vallet Inc., Detroit, architects, to

Joseph T. Ryerson & Son Inc., Chicago; bids Jan. 21.

2000 tons, gun factory, Delco-Remy division, General Motors Corp., Anderson, Ind., to Indiana Bridge Co. Inc., Muncie, Ind.

1500 tons, building for superchargers, General Electric Co., Everett, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; Turner Construction Co., Boston, contractor.

1500 tons, warehouses, quartermaster depot, Jeffersonville, Ind., to International Steel Co., Evansville, Ind.; Pearson Construction Co., Benton Harbor, Mich., contractor.

1400 tons, welding floor, Philadelphia navy yard, to Bethlehem Steel Co., Bethlehem, Pa.

1000 tons, additional shop unit, Bullard Co., Bridgeport, Conn. to Bethlehem Steel Co., Bethlehem, Pa., through Turner Construction Co., New York.

900 tons, H-beam piles, 24,900 linear feet, Martin Point bridge, Presumpscot river, Portland-Falmouth, Me., to Bethlehem Steel Co., Bethlehem, Pa.; Wyman & Simpson, Inc., Augusta, Me., contractor, $762,691.

900 tons, airplane engine parts plant, Studebaker Corp., Ft. Wayne, Ind., Giffels & Vallet Inc., architects, to Mississippi Valley Structural Steel Co., Decatur, Ill.; bids Jan. 21.

750 tons, state bridge, FAGM-6-B, Berlin, N. J., to American Bridge Co., Pittsburgh.

750 tons, airplane hangar and shop, Hinsley field, war department, Grand Prairie, Tex., 600 tons to Mosher Steel Co., Houston, Tex., and 150 tons to Austin Bros., Dallas, Tex.

740 tons, Watts Bar hydro plant, Tennessee Valley authority, Knoxville, Tenn., to Vincennes Steel Corp., Vincennes, Ind., and Midland Structural Steel Co., Cicero, Ill.; bids Jan. 13.

600 tons, torpedo station, Keyport, Wash., to Isaacson Iron Works, Seattle; Bailey Construction Co., Seattle, contractor.

540 tons, pavilion, Riverside hospital, Bronx, New York, to Harris Structural Steel Co., New York, through Federal Construction Co., New York.

525 tons, second unit, munitions factory, Buffalo Arms Corp., Cheektowaga, N. Y., new subsidiary of Houdaille-Hershey Corp., to the R. S. McMannus Steel Construction Co., Buffalo, through George A. Fuller Co., New York.

435 tons, elevated highway section, contract B-10, Triborough bridge authority, Brooklyn, N. Y. to Bethlehem Steel Co., Bethlehem, Pa.

415 tons, state highway bridges, Lawrenceburg, Ind., to Bethlehem Steel Co., Bethlehem, Pa.; letting Dec. 31.

345 tons, Kress store, San Diego, Calif., to Consolidated Steel Corp., Los Angeles.

330 tons, building, Kleinert Rubber Co., College Point, N. Y., to Ingall Iron Works, Pittsburgh.

325 tons, addition, powerhouse, Campbell Soup Co., Camden, N. J., to Lehigh Structural Steel Co., Allentown, Pa.

315 tons, grade crossing elimination, PSC 6582 Erie county, New York, to Bethlehem Steel Co., Bethlehem, Pa., through Elis G. De Lia & Co., New Hartford, N. Y.

300 tons, shop, Revere Copper & Brass Co., New Bedford, Mass., to James H. Tower Iron Works, Providence, R. I.

296 tons, steel piling, state highway, Jasper and Tyler counties, Texas, to Bethlehem Steel Co., Bethlehem, Pa.; letting Dec. 20.

250 tons, warehouse Sinclair Refining Co., East Chicago, Ind., to Hansell-Elcock Co., Chicago.

179 tons, shapes and bars, postoffice, Marion, Ind., 90 tons, shapes, to Central States Bridge & Structural Co., Indianapolis, and 89 tons, bars, to Ceco Steel Products Co., Birmingham, Ala.; Algernon Blair, Montgomery, Ala., contractor.

165 tons, four traveling gate hoists, two each Watts Bar and Cherokee dam, Tennessee Valley Authority, Knoxville, Tenn., to Philips & Davies Inc., Kenton, O., bids Jan. 7.

160 tons, factory building 55, Aluminum Co. of America, Lafayette, Ind., to Indiana Bridge Co. Inc., Muncie, Ind.

150 tons, store, F. W. Woolworth Co., Lawrence, Mass., to Bethlehem Steel Co., Bethlehem, Pa.

150 tons, miscellaneous projects, to Isaacson Iron Works, Seattle.

140 tons, factory addition, Niacet Chemical Co., Niagara Falls, N. Y., to Ernst Iron Works, Buffalo.

137 tons, state bridge 5959, Mapleton, Minn., to Illinois Steel Bridge Co., Jacksonville, Ill.

125 tons, steel sheet piling, Panama, schedule 4690, to U. S. Steel Export Co., Washington; bids Jan. 14, Washington.

120 tons, Indian River bridge, Alaska railroad, to Omaha Steel Works, Omaha, Neb.

120 tons, wide flanged steel beams for gates, U. S. engineer, Cincinnati, to American Bridge Co., Pittsburgh, $15,393.89, delivered, inv. 59; bids Jan. 20.

110 tons, one-story addition, Remington Arms Co., Bridgeport, Conn., to Porcupine Co., Fairfield, Conn.; Harry Marring Jr. Inc., Bridgeport, contractor; Fireproof Products Co., New York, awarded reinforcing bars.

105 tons, Sand Point naval base, Seattle, to Isaacson Iron Works, Seattle, The Austin Co., Seattle, contractor.

104 tons, state bridge No. 2096, Crawfordsville, Ind., to Elkhart Bridge & Iron Co., Elkhart, Ind.

100 tons, galvanized structural switch structures, Pickwick dam, Tennessee Valley Authority, Knoxville, Tenn., to International-Stacey Corp., Columbia, O.; bids Jan. 2.

Shape Contracts Pending

9500 tons, building, Prudential Life Insurance Co., Newark, N. J.

8000 tons, airplane engine plant, Buick Motor Co., Chicago, Albert Kahn, Detroit, architect; bids Feb. 10.

6500 tons, naval gun plant, Hudson Motor Car Co., Detroit.

3750 tons, buildings, Todd-Bath Shipbuilding Corp., So. Portland, Me.

2800 tons, turret and armor shop, Fore River shipbuilding division, Bethlehem Steel Crpo., Quincy, Mass.

1800 tons, hangars, Robertson, Mo., for navy; Lecoutour-Parsons Construction Co., St. Louis, contractor.

1000 tons, four fuse loading lines, La Porte, Ind., for government.

900 tons, ramp connection, McDonald avenue, Brooklyn, N. Y., for city of New York.

815 tons, inspection shed and service building, Brooklyn, N. Y., for city of New York.

814 tons, sheet piling, turning basin, Cuyahoga river straightening, Cleveland; Merritt, Chapman & Scott, apparently low.

700 tons, assembly plant and magazines, Edgewood, Md., for army.

600 tons, warehouses, Patterson field, Dayton, Ohio; bids Feb. 18.

600 tons, factory addition, Sterling Engine Co., Buffalo.

600 tons, piling, Delaware aqueduct, New York; bids Feb. 11, Department of Water Supply, New York.

510 tons, manufacturing building, Singer Mfg. Co., Elizabethport, N. J.

500 tons, state highway bridge, RC-41-1, Warrensburg-Thurman Station, N. Y.; Green Island Construction Co. Inc., Green Island, N. Y., low, $159,515.55; bids Jan. 22, Albany.

500 tons, building, General Electric Co., Lynn, Mass.; bids Feb. 7.

400 tons, live poultry market, Queens, New York; bids Feb. 14, Department of Public Works.

400 tons, flood prevention work, Paducah, Ky., U. S. engineer, Louisville, Ky.; bids Feb. 11.

350 tons, launchway girders, New York Shipbuilding Corp., Camden, N. J.

350 tons, shapes for submarine net base, Tiburon, Calif., specification 10257; bids in.

315 tons, New York Central railroad, state project PSC-6582, Erie county, New York; Elis G. De Lia & Co., New Hartford, N. Y., low $159,494; bids Jan. 22, Albany; also 105 tons, reinforcing bars.

300 tons, dry dock buildings, South Boston, Mass.; Sawyer Construction Co., Boston, contractor.

275 tons, office, American Locomotive Co., Schenectady, N. Y.

260 tons, building, Y. W. C. A., Bridgeport, Conn.

200 tons, beam bridge, Leverett, Mass., for state.

200 tons, asphalt plant, Manhattan, N. Y.; bids Feb. 18, to borough president.

175 tons, state bridge Kern river, Bakersfield, Calif.

165 tons, bridge, Monroe county, Pennsylvania; bids to state highway department, Harrisburg, Pa., Feb. 7.

160 tons, boiler house, alterations Public Service Electric & Gas Corp., Burlington, N. J.

150 tons, boiler house alterations, Public Service Electric & Gas Corp., Burlington, N. J.

150 tons, structural bar steel, Panama schedule 4761; also 300,000 feet, galvanized carbon steel pipe; bids Feb. 4, Washington.

120 tons, bleachers, borough of Ambridge, Pa.

Unstated, factory, Du Pont, Niagara Falls, N. Y.

Unstated, bank building addition, Seattle; Howard S. Wright & Co., Seattle, contractor.

Selecting Site for West Coast Carbide Plant

■ J. T. MacBain, assistant works manager, Union Carbide Co. and Electro Metallurgical Co., both units of Union Carbide & Carbon Corp., L. H. Davis, consulting engineer, C. H. Bracket, electrical engineer, and D. C. Duncan of the operating division, are on the West coast to select a location for a combined carbide and ferroalloy plant.

The plant will be so constructed as to make possible the manufacture not only of calcium carbide and ferrosilicon but manganese- and chrome-bearing alloys.

Reinforcing

Reinforcing Bar Prices, Page 101

Pittsburgh—There is some difference of opinion among producers and consumers as to whether the new schedule of quantity extras on concrete bars effective Jan. 15 by some producers will become general. With volume of new business high and unchanged, it seems probable that buyers will be forced to accept the new extras.

Cleveland—Several school projects, independent of WPA, are being figured on for the first time in several years, buildings to cost from $50,000 to $100,000 each. Largest current inquiry calls for 5000 tons for igloos for ordnance plant at Ravenna, O.

Chicago—Demand for reinforcing steel has increased somewhat but still lags as compared with other products. A considerable volume of construction jobs is pending, particularly government national defense work and related industrial plant expansion.

Boston—Housing accounts for most tonnages now pending, several thousand tons for units at Providence, R. I., Cambridge, Mass., and Hartford, Conn. Miscellaneous small-lot buying for industrial expansions is maintained at generally firm prices.

New York—Shading on larger contracts for concrete reinforcing bars has not entirely disappeared despite lower nearby stocks and growing difficulty in making replacements. Extras are also being waived in some instances. Competition among distributors brings out reductions of $2 to $3 a ton under the 2.15c base, Sparrows Point, Md., on larger lots. Nevertheless, concrete bar prices are stronger than at this time last year, and in the aggregate, considerable volume in small and medium-sized orders is moving at the listed price.

San Francisco—While rolling mills are busy on back orders new inquiries of size have developed recently. The outstanding letting called for 320 tons for a pier at the navy yard, Bremerton, Wash. Awards aggregated only 720 tons and brought the total to date to 6901 tons, compared with 8184 tons for the corresponding period in 1940.

Reinforcing Steel Awards

1527 tons, underground powder storage igloos, Elwood ordnance plant, Elwood, Ill., Sanderson & Porter, Joliet, Ill., engineers, to Truscon Steel Co., Youngstown, O. Also 115 tons of wire mesh to American Steel & Wire Co., Chicago.

1500 tons, bridge foundation, Thames river, New London-Groton, Conn., to Truscon Steel Co., Youngstown, O., through A. I. Savin Construction Co., Hartford, Conn.

637 tons, foundations, airplane engine parts plant, Studebaker Corp., South Bend, Ind., W. E. O'Neil Construction Co., Chicago, to Calumet Steel Co., Chicago; bids Jan. 24.

600 tons, ordnance depot, war department, Ogden, Utah, to Colorado Fuel & Iron Corp., Denver; bids Dec. 19.

425 tons, King county, Washington, state bridges, to Northwest Steel Rolling Mills, Seattle; A. W. Stevens Co., Mt. Vernon, Wash, contractor

400 tons, housing, Cairo, Ill., to Truscon Steel Co., Youngstown, O., States Improvement Co., Chicago, contractor.

400 tons, estimated, 75,000 square non-corrosive reinforcing fabric, U. S. engineer, Memphis, Tenn., to Copperweld Steel Co., Glassport, Pa., $2.995 per square, total bid $224,625, delivered; bids Jan. 16, inv. 142.

320 tons, addition to pier, Puget Sound

Concrete Bars Compared

	Tons
Week ended Feb. 1	6,976
Week ended Jan. 25	12,523
Week ended Jan. 18	9,054
This week, 1940	16,530
Weekly average, 1941	10,272
Weekly average, 1940	9,661
Weekly average, Dec.	7,204
Total to date, 1940	46,171
Total to date, 1941	51,359

Includes awards of 100 tons or more.

navy yard, Wash., to Seattle Steel Co.; A. W. Quist, Seattle, contractor.

300 tons, additions, Fafnir Bearing Co., New Britain, Conn., to Northern Steel Co., Boston; Aberthaw Co., Boston, contractor.

215 tons, flood protection work, United States engineer, Harrisburg, Ill., to Laclede Steel Co., St. Louis.

150 tons, WPA project 6762, Connell, Kans., to Sheffield Steel Corp., Kansas City, Mo.

102 tons, bridge project, Medford, Okla., to Sheffield Steel Corp., Kansas City, Mo.

100 tons, factory, Leeds & Northrup Co., Philadelphia, to American Steel Engineering Co., Philadelphia.

100 tons, addition, Mount Sinai hospital, Chicago, to Joseph T. Ryerson & Son Inc., Chicago, through Morris Handler Co. Inc., Chicago; bids Nov. 29.

100 tons, U. S. military reservation, Point Judith, R. I., to Jones & Laughlin Steel Corp., Pittsburgh, 2.73c, delivered; bids to U. S. engineer, Providence, R. I., inv. 136.

100 tons, shell loading plant, Hill field, Ogden, Utah, to Colorado Builders Supply Co., Denver, through Olson Construction Co. and Dobson & Robinson, Lincoln, Nebr.; also structurals to St. Joseph Structural Steel Co., St. Joseph, Mo., and Omaha Steel Works, Omaha, Nebr.

Unstated tonnage, 2-story addition, Greenfield Tap & Die Corp., Greenfield, Mass., to Truscon Steel Co., South Boston, Mass.; E. J. Pinney Co. Inc., Springfield, Mass., contractor.

Reinforcing Steel Pending

5000 tons, igloos, ordnance plant, Ravenna, O.; Hunkin-Conkey Co., contractor.

2000 tons, armory, Washington, D. C.

2000 tons, housing project, Hartford, Conn., unit 4; bids Feb. 3.

1720 tons, hangar, Curtiss Wright Corp., Columbus, O.; Darin & Armstrong, Detroit, contractor.

620 tons, conveyor ramps, Elwood ordnance plant, war department, Wilmington, Ill., Sanderson & Porter, Joliet, Ill., engineers; bids Jan. 30.

505 tons, airplane engine parts plant, Studebaker Corp., Chicago, Giffels & Vallet Inc., Detroit, architects; bids Jan. 31.

363 tons, ¾-inch rounds, 30-foot lengths, Panama, schedule 4756; bids Jan. 30, Washington.

280 tons, airplane engine parts plant, Studebaker Corp., Ft. Wayne, Ind., Giffels & Vallet Inc., Detroit, architects; bids Jan. 31.

113 tons, highway, project 2Y1, Blue Ridge parkway, Haywood-Jackson counties, North Carolina; bids Feb. 20, bureau of public roads administration, Washington.

Unstated, two concrete siphons, Oregon state, Morrow county; A. Milne, Portland, low.

Pig Iron

Pig Iron Prices, Page 102

Pittsburgh—The tight situation continues in iron markets here. Production in January reached a new high point, with only seven furnaces now idle and at least three of these scheduled to go into operation soon. Although considerable interest in second-quarter prices is manifested by consumers, no consideration has been given to the problem by sellers, and they have assured all customers iron will be available in quantities comparable to earlier shipments. The coke situation is becoming less tight as more ovens go into operation and output increases. Some brokers here report they have been approached by several coke producers over the past two weeks looking for an outlet for their material.

Cleveland—Shipments in January were usually 10 per cent ahead of December. New demand has appeared, as well as increase in specifications on contracts. Producers have kept delivery promises strictly, both as to dates and tonnages. All doubt as to price has disappeared in favor of the $1 per ton higher quotation. Producers are not yet selling for second quarter.

Chicago—Pig iron situation here grows tighter with time as blast furnaces are producing to capacity and consumers are taking contract tonnages on schedule. Some sellers are out of the market because they are well sold up for the quarter, but the majority are able to book small fill-in tonnages to regular customers. Iron production in

Behind the Scenes with STEEL

Farewell To Arms

■ We know a metallurgical engineer, his name familiar to heat treating and furnace specialists throughout the country, who recently went through a strange metamorphosis. After weeks and months of reading about world tragedies, bombings, machine gunnings, and whatnot, he stood amidst some of the engines of destruction which were being turned out in his own plant for defense—excuse it, we mean Great Britain—and suddenly became sick of the whole bloody mess. Here he was, a sincere, hard-working technical man with many years experience, now devoting the best part of his time perfecting better ways to annihilate some of his fellow-men. What satisfaction could be gained from such travail? Where was the justification for working hours so spent?—He shed his work coat, boxed up his office belongings and resigned. Today he is preaching the gospel of peace on earth and goodwill toward men in a small rural church, far from the fires of the heat treating furnaces, in a realm of controlled atmosphere of his own making.

Dare Ye Judge

■ And who shall dare say this man is lagging in his duty to his fellow-man and to his God? It is strange indeed to see a hard-bitten technician renounce his work for the more ethereal tasks of the theologist, but we'll bet that at night when he sits before his fire he is mentally and soulfully comfortable. If the nation's frenzies were whipped up just a few more beats, this man in all likelihood would be branded a slacker, his house smeared with brown stain perhaps, and the puerile finger of scorn pointed at him in his daily rounds. But we like the incident. It demonstrates a type of Courage we see little of these days, and also the comparatively narrow space between science and religion. Easily bridged by this man, it has been too often pictured as some limitless chasm between two totally irreconcilable schools of thought.

Lovely Stewardess

■ We may get mixed up in our English once in a while but hardly with the same results as this item from the *East Coast Shipping Records*: "Miss Alice—has been engaged as stewardess and social hostess aboard the *S. S. Alexandria,* which sails tomorrow. Before leaving port she will have her barnacles scraped."

Talented Secretary

■ We just heard the other day about the prompt inquiry the Frank B. Pope Co. received from their Yearbook advertisement, the day after that 440-page issue landed *kerplunk* on busy desks all over the country. As we get it, apparently the boss of a particular plant up in Buffalo showed up a little late that Monday morning and one Sara Barney couldn't resist the temptation of taking a peek at that big, good-looking magazine on his desk. Now, Sara has been doing a little sculpturing on the side so that ad on Frank B. Pope's Mayport Clay stopped her cold. And it brought action, too, because Sara sat right down and dashed off a letter, wanting to know if it would model and how it would fire for permanent use and a lot of other things. The Pope company was swell about it. They sent Sara a big sample box and told her if it worked out all right they wanted to send her a 100 lb. bag with their compliments. Maybe one of these days, as a return favor, in Frank B. Pope's reception room in Pittsburgh you'll be able to see an original Sara Barney, done in Mayport Clay.

New Version

■ Be sure to clip out that Hanlon-Gregory bedtime story on page 87 this week and take it home to scare the kids into going to sleep.

Time Saver

■ A new defense against insurance salesmen is working fine these days. Before they even give you that cheerful good morning, just say softly: *Sorry, old man, but I've been drafted.* And that settles that.

SHERLEY

this district will be increased with the blowing in of Wisconsin Steel Co.'s No. 2 furnace at South Chicago Jan. 30.

Boston — Realizing the futility of attempts to build up excessive inventories beyond liberal estimated requirements, pig iron consumers recognize curbs operative against overloading and are buying and releasing shipments more evenly.

New York—January specifications will be down slightly from December, in the opinion of most pig iron sellers here. Last month considerable pressure was placed on consumers to take in tonnage in accordance with contracts calling for delivery by the end of the year and while some of the larger buyers resisted this pressure because of approaching inventory season, the net result was an exceptionally large movement of iron, sellers declare.

Philadelphia—Pig iron shipments are at the limit of available supplies but continued appearance of inquiries from consumers seeking to supplement previous purchases indicates future requirements are not completely satisfied. Castings orders have increased materially in the past 60 days with foundry operations at the best rate in several years.

Buffalo — Merchant iron sellers report further expansion in shipments. January sales are estimated at 5 to 10 per cent larger than December and, perhaps, the heaviest on record. Hanna is now supplying the Bethlehem plant with approximately 300 tons of hot metal a day as the latter finds supplies inadequate.

Cincinnati — Shipments of pig iron are the heaviest since 1937. Most southern furnaces are virtually out of the market. One inquiry for 1000 tons was in the market, reports failing to disclose whether the order was finally accepted.

St. Louis — With first quarter needs generally covered and blast furnace interests reluctant to sell beyond that period, pig iron sales are small. Only activity in the way of new buying is in lots of 25 to 100 tons, for fill-in purposes or to supply special analysis.

Birmingham, Ala. — Pig iron production is at capacity. Merchant melters are fully booked, and no price announcement is forthcoming yet.

New York Elevated To Yield 23,000 Tons Scrap

New York—Subject to later approval by the city board of estimate, the board of transportation has awarded to the Associated Metals & Minerals Corp., 40 Hester street, the contract for demolition of the Second avenue elevated structure between Fifty-ninth and 128th streets.

The company will pay the city $40,100 and keep all steel, iron and other materials, reclaimed, about 23,000 tons. No action on disposal of the scrap to consumers has yet been taken.

Scrap

Scrap Prices, Page 104

New York — A price of $21, Pittsburgh, per gross ton, for No. 1 heavy melting steel scrap on the February railroad lists will not be considered unduly high, according to the understanding of the carriers with the defense commission. This compares with $22 on the January lists. The agreement also considers $26, Pittsburgh, on rerolling rails and $24, Pittsburgh, on scrap rails, will not be unduly high on the February lists. The increase of $1 per ton on rerolling rails is to defray to the railroads the additional cost of sorting from scrap rails. The agreements also provide that scrap rails are to be available to the foundries, according to the defense commission's desire. Current scrap buying here is slack with most shipments being made against contracts. Prices are unchanged for the most part but several grades are still regarded as too high and difficulty is being experienced in getting brokers' buying prices down to the desired level.

Pittsburgh—Prices are in a state of flux, with contrary trends being reported in various grades. Some effort is being made by consumers to force prices down on open-hearth and blast furnace grades, while low phos specialties and cast grades are strong, and in some cases have sold at slightly higher prices. This week's railroad closings are of particular interest because the Pennsylvania has noted on its offering list that bids deemed excessive in view of current conditions will be rejected.

Cleveland—Melters show little interest in scrap. Cast material is steady at current quotations. Large consumers of steelmaking grades assert they are waiting for the price to get down to $20, Pittsburgh, for No. 1 heavy melting steel. Closing of large railroad lists is awaited as an indication of the market.

Chicago—A low level of activity marks the iron and steel scrap situation, following the recent move to lower prices. Mill sales are almost completely lacking, and dealers experience difficulty in replenishing stocks moved out in the recent selling wave. Shipments to mills of material on contract are proceeding normally.

Boston — Iron and steel scrap changes are fewer and for the most part limited to minor adjustments.

Most foundry consumers and steelmakers having covered on immediate needs, buying has slackened. Some shipments are being made against orders.

Philadelphia — Checking of the scrap price rise tends to halt the switch to use of a larger proportion of pig iron in the foundry melt. The scrap market maintains fairly steady price tone. Heavy melting steel is unchanged but the trend in several other grades is slightly downward. Scrap is coming out in relatively good volume, considering unfavorable weather, but offerings are insufficient to push prices down.

Detroit—A degree of stability has appeared in the scrap market, although there is a drift to lower levels in some grades. Compressed sheet bundles, loose sheet clippings and low-phosphorus plate are off 25 cents per ton. Stove plate is revised to $11 to $11.50 per ton.

Cincinnati—Dealers' prices on iron and steel scrap are unchanged but nominal on several items including rails for melting. Although the market has the appearance of normal, several difficulties in the stabilization plan remain. Mills are accepting heavy shipments against contractual arrangements, and foundries are active purchasers.

St. Louis—Iron and steel scrap continues to exhibit the downward trends which have been in effect during the past two or three weeks, with weakness most noticeable in steel specialties. A steel foundry has issued inquiries for a substantial volume of steel specialties, and markdowns on these items are based largely on values indicated in this inquiry.

Birmingham, Ala.—Scrap is moving spasmodically with the market still confused. Dealers report stove plate up $1 a ton this week to $13.50 and No. 1 cast up 50 cents to $18.50.

San Francisco—Further advances have occurred in the market recently and the market is considered, generally, as being wide open. Prices in the San Francisco metropolitan area range from $15 to $15.50 on No. 1 heavy melting steel, at $14 to $14.50 for No. 2 and at $13 to $13.50 for compressed sheets. Los Angeles metropolitan area quotations are as follows: $14.50 to $15 for No. 1 heavy melting steel, $13.50 to $14 for No. 2 and $12.50 to $13 for compressed sheets.

Buffalo — Although prices are nominal, mixed tendencies are prevailing in the scrap market pending substantial mill buying. With leading consumers on the sidelines, steelmaking grades were dropped 50 cents a ton with No. 1 heavy melting quoted at $20.50 to $21 a ton. Strength, however, was noted in the cast market with No. 1 machinery changing hands at $21.50 to $22 a ton and borings at $14.50 to $15 a ton.

Toronto, Ont.—Scrap offerings to dealers showed sharp decline during the past week. Automobile wreckers have cut deliveries more than 25 per cent since the first of the year, and severe weather has resulted in sharp falling off in rural deliveries.

Warehouse

Warehouse Prices, Page 103

Cleveland—Steel is coming to distributors from mills in much better volume on the larger tonnages ordered a few months ago and the situation as to supply is more hopeful. Plates are still the scarcest but supply prospects there are better. January sales were on a par with, or slightly better than December.

Chicago—Warehouse steel sales and inquiries continue to move upward and business for January is in excess of that for December. Jobbers now find difficulty in obtaining mill deliveries. Consumer demand is well diversified as to source and product.

Boston—Sales volume in January with most jobbers was ahead of the previous month and would have been larger had inventories of some products been in better balance.

New York—Sustained demand for steel from warehouses has further depleted stocks of some products, replacement of which are becoming more difficult. January volume with most jobbers topped December. Demand is diversified.

Lowest quotations on 3000 kegs common wire nails for WPA requirements to July 1, were considerably below listed resale prices for less than carlot shipments and even below some mill prices.

Philadelphia—Warehouses are receiving all the business they can handle. Supplies are generally adequate with few instances of shortages reported. Sources of orders are broadening slightly as a result of wider distribution of defense work.

Buffalo — Warehouses find the supply situation becoming more acute. Sizes in several items have been broken and mills are unable to promise immediate deliveries to replenish stocks.

Cincinnati — Warehouse volume continues heavy, principal concern being over replenishing stocks. Diversion of building material orders, because of 10 to 12-weeks delay from mills, is bolstering jobber sales and also creating a problem in stocking these items. Galvanized sheets and strip are up, following the recent price increase on hot-rolled sheets.

St. Louis — Business with warehouse continues the high rate of re-

cent weeks. Demands are reported unusually well diversified, with customers in numerous instances pressing for early delivery.

Seattle—Dealers report sustained volume of business, considerable tonnage being placed in car lots. Prices are firm and well maintained.

Steel in Europe

Foreign Steel Prices, Page 103

London—(*By Cable*) — Iron and steel production in Great Britain continues at intensified rate, supplemented by heavy American imports. Ordinary commercial demand is much restricted and first quarter quotas are now issued. Shipyards have priority and their output is substantially increasing. Sheet and plate mills are working at capacity. Some small steel tonnages have been licensed for export. Tin plate export demand is active but new restrictions will considerably reduce available tonnages.

Osborn Co. Opens New Offices at Cleveland

■ Twelve hundred sheet metal dealers, suppliers, their employes and families were guests at the formal opening of the new general offices of the J. M. & L. A. Osborn Co., Cleveland, Jan. 18. Affair included afternoon trips through the offices, warehouse and manufacturing departments, a buffet dinner, and a dance.

The Osborn company also recently added a warehouse at Cincinnati, doubled the space of its Buffalo division, and purchased the business of the Globe Ventilator Co., Troy, N. Y. The company is a jobber of sheet metal, roofing and warm air heating products.

Carnegie-Illinois Lights New Gary Coke Ovens

■ Coke production in the Chicago district was increased last week with the second of two new batteries of by-product coke ovens placed in operation at the Gary, Indiana, steelworks of Carnegie-Illinois Steel Corp.

The new units, of 71 ovens each, replaced the No. 10 and No. 12 batteries formerly comprised of 70 ovens each. Work was started on the replacements last year and the first of the batteries was restored to operation two weeks ago. These additional batteries now give Carnegie-Illinois a total of 1258 coke ovens in the Chicago region, with peak annual production possibilities exceeding 5,000,000 tons annually.

Nonferrous Metals

New York—Shortage of zinc supplies has restricted consumption of that metal as well as copper, due to its requirement in the manufacture of brass. Supplies of other major metals appear adequate to meet all estimated needs.

Zinc—Representatives of the scrap and secondary markets have submitted proposals for realigning their prices with the primary zinc prices. For several weeks, secondary zinc and some scrap zinc prices have been higher than the 7.25c for prime western zinc. If maximum scrap zinc prices are established, the differential under the primary 7.25-cent quotation may be 1.50

Nonferrous Metal Prices

Jan.	Copper, Electro, del. Conn.	Copper, Lake, del. Midwest	Copper, Casting, refinery	Straits Tin, New York, Spot	Straits Tin, New York, Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
25	12.00	12.00	12.12½	50.15	50.10	5.50	5.35	7.25	17.00	14.00	35.00
27	12.00	12.00	12.12½	50.20	50.10	5.50	5.35	7.25	17.00	14.00	35.00
28	12.00	12.00	12.12½	50.20	50.10	5.50	5.35	7.25	17.00	14.00	35.00
29	12.00	12.00	12.12½	50.20	50.10	5.50	5.35	7.25	17.00	14.00	35.00
30	12.00	12.00	12.25	50.25	50.15	5.50	5.35	7.25	17.00	14.00	35.00
31	12.00	12.00	12.25	50.50	50.37½	5.50	5.35	7.25	17.00	14.00	35.00

F.o.b. mill base, cents per lb, except as specified. Copper brass products based on 12.00c Conn. copper

Sheets

Yellow brass (high)	19.48
Copper, hot rolled	20.87
Lead, cut to jobbers	8.75
Zinc, 100 lb. base	12.50

Tubes

High yellow brass	22.23
Seamless copper	21.37

Rods

High yellow brass	15.01
Copper, hot rolled	17.37

Anodes

Copper, untrimmed	18.12

Wire

Yellow brass (high)	19.73

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	8.00-8.25
Cleveland	9.50-9.75
Chicago	8.62½-8.87½
St. Louis	8.37½-8.50

Heavy Copper and Wire

New York, No. 1	9.62½-9.87½
Cleveland, No. 1	10.00-10.50
Chicago, No. 1	9.75-10.00
St. Louis	9.62½-9.75

Composition Brass Turnings

New York	7.62½-7.87½

Light Copper

New York	7.62½-7.87½
Cleveland	8.00-8.25
Chicago	7.75-8.00
St. Louis	7.62½-7.75

Light Brass

Cleveland	5.00-5.50
Chicago	5.87½-6.12½
St. Louis	5.00-5.25

Lead

New York	4.60-4.70
Cleveland	4.50-4.75
Chicago	4.50-5.00
St. Louis	4.25-4.50

Zinc

New York	6.50
Cleveland	5.00
St. Louis	4.50-4.75

Aluminum

Mis., cast, Cleveland	11.00-12.00
Borings, Cleveland	8.00
Clips, soft, Cleveland	14.75-15.00
Misc. cast, St. Louis	11.00-11.50

SECONDARY METALS

Brass ingot, 85-5-5-5, l.c.l.	12.75-13.25
Standard No. 12 aluminum	16.50-17.00

cents per pound on new clippings and 2.50 cents on old zinc scrap.

Copper—The industry continues to assure consumers that enough metal will be available for all needs, based on the fact that Metals Reserve Co. will begin soon to release the 100,000 tons of Latin American copper and is negotiating for the purchase of an additional 100,000 tons.

Lead—Sellers more than balanced their week's intakes but held prices at the 5.35-cent East St. Louis level. Weekly output has averaged around 15,000 tons, shipments at about 14,000 tons, and sales 12,000 tons. In addition, about 2000 tons of foreign refined lead are entering the domestic market weekly.

Tin—An advance of 25 per cent in ocean freight rates on tin cargoes from the Far East resulted in an advance in prices here on Friday. Straits spot closed at 50.50c compared with 50.15c at the end of the previous week.

Equipment

Seattle—Cantonment, housing and other public works call for heavy construction equipment, and shipyard construction and air field projects add to volume being placed by machinery and equipment houses. Bids to Denver for electric heaters for Coulee power house show Weis Electric Heater Co., San Francisco, and Edwin L. Weigand Co., Pittsburgh, low for various items. Bonneville project will receive figures Feb. 3 for 230-kv circuit breaker, Feb. 10 for distribution transformers, Feb. 3 for four trucks.

War Industries Shift To Canada Underway

TORONTO, ONT.

■ Plans for immediate transfer of British war industries to Canada "on a considerable scale" were reported last week by C. D. Howe, minister of munitions and supply, recently returned from England. The transfer, he said, has already been initiated in a minor way.

Munitions and supply department reported last week that total of contracts placed on Canadian and United Kingdom account in 1940, excluding certain contracts yet to be placed under the plant extension program, was $1,105,832,940. Awards placed on Canada's account totaled $671,558,791; civil aviation division for airport construction under the British Commonwealth air training plan placed contracts aggregating $17,047,938. United Kingdom's contracts totaled $263,038,792, with additional $154,187,418 for plant extensions and output of some of the new plants.

Contracts last week reported placed totaled $93,138,324. United States firms received orders aggregating $26,777,232. Orders included:

Aircraft: Various firms in Canada, $51,893,003; Air Ministry, England, $131,950; Canadian Pratt & Whitney Aircraft Co. Ltd., Longueuil, Que., $52,650; Fairchild Aircraft Ltd., Longueuil, $263,963; Aviation Electric Ltd., Montreal, Que., $57,200; Canadian Vickers Ltd., Montreal, $22,122; Canadian Wright Ltd., Montreal, $10,839; National Steel Car Corp. Ltd., Montreal, $1,890,000; Canadian General Electric Co. Ltd., Ottawa, Ont., $5188; Macdonald Bros. Aircraft Ltd., Ottawa, $8489; Standard Tube Co. Ltd., Ottawa, $9000; Link Mfg. Co. Ltd., Gananoque, Ont., $168,297; Canadian Westinghouse Co. Ltd., Hamilton, Ont., $518,965; Leaders Ltd., Winnipeg, Man., $6300.

Capital expenditure: Peacock Bros. Ltd., Montreal, $40,000; Dunlop Tire & Rubber Goods Co. Ltd., Toronto, $157,325; Carter-Halls-Aldinger Co. Ltd., Winnipeg, $232,255.

Munitions: Dominion Arsenals, Quebec, Que., $2,402,168; Defence Industries Ltd., Montreal, $269,568; Montreal Construction Supply & Equipment Ltd., Montreal, $326,025; Dominion Arsenals, Lindsay, Ont., $2,957,500; United Steel Corp. Ltd., Toronto, $9990.

Ordnance: John Inglis Co. Ltd., Toronto, $112,125; Kelsey Wheel Co. Ltd., Windsor, Ont., $39,139; Dominion Rubber

Co. Ltd., Kitchener, Ont., $109,296; Maritime Steel & Foundries Ltd., New Glasgow, N. S., $6299.

Machinery: T. E. Ryder Machinery Co., Montreal, $24,337; Canadian Ingersoll-Rand Co. Ltd., Montreal, $8654; Peoples Gas Supply Co. Ltd., Ottawa, $12,297; Canadian Fairbanks Morse Co. Ltd., Ottawa, $5360; E. W. Bliss Co. of Canada Ltd., Toronto, $76,898; Lincoln Electric Co. of Canada Ltd., Toronto, $12,849; A. R. Williams Machinery Co. Ltd., Toronto, $26,225; Brunner Corp. of Canada Ltd., Toronto, $9599; Hollup Corp. Ltd., Toronto, $10,956.

Tools: Canadian Fairbanks-Morse Co. Ltd., Ottawa, $12,646.

Electrical equipment: Canadian Westinghouse Co. Ltd., Ottawa, $138,212; Northern Electric Co. Ltd., Ottawa, $20,246; Ferranti Electric Ltd., Toronto, $9280; Masco Co. Ltd., Toronto, $12,157; Vancouver Radio Laboratories Ltd., Vancouver, B. C., $8208.

Instruments: Air Ministry, England, $87,400; War Office, England, $9000; Canadian General Electric Co. Ltd., Ottawa, $11,469; Research Enterprises Ltd., $96,700; Dominion Electric Protection Co., Montreal, $133,987; United States Gauge Co., Montreal, $21,227.

Mechanical transport: International Harvester Co. of Canada Ltd., Ottawa, $13,695; Stewart-Warner-Alemite Corp. of Canada Ltd., Belleville, Ont., $14,300; Four Wheel Drive Auto Co. Ltd., Kitchener, $7540; Ford Motor Co. of Canada Ltd., Windsor, $22,929.

Dockyard supplies: British Admirally, England, $34,400; Peacock Bros. Ltd., Montreal, $43,380; John Hay & Co. Ltd., Eastview, Ont., $7440; Canadian John Wood Mfg. Co. Ltd., Toronto, $17,000; Horton Steel Works Ltd., Toronto, $66,455; Harley-Kay Ltd., Georgetown, Ont., $14,100; J. Fred Williamson Ltd., St. John, N. B., $8060; Mine Safety Appliance Co. of Canada Ltd., Montreal, $10,937.

Shipbuilding: Halifax Shipyards Ltd., Halifax, N. S., $53,907; George T. Davie & Sons Ltd., Lauzon, Levis, Que., $46,598; Morton Engineering & Drydock Co. Ltd., Quebec, $31,512.

Miscellaneous: Atlas Steels Ltd., Welland, Ont., $18,423; B. Greening Wire Co. Ltd., Hamilton, Ont., $7214; Sarnia Bridge Co. Ltd., Sarnia, Ont., $46,981; MacLean Plumbing Service, Noranda, Que., $23,497; Canadian Comstock Co. Ltd., Toronto, $66,600; Herbert Morris Crane & Hoist Co. Ltd., Niagara Falls, Ont., $11,123; Waterous Ltd., Brantford, Ont., $19,800; International Silver Co. of Canada Ltd., Hamilton, $11,125; Walter Kidde & Co. of Canada Ltd., Montreal, $15,686; LaFrance Fire Engine & Foamite Ltd., Toronto, $17,107; Maritime Steel & Foundries Ltd., New Glasgow, $5310; Howard Furnace Co., Toronto, $47,280; Bremner-Harris & Co., Montreal, $10,000; Reid & Cambridge Ltd., Montreal, $73,000, E. Leonard & Sons Ltd., London, Ont., $16,000.

War construction projects: Fundy Construction Co. Ltd., Halifax, N. S., $184,278; Acme Construction Co. Ltd., St. John, $512,577; W. C. Brennan Contracting Co., Hamilton, $78,639; Bennett & White Construction Co. Ltd., Calgary, Alta., $783,722; Northern Construction Co. & J. W. Stewart Ltd., Vancouver, $209,676; W. E. Emerson & Sons Ltd., St. John, $349,596; La Compagne De Construction Laviolette Ltd., Three Rivers, Ont., $90,965; Dominion Bridge Co. Ltd., Lachine, Que., $109,600; Ernest A. Jones Ltd., Leaside, Ont., $81,709; Storms Contracting Co. Ltd., Toronto, $336,260; H. G. MacDonald & Co., Edmonton, Alta., $105,486.

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Contracts reported the previous week included:

Machinery: Canadian Fairbanks-Morse Co., Ottawa, Ont., $5360; E. W. Bliss Co., Toronto, $37,748; Brunner Corp., Toronto, $9599; Hollup Corp., Toronto, $10,956.

Electrical equipment: Railway Power & Engineering Corp., Toronto, $5850.

Instruments: Ontario Hughes-Owens Co., Ottawa, $55,683.

Shipbuilding: Peterborough Canoe Co. Ltd., Peterborough, Ont., $8690.

Mechanical transport: Canadian Fairbanks Morse Co., Ottawa, $18,810; International Harvester Co., Ottawa, $10,455; Dominion Truck Equipment Co., Kitchener, Ont., $9923; Ford Motor Co. of Canada Ltd., Windsor, Ont., $45,456.

Aircraft: McIntyre Porcupine Mines Ltd., Toronto, $58,830; Bickle-Seagrave Ltd., Woodstock, Ont., $63,000.

Miscellaneous: General Steel Wares Ltd., Ottawa, $40,820; Brantford Oven & Rack Co. Ltd., Brantford, Ont., $6473; Power Bros. Ltd., Lunenburg, N. S., $14,000; Pool Construction Co. Ltd., Regina, Sask., $20,000; Waterman-Waterbury Mfg. Co. Ltd., Regina, Sask., $6000; Bennett & White Construction Co. Ltd., Calgary, Alta., $6000; Canadian Comstock Co. Ltd., Toronto, $9000.

Capital expenditure: Montreal Locomotive Works Ltd., Montreal, Que., $5,145,000; Raymond, McDonell & Co., Ltd., Montreal, $64,942; Dominion Bridge Co. Ltd., Lachine, Que., $138,020; General Motors of Canada Ltd., Oshawa, Ont., $1,500,000; Sutton-Horsley Co. Ltd., Toronto, $15,500; Waterous Ltd., Brantford, Ont., $21,572; Atlas Plant Extensions Ltd., Welland, Ont., $5,500,000 (for addition to electric steelworks).

Construction and Enterprise

Michigan

ANN ARBOR, MICH. — Ann Arbor Grinding Co., 1354 North Main street, has been incorporated with $20,000 capital to conduct a general grinding business by Harry E. Barnard, 2106 Penobscot building, Detroit.

DETROIT—Superior Tool & Die Co., 6633 Rohns avenue, has let general contract to Austin Co., 429 Curtis building, for a one-story tool and die shop.

DETROIT—Square Tool & Die Co., 3327 West Vernor highway, has let general contract to Stibbard Construction Co., 3000 Grand River avenue, for a one-story tool and die shop 60 x 100 feet.

W. Bernhardi, 932 Burlingame avenue, is architect.

DETROIT—Wesson Co., 1050 Mt. Elliott, manufacturer of cemented carbide and high-speed steel cutting tools, is building a new plant on Woodward Heights boulevard, Ferndale, Detroit suburb on a 2 2/3-acre site. Structure will be one story and site provides for further expansion. New plant will double production capacity. Campbell Construction Co. is general contractor.

DETROIT—Expert Welding Machine Co., 17144 Mt. Elliott avenue, has been incorporated with $12,000 capital to manufacture welding machines by Carl Raab, 19217 Spencer avenue.

Additional Construction and Enterprise leads may be found in the list of Shapes Pending on page 113 and Reinforcing Bars Pending on page 115 of this issue.

DETROIT—Bondie & Smith Screw Products Corp. has been incorporated with $22,500 capital to manufacture automatic screw machine products by Harold J. Bondie, 6328 Pittsburgh street.

DETROIT—Lyon Screw Products Inc., 679 Franklin street, has been incorporated with $50,000 capital, screw machine products, by Chester E. Lyon, 2567 Sturtevant street.

DETROIT—Esco Engineering Corp., 4855 Fourth avenue, has been incorporated with $25,000 capital and 13,500 shares no par value, to manufacture jigs, dies and tools by F. J. McGarry, 910 Seward street.

DETROIT—Consolidated Engineering & Mfg. Corp., 2802 Barlum Tower, has been incorporated with $40,000 capital and 10,000 shares no par value by George J. Haar, 9360 Genessee street.

DETROIT—Apex Metal Specialties Inc., 13845 Elmira avenue, has been incorporated with 50,000 shares no par value to manufacture tools and dies by Morris Christensen, 130 West Euclid.

DETROIT—Modern Hard Chrome Service Co., 973 East Vernor highway, has been incorporated with $5000 to do chrome plating by Charles H. Nicholl, 17129 Hamburg avenue.

DETROIT — SAE Steels Inc., Dime building, has been incorporated with $1000 capital to conduct a business in tempering and refining iron by Theodore Sirene, 460 Wimbleton drive, Birmingham, Mich.

DETROIT—Expert Die & Tool Co. Inc., 17144 Mt. Elliot avenue, has been incorporated with $100,000 capital to manufacture dies and tools by Max A. Sievers, 13353 Hampshire avenue, Detroit.

DETROIT—Square Deal Bronze Foundry Inc., 3237 Bellevue avenue, has been incorporated with 1500 shares no par value to manufacture bronze and brass castings by Steven J. Gergeley, 20181 Omira avenue, Detroit.

ESCANABA, MICH.—Chatfield Machine & Foundry Co. has been incorporated with $75,000 capital to conduct foundry and machine shop by O. J. Thorsen, 718 Stephenson avenue.

MIDLAND, MICH.—Dow Chemical Co., Willard H. Dow, president, will build a plant here to manufacture chemicals for treating military uniforms against war chemicals. Government will build plant and Dow Chemical Co. will operate it on non-profit basis.

MT. CLEMENS, MICH.—Bacon Mfg. Co. has been incorporated to manufacture garden tools, with $10,000 capital, by R. H. Millar, 301 Price building, Mt. Clemens.

PLYMOUTH, MICH.—Vanadium Alloys Steel Co., 5221 Trumbull avenue, Detroit, will build a one-story warehouse, 100 x 250 feet, general contract to Austin Co., 429 Curtis building, Detroit.

ROMULUS, MICH.—Romulus Foundry Inc. has been incorporated with $125,000 capital to operate a general casting business by Lloyd L. Seestedt, Romulus.

Massachusetts

EVERETT, MASS.—General Electric Co., 920 Western avenue, Lynn, Mass., will build a one-story turbo-supercharger

plant, 400 x 500 and 80 x 300 feet, and distributing system.

FITCHBURG, MASS.—C. H. Cowdrey Machine Works, Sawyer Passway, will build a one-story 90 x 280-foot plant addition, general contract to Littlehale & Fisher, 49 Osgood street, costing about $64,000.

NEW BEDFORD, MASS.—International Aircraft Corp., F. M. Belleveau, president, 122 East Forty-second street, New York, plans a plane manufacturing plant on Coggeshall street costing over $40,000.

SPRINGFIELD, MASS. — Commanding officer, Springfield armory, will take bids soon for bridge 150 feet long 12 feet wide connecting forge shop with welding and machine shops, to cost about $25,000.

WORCESTER, MASS.—Reed-Prentice Corp., F. W. McIntyre, general manager, has let general contract for plant expansion of building and machinery to double production of engine and toolroom lathes for national defense, at cost of $400,000.

New Hampshire

NASHUA, N. H.—Johns-Manville Corp., 40 Bridge street, has let general contract for one and two-story 50 x 640-foot warehouse to George Belanger & Son Inc., 308 Main street, Nashua, at cost over $200,000.

Rhode Island

PROVIDENCE, R. I.—Textile Finishing Machinery Co. will build a one-story plant 100 x 200 feet and 25 x 40 feet at 31 Watson street, costing about $40,000.

PROVIDENCE, R. I.—New England Butt Co., 304 Pearl street, has let general contract to Austin Co., 19 Rector street, New York, for a 50 x 94-foot manufacturing building.

New York

BUFFALO—Sterling Engine Co., Addison F. Vars, president, is having plans made for an extension of 100,000 square feet floor space to meet demands for its products.

BUFFALO—Howard Iron Works, 281 Chicago street, will rebuild its burned plant at cost of about $40,000.

COLONIE, N. Y.—John Deere Plow Co., 125 Marcellus street, Syracuse, N. Y., will take bids in April for a warehouse to cost $100,000. N. E. Keller is architect, care owner, 1325 Third avenue, Moline, Ill.

LOCKPORT, N. Y.—Simonds Saw & Steel Co., Ohio street, will build a plant addition costing about $40,000 with equipment. General contract given to W. A. Beccue, Bewley building.

WELLSVILLE, N. Y.—Moore Steam Turbine Co., Coates street, has let general contract for a plant addition to Austin Co., Euclid avenue, Cleveland.

New Jersey

BOUND BROOK, N. J.—Bakelite Corp., River road, has awarded general contract for factory and warehouse to Turner Construction Co., 420 Lexington avenue, New York, to cost about $150,000.

BOUND BROOK, N. J.—Union Carbide & Carbon Corp., 30 East Forty-second street, New York, will build 250 x 580-foot plant for manufacture of Vinylite, at cost of about $1,000,000.

CARTERET, N. J.—Foster-Wheeler Corp., Roosevelt avenue, will build a one-story boiler shop addition 93 x 200 and 93 x 220 feet. General contract given to Wigton-Abbott, 1225 South avenue, Plainfield, N. J.

NEWARK, N. J.—Badger Steel Corp. has been incorporated with 2500 shares no par value capital. Harold Epstein is agent.

NEW BRUNSWICK, N. J.—Wallace Laboratories, 300 Communipaw avenue, Jersey City, N. J., will build one and two story 150 x 370-foot plant, including boilerhouse. Albert Kahn Inc., 345 New Center building, Detroit, is architect and engineer. Cost about $500,000.

RAHWAY, N. J.—Rahway Machine Tool Corp. has been incorporated with 25 shares no par value capital. Paul Bert is agent.

TRENTON, N. J.—American Radiator and Standard Sanitary Corp., Klockner road, has given general contract for a plant addition to Eastern Construction Co., 705 Greenwood avenue. Cost will be about $500,000.

Ohio

CLEVELAND—Donley Bros. Co., 13900 Miles avenue, manufacturer of building specialties, will build a one-story addition 62 x 206 feet, costing $45,000, with sprinkler system. Wilbur Watson & Associates, 4614 Prospect avenue, are architects.

CLEVELAND—Tool Sales & Service Inc., 5709 Hermann avenue, plans a new chrome plating shop 50 x 100 feet, costing $6000. Anson R. Aheel is in charge.

CLEVELAND—Dracco Corp., 4063 East 116th street, manufacturer of dust-control equipment, George A. Geiseler, president, will build a one and two-story addition 91 x 92 feet, costing about $22,000.

CLEVELAND—Chase Brass & Copper Inc., 1155 Babbitt road, is making plans for plant expansion. Negotiations are under way with Defense Plant Corp., Washington. Walter L. Smith is plant superintendent.

CLEVELAND — Ferro Machine &

Foundry Co., 3155 East Sixty-sixth street, is building one-story shipping building 134 x 149 feet, costing about $20,000. Bolton Pratt Construction Co., 1276 West Third street, is in charge of construction.

CLEVELAND—Pump Engineering Service Corp., 12910 Taft avenue, has bought building containing its plant and will occupy it entire, new equipment being added to increase production. John L. Menart is assistant secretary-treasurer.

CLEVELAND—John Harsch Bronze & Foundry Co., 12502 Berea road, is erecting a further plant addition of about 6000 square feet, costing $7500.

CLEVELAND—Ohio Tool Co., 3169 West 106th street, is following recent erection of storage addition by enlargement of office space by about 2400 square feet. Bids are being taken by Frank Haushka, architect, Ninth-Chester building, Cleveland.

CLEVELAND—Cyril Bath & Co., Cyril Bath, president, 6984 Machinery avenue, is enlarging machine shop by about 3500 square feet to increase production facilities.

Pennsylvania

BETHLEHEM, PA.—Air Reduction Co., 60 East Forty-second street, New York, will build oxygen plant costing about $100,000. General contract given to E. C. Machine Co., Commonwealth building, Allentown, Pa.

CHESTER, PA.—Philadelphia Electric Co., Tenth and Chestnut streets, Philadelphia, will build a power plant addition on Lloyd street, to cost over $300,000. United Engineers & Constructors, Arch street, Philadelphia, are engineers.

Illinois

CHICAGO—Verson Allsteel Press Co., 1355 East Ninety-third street, manufacturer of mechanical and hydraulic presses, has started a $365,000 expansion program, including a welding shop 60 x 500 feet, with traveling crane. Much equipment has been bought.

CHICAGO—Badger Tool & Mfg. Co., 134 South Clinton street, manufacturer of automobile parts and accessories, has bought a three-story building at Polk and Laflin streets, to provide expansion space.

CHICAGO—General X-Ray Corp., 2012 West Jackson boulevard, has plans by Graham, Anderson, Probst & White, architects, 80 East Jackson boulevard, on which bids will be taken in February, for a plant addition 115 x 120 feet, to cost about $250,000.

CHICAGO—Chicago Gear Mfg. Co., 2829 West Fulton street, has let general contract to Continental Construction Co., 340 North Central avenue, for a one-story plant addition, to cost about $40,000.

CICERO, ILL.—Harris-Hub Bed & Spring Co., 1315 South Fifty-fifth street, has bought several factory buildings at New Brunswick, N. J., from the Carrier Corp. and is spending about $75,000 for remodeling. Products are metal furniture, beds and springs.

Indiana

SOUTH BEND, IND. — Studebaker Corp. has bought site at Archer and Cicero avenues, Chicago, and will erect one-story windowless air-conditioned plant for manufacture of airplane engine parts for the government. Company is building two other similar plants at Fort Wayne and South Bend, Ind., at total cost of $49,700,000. Giffels & Vallet, Detroit, are architects.

Tennessee

MORRISTOWN, TENN.—City is considering construction of steam-electric generating plant for municipal lighting system. O. L. McMahon, city attorney, is in charge.

West Virginia

ALLOY, W. VA.—Electro-Metallurgical Co., Alloy, has given general contract to Hughes-Foulkrod Co., 1505 Race street, Philadelphia, for a plant costing over $50,000.

Missouri

ST. LOUIS—Carter Carburetor Corp., Hugh H. C. Weed, vice president and general manager, 2840 North Spring avenue, is building one-story addition costing $150,000 and boiler house costing $15,000, without equipment.

ST. LOUIS—Atlas Tool & Mfg. Co., George A. Delf, president, 5147 Natural Bridge road, is building two-story brick addition covering 20,000 square feet, costing about $75,000, for additional manufacturing space.

ST. LOUIS—Midwest Piping & Supply Co. Inc., A. G. Stoughton, president, 1450 South Second street, manufacturer of pipe fittings and coils, is building a one-story plant across street from present works, at cost of about $40,000.

ST. LOUIS—Alco Valve Co., A. B. Schellenberg, president, 2628 Big Bend boulevard, is building one-story plant addition with 18,000 square feet floor space, costing $15,000, for manufacture of air-

conditioning controls, and refrigerating machinery controls and valves.

ST. LOUIS—Wagner Electric Corp., 6400 Plymouth avenue, has given general contract to Hercules Construction Co., 8808 Ladue road, Ladue village, Mo., for additions, one story 95 x 120 feet and three story 68 x 303 feet, to cost over $150,000.

Oklahoma

OKLAHOMA CITY, OKLA.—War department engineer's office, 410 Wright building, Tulsa, Okla., will take bids soon for sewage treatment plant and equipment.

Wisconsin

RACINE, WIS.—Webster Electric Co. has started construction of a plant addition to increase manufacturing space about 30 per cent.

Minnesota

ADRIAN, MINN.—Village, F. J. Forkenbrock, clerk, has voted bond issue of $17,000 to finance purchase of second diesel unit for the municipal light and power plant.

NEW ULM, MINN.—City, A. C. Sannwald, clerk, will ask bids soon on power plant improvements, including new steam generating unit and turbine. Ralph D. Thomas & Associates, 1200 Second avenue S., Minneapolis, are engineers.

Kansas

EMPORIA, KANS.—City, J. W. Jenkins, commissioner, plans purchase of water tank and tower to cost about $50,000.

Iowa

AUDUBON, IOWA—City, Henry Curtis, clerk, plans municipal electric light and power plant costing $150,000. Buell & Winters, 508 Insurance Exchange building, Sioux City, Iowa, are consulting engineers.

CHARLTON, IOWA—City, John A. Olson, clerk, is taking bids to Feb. 11 on diesel engine or electric motor type pumping unit for waterworks plant and repair present diesel unit for standby.

GRUNDY CENTER, IOWA—City council, Helene C. Helberger, clerk, has been notified by state health authorities to build sewage disposal plant costing $50,000.

MUSCATINE, IOWA—Board of water and light, Herman Zeug, secretary, takes bids to Feb. 19 on steam generating unit, pulverized coal burning equipment. Stanley Engineering Co., Muscatine, is consulting engineer.

OSAGE, IOWA—City, F. J. Cromer, clerk, takes bids to Feb. 18 for new power plant building and three diesel combines with combined capacity 1900 horsepower, and accessories. Hubbard Engineering Co., 415 North LaSalle street, Chicago, is engineer.

Colorado

LAS ANIMAS, COLO.—Bond issue of $275,000 has been approved to finance power plant. Ted Dennison is city engineer. E. T. Archer & Co., 609 New England building, Kansas City, Mo., is engineer.

California

LOS ANGELES—Soule Steel Co., 6200 Wilmington avenue, is building an office and warehouse addition 80 x 88 feet, to cost about $5000.

LOS ANGELES — Independent Pneumatic Tool Co. is building a new manufacturing building at 6200 East Slauson avenue, at cost of $22,500.

LOS ANGELES—Universal Steel Sash Co. Inc. has been incorporated with $75,000 capital. Represented by Jack G. Schapiro, Bankers building, Los Angeles.

LOS ANGELES — Universal Aircraft Tool & Die Corp. has been incorporated with $100,000 capital by J. F. Fitzpatrick, 950 South Broadway, Los Angeles, and associates.

LOS ANGELES—Technical Enameling & Plating Co. has been incorporated with $15,000 capital by C. L. Gardner and associates. Represented by Russell D. Gardner, Title Insurance building, Los Angeles.

LONG BEACH, CALIF.—National Tungsten Co. has been incorporated with $25,000 capital by L. N. Whealton, 19 Pine avenue, Long Beach, and associates.

LOS ANGELES—California Shipbuilding Co., recently organized by merger of Six Companies Inc. and other concerns, is taking bids on an administration building, two stories, 40 x 350 feet, on west basin of Los Angeles harbor. Eight shipbuilding ways will be constructed for production of ships for the maritime commission. Cost approximately $5,000,000.

Oregon

PORTLAND, OREG. — Pennsylvania Salt Mfg. Co. of Washington plans a $350,000 plant here, 170 x 240 and 68 x 160 feet, general contract to Earley Construction Co., Tacoma, Wash.

SEATTLE—High Duty Bronze & Aluminum Co., 514 Lloyd building, has been incorporated with $10,000 capital by Harvey G. Schwarz and associates to operate a brass and iron foundry.

SEATTLE—Cascade Machinery Co., 4600 East Marginal way, is building a plant addition 100 x 150 feet, with wing for warehouse use.

Canada

BRANTFORD, ONT.—Cockshutt Plow Co. Ltd., Mohawk street, manufacturer of agricultural implements, has let general contract to Cromar Construction Co., 448 Colborne street, for an addition costing $15,000.

HAMILTON, ONT.—Canadian Liquid Air Co. Ltd., 1111 Beaver Hall Hill, Montreal, has let general contract to A. E. Rule, 100 Humbercrest boulevard, Toronto, for plant addition on Burlington road, costing $50,000.

KITCHENER, ONT.—B. F. Goodrich Rubber Co. of Canada Ltd., 251 King street West, is having plans made by Prack & Prack, architects, 35 James street South, Hamilton, Ont., for plant addition to cost about $100,000.

PETERBOROUGH, ONT. — Outboard Marine & Mfg. Co. of Canada Ltd., Monaghan road, is having plans made by W. R. L. Blackwell, architect, Bank of Commerce building, for a one-story plant addition 105 x 150 feet. Hugh Campbell is manager.

ST. CATHARINES, ONT.—McKinnon Industries Ltd., castings and steel products, will take bids soon for a one-story 260 x 460 feet, costing about $150,000, with equipment. A. E. Nicholson, 46 Queen street, is architect.

ST. CATHARINES, ONT.—McKinnon Industries Ltd., Ontario street, has given general contract to Newman Bros., 127 Paul street, for a forge shop addition 100 x 100 feet. A. E. Nicholson, 46 Queen street, is architect.

TORONTO, ONT.—Dominion Wheel & Foundries Ltd., 171 Eastern avenue, will take bids soon for alterations and additions to its plant, to cost $20,000. James, Proctor & Redfern Ltd., 36 Toronto street, are engineers.

TORONTO, ONT.—Flexible Shaft Co., 321 Weston road, will build plant addition costing $55,000. Earl L. Sheppard, 57 Queen street West, is architect.

WELLAND, ONT.—Atlas Steels Ltd., Main street, is having plans made by F. W. Warren, Huron and Erie building, Hamilton, Ont., for an addition to its alloy steel plant. Addition will be financed by the government, cost estimated at $5,500,000.

WOODSTOCK, ONT.—Truck Engineering Ltd., 667 Dundas street, manufacturer of motor vehicles, will let contract soon for plant addition 70 x 160 feet, costing about $75,000, with equipment.

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Firth-Sterling Steel Co., McKeesport, Pa.
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Youngstown Sheet & Tube Co., The,
Youngstown, O.

BINS (Storage)
Buffalo Wire Works Co.,
437 Terrace, Buffalo, N. Y.

BLAST CLEANING EQUIPMENT (Sand)
American Foundry Equipment Co.,
The, 509 So. Byrkit St.,
Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

BLAST FURNACE CLEANING (Gas)
McKee, Arthur G., & Co.,
2300 Chester Ave., Cleveland, O.

BLAST FURNACE HOT BLAST STOVES
McKee, Arthur G., & Co.,
2300 Chester Ave., Cleveland, O.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co.,
702 Magee Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co.,
1st National Bk. Bldg.,
Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
McKee, Arthur G., & Co.,
2300 Chester Ave., Cleveland, O.

BLAST FURNACE STOCK HOUSES
McKee, Arthur G., & Co.,
2300 Chester Ave., Cleveland, O.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)
Reading Chain & Block Co.,
Dept. 31, Reading, Pa.
Yale & Towne Mfg. Co.,
4530 Tacony St., Philadelphia, Pa.

BLOWERS
General Electric Co.,
Schenectady, N. Y.
Kirk & Blum Mfg. Co., The,
2838 Spring Grove Ave.,
Cincinnati, O.
North American Mfg. Co., The,
2901 E. 75th St., Cleveland, O.
Stewart Furnace Div., Chicago
Flexible Shaft Co., Dept. 112,
5600 Roosevelt Rd., Chicago, Ill.
Sturtevant, B. F., Co., Hyde Park,
Boston, Mass.
Truflo Fan Co., 600 Mercer St.,
Harmony, Pa.

BLOWPIPES (Oxy-Acetylene)
Linde Air Products Co., The,
30 E. 42nd St., New York City.

BLUE PRINTING MACHINES
Pease, C. F., Co., The,
2688 W. Irving Park Blvd.,
Chicago, Ill.

BLUE PRINTING SUPPLIES and EQUIPMENT
Pease, C. F., Co., The,
2688 W. Irving Park Blvd.,
Chicago, Ill.

BOILER HEADS
Bethlehem Steel Co.,
Bethlehem, Pa.

BOILER TUBES—See TUBES (Boiler)

BOILERS
Babcock & Wilcox Co., The,
Refractories Div., 85 Liberty St.,
New York City.
Oil Well Supply Co., Dallas, Texas.

BOLT AND NUT MACHINERY
Ajax Manufacturing Co.,
1441 Chardon Rd., Cleveland, O.
Landis Machine Co., Inc.,
Waynesboro, Pa.
National Machinery Co., The,
Tiffin, O.

BOLTS (*Also Stainless)
Bethlehem Steel Co.,
Bethlehem, Pa.
Carnegie-Illinois Steel Corp.,
Pittsburgh-Chicago.
Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Columbia Steel Co.,
San Francisco, Calif.
*Erie Bolt & Nut Co., Liberty Ave.,
at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut
Div., Dept. ST, 1912 Scranton
Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt &
Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc.,
16th and Rockwell Sts.,
Chicago, Ill.
Tennessee Coal, Iron & Railroad
Co., Brown-Marx Bldg.,
Birmingham, Ala.

BOLTS (Carriage and Machine)
Bethlehem Steel Co.,
Bethlehem, Pa.
Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave.
at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut
Div., Dept. ST, 1912 Scranton
Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt &
Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc.,
16th & Rockwell Sts.,
Chicago, Ill.

BOLTS (Special)
Bethlehem Steel Co.,
Bethlehem, Pa.
Cleveland Cap Screw Co.,
2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave.
at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut
Div., Dept. ST, 1912 Scranton
Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt &
Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Central Screw Co.,
3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co.,
2934 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave.
at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The,
1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut
Div., Dept. ST, 1912 Scranton
Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt &
Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc.,
16th and Rockwell Sts.,
Chicago, Ill.
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.
Pheoll Mfg. Co., 5700 Roosevelt
Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt &
Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BOOKS
International Correspondence Schools, Box 9369-B, Scranton, Pa.

BORING MACHINES (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
Union Steel Casting Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

BRAKE 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.
Johns-Manville Corp., 22 E. 40th St., New York City.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Ladle)
Globe Brick Co., The, East Liverpool, O.

BRICK (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.

BROACHING CUTTERS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BRUSHES
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

BRUSHES (Industrial)
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

BRUSHES (Steelgrip)
Fuller Brush Co., The, Industrial Div., Dept. SC, 3582 Main St., Hartford, Conn.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
North American Mfg. Co., The, 2901 E. 75th St., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Sumet Corporation, 1553 Fillmore Ave., Buffalo, N. Y.

BUSHINGS (Jig)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

CABINETS (Steel)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 So. Kilbourn St., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Cinder Pot)
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Dump)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Differential Steel Car Co., Findlay, O.
Pressed Steel Car Co., (Koppel Div.) Koppers Bldg., Pittsburgh, Pa.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT
Pangborn Corp., Hagerstown, Md.

CASTINGS (Acid Resisting)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., 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 Div. of Blaw-Knox Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Iron)
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Electro-Alloys Co., The, Elyria, O.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O.
Springfield, O.
Pittsburgh Rolls, Div. of Blaw-Knox Co., Pittsburgh, Pa.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Lawrence Copper & Bronze, Bessemer Bldg., Pittsburgh, Pa.
Monessen Fdy. & Mach. Co., Monessen, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Corrosion Resisting)
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American 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.
Erie Foundry Co., Erie, Pa.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
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.
Monessen Fdy. & Mach. Co., Monessen, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango-Penn Mold Co., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Electro-Alloys Co., The, Elyria, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
National Alloy Steel Div. of Blaw-Knox 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.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.

WHERE-TO-BUY

CASTINGS (Steel)—Con.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O., Springfield, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdry. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Wear Resisting)
American Brake Shoe & Fdry. Co., The, 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., Dept. E., Pennsalt Cleaner Div., Philadelphia, Pa.

CEMENT (High Temperature)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Eagle-Picher Lead Co., The, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
Norton Company, Worcester, Mass.

CEMENT (High Temperature Hydraulic)
Atlas Lumnite Cement Co., Dept. S-10, Chrysler Bldg., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

CHAIN (Conveyor and Elevator)
Baldwin-Duckworth Div. of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Power Transmission)
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

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., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Welded or Weldless)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHECKS (Metal)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

CHISELS (Chipping)
Steel Conversion & Supply Co., P. O. Box 537 (Castle Shannon), Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Chromium Mining & Smelting Corp., Ltd., 700 Bank of Commerce Bldg., Hamilton, Ont.
Electro Metallurgical Co., 30 E. 42nd St., New York City.

CHROMIUM PLATING PROCESS
United Chromium, Inc. 51 E. 42nd St., New York City.

CHUCK OPERATING CYLINDERS
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, 170 E. 131st St., Cleveland, O.

CLAMPS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANING EQUIPMENT (Metal)
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.

CLEANING SPECIALTIES
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Cowles Detergent Co., The, Heavy Chemical Div., 7018 Euclid Ave., Cleveland, O.
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

CLIPS (Packaging)
Consumer's Steel Products, 6454 E. McNichols Rd., Detroit, Mich.

CLUTCHES (Friction)
Jones, W. A. Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.

CLUTCHES (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Coal Co., 300 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wieman & Ward Co., The, Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, Waukesha, Wis.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

COAL, COKE, ORE, ASH HANDLING MACHY.—Con.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., 300 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COILS (Furnace)
Production Plating Works, Inc., The, Lebanon, O.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., 100 Koppers Bldg., Pittsburgh, Pa.

COLUMBIUM
Electro Metallurgical Co., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE (Heat Resistant)
Atlas Lumnite Cement Co., Dept. S-10, Chrysler Bldg., New York City.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Youngstown Sheet & Tube Co., The, Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
New Brighton, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Electric)
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Combustion)—See COMBUSTION CONTROLS

CONTROLS (Temperature)
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 114 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 114 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 114 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 114 Tenth St., Ellwood City, Pa.

CONVEYORS (Vibratory)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

COPPERING COMPOUND
American Chemical Paint Co., Dept. 310, Ambler, Pa.

CORRESPONDENCE COURSES
International Correspondence Schools, Box 9369-B, Scranton, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 422 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
American Flexible Coupling Co., 18th & Pittsburgh Aves., Erie, Pa.
Baldwin-Duckworth Div. of Chain Belt Co., 326 Plainfield St., Springfield, Mass.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Crawler, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp. 358 Schuyler Ave., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 So. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Osgood Co., The, Marion, 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)
Industrial Equipment Corp., Pittsburgh, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

CRUSHERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUT-OFF MACHINES (Abrasive)
Challenge Machinery Co., Grand Haven, Mich.

CUTTERS (Die Sinking & End Milling)
Brown & Sharpe Mfg. Co., Providence, R. I.

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)
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

CYLINDERS (Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DEGREASERS
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

DIE BLOCKS
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

WHERE-TO-BUY

DIE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.

DIES (Cast)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Forgings & Castings Corp., 1350 Jarvis St., Ferndale, Mich.

DIES (Punching, Stamping, Blanking)
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
Columbus Die, Tool & Mach. Co. 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

DIES (Steel, Embossing)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DOLOMITE—FLUX AND REFRACTORIES
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DOORS & TRIM (Metal)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

DRAGLINES (Crawler)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRAFTING ROOM EQUIPMENT
Pease, C. F., Co., The, 2688 W. Irving Park Blvd., Chicago, Ill.

DRILL HEADS (Multiple)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Radial)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

DRUMS (Steel)
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DRYERS (Rotary)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

DUST ARRESTING EQUIPMENT
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pangborn Corp., Hagerstown, Md.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1320 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Graybar Bldg., New York City.

ELECTRODES (Carbon and Graphite)
National Carbon Co., W. 117th St. at Madison Ave., Cleveland, O.

ELECTRODES (Hard Surfacing Welding)
Stoody Co., Whittier, Calif.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 1st National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Uhl Construction Co., 6001 Butler St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)
Brassert, H. A., & Co., 1st National Bank Bldg., Bank Bldg., Pittsburgh, Pa.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 140 Cedar St., New York City.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINES (Diesel)
Cooper-Bessemer Corp., Mt. Vernon, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Kerosene)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

EXCAVATORS
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

FANS (Crane Cab)
Graybar Electric Co., Graybar Bldg., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.
Trufio Fan Co., 600 Mercer St., Harmony, Pa.

FANS (Exhaust Ventilating)
Graybar Electric Co., Graybar Bldg., New York City.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Trufio Fan Co., 600 Mercer St., Harmony, Pa.

FANS (High Temperature)
Garden City Fan Co., 332 S. Michigan Ave., Chicago, Ill.

FANS (Portable)
Graybar Electric Co., Graybar Bldg., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Trufio Fan Co., 600 Mercer St., Harmony, Pa.

FANS (Wall)
Graybar Electric Co., Graybar Bldg., New York City.
Perkins, B. F. & Son, Inc., Holyoke, Mass.
Trullo Fan Co., 600 Mercer St., Harmony, Pa.

FENCE (Chain Link)
Cyclone Fence Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Co., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.

FERROCHROME
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank & Co., Inc. Harrison Bldg., Philadelphia, Pa.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Tennessee Products Corp., Nashville, Tenn.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa
Tennessee Products Corp., Nashville, Tenn.

FERROSILICON
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Southern Ferro Alloys Co., 2108 Chestnut St., Chattanooga, Tenn.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILING CABINETS (Blueprint, Drawing and Tracing)
Pease, C. F., Co., The, 2688 W. Irving Park Blvd., Chicago, Ill.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE CLAY—See REFRACTORIES
FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Welded Steel)
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.

FLOOR RESURFACING
Flexrock Co., 2330 Manning St., Philadelphia, Pa.
United Maintenance Sales Co., 311 Ross St., Pittsburgh, Pa.

FLOORING (Monolithic)
Carey, Philip, Co., The, Dept. 71 Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Open Steel Flooring Institute, Inc., Dept. S-1-20-41, American Bank Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

FORGING BILLETS—See BILLETS FORGING MACHINERY
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.

FORGING ROLLS
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Ampco Metal Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

FORGINGS (Drop) (*Also Stainless)
American Forge Div. of The American Brake Shoe & Fdry. Co., 2621 So. Hoyne Ave., Chicago, Ill.
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Hollow Bored)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

FORGINGS (Iron and Steel) (*Also Stainless)
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
American Forge Div. of The American Brake Shoe & Fdry. Co., 2621 S. Hoyne Ave., Chicago, Ill.
*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.
Forgings & Castings Corp., 1350 Jarvis St., Ferndale, Mich.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Upset)
American Forge Div. of The American Brake Shoe & Fdry. Co., 2621 So. Hoyne Ave., Chicago, Ill.
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 1st National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

FURNACES (Brazing)
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.

FURNACES (Gas or Oil)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Carborundum Co., The, Perth Amboy, N. J.
Despatch Oven Co., 922 Ninth St., S.E., Minneapolis, Minn.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, 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)
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Brassert, H. A., & Co., 1st National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 140 Cedar St., New York City.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J. Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

WHERE-TO-BUY

GAGE BLOCKS
Dearborn Gage Co., 22036 Beech St., Dearborn, Mich.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
Sheffield Gage Corp., 1528 E. Third St., Dayton, O.

GAGES (Indicating and Recording)
General Electric Co., Schenectady, N. Y.
Sheffield Gage Corp., 1528 E. Third St., Dayton, O.

GAGES (Pressure & Vacuum Recording)
Bristol Co., The, Waterbury, Conn.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Atlantic Steel Co., Atlanta, Ga.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattle, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Commercial Metals Treating, Inc., Toledo, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Equipment Steel Div., of Union Asbestos & Rubber Co., Blue Island, Ill.
Fanner Mfg. Co., The, Cleveland, O.
Finn, John, Metal Works, San Francisco, Calif.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Hubbard & Co., Oakland, Calif.
Independent Galvanizing Co., Newark, N. J.
International-Stacey Corp., Columbus, O.
Isaacson Iron Works, Seattle, Wash.
Joslyn Co. of California, Los Angeles, Calif.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Lewis Bolt & Nut Co., Minneapolis, Minn.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
San Francisco Galvanizing Works, San Francisco, Calif.
Sanitary Tinning Co., The, Cleveland, O.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS HOLDERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

GAS SCRUBBERS
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 1st National Bank Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GASKETS (Asbestos, Metal or Rubber)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City.

GEAR BLANKS
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Waldron, John, Corp., New Brunswick, N. J

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

GEAR MACHINERY (Lapping, Finishing, Checking)
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)
Abart Gear & Machine Co., 4825 W. 16th St., Chicago, Ill.
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)
Abart Gear & Machine Co., 4825 W. 16th St., Chicago, Ill.
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Abart Gear & Machine Co., 4825 W. 16th St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd & B. Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bmgham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., 25th St., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Electric Generator & Motor Co., 4519 Hamilton Ave., Cleveland, O.
Fairbanks, Morse & Co., Dept. 98, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GRABS—FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

GRAPPLES (Scrap Handling)
Owen Bucket Co., 7762 Breakwater St., Cleveland, O.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDERS (Foundry Core)
Milwaukee Foundry Equipment Co., 3228 W. Pierce St., Milwaukee, Wis.

GRINDERS (Precision Thread)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.

GRINDER CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

GRINDING COMPOUNDS
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Wayne Chemical Products Co., 9802 Copeland St., Detroit, Mich.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston & Valve Face)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.
Norton Company, Worcester, Mass.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rail)
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.

Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Tool and Cutter)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge & Jefferson Aves., E. St. Louis, Ill.

GRINDING (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

GRINDING WHEELS
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segmental)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

GUARDS (Belt, Machine & Window)
Buffalo Wire Works Co., 457 Terrace, Buffalo, N. Y.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. S-2-3, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

HAMMER BUSHINGS
Steel Conversion & Supply Co., P. O. Box 357 (Castle Shannon), Pittsburgh, Pa.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Power)
Yoder Co., The, W. 30th St. & Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Snater Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland, O.
National Machinery Co., Tiffin, O.

HEATERS (Air)
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

HEATERS (Electric Space)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

HEATERS (Unit)
Airtherm Manufacturing Co., 726 S. Spring Ave., St. Louis, Mo.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.

HEAT TREATING
Commercial Metals Treating, Inc., Toledo, O.

HELMETS (Blast Cleaning)
Pangborn Corp., Hagerstown, Md.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBS
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Co., Dept. 31, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, 2809 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., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, 2809 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.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1986 Kienlen Ave., St. Louis, Mo.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Harris Engineering Works, 1765 Elston Ave., Chicago, Ill.
Northern Engineering Works, 2809 Atwater St., Detroit, Mich.

HOOKS (Chain)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOOPS AND BANDS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

HOSE (Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

HYDRAULIC UNITS
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

INDICATORS (Temperature)
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Superior Mold & Iron Co., Penn, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS
American Chemical Paint Co., Dept. 310, Ambler, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Graybar Bldg., New York City.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

INSULATING BLOCK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Eagle-Picher Lead Co., The, Cincinnati, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City

INSULATING BRICK
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., Inc., 56 W. 45th St., New York City.

INSULATING CONCRETE
Atlas Lumnite Cement Co., Dept. S-20, Chrysler Bldg., New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

WHERE-TO-BUY

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Eagle-Picher Lead Co., The, Cincinnati, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATION (Building)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Eagle-Picher Lead Co., The, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Co., 985 Concord St., Lancaster, Pa.
Eagle-Picher Lead Co., The, Cincinnati, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Co., Inc., 56 W. 45th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KEYS (Machine or Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

LABORATORY WARE
Bay State Abrasive Products Co., Westboro, Mass.
Norton Company, Worcester, Mass.

LADLES
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

LAMPS (Industrial)
General Electric Co., Dept. 166-S-L, Nela Park, Cleveland, O.

LAPPING MACHINES
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

LAPPING PLATES
Challenge Machinery Co., Grand Haven, Mich.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.

LATHE CENTERS
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

LATHE DOGS (Drop Forged)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

LATHES
Jones & Lamson Machine Co., Springfield, Vt.
LeBlond, R. K., Machine Tool Co., Dept. J-1, Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.
South Bend Lathe Works, 855 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Automatic)
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Chucking)
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.

LATHES (Engine)
Monarch Machine Tool Co., Sidney, O.
South Bend Lathe Works, 855 E. Madison St., South Bend, Ind.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Railroad Car & Driving Wheel)
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.

LATHES (Turret)
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Company, The, Bridgeport, Conn.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LAYOUT SURFACE PLATES
Challenge Machinery Co., Grand Haven, Mich.

LEAD (Tellurium)
National Lead Co. 111 Broadway, New York City.

LEVELING MACHINES
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Dept., 166-S-L, Nela Park, Cleveland, O.
Graybar Electric Co., Graybar Bldg., New York City.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.
Plymouth Locomotive Works, Div. Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Div. Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric)
Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Fireless)
Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)
Differential Steel Car Co., Findlay, O.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Differential Steel Car Co., Findlay, O.

LOCOMOTIVES (Steam)
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

LUBRICATING SYSTEMS
Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hanna Engineering Works, 1763 Elston Ave., Chicago, Ill.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
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.
Broslus, Edgar E., Inc., Sharpsburgh Branch, Pittsburgh, Pa.
Cleveland Punch & Shear Works Co., The, 8917 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, 248 N. Morgan St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

MACHINERY (Used & Rebuilt)
Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 No. Peoria St., Chicago, Ill.
Keystone Machinery Co., 324 Fourth Ave., Pittsburgh, Pa.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANDRELS (Expanding)
Nicholson, W. B., & Co., 177 Oregon St., Wilkes-Barre, Pa.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIFOLDS (Gas)
Production Plating Works, Inc., The, Lebanon, O.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

MARKING DEVICES
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Cowles Detergent Co., The, Heavy Chemical Div., 7018 Euclid Ave., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. E. Pennsalt Cleaner Div., Philadelphia, Pa.

METAL FINISHES
American Nickeloid Co., 1310 N. Second St., Peru, Ill.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Hard Surfacing)
Steody Co., Whittier, Calif.

METALS (Nonferrous)
American Brass Co., The, Waterbury, Conn.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING CUTTERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine and Cincinnati Grinders, Inc., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDING MACHINERY (Foundry)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

MOLDINGS (Metal)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., Graybar Bldg., New York City.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1081 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS
(*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

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 Div. Republic Steel Corp., Massillon, O.

NOZZLES (Blasting)
Pangborn Corporation, Hagerstown, Md.

NUTS
(*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Machine Screw)
Central Screw Company, 3317 Shields Ave., Chicago, Ill.

NUTS (Self Locking)
Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Central Screw Company, 3317 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
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.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., Dept. 112, 5600 Roosevelt Rd., Chicago, Ill.

WHERE-TO-BUY

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

PACKING (Asbestos or Rubber)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.
Johns-Manville Corp., 22 E. 40th St., New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Dept. 310, Ambler, Pa.

PAINT (Industrial)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.

PAINT (Marking)
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PARALLELS
Challenge Machinery Co., Grand Haven, Mich.

PARTS (Precision)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PATTERN EQUIPMENT (Wood or Metal)
Wellman Bronze & Aluminum Co., The, 6017 Superior Ave., Cleveland, O.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

PICKLING COMPOUNDS
American Chemical Paint Co., Dept. 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING CRATES
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Youngstown Welding & Engineering Co., The, Youngstown, O.

PICKLING EQUIPMENT
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
International Nickel Co., The, 67 Wall St., New York City.
Youngstown Welding & Engineering Co., The, Youngstown, O.

PICKLING MACHINERY
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
Cellcote Co., 750 Rockefeller Bldg., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wieman & Ward Co., The, Oliver Bldg., Pittsburgh, Pa.

PIG IRON (Charcoal)
Tennessee Products Corp., Nashville, Tenn.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, 300 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Roller Bearing)
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelpha, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Case Hardened or Heat Treated)
Erie Bolt & Nut Co., Liberty Ave at W. 12th St., Erie, Pa.

PINS (Clevis)
Townsend Co., New Brighton, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.

PIPE (Steel)—Con.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., 836 So. Michigan Ave., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE FITTINGS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

PIPE ROLLS (Magnetic)
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

PIPE STRAIGHTENING MACHINERY
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.

PIPING CONTRACTORS
Grinnell Co., Inc., Providence, R. I.
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.

PISTON RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Sellers, Wm., & Co., Inc., 1622 Hamilton St., Philadelphia, Pa.

PLATE CASTORS
Hyatt Bearings Div., General Motors Sales Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 500 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 422 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.

POTENTIOMETERS
Bristol Co., The, Waterbury, Conn.

POTS (Melting)
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.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready-Power Co., The, 3828 Grand River Ave., Detroit, Mich.

PREHEATERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRESSED METAL PARTS
American Forge Div. of The American Brake Shoe & Fdry. Co., 2621 S. Hoyne Ave., Chicago, Ill.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES (Bending)
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Extrusion)
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Forging)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., 1125 E. 283rd St., Wickliffe, O.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Progressive Welder Co., 3031 E. Outer Drive, Detroit, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Progressive Welder Co., 3031 E. Outer Drive, Detroit, Mich.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Riveting)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Stamping)
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Welding)—See WELDERS

PRESSES, BRIQUETING (Turnings & Borings)
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

PRESSURE VESSELS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Boiler Feed)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Fuel Injection)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PUMPS (Hydraulic)
Brown & Sharpe Mfg. Co., Providence, R. I.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Rotary)
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.

PUMPS (Vacuum)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
Bristol Co., The, Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Ryerson, Jos. T. & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS
Blanchard Machine Co., Inc., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.

WHERE-TO-BUY

REAMERS—Con.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REBUILT EQUIPMENT
Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 N. Peoria St., Chicago, Ill.
Keystone Machinery Co., 324 Fourth Ave., Pittsburgh, Pa.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa

RECEIVERS
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
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
Abart Gear & Machine Co., 4825 W. 16th St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Globe Brick Co., The, East Liverpool, O.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

REFRACTORIES (Silicon Carbide)
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REFRACTORY CONCRETE
Atlas Lumnite Cement Co., Dept. S-10, Chrysler Bldg., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1320 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

RINGS (Steel)
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.

RIVET SETS
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.

RIVETERS (Hydraulic—Portable and Stationary)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Pneumatic)
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Chambersburg Engineering Co., Chambersburg, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Shuster, F. B., Co., The, New Haven, Conn.
Wood, R. D., Co. 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Townsend Co., New Brighton, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
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 Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., The Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLLER LEVELERS (Backed-up)
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

ROLLING DOORS & SHUTTERS—See DOORS AND SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Process Co., The., 2131 Wilson Ave., Youngstown, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co.,Warren, O.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

ROLLS (Bending and Straightening)
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 Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O. Springfield, O.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O. Springfield, O.
Pittsburgh Steel Foundry Corp., Glassport, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machine)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

ROOFING AND SIDING
Johns-Manville Corp., 22 E. 40th St., New York City.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
New Jersey Zinc Co., 160 Front St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)
Carey, Philip, Co., The, Dept. 71, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Garlock Packing Co., The, S 3-40, Palmyra, N. Y.

RUST PREVENTIVES
Alrose Chemical Co., 80 Clifford St., Providence, R. I.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

RUST PROOFING PROCESS
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES
Junkin Safety Appliance Co., 934 W. Hill St., Louisville, Ky.
Kimball Safety Products Co., 7314 Wade Park Ave., Cleveland, O.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.

SAND-BLASTING NOZZLES (Borium)
Stoody Co., 1134 W. Slauson Ave., Whittier, Calif.

SAND CONDITIONING AND PREPARING MACHINERY
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWING MACHINES (Hot and Cold)
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland, O.
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWING MACHINES (Contour)
Continental Machines, Inc., 1324 So. Washington Ave., Minneapolis, Minn.

SAWS (Band—Metal Cutting)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hack)
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Hot and Cold)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.

SAWS (Inserted Tooth, Cold)
Huther Bros. Saw & Mfg. Co., 1190 University Ave., Rochester, N. Y.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Brown & Sharpe Mfg. Co., Providence, R. I.
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SAWS (Segment)
Pittsburgh Saw & Tool Co., 78-80 Sycamore St., Etna P. O., Pittsburgh, Pa.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., Dept. 96 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Toledo Scale Co., 3216 Monroe St., Toledo, O.

SCALES (Dial & Recording)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

SCALES (Monorail)
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Fairbanks, Morse & Co., Dept. 96, 600 So. Michigan Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Toledo Scale Co., 3216 Monroe St., Toledo, O.

SCHOOLS
International Correspondence Schools, Box 9369-B, Scranton, Pa.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.
Buffalo Wire Works Co., 437 Terrace, Buffalo, N. Y.
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Ludlow-Saylor Wire Co., The, Newstead Ave. & Wabash R. R., St. Louis, Mo.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREENS (Vibrating)
Ajax Flexible Coupling Co., 4 English St., Westfield, N. Y.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Townsend Co., New Brighton, Pa.

SCREWS (Cap, Set, Safety-Set)
Bristol Co., The, Waterbury, Conn.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREWS (Cold Headed)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2930 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Townsend Co., New Brighton, Pa.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Townsend Co., New Brighton, Pa.

SCREWS (Hardened Self-Tapping)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Machine)
Central Screw Company, 3517 Shields Ave., Chicago, Ill
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Self Locking)
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thread-Cutting)
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.

SCREWS (Thumb)
Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Dings Magnetic Separator Co., 663 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.

SHAFTING—Con.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.
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 (Brass, Bronze, Nickel Silver)
Dahlstrom Metallic Door Co., Jamestown, N. Y.

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.
Dahlstrom Metallic Door Co., Jamestown, N. Y.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Div. Republic Steel Corp., 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 Co., The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Wapakoneta Machine Co., The, Wapakoneta, O.

SHEARS
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hallden Machine Co., The, Thomaston, Conn.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEARS, ROTARY (Slitting, Beveling, Circling, Flanging)
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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 S. Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., 1743 Orange St., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge & Jefferson Aves., E. St. Louis, Ill.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, Waterbury, Conn.
Ampco Metal, Inc., Dept. S-16, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc. Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.
Weirton Steel Co., Weirton, W. Va.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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, 590 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHELLS (Seamless Drawn)
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

SHOVELS (Power)
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT
Graybar Electric Co., Graybar Bldg., New York City.

SILICO-MANGANESE
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SILICON METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Broslus, 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.

SPINDLES (Lathe)
American Hollow Boring Co., 1054 W. 20th St., Buffalo, N. Y.

SOAKING PITS
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLDER
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich.

SOLENOIDS (Electric)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

SOLVENT (Degreasing)
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., Dept. E, Pennsalt Cleaner Div., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Abart Gear & Machine Co., 4825 W. 16th St., Chicago, Ill.
Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 322 Vulcan St., Buffalo, N. Y.
Grant Gear Works, 2nd & B. Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Co., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLES (Grinding)
Bryant Chucking Grinder Co., Springfield, Vt.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 422 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
*Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Coil & Elliptic)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Compression)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Oil Tempered—Flat)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Pittsburgh Spring & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Torsion)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINGS (Valve)
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.

SPRINKLERS (Automatic)
Grinnell Co., Inc., Providence, R. I.

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
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Dahlstrom Metallic Door Co., Jamestown, N. Y. 442 Central Ave., Pontiac, Mich.
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., 422 Central Ave., Pontiac, Mich.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 So. Centre St., Corry, Pa.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1667 W. Lafayette Blvd., Detroit, Mich.

STAMPS (Steel)
Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
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 & Steel Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.
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.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
*Copperweld Steel Co., Warren, O.
*Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Union Drawn Steel Div. of Republic Steel Corp., 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. 10A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., 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, 590 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
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.
Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (Die)
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (Drill)
Crucible Steel Company of America, 405 Lexington Ave., New York City.

WHERE-TO-BUY

STEEL (Electric)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (High Speed)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)

Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Dept. 10A, P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
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.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., 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., The, Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, 590 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Process Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St. ,Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill
Seneca Wire & Mfg. Co., Fostoria, O.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City. Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.

STEEL (Structural)—Con.
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.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., 139 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, O.
Crucible Steel Company of America, 405 Lexington Ave., New York City.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Forgings & Castings Corp., 1350 Jarvis St., Ferndale, Mich.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Mach. Co., 5600 St. Jean, Detroit, Mich.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

STONES (Honing)
Bay State Abrasive Products Co., Westboro, Mass.

STOOLS
Superior Mold & Iron Co., Penn, Pa.

STOPPERS (Cinder Notch)
Bailey, Wm. M. Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)
Rhoades, R. W., Metaline Co., P. O. Box 1, Long Island City, N. Y.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3520 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., Dept. E. Pennsalt Cleaner Div., Philadelphia, Pa.

SWITCHES (Electric)
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Dept. 166-S-L, Nela Park, Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TACHOMETERS
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS
Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Pickling)
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.
Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

TANKS (Wood or Steel, Rubber or Lead Lined)
Kirk & Blum Mfg. Co., The, 2838 Spring Grove Ave., Cincinnati, O.

TANTALUM-TUNGSTEN CARBIDE
Vascoloy-Ramet Corp., No. Chicago, Ill.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

TERMINALS (Locking)
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago, Ill.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

TESTING MACHINERY (Materials)
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

THERMOMETERS
Bristol Co., The, Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stanton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TONGS (Chain Pipe)
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TOOL BITS (Tantalum Carbide)
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOL HOLDERS
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOLS (Tantalum Carbide)
Vascoloy-Ramet Corp., N. Chicago, Ill.

TOOLS (Tipped, Carbide)
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Weldit Acetylene Co., 638 Bagley Ave., Detroit, Mich.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.

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
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSMISSIONS—VARIABLE SPEED
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

TRAPS (Compressed Air)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TRAPS (High Pressure Steam)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TRAPS (Steam)
Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

WHERE-TO-BUY

TROLLEYS
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Northern Engineering Works, 2609 Atwater St., Detroit, Mich.
Reading Chain & Block Co., Dept. 31, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCK CRANES
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.

TRUCKS (Dump-Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TRUCKS (Hydraulic Lift)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TRUCKS (Industrial)
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRUCKS (Lift)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Michigan Steel Tube Products Co., 9450 Buffalo St., Detroit, Mich.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

TUBES (High Carbon)
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.

TUBING (Alloy Steel) (*Also Stainless)
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Michigan Steel Tube Products Co., 9450 Buffalo St., Detroit, Mich.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

TUBING (Copper, Brass, Aluminum)
American Brass Co., The, Waterbury, Conn.
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

TUBING (Seamless Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

TUBING (Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Roller Bearing Co., The, Steel and Tubes Division, Republic
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBING (Square, Rectangular)
Ohio Seamless Tube Co., Shelby, O.
Steel & Tubes Division, Republic Steel Corp., Cleveland, O.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Michigan Steel Tube Products Co., 9450 Buffalo St., Detroit, Mich.
Ohio Seamless Tube Co., Shelby, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS
Michigan Steel Tube Products Co., 9450 Buffalo St., Detroit, Mich.
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., Cleveland, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Co., 30 E. 42nd St., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS

Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

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Brosius, Edgar E., Inc., Sharpsburg Branch, Pittsburgh, Pa.

VALVES (Brass, Iron and Steel)

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Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

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Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
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Nicholson, W. H., & Co., 177 Oregon St., Wilkes-Barre, Pa.

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Western Gas Div. Koppers Co., Fort Wayne, Ind.

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Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

VALVES (Hydraulic)

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Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

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Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

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Lincoln Electric Co., The, Cleveland, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
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Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
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Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
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Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)

Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)

Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)

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Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Columbia Steel Co., Los Angeles, Calif.
Page Steel & Wire Div., of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
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.

WHERE-TO-BUY

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Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh Steel Co., 1643 Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)

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Firth-Sterling Steel Co., McKeesport, Pa.
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WIRE (Welding)—See WELDING RODS OR WIRE

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WIRE NAILS—See NAILS

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Expert in production, processing, routing, incentive, cost control. Twenty years steel fabrication, machining and welding. Now engaged. Address Box 406, STEEL, Penton Bldg., Cleveland.

HAVE YOU ANYTHING YOU WANT SOLD to the body manufacturers in Detroit or their airplane program? Know parties to contact in these organizations for quick results. Reply Box 410, STEEL, Penton Bldg., Cleveland, Ohio.

Castings

OHIO

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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EXPERIENCED HEAVY FORGER AND blacksmith. Opening in large California Plant, best of climate and working conditions. Steady work. Good wages. Age under 45. Experience required in crankshaft, straight shaft and general light forgings, alloy and carbon steels. Address Box 389, STEEL, Penton Bldg., Cleveland.

WANTED

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Experienced in precision production work, consisting mostly of Warner & Swasey, hand screw, milling machines and drill presses; by company in Detroit vicinity established for 25 years. Address Box 403, STEEL, Penton Bldg., Cleveland.

ENGINEER OR DRAFTSMAN CAPABLE of designing and detailing structural and plate work. Central Illinois location. State age, education, experience, and salary requirements. Address Box 392, STEEL, Penton Bldg., Cleveland.

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A BARGAIN
GREY IRON AND SEMI STEEL OR ALLOYS

Operating at present. Equipped with two 72″ cupolas for castings to eight tons. Have pattern and machine facilities under our own roof. Located northern Indiana, good industrial city. Will sell at appraised value buildings and equipment. Address Box 408, STEEL, Penton Bldg., Cleveland.

FOR SALE

Large machine shop, foundry, forge shop, one thousand ton marine railway. Main building contains 24,000 square feet floor space. There is 735 feet water frontage on St. Mary's River in city limits of Sault Ste. Marie, Michigan. Present owners in business over fifty years and desire to retire. Address inquiries to Fred S. Case, First National Bank, Sault Ste. Marie.

Employment Service

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$2,500 to $25,000

This thoroughly organized advertising service of 31 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.

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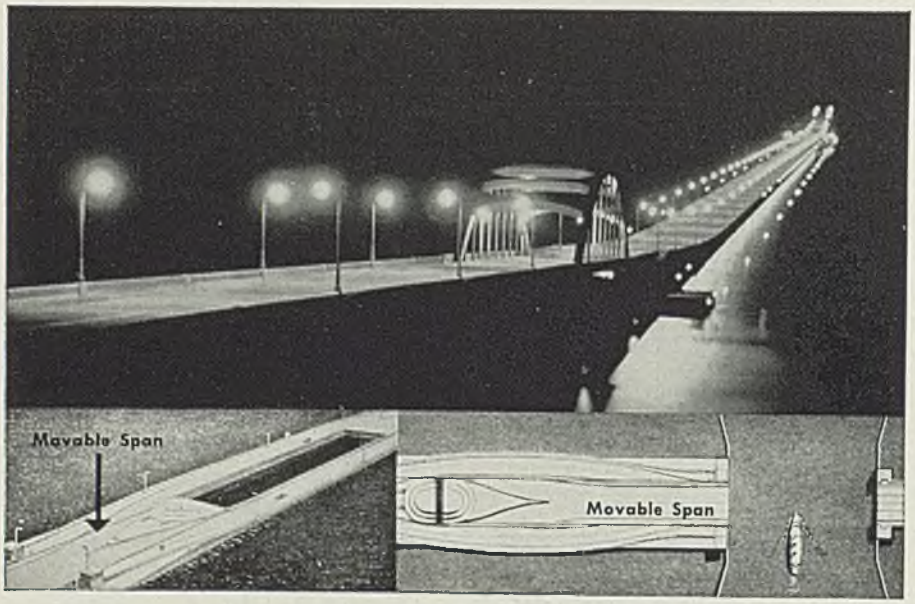
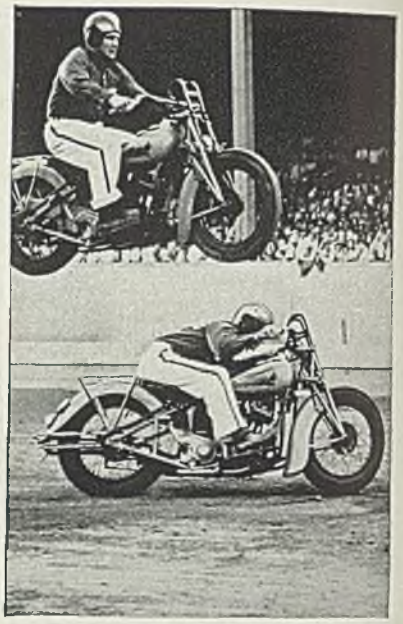
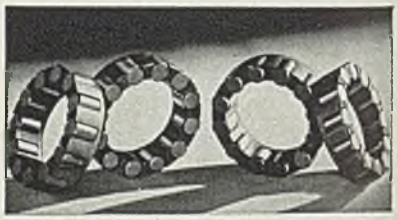
WITH BANTAM BEARINGS

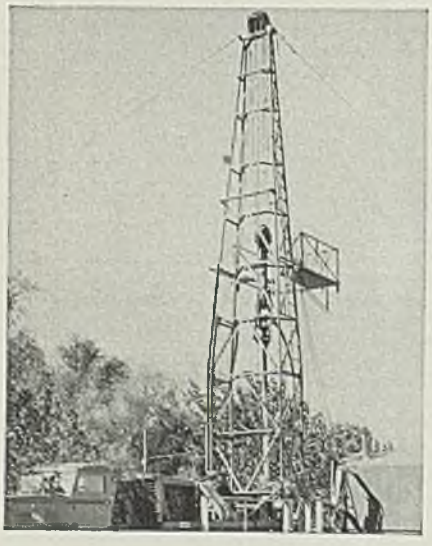


UNIQUE ENGINEERING FEAT is the pontoon-supported Lake Washington Bridge at Seattle—longest floating bridge in the world, first of its type to be built of reinforced concrete. Striking feature of the novel structure is the movable span which slides back into a U-section to permit passage of large steamers. Insets show span in open and closed positions. Guide rollers keep movable span in horizontal and vertical alignment. Specially designed Bantam Tapered Roller Bearings for vertical guides measure 10½" I.D., 16"O.D., 2⅛" thick, are rated at 331,000 pounds at 14.3 RPM. Horizontal guides use 8 Bantam Straight Roller Bearings, 10" I.D., 15¾" O.D., 6⅛" thick.

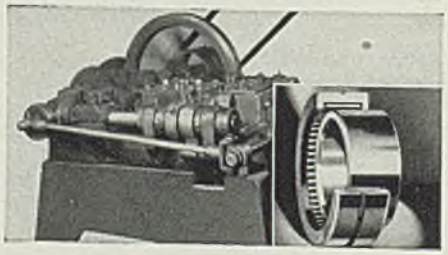




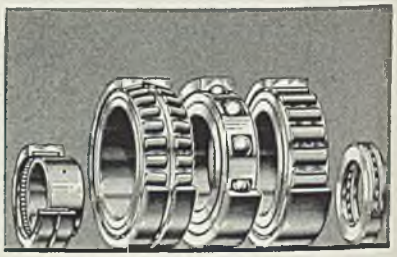
A FLYING MOTORCYCLE LEAP calls for plenty of stamina in the machine—and so does normal operation at high speeds over rough roads. Bantam designed special roller bearings to meet the requirements of long life and accurate tolerances—and Indian Motocycle Company installed them at 14 vital points on its 40-horsepower Indian 74.



OIL FIELDS PAY OUT when they use Franks Mfg. Corporation's drilling rig, which travels around, derrick and all, on a single truck. Low drilling costs make it profitable to work poorer paying fields. Since low-cost operation is keynote of the rig, Franks selects Bantam Bearings for rotary table and swivel. Bantam Bearings efficiently serve the makers and users of every type of oil field equipment.



WIRE NAIL MACHINE built by Wm. Glader Machine Works, Chicago, is subjected to frequent severe impact loads. Bantam's Quill Bearings are used on actuating roller. This compact antifriction bearing is high in capacity, low in cost, easy to assemble. For full information on the Quill Bearing, write for Bulletin H-104.



EVERY MAJOR TYPE OF ANTI-FRICTION BEARING is included in Bantam's line—straight roller, tapered roller, needle, and ball. Bantam serves every industry with a wide range of *standard bearings*—and Bantam engineers design *custom-built bearings* in large sizes and special types for unusual applications. If you have an exceptionally difficult bearing problem, TURN TO BANTAM.

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA