STEEL

The Magazine of Metalworking and Metalproducing

VOL. 117. NO. 25 DEC. 17, 1945

NEWS

TECHNICAL

FEATURES

MARKETS

NEXT WEEK...

Century of Progress in Making Fasteners

Carbon Lining for Blast Furnaces

"Shimmy" Dies for Drawn Steel Parts

Lubrication Problems in Drawing Aluminum

Supersonic Inspection of 1/1000-In. Flaws

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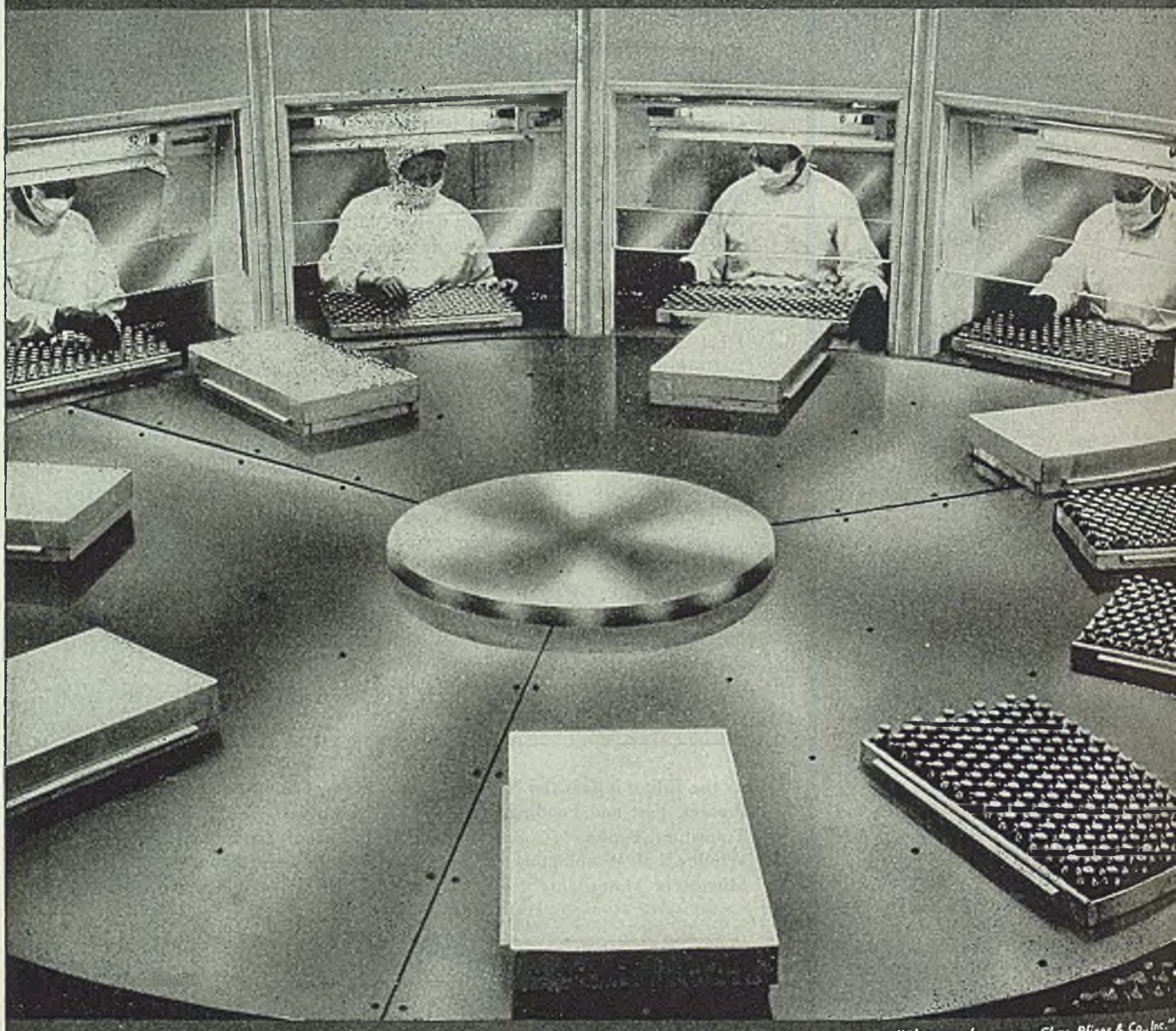

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STEEL
December 17, 1945

For Saner Price Control

Much of the confusion in regard to price controls stems from the difficulty of reconciling theory and objectives with practice and results. Half the time the debaters as to the merits of government price control are not talking the same language. The government official, speaking in favor of continued price controls, is arguing from the standpoint of what he thinks controls are accomplishing or what he hopes they will accomplish. The harassed business man, arguing not against controls in principle but against the way controls are ruining his business, is talking about actual results in the present and past tense.

This discrepancy is apparent almost daily. Whenever Price Administrator Chester Bowles appears in public to plead for or defend a continuation of price controls, he makes out a pretty good case. At his appearance before the National Association of Manufacturers, his statement that price controls already had saved the nation $64 billion was impressive, even though some persons might question its accuracy. Again in his testimony last week before the Senate Small Business Committee, his recital of nine steps taken by OPA to adjust its policies to the objective of full peacetime production and employment was convincing—from an overall standpoint.

Yet in spite of the plausible arguments of Mr. Bowles and others, the fact remains that the end result of price control in hundreds of instances is disastrous to individual companies. The intricate red tape of price regulations, delays, inequalities and other defects in the system are forcing manufacturers to go into new or fringe lines of business in a frantic effort to survive. There is too wide a gap between what Mr. Bowles thinks controls are accomplishing and what they actually are doing to individual companies.

Mr. Bowles and others claim that their surveys show that industrial executives favor a continuance of price controls. This is true. Independent polls on this question show definitely that a majority of industrialists favor price control in principle. But this does not mean that they favor price control of the kind that is in effect now. Again there is the confusion between theory and objective on one hand and practice and result on the other.

Two remedies seem to be worth trying. One is to simplify the system, so as to narrow the gap between the objective for all and the result for the few. The other is to divorce price policy from wage, labor dispute, political and other irrelevant considerations.

1945 STEEL CAPACITY: Special importance attaches to the American Iron & Steel Institute's "1945 Iron and Steelworks Directory" because as the first edition to be issued since 1938 it reflects the drastic changes that have occurred in the industry's production facilities during seven unusual years.

It shows that as of Jan. 1, 1945, the nation had 243 blast furnaces capable of producing 67 million tons of pig iron annually; 11,488 by-product and 4694 beehive coke ovens with a capacity of 60 million tons of coke a year; 990 open hearths, 262 electric and crucible furnaces and 41 bessemer converters rated to produce 95 million tons of steel ingots annually; and extensive finishing facilities for rails, bars, plates, shapes, tubes, sheets, strip, wire and other products. The directory also lists Canadian iron and steel capacity.

The figures indicate a trend toward larger productive units concentrated in the hands of fewer companies. For instance the 1938 directory listed 243 blast furnaces owned by 52 companies and having

(OVER)

an annual capacity of 57 million tons. The 1945 directory also lists 243 stacks, but they are owned by only 39 companies and their capacity is 67 million tons a year—an increase of 10 million tons.

Studious minds will find much to ponder in the institute's latest directory.

—pp. S-1 to 16, following p. 76

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NEED 40,000 ENGINEERS: Almost every meeting of technical men that has been held since V-J Day has been marked by unusual attention to the subject of industrial research. Discussion usually centers on the need for greatly expanded facilities for research and for more technically trained men.

The first need, that of more and larger laboratories, seems to be recognized by most industrial companies. Hundreds of corporations are giving priority to expanded research facilities in their postwar programs.

Unfortunately, the need for more technical men is not as generally recognized. At a meeting of engineers last week, Col. Blake R. Van Leer, president of Georgia School of Technology, said that in spite of the present flood of students into technical schools, there will be an estimated shortage of 40,000 technically trained men over the next seven years.

This is a serious prospect. Industrial executives whose companies have a big stake in research should try to help the engineering schools in solving this important problem. —pp.72, 73

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FACT FINDERS AT WORK: President Truman has appointed a fact-finding board of three men to study the dispute between General Motors and UAW-CIO. It is expected that he will name a similar three-man team to seek facts in the steel employees' dispute. The fact finders in the automobile case will start work next Wednesday.

The fact seekers appointed by the President are supposed to be counterparts of similar boards which would be authorized by Congress, if and when Congress gets around to enacting the anti-strike legislation Mr. Truman has requested. Should Congress delay action until after the holiday recess, then the performance of the automobile and steel fact finders might easily serve as evidence to "sell" or "unsell" the lawmakers on the effectiveness of fact finding as a remedy for disputes.

Experience may prove that it is not the mere finding of facts but rather the determination of which facts are pertinent and admissible that is important.

—pp. 67, 68, 69

POSTWAR POSTSCRIPTS: Private industry has purchased about $1 billion worth of government-owned surplus war plants (p. 74), paying approximately 70 per cent of the original cost of the properties. . . . After airing considerable opposition, Congress probably will approve the $4400 million loan to Great Britain (p. 77), paving the way for a freer flow of foreign trade. . . . Evidence is mounting to indicate that numerous General Motors employees made idle by the strike (p. 84) are seeking interim employment. . . . West Coast rumor has it that government surplus property officials (p. 86) are preparing to call for new bids on the Geneva steelworks. . . . A Kansas City bank, analyzing returns from 660 employers in the Kansas City area (p. 88), reports that expansion plans for 1946 call for an increase in employment of 23.9 per cent by next fall which would represent a gain of 40.5 per cent over employment by the same companies in the fall of 1940. . . . Twentieth Century Fund in a report entitled "Trends in Collective Bargaining" (p. 89) states that "on the whole, unionism has not convinced any large segment of management of its eagerness for technological advance. This may require a change in attitude on the part of organized labor as great as the one necessary if employers in general accept rather than oppose the spread of unionism". . . . Iron and steel engineers and operating and maintenance men last week inspected large turbo-blowers (p. 72) at the plant of Ingersoll-Rand in Phillipsburg, N. J. One unit, capable of supplying 125,000 cu ft per minute at 30 lb per sq in., was shown under test. Some visiting steel men believe that henceforth most blast furnaces of the size now being built will be equipped with blowers of this or higher capacity. . . . Observers of labor negotiations in motordom are noting the significant differences in the General Motors and Ford cases. The GM-UAW conferences are heated and bitter, those of Ford-UAW cooler and more deliberate (pp. 68, 83), with the factor of union responsibility attracting widespread attention. . . . Gen. Leonard P. Ayres, viewing the outlook for 1946 rather optimistically (p. 73), says that the "need for new houses is so great that the accumulated shortage of them could probably keep a brisk building boom going for the next ten years. Perhaps as many as 12.5 million new homes will be needed in that time."

E. L. Shaner

EDITOR-IN-CHIEF

103 Christmases!

Forgive us if we reminisce a little, while we wish you the merriest Christmas possible, and the best of New Years. But our company was started in 1842, in a little two-story building in Chicago, and the Christmas Day just ahead will be our 103rd.

How much has happened since that first Christmas!

The raw little town of Chicago has grown into a metropolis only a day's journey from London by air. Four great wars have come and gone. The telephone has become an unnoticed convenience. The radio is almost always present—sometimes when we would rather it were not. Television is just about here.

Business tempos have speeded up immeasurably. Swift trucks hurry through streets where once horse-drawn drays leisurely carried our steel. Ladies' skirts which once swept the wooden sidewalks are—well, higher. The motor car has made the farmer almost a city dweller, so easy is it for him to go back and forth from his farm.

And now atomic power!

But if so much has changed in 103 years, the spirit of Christmas remains just what it was—cheery good will to all men everywhere. May this spirit continue with us in the years to come.

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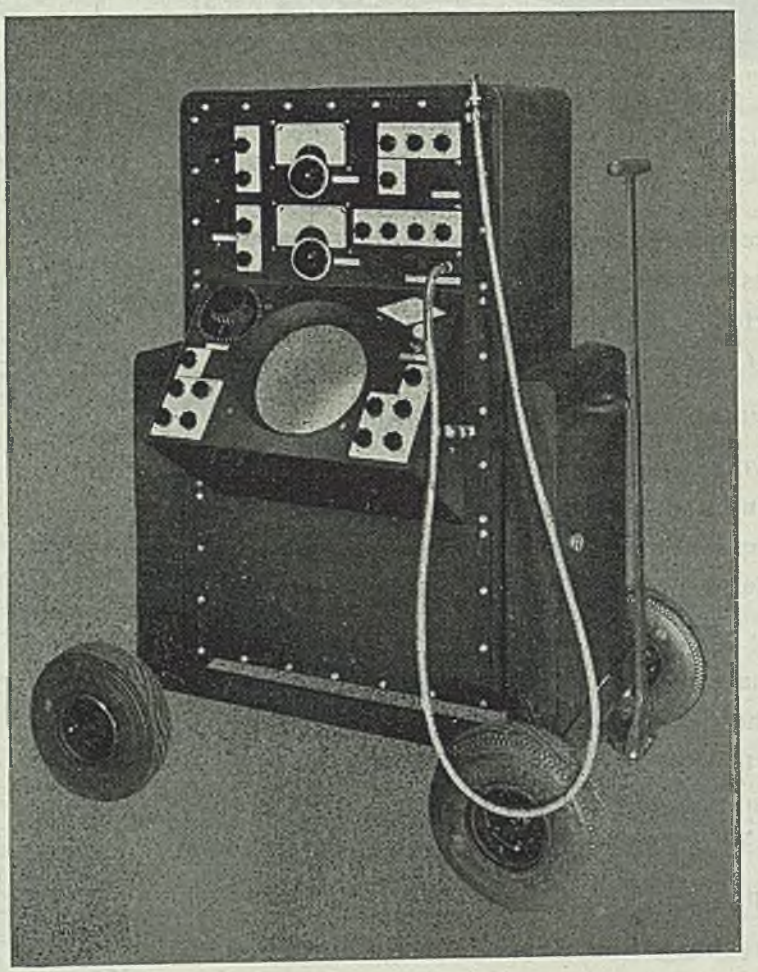

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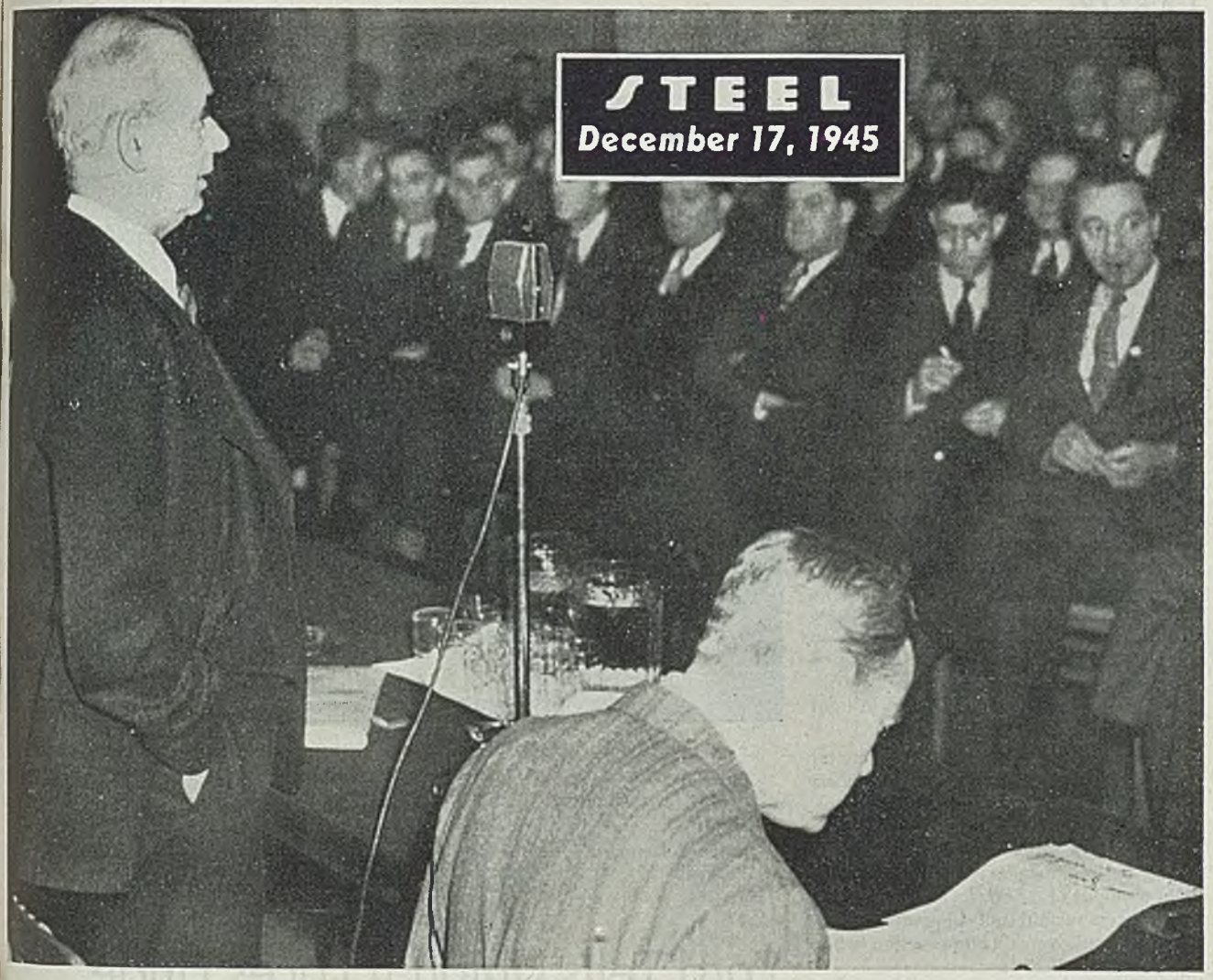

Nation-wide steel strike was set for Jan. 14 at a meeting of United Steelworkers' Wage Policy Committee in Pittsburgh Dec. 11. Previously the strike had been approved in a War Labor Board election by the rank and file. Above is shown Philip Murray, president of the union, addressing a meeting of the Wage Policy Committee

Seek Means To Avert Steel Strike

Hope for settlement of wage disputes rests in government action. Several solutions to impasse seen, including legislation embodying President Truman's recent labor proposals and granting of price relief to the industry before the walkout deadline, Jan. 14

GOVERNMENT intervention appears to be the only hope for averting a nation-wide steel strike, following action by the wage policy committee of the United Steelworkers in calling a walkout for Jan. 14.

On the surface, the position of the opposing parties appears adamant. Steel producers have declared repeatedly they cannot increase wages unless substantial price relief is granted; the Office of Price Administration has refused to consider general steel price increases until financial returns of producers for all of 1945 are studied, an impossibility before the date of the scheduled strike.

The union, on the other hand, insists its demand for a $2-a-day wage increase is not subject to "dickering or compromise" and has taken all the action necessary to start a strike in mid-January. Last week, however, Philip Murray, union chief, was quoted as stating the demand was negotiable.

Several solutions to the impasse are conceivable. Congress may enact legislation embodying the proposals recently made by President Truman for fact-finding boards and cooling off periods. Secretary of Labor Lewis B. Schwellenbach last week urged the legislators to make haste in approving such a law, although it was considered doubtful that a measure could be passed before the Christmas recess.

Another possible solution might be reconsideration by OPA of its stand against steel price increases. Should the price control agency modify its position, negotiations between the producers and the union might be resumed and a compromise wage settlement reached.

As a last resort, the government might take over the steel plants to prevent a shutdown which would paralyze industry, throw millions of wage earners out of jobs, deprive returning veterans of jobs and earnings and possibly cause a collapse of the economy.

Some observers see hope in the fact the union had allowed 33 days between the strike call and its effective date. This interval will permit time for further efforts toward resolving the controversy. It is entirely possible that the automobile

disputes may be settled during this interval and whatever settlement is reached in the automotive cases is expected to influence other pending disputes.

The scheduled steel strike would involve about 700,000 workers in nearly 800 plants in 27 states and would be by far the most widespread and disruptive work stoppage in the country's history. Such a walkout, it is estimated, would affect four out of every ten factory workers because of industry's dependence on steel. Many large metalworking companies would be forced to close in a few days after the steel plants were struck; steel inventories of most companies soon would become either exhausted or unbalanced should deliveries be cut off.

While the "float" of steel in consumers' plants varies widely, it generally is small. Few consumers have been able to build up normal stocks since the war.

Automotive plants, especially those struck, have been accumulating some steel in warehouses near their plants in recent weeks as shipments were continued while consumption was nil. Such stockpiling is expected to be continued in light of the threatened steel strike.

If the scheduled steel strike materializes, the loss to both the producers and the steelworkers will be tremendous.

The 700,000 steelworkers would lose approximately $6¼ million a day in wages, based on the average straight time daily earnings of $8.96. In most states the steelworkers would not be permitted to draw unemployment compensation while on strike.

Strike To Cause Additional Expenses

The companies, in addition to loss of production, would incur unusual expense in banking blast furnaces and shutting down open hearths and coke ovens, considerable scrap loss on stock in process, and accelerated depreciation on all equipment. While most equipment could be placed in standby condition, provided reasonable notice of the strike is given and provided maintenance men were allowed to remain in the plants, serious damage might result to other facilities. For example, walls of coke ovens in areas where natural gas is not available for maintaining heat might collapse.

In issuing the strike call, the United Steelworkers widened the breach between the Congress of Industrial Organizations and the national administration which appeared after President Truman made his proposal for a bill patterned after the Railway Labor Act and providing for cooling off periods and fact finding boards.

"Compulsion to work—regardless for how brief a period—is but the first step toward industrial serfdom . . . We therefore condemn President Truman's proposed legislation as viciously antilabor and an attack on our basic democratic liberties."

The union also bitterly attacked what

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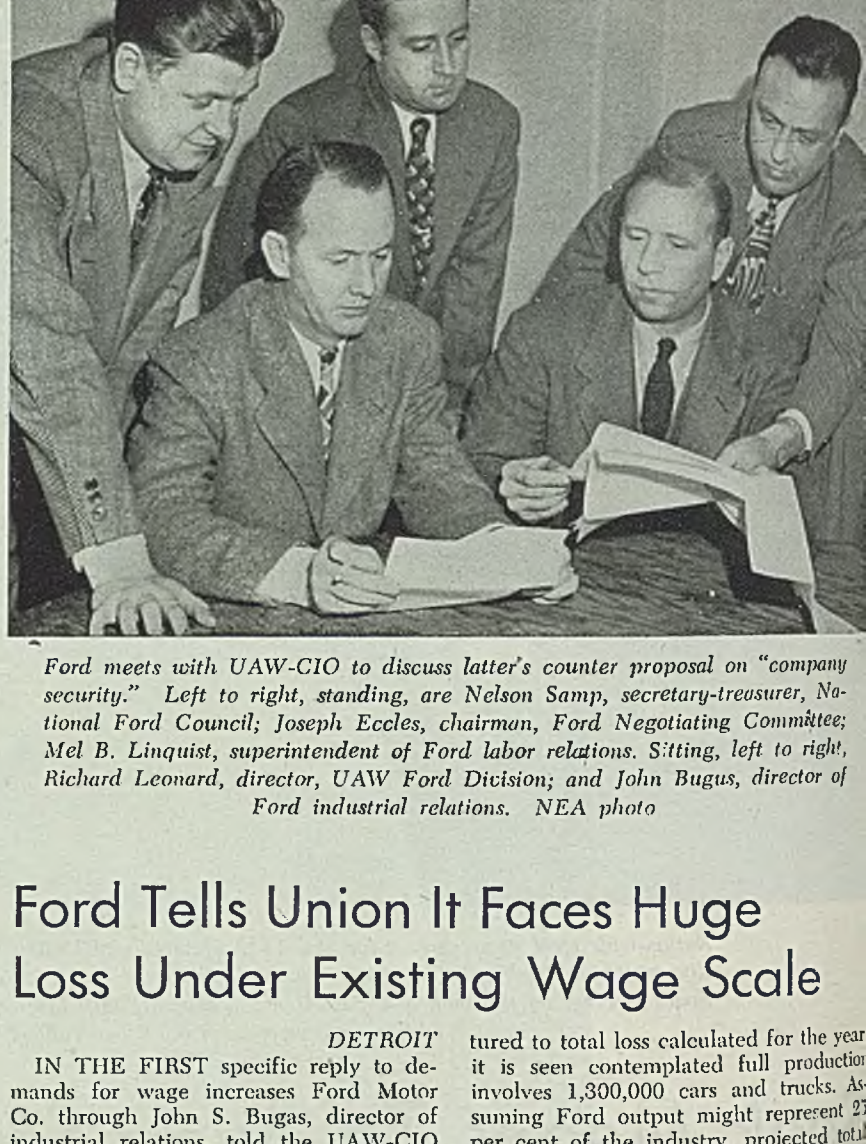

Ford meets with UAW-CIO to discuss latter's counter proposal on "company security." Left to right, standing, are Nelson Samp, secretary-treasurer, National Ford Council; Joseph Eccles, chairman, Ford Negotiating Committee; Mel B. Linquist, superintendent of Ford labor relations. Sitting, left to right, Richard Leonard, director, UAW Ford Division; and John Bugas, director of Ford industrial relations. NEA photo

Ford Tells Union It Faces Huge Loss Under Existing Wage Scale

DETROIT

IN THE FIRST specific reply to demands for wage increases Ford Motor Co. through John S. Bugas, director of industrial relations, told the UAW-CIO the company was faced with a loss of $27 per passenger car and truck built or $35 million in all during 1946 on the basis that full production could be achieved next year, that wages would not increase and that there would be an increase of 16 per cent in present low productivity or individual effort.

The company also maintains it is paying wages 7 per cent higher than its nearest competitor and between January, 1941, and July, 1945, has increased wages by 36.65 per cent not including increases in the form of vacation and shift premiums. This appears to give the lie to union charges that wages have not kept pace with the cost of living increases since the highest estimate seen for the latter is 33 per cent.

Mr. Bugas declared, "It is inevitable that our discussions on wages must consider our joint ability to increase the productivity of the employees of this company and upon our ability to get into full production."

Relating the loss per unit manufactured to total loss calculated for the year it is seen contemplated full production involves 1,300,000 cars and trucks. Assuming Ford output might represent 2[illegible] per cent of the industry, projected total output would figure to 5,200,000 units or well below earlier estimates of increased postwar schedules.

Hints that serious dents have been suffered by the UAW-CIO's reported General Motors strike fund of $4 million are seen in announcement the union is now asking all members to contribute $[illegible] weekly to bulwark the fund. Along with this, several of the staff members of the UAW international office in Detroit have declared they are contributing their entire "takehome" pay to the strike fund.

Meanwhile from CIO headquarters in Pittsburgh comes announcement that the wage policy division of the union has appropriated $100,000 in support of General Motors strikers.

General Motors has made its position on wages crystal clear by pointing out its recent offer of a 13½-cent an hour or $1.08 per day increase would bring average weekly takehome pay of auto workers to a level higher than during wartime by better than 10 per cent. Thus, during the last year of war, GM

hourly-rate workers earned an average of $56.93 per week for 45.6 hours of work; under the proposed increase they would receive $63.44 per week average for 45-48 hours of work, overtime operations still being necessary to keep apace with demand for goods and services.

This points up a fact all too often overlooked—that wartime wages did not represent 52 hours' pay for 48 hours' work. Bureau of Labor Statistics figures show average weekly hours in the automotive industry were 39.6 in 1941; 44.4 in 1942; 46.2 in 1943, and 45.6 for 1944. In July, 1945, the average was down to 42.4 hours. If operations are to be continued on an overtime basis, as there seems every reason to believe, the only result of the proffered 13½ cents an hour increase can be a further increase in takehome pay.

General Motors' offer, made originally to the United Electrical, Radio & Machine Workers of America-CIO, was accompanied with the stipulation it would be retroactive to Nov. 7, 1945, provided it was accepted before Jan. 7, 1945; plus the suggestion the increase be distributed on the basis of 12 cents per hour increase for each employee (identical with what Studebaker has agreed upon with the UAW) and the balance of 1½ cents per hour be used on a fund basis for adjustment of any inequalities which may exist within a specific plant, the latter to be negotiated locally.

Along with the offer to the UERMWA, subsequently rejected, of course, was the proviso that local plant managers were prepared to include in local wage agreements a minimum hiring rate of 80 cents an hour for both male and female employees, this rate to increase under a progression plan now in effect in each plant to a minimum job rate of 90 cents an hour.

Fact-finding commission appointed by President Truman to study the General Motors tieup includes Chief Justice Walter P. Stacey of the North Carolina Supreme Court, and chairman of the recently terminated labor-management conference in Washington; Lloyd K. Garrison, chairman of the War Labor Board, and Milton Eisenhower, president of Kansas State College. The board will not meet until Wednesday of this week and presumably would have 20 days to study the facts and arrive at a decision. It likely will require all of this time to acquire even a basic understanding of the issues involved and the mechanics of automobile production.

Total production of 1946 passenger cars as of last week was estimated at slightly over 50,000, or roughly 10 per cent of what had been projected by the industry earlier this year. December production alone had been figured at around 250,000 units, but will not likely exceed 20,000. About half of production thus far achieved has come from Ford plants.

Labor and Management Watch Oil Panel's Procedure Closely

ORGANIZATIONAL procedure of the Oil Panel is being watched with interest in labor and management circles since it is the first of the panels to be set up under President Truman's policy of appointing fact-finding groups to investigate the factors involved in major strikes.

The course of action to be taken by this panel will establish precedent governing similar panels to be appointed in the future.

The Oil Panel is the outgrowth of the government's interest in the petroleum refinery strike which caused the President, on Oct. 4, to order the Navy to seize and operate certain leading refineries and other oil facilities pending final action on the union's demand for a 30 per cent raise in hourly pay and other benefits. The panel, appointed by Secretary Schwellenbach on Nov. 27, is to report no later than Dec. 27 "its finding of fact and recommendations which shall conform to the wage and price stabilization policies contained in Executive Orders Nos. 9599 and 9651."

It consists of three members "representing the public interest." They are Frank Graham, president of the University of North Carolina, serving as chairman, and Paul Eliel of Stanford University, and Otto Beyer of Washington.

Public hearings by the Oil Panel are scheduled to begin Dec. 17—probably in the Department of Labor building. In the meantime it is busy making decisions as to what type of data it will seek and admit into the record.

When the hearings open, the two parties—first the oil workers and then the employers—will be permitted to present their cases in both oral and written form. Next the parties will have opportunity, within time limits still to

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Novmber Steel Production Gain Reported

STEEL ingot production in November was above the 6,000,000-ton mark for the first time since July, as the industry recovered from summer slackness and effects of the coal strike in October, according to figures by the American Iron & Steel Institute, New York.

November output of ingots and steel for castings was 6,246,759 net tons, compared with a revised total of 5,597,782 tons in October. In November, 1944, production was 7,278,719 tons. Operations in November averaged 79.5 per cent of capacity, compared with 69 per cent in October and with 94.3 per cent in November, 1944. An average of 1,456,121 tons was made each week in November, against 1,263,608 tons per week in October and 1,696,671 tons averaged per week in November, 1944.

Production for all 11 months aggregated 73,706,031 net tons, a decline of 8,569,374 tons from the 82,275,405 tons produced in the comparable portion of the previous year.

Finished steel shipments by the United States Steel Corp. in November totaled 1,346,407 net tons, an increase of 56,049 tons from October shipments of 1,290,358 tons. Decrease from November, 1944, was 397,346 tons. For 11 months this year shipments totaled 17,024,474 tons, compared with 19,383,188 tons in the comparable period in 1944.

STEEL INGOT PRODUCTION STATISTICS

Based on reports by companies which in 1944 made 97.9% of the open hearth, 100% of the bessemer and 86.7% of the electric ingot and steel for castings production

1945

	Estimated Production—All Companies								Calculated weekly production, all companies	Number of weeks in mo.
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	
Jan.	6,468,815	90.5	379,062	76.0	358,346	77.3	7,206,223	88.8	1,626,687	4.43
Feb.	5,967,842	92.4	347,227	77.1	339,520	81.1	6,654,589	90.8	1,693,647	4.00
Mar.	6,927,377	96.9	398,351	79.8	382,237	82.4	7,707,965	95.0	1,739,947	4.43
1st qtr.	19,364,034	93.3	1,124,640	77.8	1,080,103	80.2	21,568,777	91.6	1,677,199	12.86
Apr.	6,541,097	94.4	372,952	77.2	377,877	81.4	7,291,926	92.8	1,699,750	4.29
May	6,663,377	93.2	402,100	80.6	386,075	83.3	7,451,752	91.8	1,682,111	4.43
June	6,129,366	88.5	378,807	78.6	333,217	74.2	6,842,290	87.1	1,594,949	4.29
2nd qtr.	19,333,940	92.1	1,154,859	78.8	1,097,169	80.6	21,585,968	90.6	1,659,183	13.01
1st hlf.	38,697,974	92.7	2,279,499	78.2	2,177,272	80.4	43,154,745	91.1	1,668,139	25.87
July	6,318,463	88.6	381,832	76.7	286,713	61.9	6,987,008	86.3	1,580,771	4.42
Aug.	5,171,925	72.3	347,088	69.5	217,363	46.9	5,736,376	70.7	1,294,893	4.43
Sept.	5,435,358	78.7	352,847	73.2	195,156	43.5	5,983,361	76.3	1,397,982	4.28
3rd qtr.	16,925,746	79.9	1,081,767	73.1	699,232	50.9	18,706,745	77.8	1,424,733	13.13
9 mos.	55,623,720	88.3	3,361,266	76.5	2,876,504	70.4	61,861,490	86.6	1,586,192	39.00
Oct.	5,146,370	72.0	242,122	48.5	209,290	45.1	5,597,782	69.0	1,263,608	4.43
Nov.	5,692,518	82.2	358,639	74.2	195,602	43.6	6,246,759	79.5	1,456,121	4.29

For 1945 percentages are calculated on weekly capacities of 1,614,338 net tons of open hearth, 112,658 tons of bessemer and 101,640 tons of electric ingots and steel for castings, total 1,831,636 tons; based on annual capacities as of Jan. 1, 1945 as follows: Open hearth 84,171,500 net tons, bessemer 5,874,000 tons, electric 5,455,890 tons.

Steel Allocation Plan Suggested

Government reported considering proposal to resume partial control of mill shipments in move to provide tonnage for export and also aid small steel producers lacking semifinished

RESUMPTION of government allocation of steel, at least on a partial basis, last week was reported under consideration by the Civilian Production Administration, successor to the War Production Board.

Rumors circulating in the steel trade were to the effect that a meeting of CPA officials with the Steel Industry Advisory Committee in New York late in the week would take up the question of government resumption of allocation of steel for export for rehabilitation work in Europe. The tonnage involved in this work, it was said, would total 4,000,000 to 5,000,000 tons.

Accompanying this rumor was another to the effect that allocation of pig iron and some steel production for the domestic market had been suggested in official circles as a means of relieving severe supply bottlenecks which have developed in the reconversion program.

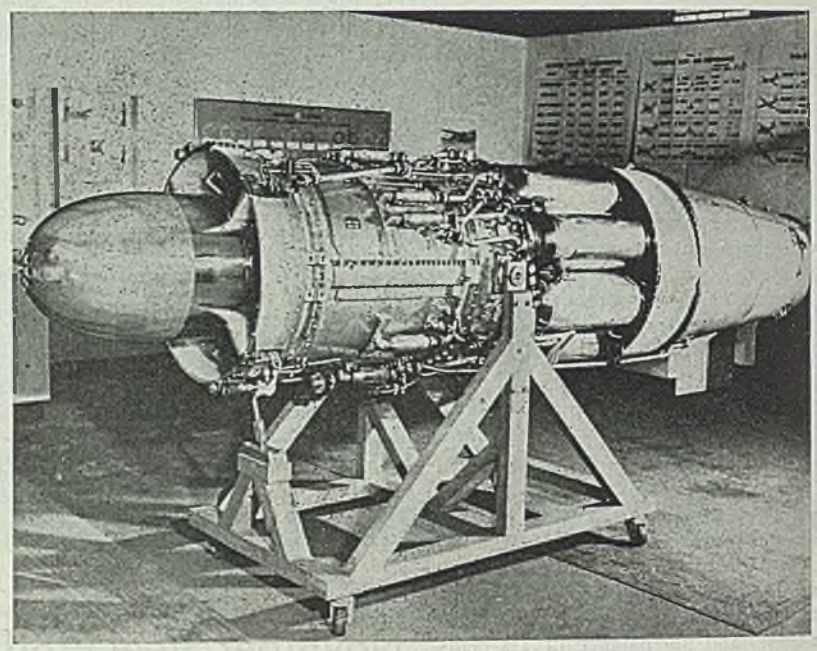
This latter rumor, however, appeared to be based on speculation.

Further, the plight of the small nonintegrated steel mills in being unable to obtain sufficient supplies of semifinished steel from the integrated mills has directed attention to the possibility of allocating semifinished to them.

With respect to other products it is reported concentration of production on the more profitable items is resulting in a tight supply situation in such products as bands, electrical sheets, galvanized sheets and certain light structurals.

Some talk heard in the trade that the government is considering allocation of steel because of reported excessive stockpiling in the automotive industry appears without foundation. It is pointed out that the 60-day supply limitation order continues in effect.

Practicability of government allocation of steel on a sizable scale is questioned in most circles. For one thing the personnel of the Steel Division of the Civilian Production Administration has been trimmed to 35 employees and only a few of these are practical steel men. It was pointed out, however, that steel allocation could be handled through the steel companies under the direction of the American Iron & Steel Institute acting as agent for the government.



STREAMLINED JET: Shaped like a torpedo, this axial flow jet developed by General Electric Co., Schenectady, N. Y., has such small frontal area that it will fit snugly into the wings of large transport planes. NEA photo

Relief Program for Nonintegrated Steel Mills Being Sought by OPA

AT TWO meetings of steel producers with representatives of the Office of Price Administration last week, one in Pittsburgh and the other in New York, efforts were made to map a program designed to aid the small nonintegrated and semi-integrated steel mills in their struggle to overcome the handicaps resulting from frozen ceiling prices and contracting raw material supply.

The plight of some of the nonintegrated mills is extremely serious, a number of them being reported about to close down, possibly go out of business, chiefly because of inability to obtain semifinished steel, their raw material, in sufficient tonnage to sustain operations.

At the New York meeting a discussion was held concerning the hardships confronting the steel industry and especially the semi-integrated and nonintegrated steel producers. At this meeting the steel advisory committee recommended to OPA that individual companies within the limitations set forth by OPA be given the privilege of accepting exemptions from revised schedule No. 6—the regulation which covers the sale of steel products—or of availing themselves of the present privilege of applying for individual price relief.

The committee also moved that standing subcommittee of controll meet with representatives of the Me Branch of OPA at the earliest possib date in order to establish procedure f the expeditious handling of current fi ancial data in line with OPA Admin trator Bowles' statement of Nov. 23 which he stated that there would be prompt review after the first of Janua of the financial picture of this industr

At the meeting in Pittsburgh, Dec. of OPA officials with representatives the steel mills a number of suggestio were made for helping the small produ ers. These included: 1, Extension of pri relief on an individual company basis; lifting price ceilings entirely for sm companies doing business up to a c tain figure; 3, granting price increases the integrated producers on semifinish products; 4, possibility of providing su sidies by having the government pu chase semifinished for resale to the no integrated firms; 5, reinstating some fo of allocation on semifinished; 6, granti price relief through permitting the small companies to charge quantity extras plates and sheets insofar as such extr

apply on small orders; 7, enable the small producers to set up their own semifinished supply source.

Representatives of the semi-integrated and nonintegrated steel companies at this meeting are understood to have rejected the suggestion of OPA officials to lift price ceilings for all companies doing a business volume under $6 million per quarter. In the discussions it was brought out that while some of the small mills are primarily concerned with the question of prices for their finished products, many of them are deeply concerned over the problem of their semifinished steel supply.

The position the companies took regarding prices was that OPA should adopt a more realistic approach in their method of computing price ceilings so that the present position of the small companies can be remedied. It was said that OPA in its decision refusing a general steel price increase took into consideration only the overall profit showing of the integrated mills, which during recent years have been able to make a profit due to the production of armor plate and other war steel products which enabled them to offset losses on a number of steel products.

Several nonintegrated steel company representatives indicated at the meeting that the lack of semifinished steel supply was their most serious problem.

The suggestion brought up at the meeting that some form of allocation of semifinished steel products, and subsidizing the industry through purchase of semifinished steel by the government for resale to the nonintegrated companies were not considered the answer to the small mills' problem.

As a general thing, it is understood, industry representatives at the Pittsburgh meeting were not favorable to blanket lifting of price controls. It was pointed out, also, that even though the integrated steel mills were permitted to advance their semifinished steel prices moderately such action would not assure the nonintegrated mills much relief with respect to semifinished supply since the larger mills would be inclined to divert their tonnage into lines of finished steel production netting them the best return.

With respect to the proposal that small nonintegrated steel mills set up their own plant as a source of semifinished supply, it is reported a group of these companies already has put up $500,000 to finance such a plant.

Resellers Allowed To Pass On Part of Price Increase

Resellers of flat galvanized steel sheets were authorized by the Office of Price Administration last week to pass on to their customers one-half of the mill price increase of 20 cents per 100 pounds which they have been required to absorb since the higher mill price was established on May 21, 1945.

OPA also announced that as the result of a re-examination of warehouse and jobber operating data submitted to OPA, a trading margin of 22.5 per cent for heavy line products will hereafter by used in calculating the amount of relief granted resellers applying for adjustments in prices, rather than the 18.5 per cent trading margin used previously.

Favors Limited Extension Of Stabilization Act

At the opening of hearings last week on the question of extending the Stabilization Act beyond present expiration date, June 30, House Postwar Committee heard Ralph E. Flanders express doubt whether all items can safely be removed from price control by the end of next June. Mr. Flanders appeared as chairman of the Research Committee of the Committee for Economic Development. He is president of the Federal Reserve Bank of Boston and is president on leave, Jones & Lamson Machine Co., Springfield, Vt.

He thinks some further extension of control may be necessary in a few raw materials like tin and sugar, some durable goods like automobiles and washing machines, and especially rents and some building materials.

This proposal, he said, is based partly on one fact of great significance which only recently has become clear and that is that we already are in the early stages of inflation.

Mr. Flanders said he has not too much confidence in the course that businessmen will take if they are given a free hand. "We will find ourselves raising prices in proportion as we raise wages, and thus as employers and employees, find ourselves conspiring together against ourselves as consumers," he said.

Forged Steel Axle Price Ceiling Raised by OPA

OPA last week announced an increase to $3.50 per 100 pounds in the base ceiling price of forged steel railway axles, the former price was $3.15. The new price becomes effective Dec. 19. The price is for axles in the rough. Prices for completely finished axles are plus cost of extra work and treatment as requested by the purchaser and other extras.

Present, Past and Pending

■ HUNT NAMED GENERAL MANAGER OF KAISER-FRAZER CORP.
DETROIT—First major shakeup in administrative personnel of Kaiser-Frazer Corp. sees the retirement of Vern R. Drum as general manager to be succeeded by E. J. Hunt, at one time master mechanic for Chrysler Corp. and later manager of the Chrysler tank arsenal.

■ RULES EMPLOYERS MUST CONSULT UNIONS ON WAGES
WASHINGTON—Supreme Court last week ruled 5 to 3 that it is unfair labor practice for an employer to ask authority to raise wages without dealing through his certified union which he did not recognize. The ruling was against the Famous-Barr Co., St. Louis, a department store which sought permission to raise wages $2 per week.

■ ITALY PLACED UNDER GENERAL EXPORT LICENSE PLAN
WASHINGTON—Effective immediately, Commerce Department has admitted Italy to the list of countries to which American exporters may ship under general license without value limitations.

■ PRODUCTION OF BILLITON TIN TO RESUME SOON
NEW YORK—Production of Billiton tin in the Dutch East Indies may be resumed "on a satisfactory scale" within six months, according to a report by Billiton Tin Co. The company produced 11,800 tons in 1939.

■ AMERICAN CAN PLANS TO BUILD $6 MILLION PLANT
NEW YORK—American Can Co. plans a $6 million plant in Baltimore. It will be in addition to two plants now being operated by the company in that area.

■ WAGE INCREASES PERMITTED IN SOIL PIPE INDUSTRY
WASHINGTON—War Labor Board has been authorized to approve wage increase applications in the cast iron soil pipe industry where necessary to secure manpower.

■ WESTINGHOUSE TO MOVE MOTOR DIVISION TO BUFFALO
PITTSBURGH—Westinghouse Electric Corp. plans to move its East Pittsburgh Motor Division to Buffalo. Operations are scheduled to begin by mid-March.

■ REYNOLDS METALS LEASES TWO ALUMINUM PLANTS
WASHINGTON—Reconstruction Finance Corp. has approved leasing of the government-owned Hurricane Creek, Ark., alumina plant and the Jones Mill, Ark., aluminum reduction plant to Reynolds Metals Co., Richmond, Va.

Wartime Role of Science Keynote Of ASA Meeting

Significance of developments to peacetime industry emphasized by speakers. Henry B. Bryans re-elected president

IMPACT of war on science and industry as a driving force in peacetime was the keynote of the annual meeting of the American Standards Association held at Hotel Biltmore, New York, last week.

Guest speaker at the meeting, Dr. Lyman J. Briggs, member of the ASA board of directors, in his address, reversed the usual procedure of explaining science's contribution to war and discussed the impact of war on science. The outstanding contributions of science to the war effort, he said, were brought about by teamwork, declaring that the greatest concerted scientific effort of all time on a single project was that associated with the atomic bomb.

Dr. Briggs declared that the most important phase of the whole subject of research concerns industrial research. He held that this should be encouraged in every possible way, including tax exemptions or similar indirect subsidies.

Pointing out the great contributions to science already made by industrial laboratories, the speaker said the war brought a new realization of the advances that are possible through research. New laboratories, he declared, will be established and old ones enlarged.

Henry B. Bryans, president of the association and executive vice president, Philadelphia Electric Co., Philadelphia, in his address told the assembled executives of trade, technical and governmental groups that the association is ready to prove that individual enterprise, championed by business, labor and government spokesmen, can produce superior results.

Dr. H. S. Osborne, chief engineer, American Telephone & Telegraph Co., pointed out in his report as retiring chairman of the ASA Standards Council that 85 per cent of the standards adopted by the ASA in the past year were directly concerned with the war effort.

Mr. Bryans was re-elected to serve a third term as president of the association. Frederick R. Lack, vice president and manager, Radio Division, Western Electric Co., was elected vice president. Other officers announced at the meeting, were E. C. Crittenden, assistant director, National Bureau of Standards, as chairman of the Standards Council, and L. F. Adams, General Electric Co., as vice chairman of the Standards Council.

CONGRATULATIONS: Robert R. Wason, left, president of the manufacturing firm of Manning, Maxwell & Moore Inc., New York, who recently was elected president of the National Association of Manufacturers, is congratulated by the retiring NAM president, Ira Mosher. NEA photo

Ingersoll-Rand Turbo-Blower Conferences Attended by 150 Steel Industry Engineers

MORE than 150 engineers and operating and maintenance officials of the iron and steel industry attended two 2-day turbo-blower conferences held last week by Ingersoll-Rand at Phillipsburg, N. J. The first conference convened Dec. 10 and 11 and the second Dec. 12 and 13.

On the first day of each conference, the steel industry officials were taken to Hillcrest Club, Ingersoll-Rand's employees' club house and recreation center, where they were greeted by B. L. Spain, manager of the Turbo-Blower Department. P. J. Bentley, general manager of the Phillipsburg plant, and Walter R. Bell, general manager of sales, spoke briefly.

Carlton B. Kidney, engineer in charge, Turbo-Blower Department, presented an exhaustive paper on the development of the Ingersoll-Rand turbo-blower. He traced the growth of these units from the first ones built in the United States shortly after the turn of the century to the present blowers which are rated at 125,000 cu ft per minute, 30 lb per sq. in. and 14,500 hp. Following Mr. Kidney's address was an interesting discussion, chiefly in regard to performance of the latest blowers under present-day blast furnace operating conditions.

Following luncheon at the Hillcrest Club, the visitors were escorted by guides through the company's plants in Phillipsburg and Easton. Chief interest was manifested in a 125,000 cfm 30 psi unit on test and many other large turbo-blowers in various stages of manufacture. Numerous other products of Ingersoll-Rand were on display. Following the tour of the shops, the party was taken to the Northhampton Country Club for dinner.

On the second day, the steel officials inspected the turbo-blower engineering department and the Cameron Pump Division. A discussion period at the Hillcrest Club brought out clearly the trend toward larger capacities in blowing equipment for blast furnaces. Seven units of the 125,000 cfm capacity now are in process of construction.

Present Technical Papers At British Steel Meeting

LONDON, ENGLAND

Presentation of the Williams prize was made to R. W. Evans for his paper entitled, "The Heating of Open Hearth Furnaces with Mixed Coke Oven and Blast Furnace Gas," at the fall meeting of the British Iron & Steel Institute in London.

Other papers presented at the meeting included: "Distribution of Materials in the Blast Furnace," by H. L. Saunders

and R. Wild, Imperial College, London; "Sinters and Sintering," and "A Rapid Method of Ore Testing. The S. K. Porosity Test," by H. L. Saunders and H. J. Tress, Imperial College, London; "Dolomite Linings for Basic Electric Arc Furnaces," by E. C. Brampton, H. Parnham and J. White, General Refractories Ltd., Sheffield; "Some Design and Operating Features of a New Blooming Mill," by G. A. V. Russell and G. W. Fox, United Steel Cos. Ltd., Templeborough.

"A Micro-Spectrographic Method for the Quantitative Analysis of Steel Segregates," by J. Convey and J. H. Oldfield, Bragg Laboratory, Sheffield; "Sources of Error in Diamond Pyramid Hardness Measurements on Hardened Steel," by W. N. Hindley, Armament Research Dept., Ministry of Supply; and "The Determination of Nitrogen in Ferro-Alloys and Other Material by Direct Nesslerization Without Distillation," by W. C. Newell, Brown-Firth Research Laboratories, Sheffield.

Georgia Tech Head Says 40,000 Engineers Lacking

Declaring atomic energy can produce the greatest industrial development the world has ever known, the National Society of Professional Engineers which met in Cleveland last week in annual convention, sent a telegram to the Senate Atomic Energy Committee urging it to prevent the use of the atom for destructive purposes.

Col. Blake R. Van Leer, president, Georgia School of Technology, pointed out the critical lack of technically trained men caused by the Selective Service policy which permitted the drafting of technical students before they could complete their college work.

Colonel Van Leer said that despite the flood of students into technical schools at present, there will be an estimated shortage of 40,000 technically trained men over the next seven years, during which time the shortage will be accentuated by the demand for the services of engineers in devastated sections of Europe and Asia and in Latin American countries.

Freight Rate Reduction Sought On Steel Moving to West Coast

FREIGHT rate relief on shipment of steel products from inland producing points to Atlantic ports for further shipment by water to Pacific Coast ports is being sought in an action before the Interstate Commerce Commission. Hearing on the petition, initiated by the United States Steel Corp., had been scheduled to open at Buffalo on Dec. 12, but because it conflicted with a hearing on fabricated steel at St. Louis, the date for the steel session was postponed until mid-January.

Great significance is seen in the action since it reflects the importance attached to freight rates in the postwar market. In this connection, last week the ICC ordered that relief which it authorized on May 31, 1944, on rates on iron and steel billets from East St. Louis, Federal, Sterling and Chicago, Ill., and Gary, Ind., to Shreveport, La., be extended from Dec. 31 this year to June 30, 1946.

In the steel rate case lower rates are sought from such points as Pittsburgh, Youngstown and Cleveland. It is claimed that such tariff reductions will be necessary to enable midwestern mills to compete for business on the Coast with western producers in event these latter are granted some form of government subsidy or western rates are reduced.

Further, it is pointed out that a reduction in freight rates from midwestern producing points to Atlantic ports would eliminate some of the competitive advantages over midwestern mills held by producers located closer to and on tidewater. For example, under the present rate setup mills at Pittsburgh must absorb $6 or more per ton than mills at tidewater on shipments to the West Coast.

Steel men point out in arguing for the rate reduction that the domestic rail rate from Chicago to Mobile, Ala., is 55 cents per 100 pounds, but the rate for steel destined for intercoastal shipment is 47 cents.

Breakdown of present freight rates from Pittsburgh, Youngstown and Cleveland, to Baltimore, Philadelphia and New York, contrasted with the proposed schedule is given in the following table:

FREIGHT RATES FROM PITTSBURGH
(Cents per 100 pounds)

To	Present	Proposed
Baltimore	30	23
Philadelphia	32	24
New York	36	27
FROM YOUNGSTOWN		
Baltimore	33	25
Philadelphia	35	26
New York	39	29
FROM CLEVELAND-LORAIN		
Baltimore	36	27
Philadelphia	39	29
New York	41	31

Boom To Follow "Present" Depression, Says Ayres

Business is entering a primary depression which will last until national income stops falling and begins to increase once more, Brig. Gen. Leonard P. Ayres, vice president, Cleveland Trust Co., Cleveland, said last week in his annual business forecast. He said the postwar depression would be followed by a boom.

General Ayres predicted the end of the depression will in all probability take place in 1946 but cited the following contingencies which may retard its advent: Possibility reconversion and industrial production may be handicapped for some months to come by the combined restraints resulting from strikes and price controls; wage increases may prove to be too numerous and too large to be accommodated within the rest of the wage structure of the nation.

Elements which provide a basis for boom conditions were listed as the country's great accumulated shortages of almost everything, reductions in debt, and accumulation of savings. "There has never before existed in peacetime anywhere," he said, "such a combination of conditions making for a business boom of great intensity and probably of considerable duration."

Reviewing the outlook for the construction industry, he said the "need for new houses is so great that the accumulated shortage of them could probably keep a brisk building boom going for the next ten years. Perhaps as many as 12.5 million new homes will be needed in that time, and it may be that the value of new construction of all sorts needed in the next ten years will be between $50 billion and $100 billion."

In regard to wages he said the only way to continue to pay increasing wages to industrial workers is to make it possible for them to keep on increasing their per capita production.

Calendar of Meetings . . .

Jan. 7-11, Society of Plastics Engineers: Annual meeting and exhibit, Convention Hall, Detroit. Thomas E. Orr, Plastic Engineering Inc., Cleveland, chairman of arrangement committee.

Jan. 11-20, National Air Show: Exhibit of air power, Public Auditorium, Cleveland.

Jan. 14-18, American Road Builders' Association: Forty-third annual convention, Stevens Hotel, Chicago. Charles M. Upham, International Bldg., Washington 4, engineer-director.

Jan. 20-22, Institute of Scrap Iron & Steel Inc.: Eighteenth annual convention, Congress Hotel, Chicago. Edwin C. Barringer, 1536 Connecticut Ave. N.W., Washington, president.

Feb. 4-8, American Society for Metals: Twenty-seventh National Metal congress and Exposition, Public Auditorium, Cleveland. William H. Eisenman, 7301 Euclid Ave., Cleveland, secretary.

Feb. 25-28, American Institute of Mining & Metallurgical Engineers: Annual meeting, Palmer House, Chicago.

Government Realizes 70 Per Cent Return on Disposal of War Plants

Selling prices to date aggregate about $1 billion with government absorbing difference between high wartime building cost and present reproduction cost. Potential employment in readily usable government war plants estimated at 470,000

PRIVATE industry has purchased about $1 billion worth of surplus war plants, it was reported in official circles last week. The recovery rate is about 70 per cent; the loss representing the difference between wartime cost of building and present cost of reproducing the plants.

More than 300 government factories are said to have been sold, leased or are in an "advanced stage of negotiation" with private operators. It is estimated that 1300 plants, which cost the government about $8 billion and represent about one-fourth of the country's productive capacity, will eventually be declared surplus and disposed of by the Reconstruction Finance Corp.

If it were possible to convert the readily usable government-owned wartime manufacturing plants to peacetime production, they would open a potential employment of some 470,000 workers, according to a recent Civilian Production Administration report. CPA estimates that at least one-third of the government's $14 billion expenditures for manufacturing facilities might be made available for production of goods for the civilian economy.

Employment possibilities were listed at 177,000 additional workers for the machinery and equipment industry on which the government spent $533 million for manufacturing plants.

The iron and steel industry was estimated to have a potential of 86,000 workers from new plants and facilities which cost the government $1202 million; nonferrous metals, 75,000 persons, $1018 million manufacturing expansion cost; chemicals and petroleum products, 30,000, $686 million expansion cost; synthetic rubber, 23,000, expansion cost of $667 million; aviation gasoline, 7000, $237 million expansion cost; and other manufacturing plants, 66,000, $169 million expansion cost.

Total disposals of government surplus property during November amounted to $764,233,000 in original cost, or almost half of all disposals to date, according to preliminary figures. Actual sales last month totaled $70,746,000 for property which cost $171,274,000. These sales were the largest for any month on record and were 65 per cent ahead of October sales.

Of the November disposals total, $586,867,000 represented the scrapping of nonsalable aircraft and $7 million other miscellaneous disposals. In addition, there was $131,069,000 of surplus property on lease on Nov. 30.

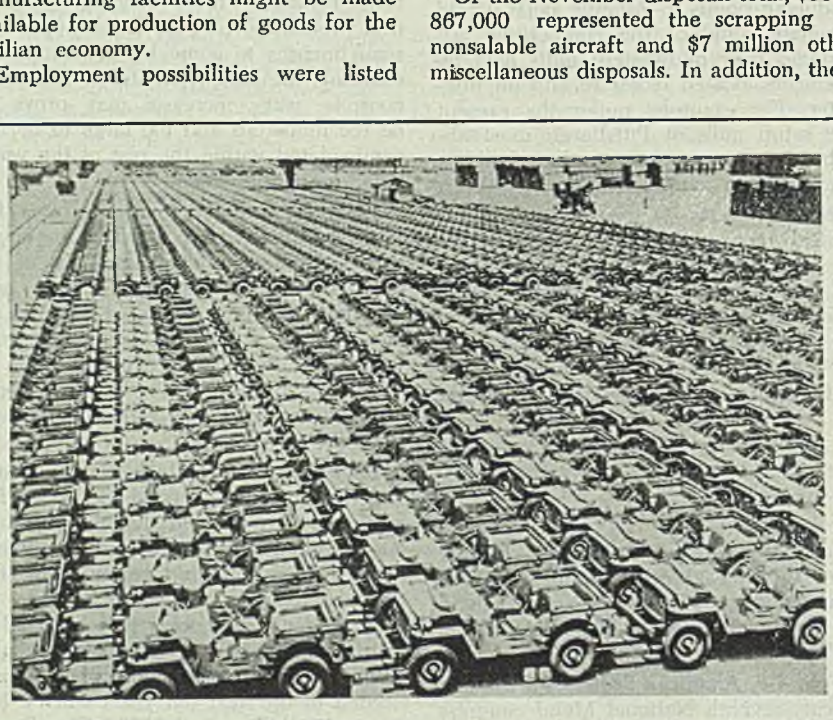
At the beginning of November, RFC held almost $6.6 billion worth of surplus producers' and capital goods. Through Oct. 31, RFC had made sales including the following on the basis of cost and selling prices, respectively: Steel, $21,584,000 and $12,180,000; metal working machinery, $13,793,000 and $6,377,000; machine tools, $68,124,000 and $40,427,000. Inventories on hand as of the same date included: Steel and steel products, $56,227,000; nonferrous metals, $20,989,000; fabricated metal basic products, $22,091,000; general purpose industrial machinery equipment $32,737,000; electrical machinery and apparatus, $22,550,000; special industry machinery, $16,994,000; machine tools $138,717,000; metal working machinery except machine tools, $72,675,000; plant and industrial real estate, $1,464,476,000.

The latest reported sale of government-owned war properties was that of six plants to their wartime lessee, General Electric Co., Schenectady, N. Y. The plants, representing investment of $7,709,000 and purchased for $5,824,103 are located at West Lynn, Mass., Fort Edward, N. Y., Trenton, N. J., Decatur, Ind., and two plants at Erie, Pa. The sale included $233,878 for equipment and machinery in the Lynn plant and miscellaneous furnishings in the Erie plants. The remainder of the machinery and equipment, costing $12,963,000, has been declared surplus and will be sold separately.

Additional Plants Listed

RFC is offering for sale or lease the Philadelphia Armor Plant No. 1 which was integrated with the privately-owned facilities of Henry Disston & Sons Inc. The agency is also offering the Ordnance Steel Foundry Co. plant, Bettendorf, Iowa, which was built for the production of steel castings and operated during the war by Campbell, Wyant & Cannon Foundry Co. Another plant located at Bettendorf and operated by Bettendorf Co. is offered for sale or lease.

Other plants offered by RFC for sale or lease include the following, designated by their wartime operators: Des Moines Ordnance Plant, Des Moines, Iowa; Evansville Ordnance Plant, Evansville, Ind.; Gear Grinding Machine Co., Hamtramck, Mich.; General Motors Corp., New Departure Division, Bristol, Conn.; Studebaker Corp., South Bend, Ind.; ordnance plants at Indianapolis, Grand Island, Neb., McGregor, Tex., and St. Francis, Tex.; Char-Gale Mfg. Co., St. Cloud, Minn.; Vickers Inc., Royal Oak, Mich.; Bendix Aviation Corp. (three plants), Wayne and Owosso, Mich., and Philadelphia; Waco Aircraft Co., Troy, N. Y.; Douglas Aircraft Co., Inc., Santa Monica, Calif.; Victor Adding Machine Co., Chicago; Wellman Bronze & Aluminum Co., Cleveland; Titan Metal Mfg. Co., Bellefonte, Pa.; and Perfect Circle Co., Richmond, Ind.



SURPLUS: Part of the lot of 2000 surplus Army jeeps to be offered for sale to war veterans by the Reconstruction Finance Corp. are pictured in open-air storage at an Army Service Forces depot at Columbus, Ohio. NEA photo

Hold Line During Transition, Bowles Tells Senate Small Business Group

Decisions made now will have profound effect on economy for years to come, OPA administrator tells committee. Lists agency's post-V-J Day actions to promote large-scale peacetime production

IN THE 10 months following V-J Day Congress and the administrative agencies of the government in all probability will make decisions that will profoundly affect the economy and perhaps the political history of the next ten years, Chester Bowles, price administrator, told the Senate Small Business Committee last week.

"If we go into a postwar inflation, as we did after World War I, millions of Americans will face economic tragedy. But if we hold things steady until production permits lifting of controls without inflation, we should be able to go forward into an era of long-lasting prosperity," said Mr. Bowles. He warned against the dangers of abandoning present price and rent controls too soon.

"In the Revolutionary War," he said, "the value of the dollar fell to 33 cents. During the Civil War the value of the dollar fell to 44 cents. In the period of World War I the value of the dollar fell to 40 cents. But at the end of World War II—the greatest war of all—the dollar was worth 75 cents as compared with its 1939 buying power. And almost all of the decrease in the buying power of the dollar in World War II took place before the hold-the-line order was issued in April, 1943."

Price Control Encouraged Production

Mr. Bowles cited termination of food rationing and the record sales of department stores as proof that there is no foundation to claims that the OPA has hampered production. OPA, he continued, has had an opposite effect. "Steady prices discourage inventory hoarding and encourage production by assuring businessmen and farmers of stable production costs."

Further, he said, price control has created no appreciable hardship for business generally. "The truth is that never in our history have business profits been so large and business failures so few . . . We know that in some cases price control has created difficult problems for individual firms, but the indications are that fewer businesses have been in distress than ever before."

Mr. Bowles cited recent reports by the Civilian Production Administration, the Committee for Economic Development and the National Association of Manufacturers to prove that reconversion is progressing with unexpected speed and is not being held back by price controls.

"With retail sales reaching all-time peaks and reconversion progressing rapidly," he believed, "we appear likely to pass through reconversion without a decline in buying that will, in itself, relax pressure on ceilings. Hence it is clear that the danger of inflation is not yet past. The history of wars indicates that the greatest dangers from inflation have occurred after wars are over."

"To keep inflation from happening again, OPA set out on V-J Day to adjust its policies to the new objectives of the nation—full peacetime production and employment. We have taken nine steps in this direction:

"1. *Reconversion Industry Pricing.* Most reconversion goods still had ceiling prices set at 1942 levels. Cost increases obviously had taken place since then, yet reconversion industries had no recent cost-and-profit experience for judging whether 1942 prices were still 'generally fair and equitable' or whether price increases were justified. To get these industries fair prices as soon as they were ready to produce was a first duty. We simplified it by setting up special reconversion pricing formulas.

"2. *Reconversion Trades.* Wholesale and retail distributors in the consumer durable goods field were also without recent cost-and-profit figures in selling these goods. Again OPA worked out a pricing policy which applied to them the cost absorption principles that had been applied to all other trades during the war period.

"3. *New products.* The end of the war was certain to bring in a flood of new consumer durable products for pricing. To speed pricing and to get rid of a huge administrative load, we established self-pricing in this field for firms doing less than $200,000 of business a year. Producers priced on the basis of comparable products already in the market or on the basis of estimated costs. If OPA does not object within 15 days after these prices are filed, they become official. This policy took out of the office 75 per cent of the work-load in pricing new products. It allowed more time for pricing the new products of larger firms. In some cases it has resulted in variations in prices for similar goods, but the gains have far exceeded these difficulties.

"4. *Building Material Price Increases.* Production of building materials, except for war purposes, had not been encouraged during the war. Materials and labor were needed for running the war. After V-J Day the situation was changed. A vast home-building program was needed. Large production of building materials was required. Ceiling prices were increased on brick, tile, soil pipe, and other building materials, to stimulate production.

"5. *Dollar-and-Cent Prices on Building*

LULL IN PULLMAN FIGHT: Thurman Arnold, former trust-buster in the Department of Justice, and now counsel for Otis & Co., Cleveland investment firm seeking to purchase the Pullman Co., chats with George Wharton Pepper, attorney for the Pullman Co., in Philadelphia federal court where the case is being heard. NEA photo

Materials. To encourage building still further we are replacing ineffective freeze regulations with community ceiling prices on building materials and some contractors' services. These uniform community ceiling prices are similar to those which have proved so effective on foods. They will not change the level of legal prices but, by enabling persons building or remodeling homes to know when they are being overcharged, will make compliance a far easier undertaking.

"6. *Extension of Individual Pricing.* The war's end left some firms within industries in an abnormal cost situation. Some firms, with a long record of successful operation, found themselves unable to continue under prices that were generally profitable for their industries as a whole. Recognizing this, OPA has greatly extended its provisions for individual adjustments, wherever this could be done without upsetting effective price control.

"7. *General Rescue Order.* As a part of this individual adjustment program we adopted a general rescue order. This is designed to give manufacturers, operating at an over all loss, prices sufficiently high to cover their total costs, however high they may be, even though previous ceilings were generally profitable to the industry. This adjustment order is available to all manufacturers except where price control techniques are not adapted to individual increases—as for example, in the industries subject to uniform dollar-and-cents pricing.

"8. *Stimulation of Low-End Production.* Rising costs usually hit, first, low-end items on which producers ordinarily had low-end margins. It should be emphasized that many profitable low-end items have been dropped because manufacturers could, in a sellers' market, concentrate on high-price, high-profit lines. It is true, however, that wartime increases in labor and materials have made some low-end goods unprofitable to produce. We are granting special price increases on such low-end goods to encourage their production. For example, we have issued an order granting average increases of 15 per cent on low-end apparel, and encouraged another order granting substantial increases on low-end furniture. We will soon issue orders granting increases on low-end shoes, some textiles, and other goods for consumers.

"9. *Field Office Adjustments.* Channeling individual adjustments through the national office created difficult administrative problems and resulted in delays. It also gave firms, with resources to employ Washington representatives or make trips to the Capitol, advantages over smaller firms. We, therefore, delegated to our field offices most authority to grant individual firm adjustments affecting smaller firms. Most new goods pricing was also delegated to the field. As a result there will inevitably be some variations in prices on similar products but the gains far offset this disadvantage."

These changes, said Mr. Bowles, reflect no departure from price control standards which Congress wrote into its legislation; they indicate that within the provisions of this legislation "there is flexibility to permit adaptation of price control policies to the needs of the transition period."

At present, said Mr. Bowles, there are expectations in many quarters of upward revisions in prices. He warned the committee that it would be a great disservice to the nation to spread the idea that the price line cannot or will not be held; this, he said, would mean dissipation of a large portion of our wartime savings.

"I trust that we shall not now, in th name of free enterprise," said Mr. Bowle "decide in favor of a postwar inflatio collapse, and depression that will put o cherished free institutions in jeopar . . . Business men who think their inte ests will be served by lifting contr before pressures are eased have not re history."

Mr. Bowles emphatically denied th he was pleading "for indefinite contin ance of our authority. Except in a p riod of emergency, price ceilings ha no place in a free economy. We sh remove them, product by product, ju as soon as it can be done without infl tion . . . I expect that by next sprin we shall be out from under a large nu ber of controls."

Mr. Bowles was slated to be call later to reply to a large number of cr icisms from small business men urgi immediate remedial action where pri controls and trade restrictions have th effect of hampering them in their bus ness. The Small Business Committ proposes to continue the hearings lo enough to hear all complaints and enable it to formulate a program of re ommendations to Congress with respe to the future activities of OPA.

STEEL STATISTICS

Additional copies of the special 16-page section in this issue showing the statistical position of the steel industry in detail may be obtained at a cost of 25 cents each by addressing: Reader's Service Department, STEEL, 1213 West Third Street, Cleveland 13, O.

TRANSITION TOPICS

STEEL STRIKE—Government intervention seen as only hope for averting nationwide steel strike scheduled for Jan. 14. Ford Motor Co. predicts it will produce at loss in 1946 as auto industry negotiates with union. See pages 67, 68, and 83.

SCIENCE'S FUTURE—Effect of war on peacetime science and industry discussed by American Standards Association. See page 72.

FREIGHT RATES—Hearing on request for freight rate reduction on steel products moving to West Coast to be held in January. See page 73.

PLANT DISPOSAL—Government gets 70 per cent return in selling $1 billion worth of surplus war plants to private industry. See page 74.

GENEVA STEEL—Surplus Property Board may seek new bids in an effort to dispose of Geneva steelworks. See page 86.

PRODUCTION—Continental Motors Corp. applies mass production methods to building of engines for personal airplanes. See page 95.

STEEL PACKAGING—Reusable steel shipping containers favored by American Air Forces provide high safety factor and absolute moisture-proofing desirable for certain commercial activities. See page 96.

STRETCH-FORMING—Vastly improved methods and machines for producing uniform and irregular curves in rolled or extruded aluminum shapes for aircraft may become logical choice for other production. See page 100.

STRESS ANALYSIS—Brittle lacquer method of stress analysis telescopes 20 years' development into single year, with result that research on new machine parts will move much faster. See page 104.

SULPHURIZED STEELS—Increased tool life and greater production expected in high-speed machining of sulphite-treated alloys. See page 116.

Loan to Britain Hailed as Promoting American Position in World Markets

Administration spokesmen believe $4.4 billion loan will take Britain out of bloc arrangements and enable freer traffic in foreign trade. Congress expected to ratify agreement after preliminary opposition

AGREEMENT announced by the State Department Dec. 6, under which the United States will loan $4400 million to Great Britain—including $3750 million to be spent in the future and $650 million to settle lend-lease, surplus property and other claims—is regarded by administration spokesmen as the most important single development to date to promote the postwar position of American business in world security and trade.

"If we fail to make this loan, Britain will be forced to do business by barter with a bloc of nations," said Secretary of State Byrnes. "Those nations in turn will be forced to do business with Britain on preference to other nations. That means dividing the world into economic blocs."

The agreement, Secretary of the Treasury Vinson added, contains "many economic advantages for the American businessman, farmer and worker."

Former Secretary of State Cordell Hull hailed the agreement as "another long step forward to build a better world by profiting from the bitter lessons of the past. I feel that this may be our final opportunity to make a peace that will last."

Congressional Debate To Be Fiery

The loan is subject to ratification by Congress where it will be subjected to oratorical fireworks. The reception awaiting it is indicated by numerous advance comments. When Sen. Ed. Moore (Rep., Okla.) heard the news he demanded that the British first pay the balance of the $390 million RFC loan they got from this country in 1941. Rep. Emanuel Celler (Dem., N. Y.) denounced the agreement on the ground it "will promote too damn much socialism at home and too damn much imperialism abroad."

But Congress is expected to give its approval in the end, since majority sentiment seems to favor the concept that substantial loans of United States dollars will have to be made to numerous countries to safeguard the position of this country in world trade. A large share of the time of Congress next year is expected to be spent on such loans, for applications have been made or are in formulation by various countries.

Largest borrower is expected to be the U. S. S. R. whose needs are expected to be in the neighborhood of $6 billion. The negotiations with the Soviets will not be easy; they may want to stipulate exacting terms resulting from their apparent intention of dictating economic conditions in some of the countries with which they have common borders. Numerous problems come under the head of reparations, as in the case of American-owned equipment removed from plants in Germany. The United States probably will have to devise stipulations which will adequately prevent employment of future United States loans in payment of reparations to the U. S. S. R.

China has signed its intention of seeking at least $2 billion in credits. Other countries desiring loans include France, Poland, Finland, Belgium, the Netherlands, Denmark, Turkey and Greece. While all these cases involve difficult problems, the State Department will seek to conduct the negotiations with dispatch, for it believes that undue delays in establishing the basis for postwar trade would work to the detriment of the American economy.

From the United States point of view, most important provisions of the agreement with Great Britain call for removal of British empire barriers to the importation of United States goods, and abolition of the sterling area dollar pool. American manufacturers have lost a lot of business already due to refusal of empire countries to grant the necessary import permits. They also have lost a considerable amount of business due to British trade agreements with other countries. Only a few weeks ago, for example, some Belgian orders for American machine tools and small tools fell through because of a temporary trade agreement embracing that country, Great Britain, Switzerland, Sweden and Denmark; the reason given was lack of dollar exchange.

By taking the British out of such blocs, these trade arrangements will fade away, for it is Britain which has the greatest use for dollar exchange in the postwar trade, and which has taken the lead in persuading satellite countries to advance the cause of sterling exchange.

Whether the agreement with the British will work out 100 per cent as its American sponsors hope is a matter that remains to be seen. Reports from Europe reflect doubt in the willingness of the United States to buy foreign goods in the volume necessary to keep European dollar holdings from running out in the course of time. Britain and the European countries expect that we will continue to buy Scotch whiskey, tin, manganese ore, diamonds, vegetable oil and some other items in quantity. But they are doubtful about selling here in volume under our existing setup.

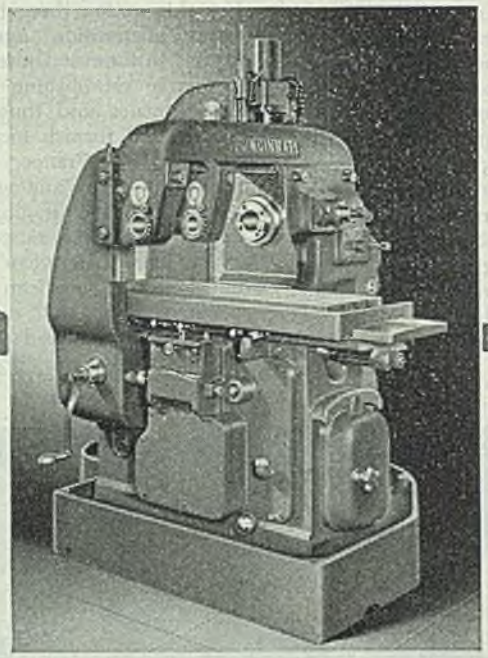
For this reason there has been an increasing disposition among European countries to interest United States manufacturers in establishing more plants in those countries and thus use local raw materials and furnish local employment. Great Britain, France, Czechoslovakia and Belgium are among the countries interested in encouraging such undertakings. The ideas range all the way from engaging American engineers who would build up American "know-how" in the various countries, using local capital or capital borrowed from the United

(*Please turn to Page* 80)

Officials sign agreement for $4.4 billion loan by the United States to Great Britain in ceremony at Washington. Signers, left to right, are: Lord John Maynard Keynes, head of British loan mission; Lord Halifax, British ambassador; Secretary of State James F. Byrnes; and Secretary of Treasury Fred Vinson. NEA photo

WITH CINCINNATI'S RISE AND FAL

THESE FRAGILE PARTS ARE MILLED CONTINUOUSLY AND FINISH IS UNMARKED



CINCINNATI *2-24 Automatic Rise and Fall Miller. Complete specifications may be obtained by writing for Catalog M-909-1. Sweet's Catalog File for Mechanical Industries gives a brief description of the machine.*

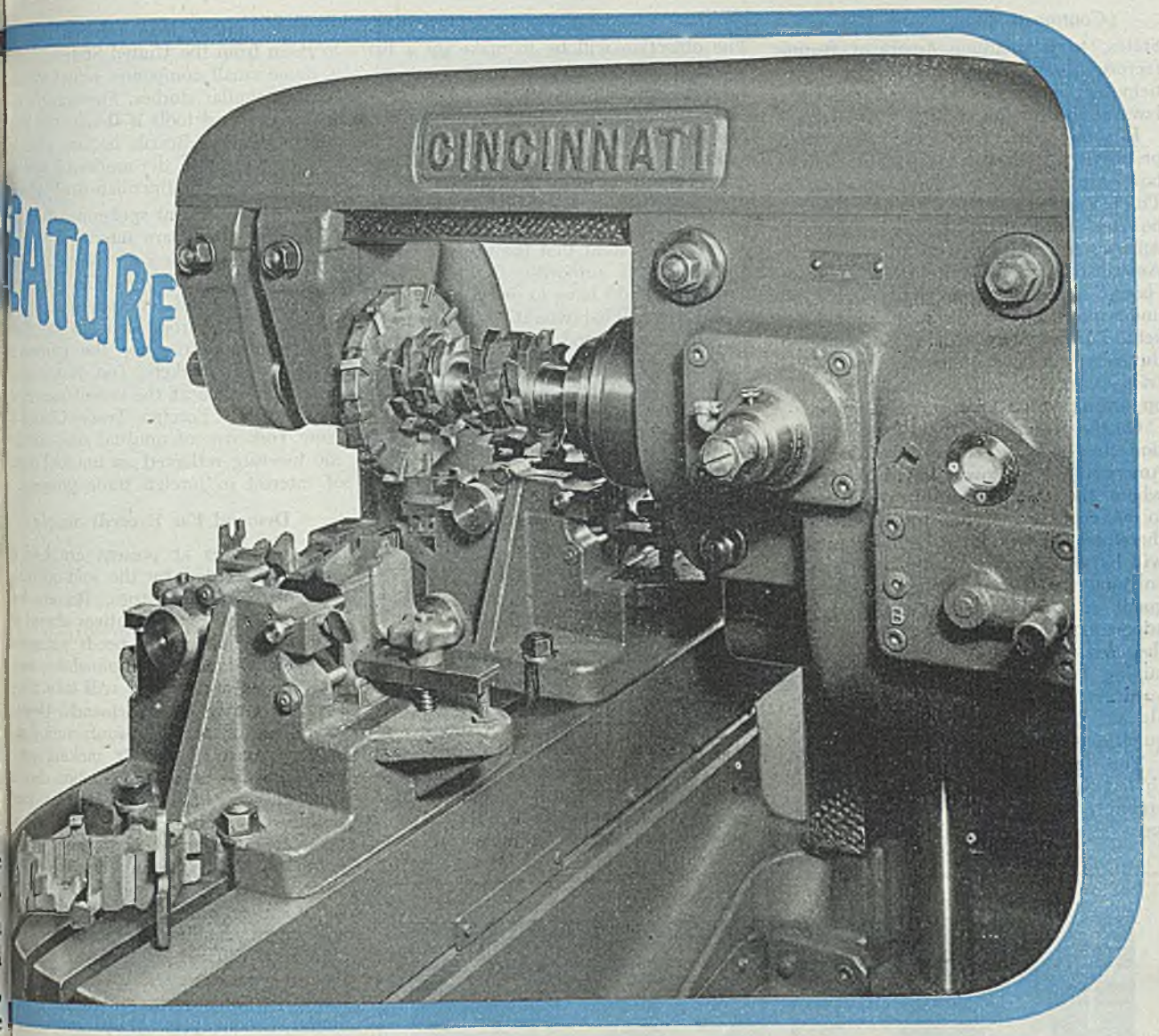
Milling only one surface of a fragile part wit out chatter and resultant bad finish, is a di cult accomplishment in itself, but the machi illustrated here mills *several* surfaces of fr ile cast iron frames to a good finish with cl tolerances of accuracy and minimum expe iture for equipment. ¶ The machine is CINCINNATI No. 2-24 Automatic Rise a Fall Miller equipped with raised headsto two fixtures and a special gang of cutters. T Rise and Fall feature provides two importa advantages on jobs of this type: (1) preve marred finish on return stroke; (2) permits creased freedom to design more effective w holding fixtures since cutters can hurdle stacles in the fixture. ¶ The know-how Cincinnati Application Engineers is manif in the design of fixtures and cutters to r many surfaces on a fragile part, and at same time keep it from springing. If you h a similar problem, our engineers will be glad recommend a productive, economical soluti

CINCINNATI

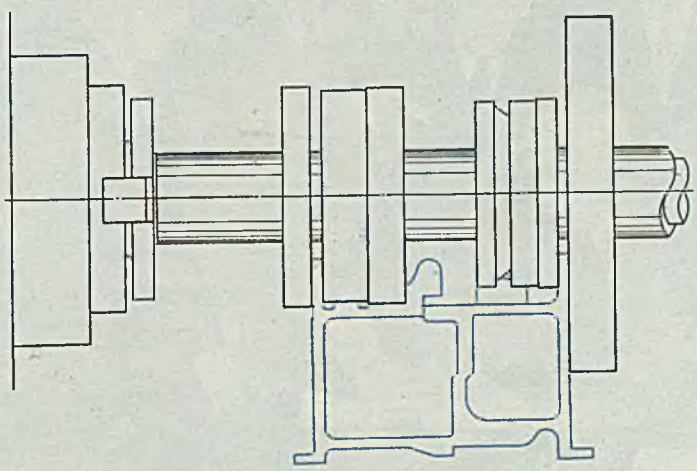
THE CINCINNAT

MILLING MACHIN

EATURE



The illustration above shows the multiple cutter arrangement and the two fixtures which facilitate loading and unloading to make cutting virtually continuous. The machine used for the operation is a CINCINNATI *2-24 Automatic Rise and Fall Miller.*



Sketch shows the surfaces milled.
Name of Part: Frame
Material: Cast Iron
Operation: Gang mill several surfaces opposite feet
Production: 37 per hour

MILLING MACHINE CO. CINCINNATI 9, OHIO, U.S.A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

(*Continued from Page* 77)

States, to persuading American manufacturers to become parties to joint participation enterprises organized under the laws of the foreign country.

In some quarters in Washington, these proposals to export American "know-how" are regarded as having some merit. The plants in the foreign countries would be run, at least in the beginning, by Americans, and they would have largely American equipment. Being a part of the "home" industry, these plants would be under no handicaps in developing markets. Further, they would contribute to the industrial development of these countries—a trend which enhances sales opportunities for American equipment.

On the other hand, there is no disposition to encourage the movement of American "know-how" abroad to a point where the trend would prove harmful to our economy. Administration thinkers, therefore, believe that something tangible will have to be done in the long run to encourage wider acceptance of foreign goods in the United States. Only by adequate encouragement of imports, they believe, can we be sure of maintaining the dollar position abroad at a level necessary to permit foreign nationals, or foreign countries to buy large quantities of American goods.

The first move aimed at reducing United States barriers to imported goods probably will be made by State Department representatives at a World Trade Conference scheduled to be held in 1946. The objective will be to make up a list of the goods which we can import advantageously, and work up trades with Great Britain and other nations on the basis of this list. To a large extent, it is believed, the program could be set up under the Reciprocal Trade Agreements Act under which the State Department has considerable latitude for bargaining. To the extent that the program calls for additional authority, the State Department would have to get the approval of Congress. That would mean hearings at which interested businessmen could state their views and submit their complaints to congressional committees.

Negotiations at the coming World Trade Conference "will relate to tariffs and preferences, quantitative restrictions, subsidies, state trading, cartels and other types of trade barriers."

One of the questions that may be settled at this conference is the fate of our war-built synthetic rubber industry.

In the Department of Commerce it is believed that after the government has set up trade arrangements, and granted necessary loans to foreign powers, American manufacturers and businessmen can be counted on for initiative to make the most of the opportunities. A number of large companies report that they are resurveying their position in the markets of the world, and have already reached the tentative conclusion that they should establish manufacturing plants in some countries rather than rely on exporting to them from the United States.

Some small companies report they are making similar studies. For example, one maker of hand tools is thinking of locating a plant in Brazil; he has asked for information as to the grades of steel obtainable from the Brazilian steel industry.

State Department spokesmen have evidence Americans are interested in trade opportunities abroad. For instance, there has been a big increase in the past couple of months in the number of Americans traveling to Europe and to the Latin American countries for the purpose of investigating markets. Too, it was noted that attendance at the recent meeting of the National Foreign Trade Council in New York was of unusual size, and that the meeting reflected an unusual degree of interest in foreign trade prospects.

Demand Far Exceeds Supply

Export sales at present are held up by scarcities and by the sold-up condition of many industries. Reports from United States representatives abroad are that the whole world needs automotive equipment, including automobiles, trucks and busses and that it will take a long time to satisfy these demands. Demand is active for textile manufacturing machinery, particularly for making cotton piece goods—and the situation here is bad in view of the fact that many builders of such equipment are sold up for a period of years. A pressing problem exists in coal mining equipment for Europe and tin dredges for Malaya because earliest obtainable delivery on such equipment usually is sometime in 1947. The same difficulties are encountered in various types of materials handling equipment, particularly in gravity and other kinds of conveyors. While tractors are rather easy to get for export, the situation in plows and most other types of agricultural implements and machinery is acute. Printing press, construction equipment and drug and chemical machinery demands in many cases have offered difficulties. The situation also is tight in both mechanical and hydraulic presses, particularly the heavier units and in sheet metal forming machinery generally.

In general, machine tool orders for export can be filled with ease, particularly because of a somewhat easier procurement situation in the field of gray iron and malleable castings.

But tight situations are feared in all classes of machinery if the strikes in the antifriction bearings plants continue much longer.

The "positive list" of the Department of Commerce's Office of International Trade Operations (successor to the Foreign Economic Administration) now includes the following products requiring a license to export to all destinations: Rubber and manufactures of rubber, naval stores, lumber, coal and related fuels, petroleum and products, various minerals and mineral products, chemical

SIGNS PUBLIC CORPORATION CONTROL BILL: President Truman is shown as he signed an act strengthening the control by Congress of government corporations having assets estimated at $20 billion. The bill, said the President, is an important forward step in furthering business-like management of government. Looking on are, left to right: Sen. Harry Byrd (Dem., Va.); Sen. Hugh Butler (Rep., Nebr.); Rep. William M. Whittington (Dem., Miss.); Rep. Francis Case (Rep., S. Dak.)

JOIN IMPORT-EXPORT BANK: Justice of the Supreme Court William O. Douglas, left, chats with William McChesney Martin, center, and Herbert E. Gaston, right, after swearing them in as members of the Import-Export Bank's board of directors. Martin is chairman of the board. Gaston is an assistant secretary of state. NEA photo

specialties, industrial chemicals, pigments and paints and varnishes, pig iron, iron and steel scrap, tin plate, galvanized sheets, terne plate, expanded metal lath, cast iron soil pipe and fittings, woven wire screen cloth, tin hollow ware except dairy farm milk pails, tin cans, cast iron bathtubs, cast iron radiators, circular diamond saws, tools incorporating industrial diamonds, builders' hardware, scrap brass and bronze, brass and bronze in various finished forms, lead and lead manufactures, tin and tin manufactures, babbitt metal, monazite sands, uranium ores and concentrates, antimony, cadmium, radium, uranium metal, platinum, silver in base or ingots.

Storage batteries, mine locomotives and cars, telephone instruments, hand generators and parts, magnetos and parts, magnets and parts, batteries and boxes, telephone instrument parts, varnished separators, dredging machinery of all types, mine conveyors, mining and well and pumping machinery, diamond dies, metal alloy slugs containing diamonds, milk shipping containers, milk shipping cans, automobiles and parts and accessories, motor trucks and parts and accessories, new Army Jeeps, coal tar products, sensitized tracing cloth, dental burrs, small arms and small arms ammunition.

At the present time, due particularly to the interruptions to production because of strikes, chances are that this list may be enlarged rather than curtailed. But after production gets back in full swing the list should be shortened rather rapidly. The chances are believed good that the list will have been cut to substantially zero by the middle of 1946.

In the meantime, the government stands ready to offer any possible assistance in getting export orders placed and filled when the need is shown to be urgent. For example, the Civilian Production Administration was scheduled to hold a meeting in New York, Dec. 13, with Department of Commerce spokesmen in attendance, to study with the Steel Products Advisory Committee the possibility of early shipment of sheets, tin plate and structural steel to a number of European destinations.

Export-Import Bank Lends $550 Million to France

Export-Import Bank and the French government have concluded a loan agreement furnishing a line of credit to France amounting to $550 million to finance the purchase in this country of specified products and services for the rehabilitation of France.

The agreement is subject to ratification of the French Assembly. Specified products and services include those sought by France under lend-lease, but not contracted for before V-J Day, and purchase of which has been contracted for since then. Eligible products will be financed up to their cif value, French European ports. Purchases will be made by the French Supply Council through American private trade channels.

The loan will be used, French Ambassador Henri Bonnet said, to purchase transportation equipment, machinery and raw materials urgently needed for rehabilitation.

Cites Wartime Progress In Protective Coatings

War-born advances in the technique of protective coating for steel hold great promise in the postwar period, according to Jacob Levin, of the Metals & Minerals unit of the Bureau of Foreign and Domestic Commerce.

Stressing the vulnerability of bare steel to natural corrosive elements, he pointed to the demonstrated value of coatings of metallic zinc, tin or other nonferrous metals and alloys; however, he added, there are others, and many improvements have been made in the field.

"Corrosion is an expensive item in our economy," he said, "estimated to run into hundreds of millions of dollars a year."

He cited experiments now under way at Kure Beach, N. C., by three leading metal companies, some 200 other companies, and representatives of technical societies, to determine the effect of sea air and water on iron and steel, nonferrous metals, and means of combating this effect.

"The shortage of tin has not been an unmixed curse," he concluded. "It has hastened, among other things, the advancement of other materials for container use . . . and led to a search for better protective coatings for vulnerable metals.

Tightening of Patent Procedure Recommended

Tightening of the procedure for issuance of new patents and enlargement of the staff for research have been recommended by Commissioner of Patents Casper W. Ooms.

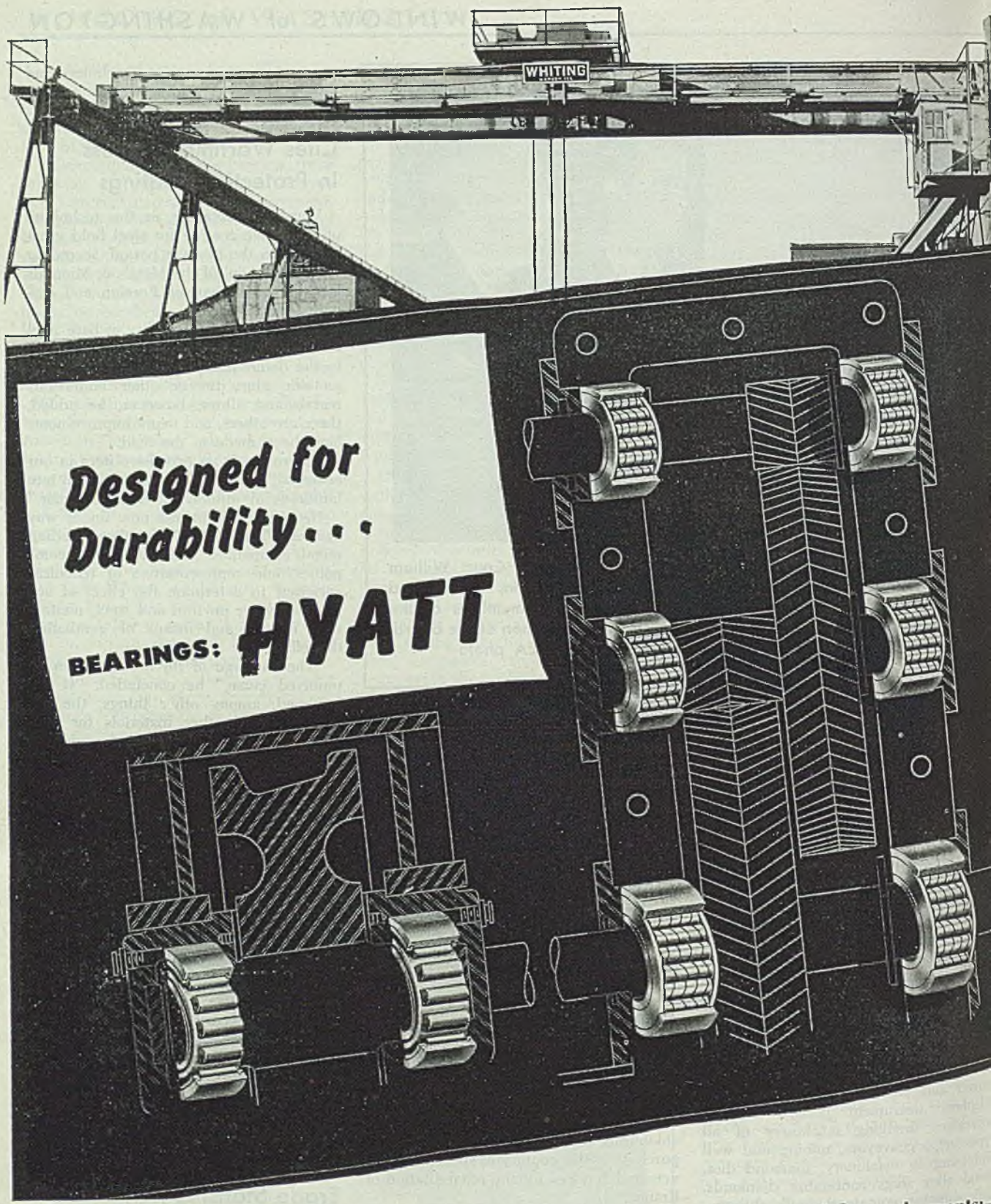
Improvements which can be effected in Patent Office procedure would do much to reduce the number of court controversies over patents, he believes.

"Every good patent is disparaged and depreciated by every bad one that is issued," he continued. He plans to insure a more thorough research before patents are issued, and greater selectivity in their issuance.

Trade Statistics Released By U. S. Commerce Bureau

The Bureau of Foreign and Domestic Commerce, Washington, is now releasing import and export statistics by countries and commodities that could not be issued during the war for security reasons.

Approximately 15,000 standardized tables on international trade of the United States and most foreign countries during the war years and the immediate prewar period have now been compiled, it was stated.



Cranes represent an important durable goods investment, anticipating long care-free service as exemplified by the Hyatt equipped units built by the Whiting Corporation.

The reason Hyatt Roller Bearings have been and continue to be the outstanding choice for cranes, trolleys and hoists is because they measure up to the three essential requirements:- rugged durability—simplicity—and minimu of maintenance required.

Millions of rollers roll in Hyatt Roller Bea ings throughout all industry, agriculture an transportation. If you have a bearing proble why not discuss it with Hyatt engineers?

HYATT BEARINGS DIVISION · GENERAL MOTORS CORPORATION

Harrison, New Jersey · Chicago · Detroit · Pittsburgh · Oakland, California

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Union responsibility for prevention of wildcat work stoppages emphasized in automotive labor negotiations. Ford local proposes unauthorized strikers be fined and penalty deductions turned over to charity. General Motors cancels union contracts

DETROIT

TENOR of labor-management discussions in the automotive industry is veering away from the wage question and concentrating on "company security" or rather some form of guarantee from unions that their members will live up to the requirements of contracts and make an effort to restore productivity back to where it was in 1941. The trend was emphasized by termination of Chrysler's contract with the UAW-CIO and the failure of either party to agree to extension, and again last week by General Motors' cancellation of its union contract. The latter would not have expired until April 28, but was abrogated under terms of a clause which permitted such action by either company or union ten days after a strike had started.

C. E. Wilson, GM president, said his company would insist on provisions requiring union responsibility and assurance of uninterrupted production in any new agreement to be worked out later. This action doubtless will prolong the present strike which a week ago appeared to many to be on the way to solution.

Ford Negotiations May Hold Key

Possible key to the disrupted automotive labor picture now may rest in negotiations going on between the union and Ford, where union local officials, definitely on the spot, finally came forward with the half-hearted acceptance of the company's demand for financial guarantees against wildcat strikes. The UAW reply, which was at least far more reasonable and conciliatory than those emanating from their confreres in the GM negotiations, agreed to fines of $3 per day for the first offense and $5 per day for the second offense of participating in a wildcat strike, along with discharge of leaders of such walkouts. However, the proposal was hemmed in with a lot of provisos which may not be readily acceptable to Ford. In the first place, fines would not be deducted from union dues collected by the company under the checkoff system, but rather from paychecks of individuals involved. Secondly, the right of appeal to the union, and then to an impartial umpire, would be granted to such strikers. Thirdly, any money collected in fines would be turned over to the National Foundation for Infantile Paralysis. Fourthly, the company would have to agree to fines and possible discharge for any supervisory personnel determined guilty of provoking strikes and walkouts.

It should be pointed out the company has no serious objections to turning over fines, if any, to a charitable institution. What it wants solely is insurance against interrupted production, and greater man effort. As against other automobile companies, Ford is in a particularly strong position to bargain since it has collected for the union dues account nearly $8 million since the start of the checkoff system in August, 1941, and it is in no mood to continue such union security if it cannot receive in turn a reasonable degree of production security. Ford officials dealing with the UAW-CIO, headed by John S. Bugas and M. B. Lindquist, have been entirely friendly but at the same time entirely firm. The burden of proof rests on leaders of the Ford local who themselves, in contrast to Reuther & Co., have been fairly non-inflammatory in their discussions.

As an example of this friendliness, just the other day Richard T. Leonard, head of the Ford local, and several of his associates were interrupted during negotiations by an invitation to the Ford engineering department for an exclusive look at the 1947 Ford model and to hear a brief discussion of future production planning from R. H. McCarroll, executive engineer. They were told Ford plans to bring out the 1947 model about Sept. 1, and engineeringwise is already moving into the 1948 model planning. The hint also was dropped that an automatic transmission might be available on the early Lincoln-Mercury models. This made a swell inside story for the newspapers and certainly did the acompany no harm in its negotiations.

The hurry-up secret meeting called in Pittsburgh recently by Philip Murray of the CIO and attended by representatives of both General Motors and the UAW was interpreted in some quarters as bearing on strikes in the glass industry, various other suppliers' plants and the threatened tieup in the steel industry. Reasoning was that it would do no good to settle the GM strike as long as the corporation divisions would still face a glass shortage and the possibility of a steel shortage. This impasse may have been put up to Murray for possible action by him; no positive word to this effect has leaked out. Anyway, the negotiators rushed back to Detroit to resume conferences, and ever since that time Walter Reuther has slipped into the background, with R. J. Thomas taking the lead in discussions for the first time.

This also may have been Murray's doing. Certainly the extended biographical sketches which have appeared in at least three national magazines giving the build-up to Reuther have not rallied his cause particularly in union circles. One can imagine Mr. Thomas' feelings, for instances, when he read one of the reviews in which he himself, Reuther's boss, was described as "bumbling and

PARTS BACKLOG: Interesting pattern is made by gasoline tanks ready for installation on 1946 Packards. The tanks are moved by conveyor to the chassis line on the first floor for assembly

L. C. GOAD

Mr. Goad has been named group executive in charge of General Motors divisions at Dayton, O.—Frigidaire, Delco Products, Moraine Products, Aeroproducts and Inland Manufacturing; Delco Appliance Division at Rochester, N. Y., and also Buick-Olds-Pontiac assembly division with its present and contemplated plants.

E. F. JOHNSON

Mr. Johnson is relinquishing his status as group executive of General Motors' Dayton, O., divisions and is retiring Dec. 31 as GM vice president and member of the administration committee. He has been associated with the corporation continuously since 1919, with the exception of three years in Washington where he served with war production agencies.

ineffectual." During recent days of the GM negotiations Reuther has been absent frequently, ostensibly because of "illness."

Meanwhile the whole sorry mess continues, with rancor and ill-feeling tending to mount. Ford workers threw a mobile sympathy picket line around the General Motors building on a recent Saturday afternoon, blowing horns and generally choking up traffic. The following Monday several hundred assorted pickets ringed the building on foot, shouting and waving placards. With the corporation occupying only 35 per cent of the space in the large building, it is difficult to see what union leaders hope to accomplish by such nuisance tactics, other than possibly to injure their cause further in the public mind, or to touch off some incidence of violence which would bring the entire strike matter to more of a head.

Purchasing and follow-up departments of most divisions of GM, even though excluded from their offices at plants, have managed to keep in touch with most suppliers, either from their homes, offices of friends or temporary offices established at undisclosed locations. Instructions generally have called for continued fabrication of materials and parts on order, but sources are being asked to store material pending shipping instructions, with GM paying storage charges, if they are involved. In other cases, suppliers have been requested to continue fabrication at a rate 50 per cent of that in effect before the strike, and either to store material themselves or to ship to warehouses in the Detroit area.

The fact wage increases are coming to be secondary considerations in current contract negotiations is further borne out by a declaration from Mr. Leonard of the Ford local 600 of the UAW-CIO. Last week he said, "The union is not demanding 30 per cent 'or else'. The company can give us 30 per cent more pay, but when the wage question is settled, we'll probably receive about 20 per cent straight time and 10 per cent in other concessions such as increased vacation allowances, pensions, profit-sharing plans and bonuses." There was no confirmation from company sources of any such eventuality.

Many of the 175,000 GM strikers reportedly are seeking interim work to meet the family budget. This would mean conflicts with picket line assignments, rotated among strikers, but union locals are attempting to assess $1 per day fines for failure to report for picket duty, and further to be asking members to remit to the union treasury 10 per cent of all wages earned by such interim jobs.

Dodge Truck has announced a civilian adaptation of the four-wheel drive military vehicle which it built during the war in quantity of over ¼ million. The 1-ton unit is designed for both offhighway use and over unimproved roads, having 94-hp engine, four-speed transmission, two-speed transfer case, conventional closed cab, steel express body 8 feet long, 4½ feet wide and 22¼ inches high with special reinforcements, 126-inch wheelbase and heavy-duty hydraulic telescoping type front shock absorbers. Front wheel drive may be disengaged when desired.

Dual power takeoff is available for mounting on the left side of the transmission. Through a front driveshaft, it operates a winch mounted on the forward end of the truck; through a rear shaft, it powers auxiliary equipment either stationary or when towed. This takeoff delivers 536 rpm at the rear or tailshaft to operate a combine, corn picker, forage harvester, orchard sprayer or other similar equipment. The front-mounted power winch of 7500-pound capacity, is available with 250 feet of ⅞-inch cable, and is controlled from inside the cab. A 9-inch diameter belt pulley drive is available for powering a variety of auxiliary equipment. It is driven by the power takeoff through the tailshaft at belt speed of 3124 feet per min.

Draw bar assembly or pintle hook also are available for rear mounting. The express body will accommodate 28 milk cans of the 10-gallon size, or 15 bushel baskets. From these specifications, it can be deduced the new truck is aimed at the same market for which the Willys Jeep now aspires, although the Dodge version is somewhat larger and more rugged in design. An attractive price on the Dodge unit could touch off an interesting price war between the two multipurpose vehicles, and it is whispered this may be in the offing.

Newest creation in the passenger car field, still pretty much in the drawing board stage, is the Tucker Torpedo, a full-size car powered by 150-hp two-cylinder engine using fuel injection, designed to "cruise" at 100 miles an hour and to sell for approximately $1000. Designer is Preston Tucker, Ypsilanti, Mich., engineer, who for a time during the war worked on power driven aircraft gun turrets and on a new diesel engine design for Higgins interests in New Orleans. In earlier years he was associated with design of racing cars in co-operation with the late Harry Miller.

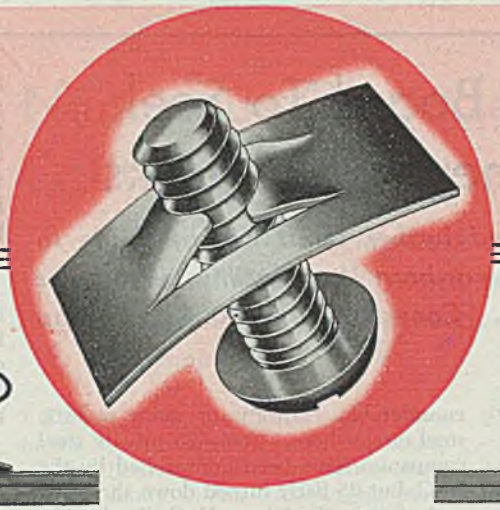
No Large Forming Dies Needed

Engine of the Tucker special is mounted between the rear wheels and drives through a hydraulic torque converter. Chassis is of welded steel tubing, and body will be either aluminum or plastic, requiring no large forming dies, and assembled much as are airplane fuselages. Wheelbase is 126 inches, height 58 inches, thread standard. Front fenders turn with the wheels, and headlights are mounted in the fenders, with the exception of a central "cyclops eye" light. Brakes are of the single disk type, actuated hydraulically.

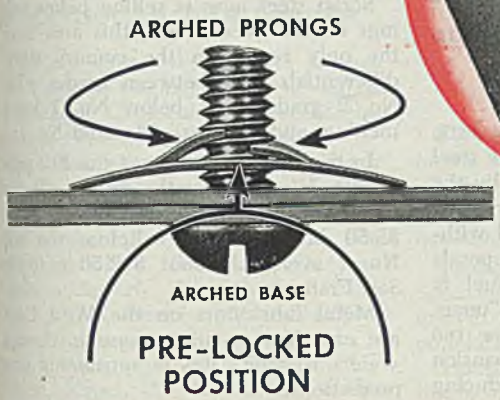
Front seating arrangement is unusual, with a central operator's seat behind the steering wheel, flanked by two seats which swivel to permit access to doors.

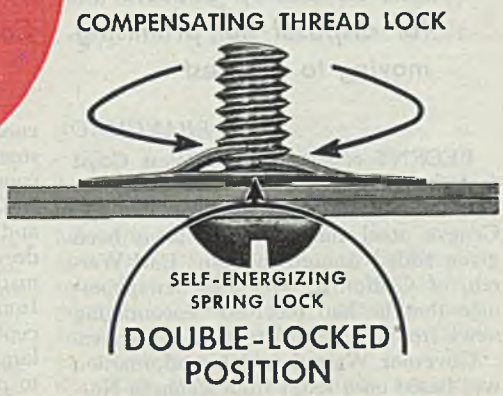
Beyond the building of preliminary models, no manufacturing plans have been disclosed by designer Tucker. Speculation has linked his name with important money in the aircraft field and perhaps an independent auto manufacturer, but there is little to substantiate it.

SPEED NUTS



SPEED CLIPS

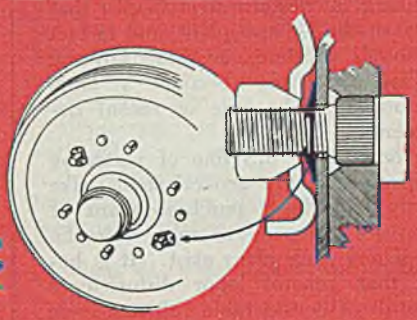




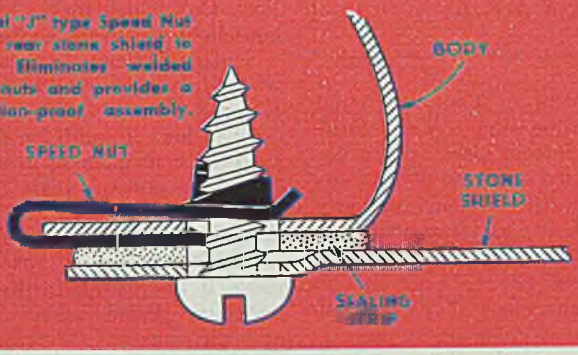
PROVED IN YEARS OF PERFORMANCE

Under all tests

Here this Speed Nut design simplifies the difficult problem of radiator grille assembly.



Here, two flat Speed Nuts hold brake drum to axle during assembly or removal of wheel.



Special "J" type Speed Nut holds rear stone shield to body. Eliminates welded cage nuts and provides a vibration-proof assembly.

Here, tail pipe is suspended with a special "U" shaped Speed Nut fastening bracket assembly to frame.

The proof of performance lies in the tests of actual usage. Today, Speed Nuts are still in use—holding with a firm spring-tension grip—after many years performance. Small wonder they are ordered in millions, when Speed Nuts are the only fastening devices engineered with both a compensating thread lock and a self-energizing spring lock. Write for catalog or send details of your assembly problem.

TINNERMAN PRODUCTS, INC., 2039 FULTON ROAD, CLEVELAND 13, OHIO

Speed Nuts* PATENTED

* Trade Mark Reg. U. S. Pat. Off.

Surplus Property Board To Seek New Bids for Geneva Steelworks

Western industrialist advised further effort will be made to interest steel producers in war-born Utah facility. Prospects for disposal not promising. Considerable West Coast scrap moving to Midwest

SAN FRANCISCO

RECENT reports on the West Coast that the government may take some action soon in an effort to dispose of the Geneva steel mill in Utah have been given added stimulus by Gov. Earl Warren, of California, who told newspapermen that he had received "encouraging news from the East" regarding Geneva.

Governor Warren said his information was based on a letter from Kenneth Norris, head of the Western States Council, in which Norris reported that Surplus Property Director Symington was preparing a new call for bids. Mr. Symington is said to have indicated there will be bidders for the plant, although no details were given.

On the other hand, there is a growing feeling in western steel circles that disposal of the Geneva plant, and in fact of all other wartime government-owned steel facilities, may become a long-drawn-out affair because of recent developments.

For one thing, this line of reasoning goes, prospects of a general steel strike probably will delay purchase plans of any private company to take over the plant, if any such plans exist. It is believed that general labor disturbances will result in considerable reluctance on the part of firms to expand their production facilities or to embark on a new venture of the size embodied in the Geneva plant.

Elaborating on this theme, it is pointed out that even under the best conditions, Geneva would be difficult to operate profitably. In fact, Mr. Symington not long ago stated his belief that U. S. Steel Corp. probably is the only firm in the country capable of operating it at a profit. Now that wage costs and general operating expenses are increasing, it is said that profitable operations will be all the more difficult and that alone is likely to cause possible purchasers to think twice.

One major determining factor in disposal of the Geneva plant will be action to reduce railroad freight rates. Peacetime rates are too high in comparison with intercoastal water rates to permit equal competition and it is believed unlikely that a purchase commitment will be made without a prior understanding that the Interstate Commerce Commission will order a rate reduction.

Just who will bid for the plant, as indicated in Mr. Symington's letter to Mr. Norris, is a question that has aroused considerable curiosity in more realistic steel circles here. Some 28 private steel companies have been approached by the RFC, but 25 flatly turned down the offer, and of the other three U. S. Steel withdrew its bid, and the tentative proposals made by Kaiser and Colorado Fuel & Iron Corp. have been termed "unacceptable" because they called for too large government outlays on expansion to make the plant suitable for producing peacetime products.

Governor Warren in his recent statement advocated that Henry Kaiser's RFC-financed plant at Fontana should be refinanced on the same terms as those which the government may set up for Geneva. He called $1055 million an excessive price for the Fontana property and pointed out that as far as construction costs are concerned Geneva and Fontana are equal.

An unusual movement of West Coast scrap to Chicago is going on at present. Coast steel men say the shipments are because of a coal shortage at Chicago and also reflect the closing of blast furnaces for repairs. They expect the movement to be only temporary.

During the war considerable Western scrap was moved eastward under land grant rail rates under WPB emergency allocations, but the present shipments, which are mostly from the Pacific Northwest, are the first since the end of the war for private account.

This scrap, delivered in Chicago, is expensive. The material which is No. 1 prepared heavy melting, is selling for $12 a ton f.o.b. in the Pacific Northwest. Shipping charges to Chicago are $12.32 a gross ton, bringing total cost laid down in the mid-western city to $24.32 a ton. That compares with the ceiling price of $18.75 in Chicago.

Scrap steel now is selling below ceilings on the West Coast, this area being the only region in the country where differentials exist between grades. The No. 2 grade is $1 below No. 1 heavy melting, and bales are $2 under No. 1.

In the Pacific Northwest the $12 price for No. 1 is $2 under the ceiling. In San Francisco the price is approximately $2.50 below ceiling. Before the war No. 1 averaged about $12.50 a ton in San Francisco.

Metal fabricators on the West Coast are experiencing an increase in demand which in some cases is outrunning prior predictions.

Two firms in San Francisco, for example, are illustrative of the general trend.

Oliver United Filters Inc., which produces all types of industrial filtering equipment, reports that its current orders are running about 50 per cent over last year's level. As a result, volume has been so heavy the company has been able to make only slight progress on cutting down its heavy backlog of unfilled orders. At present the firm's two plants, working two shifts daily, are employing more people than at any time in its history.

Materials Shortage Is Bottleneck

For Oliver, materials shortages continue to be the major bottleneck, although the company also has need for more workers than it has been able to hire.

The second company, whose experience roughly parallels Oliver's, is Schlage Lock Co., which makes locks and other household hardware accessories.

Schlage officials estimate that anywhere from a year to 18 months will be required for it to catch up with its present backlog. In addition they anticipate a 50 per cent increase in business in the immediate postwar years compared with prewar.

Schlage's production now is only about 55 per cent of capacity chiefly because it has had difficulty in obtaining necessary skilled workers, such as tool and die makers. Materials are less a problem, as fairly adequate supplies of brass and bronze are being received. Schlage plans to employ brass and bronze in its basic hardware lines, but more and more it intends to develop products made of aluminum. It is believed that possibly 50 per cent of its eventual production will be aluminum products. The firm now is installing $450,000 of new equipment and is nearly doubling the size of its metals finishing department.

Both Oliver and Schlage, as well as many other firms on the West Coast,

COMPENSATION PAY

Unemployment compensation was being given 95,455 residents of Los Angeles county, California, at the end of November, the United States Employment Service reported last week. The checks averaged $19.50 per person and the total weekly outgo was $1,761,000.

In a recent four-week period claims for jobless pay totaled 39,000 out of which only 16,000 actually were certified for checks, the others having taken jobs, gone into business or retired from the labor market. The USES cited the latter instance to show a trend toward re-employment which has become evident recently.

have been encouraged by recent inquiries and orders from abroad to believe that their export trade in postwar will be considerably higher than at any time in the past.

California Foundrymen To Sponsor Lecture Course

A lecture course designed to further interest in steel castings will be given by the Southern California chapter of the American Foundrymen's Association.

The course will consist of five lectures to be given on consecutive Monday nights from Jan. 28 to Feb. 25, 1946.

The speakers and subjects of the five lectures are: E. K. Smith, metallurgical consultant, Beverly Hills, Calif., "Specifications;" J. A. Burgard, Columbia Steel Corp., Los Angeles, "Patterns;" N. J. Dunbeck, vice president, Eastern Clay Products, Eifort, O., "Molds and Cores Materials;" Fred Sefing, International Nickel Co., New York, "Gating and Riser-ing Practice;" and Edward G. Smyth, Standard Oil Co. of Calif., Los Angeles, and C. E. Lloyd, Consolidated Steel Corp., Shipbuilding Division, San Pedro, Calif., "Inspection and Repairs."

OPA To Review Brass Mill Product Prices After Jan. 1

Office of Price Administration has denied reports in the trade that a general increase in ceiling prices for brass mill products was imminent. The price agency added that the price situation would be reviewed when financial returns are submitted to OPA after Jan. 1.

Numerous Obstacles Hampering California Industrial Reconversion

Labor shortage holding back expansion in civilian goods production with hundreds of workers unwilling to accept employment until their housing needs are met. Delays in raw material shipments also felt

SOUTHERN California industrialists face a series of obstacles to reconversion which, because they are exaggerated, reflect plainly similar problems in other manufacturing centers.

Reason for the exaggeration is that nowhere else has a comparable wartime growth taken place—in ratio to prewar population and industrial capacity.

Housing demands in Los Angeles, for instance, by workers and potential workers, far outdistance similar needs elsewhere.

War-swollen populations, among whom are many skilled workmen in a variety of trades, remain in an uprooted state of mobility, unwilling to accept employment until their housing needs are met. Few are leaving the area. Meanwhile industries lacking these skills apply in vain to USES and other employment offices and receive, in the main, only the type of unskilled labor always dominant in point of numbers in any community.

Topping the wall of government red tape, natural delays in shipments of raw materials coincident with reconversion readjustments, and the labor shortage, Los Angeles industry is being called upon to surmount another troublesome, if relatively minor, postwar hurdle.

This is a threatened cutback in the supply of industrial gas for furnace operations, or, at best, a diminishing of amounts anticipated until a few weeks ago. Cause of the gas shortage is directly related to surplus and still unabsorbed populations which have migrated there since 1941 to overflow a metropolitan area equipped to care for at least half a million fewer persons than are now residing there.

Industrial gas consumers report that under terms of leases with gas utilities, supplies may be reduced when weather temperatures reach a certain level.

Heretofore this arrangement has worked no hardship. Now, with more than half a million new residents, domestic consumption has risen sharply and has left industry on short gas rations. This will continue, industry spokesmen say, until new sources of gas supplies are brought into the area.

While many of the larger plants heat with oil, some are still equipped only with gas-burning apparatus. Smaller fabricating plants almost without exception, depend upon gas.

Plans $1 Million Furniture Plant

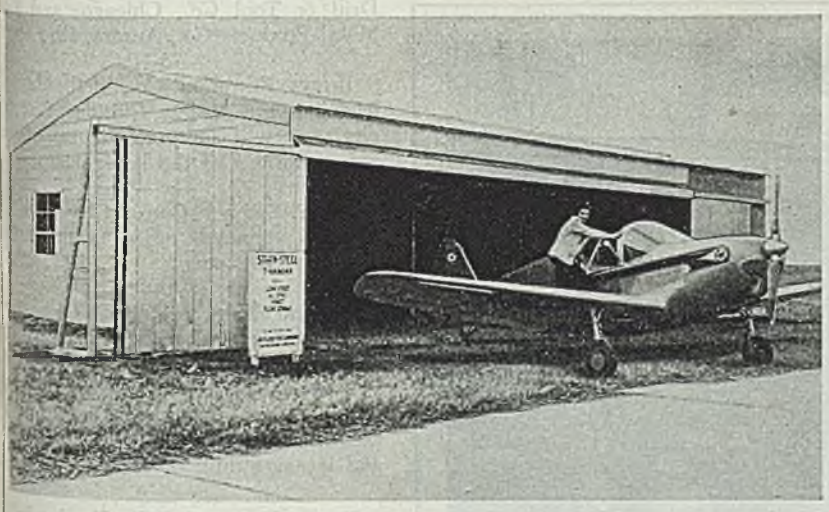
Occupying a four-acre tract in Los Angeles, the Superior Sleeprite Corp. will erect a million-dollar, two-story structure on the site for the largest bedding and metal furniture factory west of the Rockies, it was announced last week by the industrial department of the Los Angeles Chamber of Commerce.

With completion slated for next spring, the plant will employ from 500 to 600 persons. It will be completely conveyor-equipped and will utilize modern production processes throughout.

The company has disclosed that the factory will be second only to its main plant in Chicago in production volume.

Steel warehouse facilities have been established in Los Angeles at 1560 N. Ditman St., it was announced last week by Herbert Ziegler, general manager of the Ziegler Steel Service Co., who said the company will stock steel sheets, strip and light plate in hot-rolled, hot-rolled pickled and oiled, cold-rolled and galvanized finishes.

Arrangements have been made for production shearing, which should be available in the near future, it was reported. The warehouse supplements the concern's direct sales division, Mr. Ziegler said.



PACKAGED HANGAR: New mass production developments point the way to less expensive private flying as the steel T-hangar and the Globe Swift plane are introduced. The T-hangar is manufactured by Stran-Steel Division, Great Lakes Steel Corp., Detroit, and utilizes the Quonset building method of construction. The all-metal plane, soon to be in assembly-line production by Globe Aircraft Corp., Ft. Worth, Tex., features replaceable aluminum surface sections

Kansas City Bank Presents Data On Employment

660 reporting firms expect to employ 24 per cent more workers by next fall, 40.5 per cent gain over 1940

EMPLOYERS of more than 25 per cent of the approximately 300,000 workers in Greater Kansas City recently submitted confidential reports to the Federal Reserve Bank there in a survey of employment conditions now, before the war and what they are expected to be in the fall of 1946.

The bank's analysis of the 660 reporting firms showed that expansion plans for 1946 call for an increase in the total employment of 23.9 per cent by next fall which would be a gain of 40.5 per cent over the payroll total of the same firms in the fall of 1940.

The 660 firms reported that they now have 80,798 employees, expect to have 100,113 by next fall and had 71,258 in the fall of 1940.

The survey also included reports for 229 industrial and commercial firms and 33 from home building contractors. The bank analysis of those reports indicated that building construction would reach an all-time peak in the next three years. Of planned new construction in the 3-year period of $102,366,535, there would be spent for residential construction $49,118,000 and for nonresidential $53,248,535.

The survey was sponsored by the Greater Kansas City Committee for Economic Development. Joseph F. Porter Jr., vice president of Kansas City Power & Light Co., and committee chairman, said that he believed the scope of the survey made it one of the most valuable and factual samplings of postwar planning made in the country.

The committee, in the belief that it would get fuller co-operation, did not see the reports but asked that they be submitted directly to the bank for analysis.

The data upon which the survey was made was taken from the books of the companies between Sept. 15 and Oct. 15. It did not reflect any increased employment resulting from new industries, and only the experiences and estimates of long-established businesses were used.

The planned labor force of the reporting companies and firms would call for the employment in the next twelve months of 15,307 men and 3244 women in addition to the number now on the payrolls. Kansas City, as did most Middle Western cities, had extensive experience in war industrialization and the committee chairman expressed the opinion that the follow-up there may prevail in many other cities.

The survey broke down the 660 reporting businesses into five classifications: Manufacturing; trade; transportation and communication; service; and finance and insurance. The largest planned increase in labor forces—9441 men and 2957 women—is in the group of 221 reporting manufacturers. Firms with between 51 and 100 workers employed at present plan the largest percentage increase (47 per cent), and those employing more than 500, the smallest (15.4 per cent). In terms of numbers, however, the firms employing between 101 and 250 persons plan to add the largest number of employees and those employing more than 500, the second largest number.

Charles O. Hardy, vice president of the bank, said that forecasts were particularly difficult to make due to the variables of labor and material and that "employment plans reported, therefore, cannot be considered as commitments by the reporting firms, but as the best estimates of September, 1946, employment that could be made by business executives at this time."

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

Weatherhead Co., Cleveland, has announced its subsidiary, Weatherhead Co. of Canada, Ltd., St. Thomas, Ont., will become entirely self-supporting in its parts making for the Canadian automotive, aircraft and refrigeration industries.

—o—

Precision Equipment Co., Chicago, has been appointed distributor for Republic Drill & Tool Co., Chicago, and Lyon Metal Products Co., Aurora, Ill.

—o—

Briggs Filtration Co., Bethesda, Md., has acquired Briggs Clarifier Co., that city, and will continue the manufacturing operations of the latter company.

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Ferro Enamel Corp., Cleveland, has opened a branch office in the Arcade building, St. Louis.

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General Tire & Rubber Co., Akron, and Liquid Carbonic Corp., Chicago, have formed a new corporation which will be housed in a $1 million plant now being built in Morrison, Ill., to manufacture a combination home refrigerator and freezing unit.

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Bryant Heater Co., Cleveland, is building a plant in Tyler, Tex., to manufacture water heaters, floor and sidewall furnaces and unit heaters.

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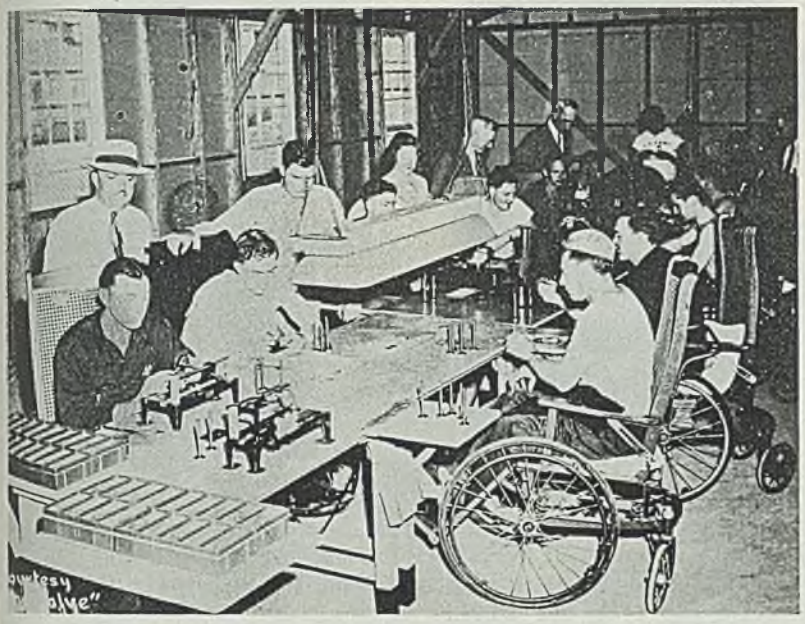
American Rolling Mill Co., Middletown, O., has announced its stockholders have approved a proposed merger with Rustless Iron & Steel Corp., Baltimore. Shareholders of the latter company will

POSTWAR BOX CARS: First new standard steel box cars built by Mt. Vernon Car Mfg. Co., a division of H. K. Porter Co. Inc., are rolling from assembly lines at Mt. Vernon, Ill., where an order for 500 is being filled for the Atchison, Topeka & Santa Fe. Steel-sheathed and wood-lined, the cars are 40½ feet long, have capacity of 3966 cubic feet



JOBS MADE EASY FOR DISABLED VETERANS: Dial indicating gages smooth the rehabilitation pathway for these disabled veterans at Valor, a unique plant at the Percy Jones General Hospital Annex, Ft. Custer, Mich. Here servicemen with serious disabilities work at specially constructed benches to which their wheel chairs can be drawn close. Dial gages, manufactured by Federal Products Corp., Providence, R. I., enable the veterans to become proficient on inspection work more quickly than they could by using older type instruments

vote later this month, and if approved, the merger will become effective at the end of the year.

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SM Equipment Co., Los Angeles, has moved to 5531 S. Vermont Ave., Los Angeles 37.

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B. F. Goodrich Chemical Co., Cleveland, has acquired the physical assets and trade names of Hycar Chemical Co., Akron, which will continue production of synthetic rubber.

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Chicago Foundry Co., Chicago, has suffered a fire in its coreroom, with resulting damages amounting to about $30,000.

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Midwest Iron & Steel Works Co., Denver, has donated $750 to the University of Colorado for research in civil engineering.

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Williams Gold Refining Co., Buffalo, has announced plans for doubling the capacity of its Buffalo plant and for construction of a new plant in Rio de Janeiro.

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Stacey Bros. Gas Construction Co., Cincinnati, is completing a large expansion program.

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Navarro Corp., Pittsburgh, has been awarded a $995,000 contract for general construction work to complete the major buildings of the new Bureau of Mines synthetic liquid fuels research and development laboratory near Bruceton, Pa.

New Company Organized To Fabricate Sheets, Plates

Metal Fabricating Co., a division of Detroit-Michigan Stove Co., has been organized to form and fabricate heavy sheet and plate. The plant, located at 6450 E. McNichols Road, Detroit, was formerly operated as an armor-plate fabricating unit of the company and is now soliciting production items in the heavier types of press and brake forming. The plant is equipped with a full complement of shears, presses, brakes, welding and cutting machinery, heat treating furnaces and related equipment. James H. Burgess and L. A. McCleish, 717 Fisher Bldg., Detroit, have been designated exclusive sales agents.

Government Sells Shipyard To City of Providence, R. I.

Surplus Property Administration has approved the sale of the Walsh-Kaiser shipyard at Providence, R. I., to the city of Providence for $308,093. The transaction represents the first disposal of a government-owned shipyard under the Surplus Property Act. Its original cost to the government was in excess of $10 million.

Report Issued On Trends in Labor Relations

Declares technological progress can be made without great hardship if labor and management co-operate

NEW PRODUCTS, materials and labor-saving machinery—such as are now expected as peacetime production gets under way—can be introduced without great hardship to labor or management if both will co-operate with the process, the Twentieth Century Fund, New York, declares.

This finding is included in the Fund's summary report on "Trends to Collective Bargaining," just issued. The report is based on a long-term investigation of collective bargaining practices and includes recommendations made by the Fund's impartial labor committee which has management, labor, government, and public members. The Twentieth Century Fund, founded in 1919 and endowed by the late Edward A. Filene, is an institute for research in economic problems.

The report reviews some of the technological battles of the past, as when hand printers resisted typesetting machines, and reaches the conclusion: "The record of collective bargaining shows the futility and short-range attitude of restricting improved methods of work.

"On the whole, unionism has not convinced any large segment of management of its eagerness for technological advance. This may require a change in attitude on the part of organized labor as great as the one necessary if employers in general accept rather than oppose the spread of unionism.

Looking with approval on a union's pledging not to oppose new machinery or to restrict output provided the union has a part in planning the new techniques, the report says, "This involves recognition of production problems and union co-operation with the employer, which very well might be one of collective bargaining's greatest current contributions." The report is careful to point out that not all resistance to new methods comes from workers. "Employers denounce unions for make-work tactics and for restrictions upon output, practices which are encountered in their own group. Manufacturers of almost everything have sought protective tariffs.

The report points out that in the steel industry, technical improvement was particularly rapid between 1935 and 1940. "Major steel companies produced 10 per cent more with 7 per cent less labor than in 1937; and although labor costs in 1939 were the same as in 1936, wage rates were 25 per cent higher."

MEN of INDUSTRY

WILSON H. MORIARTY

BINGHAM VAN DYKE

FRANK T. SISCO

Wilson H. Moriarty has been elected vice president in charge of sales, National Malleable & Steel Castings Co., Cleveland. James A. Slater, vice president in charge of railway sales, who has been associated with the company 48 years, has retired but will continue as a director and as assistant to the president as a consultant in railway matters. Mr. Moriarty has been with the company since leaving the Army following World War I, serving in various capacities. Since 1943 he has been assistant to the president.

—o—

Charles E. Kline has been elected vice president in charge of sales, United Tube Corp., Cleveland. Mr. Kline's experience has included association with Brainard Steel Corp., Warren, O.; Steel & Tube Division, Republic Steel Corp. in the company's New York and Cleveland branches, also the Strip Division, Republic Steel Corp.

—o—

E. J. Sanne has been appointed manager of sales, Tin Plate & Export Division, Inland Steel Co., Chicago, effective Jan. 2, assuming the responsibilities of **Frank R. Meyer Jr.**, vice president, who is retiring. Mr. Meyer has been associated with the company since 1911. **J. F. Smith, Jr.**, manager, Order Division, succeeds Mr. Sanne as assistant manager of sales, Sheet & Strip Division. **C. L. Holmberg**, assistant manager, Order Division, becomes manager of that division.

—o—

A. E. R. Peterka has resigned from the Reconstruction Finance Corp. to resume charge of advertising and aircraft and miscellaneous specialties for the Lamson & Sessions Co., Cleveland. He was relieved from active duty as lieutenant colonel with the Army Air Forces in March, 1945, to set up an organization for the disposal of the surplus aircraft parts and components for the RFC, Washington.

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Joseph W. Sears, previously district sales engineer, Link-Belt Co. in Dallas, Tex., has been appointed district sales manager with headquarters in Houston, Tex. **Stuart Penick** has been appointed district sales engineer at Dallas.

—o—

Bingham H. Van Dyke has been appointed manager of the new products department, Elliott Co., Jeannette, Pa. Previously assistant to the director of research and development, Mr. Van Dyke joined the Elliott Co. following service with the War Production Board as deputy chief, Heat Exchanger & Pressure Vessel Branch.

—o—

Raymond T. O'Keefe Jr. has been elected vice president, Kropp Forge Co., Chicago. He has been associated with the company since early in 1942 when he became personnel manager, and effective immediately he becomes special assistant to **Roy A. Kropp**, president, in matters pertaining to the general operation of the business and his sales representative in the Chicago area.

—o—

George L. Davis, formerly general staff manager of sales, Carnegie-Illinois Steel Corp., Pittsburgh, has joined Continental Foundry & Machine Co., Pittsburgh, in a sales capacity and is working on special assignments. **Edward Mitchell**, identified with the casting industry for the past 35 years, has become associated with the company as manager of alloy casting sales.

—o—

Maurice P. Whitney has been named acting general manager, Eclipse Machine Division, Elmira, N. Y., Bendix Aviation Corp. Mr. Whitney, who has been chief engineer of the division, succeeds **T. W. Tinkham**, recently resigned. **Frank T. Christian** has been appointed chief engineer to succeed Mr. Whitney. Mr. Christian has been associated with the Eclipse engineering staff since 1929.

—o—

Capt. Vincent H. Godfrey, who recently completed a tour of service with the United States Navy, has returned to Page Steel & Wire Division, American Chain & Cable Co. Inc., Bridgeport, Conn., as sales engineer. Mr. Godfrey will have headquarters at Monessen, Pa.

—o—

Frank T. Sisco, the past four years secretary, Iron & Steel Divison, American Institute of Mining & Metallurgical Engineers, has resigned to become director of *Alloys of Iron Research*, Engineering Foundation, New York. Mr. Sisco, author of four technical books, was associated with the foundation for 11 years before taking up his secretarial duties with AIME.

—o—

Charles W. E. Clarke has been elected vice president and consulting engineer, United Engineers & Constructors Inc., Philadelphia. He has specialized in the field of steam engineering practice for the past 35 years, and has served as consulting engineer with the company since its organization in 1928. **Stanley C. Cook** and **Benjamin S. Thayer** have been elected vice presidents and construction managers.

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L. S. Wilcoxson has been elected vice president in charge of research and development, Babcock & Wilcox Co., New York.

—o—

Harold A. Felix who served as counsel to the Steel Division, War Production Board, Washington, has resigned from its successor organization, Civilian Production Administration, to re-engage in private law practice as a member of the firm of Leve, Hecht & Hadfield, New York.

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William H. Boardman has been made resident representative at Providence, R. I., for Bethlehem Steel Co., Bethlehem, Pa. His headquarters are in the Industrial Trust Bldg.

—o—

Lester Beltz, John C. Widman and **Howard G. Reed** have joined the expanded engineering department of Ford Motor Co., Dearborn, Mich. Mr. Beltz has been associated with Reo Motor Co.,

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CLARENCE A. FEE

JOHN T. ROBBINS

WILLIAM J. PRIESTLEY

Studebaker Corp., and Packard Motor Co. Mr. Widman joined Ford's Research Division after 15 years with the Murray Corp. of America, where he specialized in body design. Mr. Reed, a chassis engineer, comes to Ford after association with Buick, Willys-Overland and Packard.

—o—

Clarence A. Fee recently became president and general manager, Abrasive Co., Philadelphia, a division of Simonds Saw & Steel Co., Fitchburg, Mass. Mr. Fee succeeds **J. W. McLean** who is retiring after serving 16 years as president of the Abrasive Co. Mr. Fee, until his recent appointment, was Chicago branch manager for the Simonds company, having been associated with the company since 1912.

—o—

Harold W. Dodge has been assigned as assistant manager, parts sales, ACF-Brill Motors Co., New York. His territory will include states west of the Ohio and Mississippi rivers and he will have headquarters in Chicago.

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Lt. Col. Jack Singleton, chief of the bridge branch, Office of the Chief of Engineers, has been released from active duty and will become chief engineer, American Institute of Steel Construction Inc., New York.

—o—

Thomas Robinson Jr. has joined the executive staff, Marlin Firearms Co., New Haven, Conn., as research director. He formerly was with High Standard Mfg. Co., New Haven.

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George Liff, recently returned from more than three years with the Army Air Corps, has been elected vice president, Klein-Farris Co. Inc., Boston. Mr. Liff will be in charge of sales of foundry supplies and equipment in Connecticut.

—o—

John R. Henkle and **George Hettinger** have rejoined the sales staff of the Mercury Mfg. Co., Chicago, following service with the armed forces. The company also announces the appointment of the following representatives: **W. Blackman Davis,** Wendler-Davis Co., Houston, Tex. to serve the state of Texas and Lusk Equipment & Supply Co., Wichita, Kans., covering parts of Kansas, Colorado and Oklahoma.

—o—

John T. Robbins, former senior process engineer, Curtiss-Wright Corp., has joined the technical service staff of Peter A. Frasse & Co. Inc., New York. Previously with American Rolling Mill Co., Middletown, O., and at one time senior metals inspector for the United States Treasury Department, Mr. Robbins will represent the Frasse organization as metallurgical consultant, specializing in stainless steel and corrosion-resistant alloys. Mr. Robbins will operate from the New York, Philadelphia, Buffalo and other Frasse branch distributing points.

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Richard R. Ramsay, Kenmore, N. Y., has been appointed a representative of the Janitrol sales organization, Surface Combustion Corp., Toledo, O.

—o—

Palen Flagler has been appointed director of advertising and publicity, De Laval Steam Turbine Co., Trenton, N. J. Mr. Flagler recently was with Bendix Aviation Corp., Philadelphia Division.

—o—

Samuel G. Baker has been appointed general manager, electrochemicals department, E. I. duPont de Nemours & Co. Inc., Wilmington, Del. **Milton Kutz,** who has been acting assistant general manager, becomes a special assistant to **F. S. MacGregor,** general manager. **Maurice du Pont Lee,** since 1932 manager of the Rayon Technical Division, has been named general consultant in the engineering department.

—o—

M. J. Way has been appointed sales manager of accessories and repair materials, Associated Tire & Accessory Division, B. F. Goodrich Co., Akron. He succeeds **E. A. Schneider,** who has resigned. **James A. Windram** has been appointed manager of the St. Louis district, Industrial Products Division, succeeding **George Livermore,** who is retiring from the company after service of 30 years.

—o—

Union Carbide & Carbon Corp. has elected eight new vice presidents and a secretary-treasurer. All are officials of subsidiaries. Vice presidents are: **Dr. Joseph G. Davis,** president, Carbide & Carbon Chemicals Corp., heading the Chemicals Division; **Stanley B. Kirk,** president, Linde Air Products Co., Industrial Gases Division; **James McLaughlin,** president, Bakelite Corp., Plastics Division; **William J. Priestley,** president, Electro Metallurgical Co., Alloys & Metals Division; **John H. Rodger,** president, Oxweld Railroad Service Co., Railroad Division; **Arthur V. Wilker,** president, National Carbon Co. Inc., Carbon Division; **H. Earl Thompson,** vice president and director, Carbide & Carbon Chemicals Corp. and Bakelite Corp., Engineering Division; and **Robert J. Hoffman,** a director of various subsidiaries and president of Union Carbide & Carbon Research Laboratories Inc., Industrial Relations Division. **Morse G. Dial** is secretary-treasurer.

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Capt. Walter A. Hamilton, USNR has rejoined TWA, Kansas City, Mo., and has been named special assistant to the executive vice president.

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Dr. E. A. Goldenweiser, economic adviser to the board of governors, Federal Reserve System, Washington, will leave that post Jan. 1 to become a member of the Institute for Advanced Study, Princeton, N. J.

—o—

Walter L. Kinney, for many years associated with Duplex Inc., Los Angeles, has been appointed general sales manager. **George Finnie Jr.,** until recently with North American Aviation Inc., has been appointed assistant to the general manager in charge of purchasing.

—o—

Andrew VanBeek, manager, Radford Ordnance Works, operated by Hercules Powder Co., Wilmington, Del., has been appointed assistant director of purchases

W. H. STEELE

Who has been appointed director of purchases, Bendix Home Appliances Inc., South Bend, Ind., noted in STEEL, Dec. 10 issue, p. 108.

JOHN D. DALE

Who has been elected president, Charles Hardy Inc. and Hardy Metallurgical Co., New York, noted in STEEL, Dec. 10 issue, p. 106.

EDWARD M. WHITING

Who recently was elected president, Phecl Mfg. Co., Chicago, noted in STEEL, Dec. 10 issue, p. 106.

for the Hercules company. J. Joseph Kelleher has been appointed manager of the contractors' division, explosives department.

—o—

Jacob S. Shapiro, United Iron & Metal Co., Baltimore, was elected president, Seaboard chapter of the Institute of Scrap Iron & Steel Inc., succeeding Israel D. Shapiro, United Iron & Metal Co., Baltimore. Other officers are: Vice president, Harry Klaff, H. Klaff & Co., Baltimore; secretary-treasurer, Samuel Lazinsky, Continental Iron & Metal Co., Baltimore.

—o—

Keith H. Bliss has been appointed sales engineer, H. M. Harper Co., Chicago. Mr. Bliss formerly was associated with Powercraft Corp., St. Louis, and Warner & Swasey Co., Cleveland.

—o—

Edwin M. Perrin, advertising manager, Robins Conveyors Inc., Passaic, N. J., since 1942, has been promoted to assistant manager of equipment sales.

—o—

Paul S. Ellison, director of advertising and sales promotion, Sylvania Electric Products Inc., Ipswich, Mass., has been elected chairman, Association of National Advertisers.

—o—

Frank W. Jones, former Navy lieutenant commander, who served on the carriers ENTERPRISE and LEXINGTON, has been named to head the Light Metal Products Division, Northrop Aircraft Inc., Hawthorne, Calif.

—o—

Frederic Vieweg, formerly vice president in charge of West Coast operations, Trona, Calif., American Potash & Chemical Corp., New York, has been named president of the company. Peter Colefax, formerly vice president and secretary, has been named executive vice president.

—o—

A. J. Stream, for the past five years assistant general manager, Plant Rubber & Asbestos Works, San Francisco, has been elected a vice president.

—o—

R. N. Green has returned from two years' military service to resume his post as president and general manager, Pilgrim Drawn Steel Corp., Plymouth, Mich. It was incorrectly reported in the Dec. 10 issue of STEEL that he had returned as president of Pilgrim Products Corp.

—o—

Lewis M. Smith, director of public relations, Alabama Power Co., Birmingham, has been elected a vice president of the company.

—o—

Herbert F. Byrne has been appointed director of production planning, United States Steel Corp. of Delaware, Pittsburgh. Mr. Byrne joined U. S. Steel three years ago after a career in the automotive industry which included 17 years with Hudson Motor Car Co., Detroit. Since 1943, he has been an executive in the Production Planning Division, Carnegie-Illinois Steel Corp.

—o—

N. P. Finkbone, American Rolling Mil Co., Middletown, O., is the new chairman of the governing board, Galvanizers Committee, American Zinc Institute Inc Retiring chairman is F. G. White, Granite City Steel Co., Granite City Ill.

—o—

G. O. Britton recently was named director of sales, Farm Equipment Division, Graham-Paige Motors Corp., Willow Run, Mich. Mr. Britton started as district manager for Allis-Chalmers Mfg. Co., Milwaukee, in 1934 and later was associated with Minneapolis-Moline Power Implement Co., Minneapolis.

—o—

Charles C. Fichtner, vice president and treasurer, Wales-Strippit Corp., North Tonawanda, N. Y., has been appointed executive vice president of the Buffalo Chamber of Commerce.

—o—

Lt. Thomas M. Riley, USNR, has been appointed to manage advertising activities, Pacific Coast Paint Division, Pittsburgh Plate Glass Co. His headquarters will be in Los Angeles.

OBITUARIES . . .

E. W. LaPlant, 73, co-founder of LaPlant-Choate Mfg. Co. Inc., Cedar Rapids, Iowa, died Dec. 4 after a long illness. Starting in the house-moving business in 1889, later he entered into the design and manufacture of house-moving trucks and finally the manufacture of earth-moving equipment, wagon scrapers and dozers. He had been inactive since 1927, though he continued as a director of the corporation until 1944.

—o—

Edgar A. Blasdell, 68, president and treasurer, Reliance Steel Casting Co., Pittsburgh, died Dec. 8 at his home in Fox Chapel, Pa. Mr. Blasdell was an organizer of the company which was founded in 1910.

—o—

William E. Savage, 72, vice president, Trundle Engineering Co., with offices in New York, Cleveland and Chicago, died Dec. 7 in Cleveland. Mr. Savage joined the organization in 1929 as a field engineer.

—o—

Charles H. Van Slyck, retired vice president and treasurer, Watson-Flagg Engineering Co., New York, died recently in that city. He retired in 1937.

—o—

Earnest Barnes, 70, blast furnace foreman, Republic Steel Corp., Cleveland, died Dec. 10 in that city.

Assembly Line Production Methods Adopted by Continental Motors

Engineering design simplified. Many parts on four and six-cylinder units interchangeable, permitting use of special purpose machine tools whose cost is amortized over long production runs. Company has backlog of 35,000 engines

MASS production methods are being applied to the building of engines for personal airplanes in the Muskegon, Mich., plant of Continental Motors Corp. which is working off a backlog of 35,000 engines ranging from 65 to 210 horsepower. This is nearly 10 times as many units as the company manufactured in 1941 and is believed by the company to represent about 90 per cent of the total engine business which the personal plane industry will afford during the coming year.

As the leading producer of light plane engines before the war, Continental had instituted as up-to-date manufacturing methods as were possible with the comparatively limited volume of business then available. With the current increase in orders, the company now is going much farther in assembly line production.

Engineering designs for all four and six-cylinder engines have been worked out to facilitate adoption of the latest mass production techniques evolved as a result of its wartime manufacturing experience. Considerable simplification of engineering design has been achieved, with the result that interchangeability of parts between all engines, four and six-cylinder, is high. This is making possible important gains in manufacturing efficiency through extensive use of special purpose machine tools, whose cost can be amortized over greater production runs than would be possible if so many parts were not interchangeable.

More Six-Cylinder Engines Coming

Continental now is stepping up production of three new six-cylinder models, the A-100, C-115 and C-125 (figures indicate horsepower). Within a few weeks the company will place in production three additional six-cylinder models, the E-165, E-185 and E-210. Largest volume, however, still comes from its A-65, C-75 and C-85 four-cylinder models which were the first to be put into production after V-J Day.

Like Continental's four-cylinder A-65, C-75 and C-85 engines for light planes, the new A-100, C-115 and C-125 are horizontally-opposed, air-cooled, direct drive, normally aspirated engines. Except for the difference in crankcase, crankshaft and other parts occasioned by the greater number of cylinders, the six-cylinder models embody the general construction characteristics of the four-cylinder models. As between the A-100, C-115 and C-125, the main differences are in bore and stroke, the rated speed and some accessory equipment. The A-100 engine has a bore and stroke of 3⅞ x 3⅝ inches, the same as the A-65 model. Both the C-115 and the C-125 engines have a bore and stroke of 4 1/16 x 3⅝ inches, the same as the company's C-75 and C-85 four-cylinder models.

The cylinder assemblies of the A-100 are completely interchangeable with those of the A-65. This interchangeability is carried through to such other items as piston assemblies, connecting rod assemblies, valve and rocker arm assemblies and numerous other items.

There also is interchangeability of parts between the A-100 and the C-115 and C-125 models.

Glenn Martin Announces $19 Million Plane Orders

Orders from eight air lines for conversion of four-engine C-54 transports, amounting to more than $12 million, were announced recently by Glenn L. Martin, president, Glenn L. Martin Co., Baltimore.

The eight lines are Pennsylvania-Central Airlines, TWA, Eastern Air Lines, Pan American Airways, Braniff, Northeast, Chicago and Southern and Cruzero do Sul, Brazilian air line.

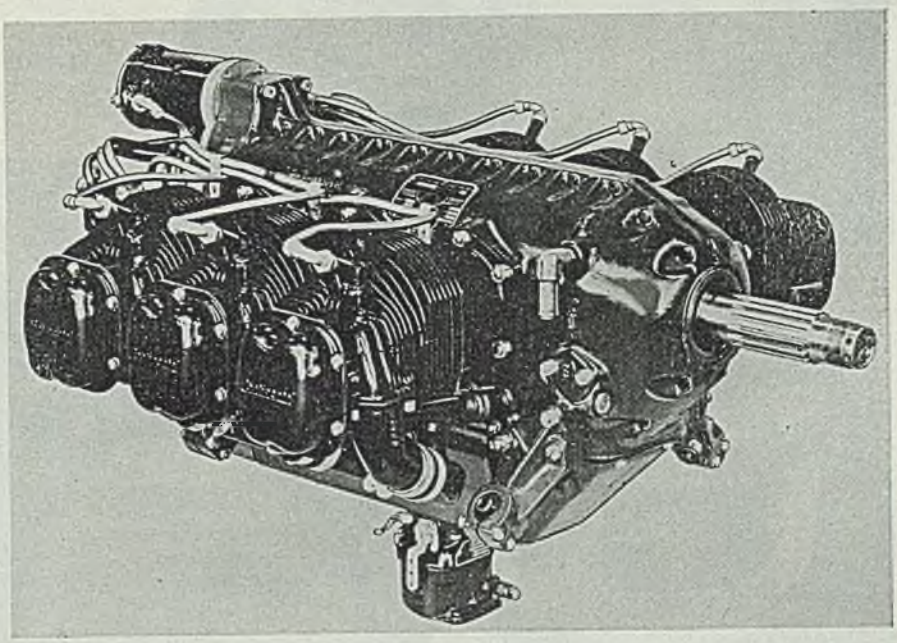
Delivery of the C-54s will reach one a day in January, Mr. Martin said.

Pennsylvania-Central Airlines has announced a $7 million order for 35 new Martin 202 transports. Other lines are expected shortly to announce orders for this new model, production of which will reach 40 per month in January, 1947.

Revolutionary Jet Engine Propels "Shooting Star"

Success of America's fastest airplane, the Lockheed P-80 Shooting Star, lies in the development of two revolutionary types of jet engines, known as the I-16 and the I-40, according to the Air Technical Service Command.

In both engines air is drawn through an intake duct in the front and forced into the combustion chamber by means of a centrifugal compressor. Kerosene is used for fuel. It is injected into the combustion chambers where it is atomized, mixed with air from the compressor, and burned. Continuous combustion of the kerosene occurs at a relatively constant high pressure, resulting in a stream of high-velocity gas which is released through the rear nozzle and drives the airplane forward. The turbine is activated by this stream of gas and provides power for the compressor.



This is a front end view of Continental Motors' new C-115-125 six-cylinder engine for light planes, whose production is being increased to meet personal plane manufacturers' requirements. The engine is rated at 115 horsepower at 2350 revolutions per minute and 125 horsepower at 2550 rpm. It has been designed to achieve a high degree of interchangeability of parts with other four and six-cylinder engines built by Continental

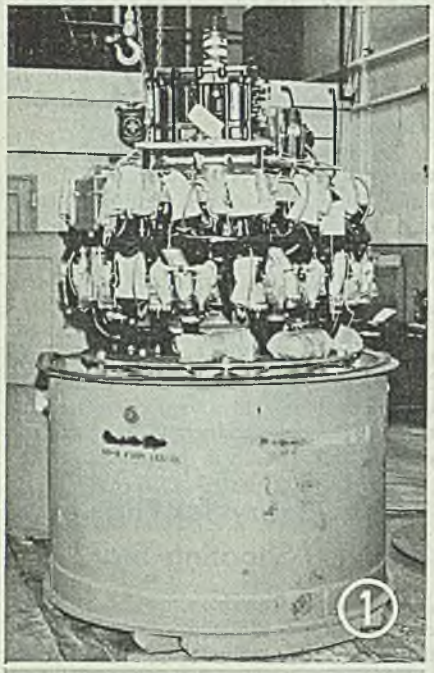
STEEL

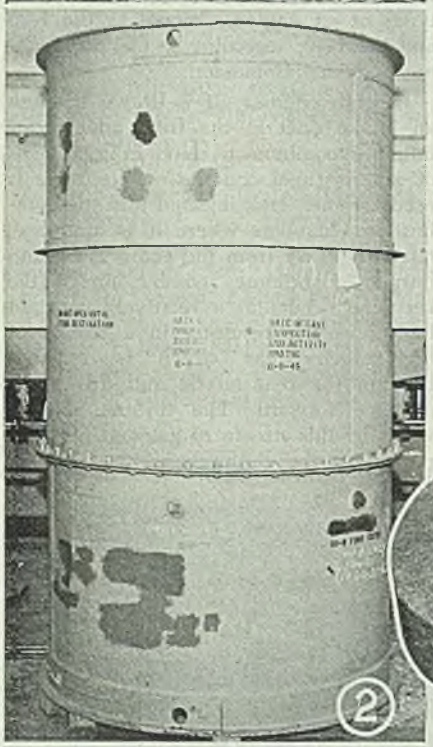
Reusable and resealable steel drums for export shipment and prolonged storage of engines, motors and instruments of all types exceed expectations of AAF. Absolute moisture-proofing and high safety recommend containers for commercial use

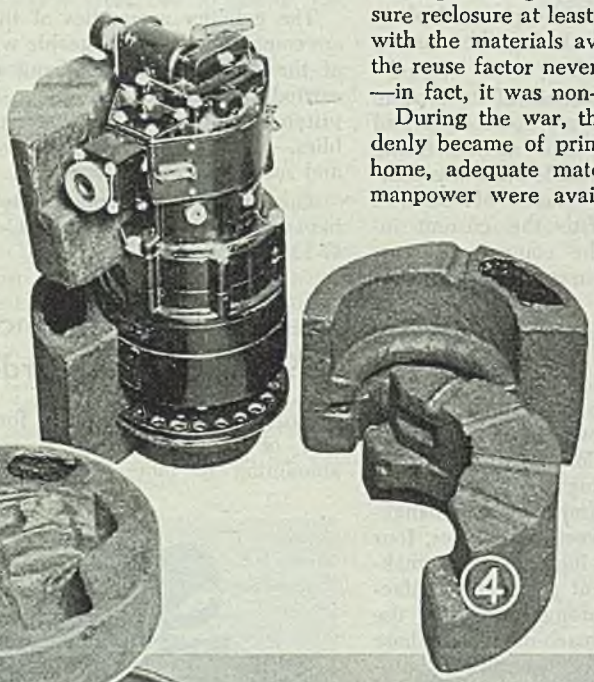
SINCE the first practical application of dehydrated packaging of mechanical equipment by the Army Air Forces in conjunction with industry in early 1941, the search for the ideal moisture-vapor barrier has gone on relentlessly. The ideal moisture-vapor barrier may be defined as one having zero moisture transmission rate and capable of being reused without any deterioration of its qualities.

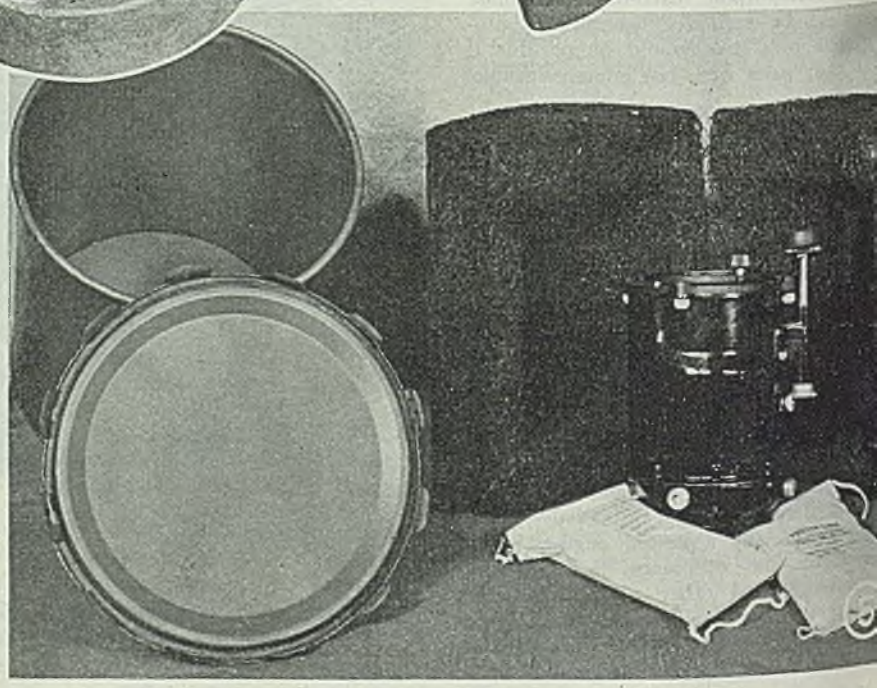
Early efforts in this direction are evidenced by some of the first specifications that were prepared in which the moisture transmission rates were specified and the envelopes designed and specified to insure reclosure at least six times. However, with the materials available at the time, the reuse factor never became a problem —in fact, it was non-existent.

During the war, the reuse factor suddenly became of primary importance. At home, adequate materials, facilities and manpower were available to insure the









PACKAGING

By WALTER L. HARDY
Formerly Lt. Col., AAF, and ex-Chief
Container and Packaging Branch, Eng. Div.
Air Technical Service Command
Wright Field, Dayton, O.

proper packaging and preservation of aeronautical equipment, but in the theaters of operation all three of these essentials were either limited or totally lacking. Temperature, humidity and storage conditions in widely scattered bases supplying war fronts represented all extremities of the weather scale. The necessity of opening containers for checking and inspection, or for repacking all or parts of the contents for reshipment, especially in the warmer and damper latitudes, naturally exposed metal parts to accelerated corrosion.

The ideal moisture-vapor barrier, then, was one that would protect the new piece of equipment from the point of manufacture to the using facility in the designated theater of operation. It had to be one that would serve as the barrier for transporting the replaced, repairable item to a rear echelon overhauling facility, and then carry the repaired item back to the using facility. Such a barrier would insure protection of original equipment and its replacements as long as the barrier would remain undamaged.

As stated, the search went on until it finally was rewarded with a solution in the reusable, resealable steel shipping container. Its utility and value to the Army Air Forces has a parallel in the Army's successful use of metal containers or barriers (See STEEL, Sept. 10, 1945, p. 112) in "canning" guns for preservation over any period up to 50 years. From industry's standpoint, the reusable, resealable steel container holds forth the prospect of a high-strength, moisture-proof vehicle for transporting with safety a wide variety of delicate gages and instruments, motors, precision-made highly finished engine parts and accessories, ad infinitum. Domestically, this would be advantageous for long-term storage of replacement parts and even original equipment in manufacturers' or distributors' inventories, and to withstand abusive handling in overland shipment. Used in export, the steel container would afford consumer articles made of metal the same protection it has given military aviation equipment.

Advantages of Steel Containers

The advantages of using steel shipping containers for packaging of mechanical equipment, as seen by men of the Air Technical Service Command, are several:

1. Container is light weight and, in certain cases, provides in itself an export container which may be palletized.
2. When properly sealed, it provides an excellet moisture-vapor barrier.
3. Blocking and bracing of the items within the container are easily accomplished with a minimum of material and labor and with excellent results.
4. Container is reusable. Low original cost is further reduced by reuse.

Reusable, resealable metal containers are now specified for use on many items of Air Force equipment. Among items so packaged are engines, instruments, certain oxygen equipment, bombsights, starters, generators, magnetos, amplidynes, etc. The only limiting factor on utilization of the steel shipping container (up to the fall of 1945) has been the unavailability of sheet steel and container manufacturing facilities.

This shipping container can be utilized for all classes of aeronautical equipment, with all of the advantages enumerated previously. Steel shipping containers have been designed and tested for items of equipment ranging from aircraft engines, as illustrated in Figs. 1 and 2, to small delicate gyroscopic instruments which are packaged in the resealable container illustrated in Fig. 6.

Large container in Fig. 1 is used for radial engines as illustrated. Fig. 2 shows container with upper housing sealed and bolted in place, ready for shipment. It is made of medium heavy gage steel plates, rolled to shape and lap welded. Reinforcement consists of steel bars welded on at top and bottom and additionally reinforced where eyelets permit entry of lifting hooks for crane handling. Angle iron is welded on to reinforce the side walls of upper housing. Its out-turned leg will take the first shock of collision with any other heavy object while container is in transit. Assembly by bolts and nuts at point of closure (sealed by a special gasket) permits mechanics at point of destination to open the container with ease, a wrench being all that is required. Supports welded to inner walls of the engine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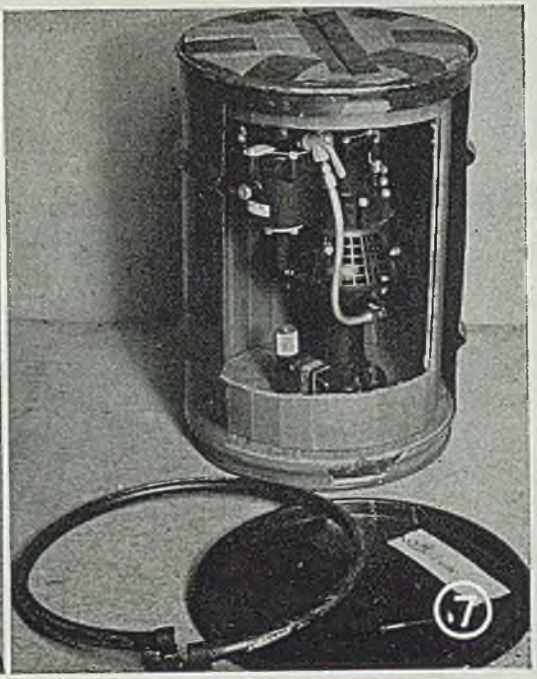
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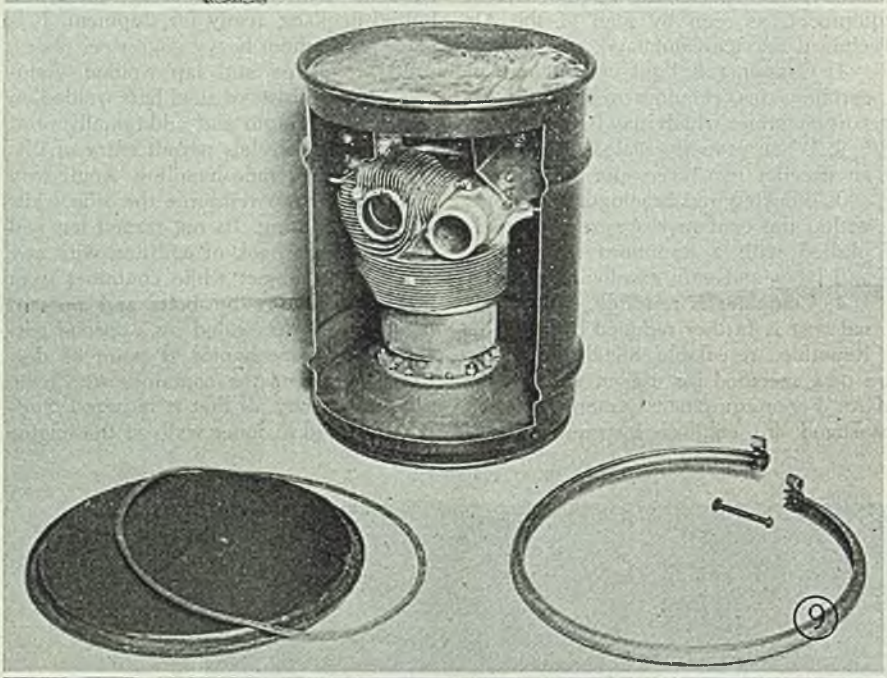
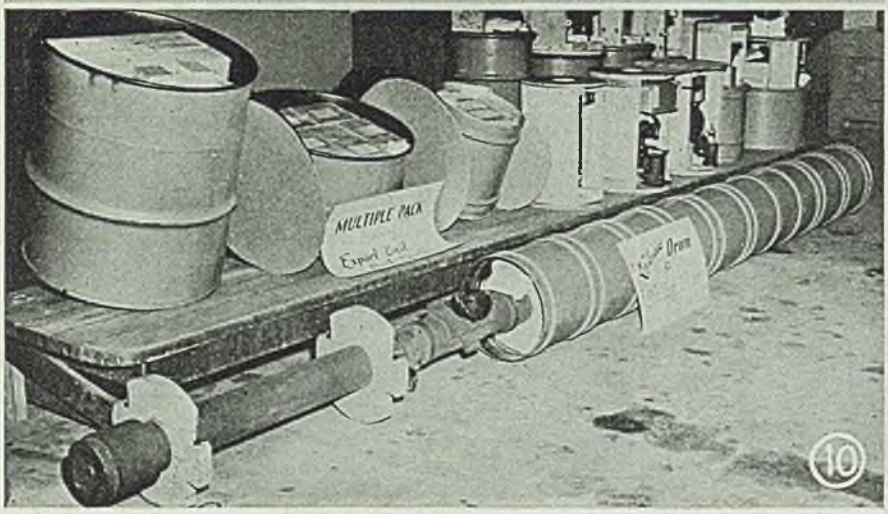
INTERIOR DIMENSIONS OF REUSABLE, RESEALABLE METAL SHIPPING CONTAINER

No.	ID Inches		Height Inches	Cushioned Maximum Net Load Capacity (lb)
1	5	x	4½	5
2	5	x	8½	8
3	6½	x	4½	8
4	6½	x	8½	8
5	8½	x	6	8
6	8½	x	7½	8
7	8½	x	9	8





container carry the mounting ring to which engine is bolted, nose up. Note packaged spare parts lying on the ring and packets of Protek-Sorb silica gel, dehydrating agent produced by Davison Chemical Corp., Baltimore, strung in double row around partially dismounted engine. Total weight of container and load in this case is 4250 lb.

Fig. 6 illustrates method employed to box six small interior type resealable containers as one unit. Wooden case with heavy frame is compartmented to accommodate the individual cans for gyroscopic instruments. This container is one of the smallest used by the Army Air Forces. In Figs. 5 and 7 are shown method of packaging aircraft cabin pressure regulators, cutaway views of container permitting size comparison between unit to be shipped and the barrier, or can, (Fig. 5) and relative space occupied by the regulator when packaged (Fig. 7). In some cases, no wood blocking or bracing is needed; mats, shaped to the contours of the article, motor or instrument, effectively serve as dunnage to prevent shifting and damage during handling. Container in Figs. 5 and 7 has corrugated drum and pressed flanges at chime top and bottom for strength. Flanges also are for attachment of bottom plate and to facilitate use of top and locking ring as shown. Regulator is bolted to plywood inner base and twin thickness of heavy cardboard encircles unit.

Dunnage Fits Into Container

Dunnage in Fig. 5, curled hair and latex, is molded to the shape of aircraft cabin pressure regulator which stands before it with two bags of Protek-Sorb to absorb moisture in trapped air. Diameter of cushioning is same as inside diameter of the can, so that nothing else is required to complete this package.

Fig. 4 demonstrates use of a paper maché-like material molded in five segments to fit a motor starter. Here, again, dunnage is made to fit the inside of container, allowing no space for load to shift.

Use of wood blocking within the container to eliminate mats or dunnage is illustrated in Fig. 3. In this instance, the generator is attached to the blocking (made up as single unit and securely fastened inside container by two hollow metal rings which fit first and second corrugations of the drum) by four hex-head bolts and nuts and two sets of four washers, one standard and one spring-type. An alternative method of cushioning the generator inside container is illustrated in Fig. 8. Here, rolls of air-cell paper are strapped against the generator itself while additional coils protect protruding portions such as the shaft. This bundle fits within the large coil at upper left, and disks of air-cell paper for top and bottom of container complete the bundle except for the ever-present dehydrating agent.

Aircraft engine cylinders are packed as shown in Fig. 9. A drawn steel ring,

(*Please turn to Page* 138)

Automatic CENTERING MACHINE . . .

simultaneously produces accurate, properly lined-up center holes in each end of a piece of stock

CAPABLE of producing accurate, properly centralized and lined-up center holes simultaneously in each end of piece of stock, a 1¼ x 18-in. full automatic centering machine, rear and front views shown in Figs. 1 and 2, respectively, requires only keeping magazine supplied with work, taking away centered parts, and caring for ordinary center drills used.

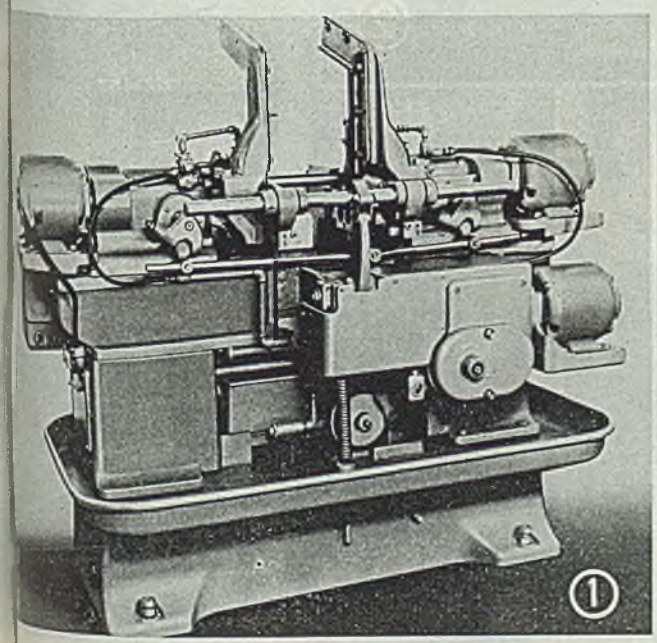
Both ends of work are centered in one operation, with drills being fed in connection with a full automatic work handling mechanism. Drills are withdrawn twice during operation to clear the chips and permit oil to enter drilled holes. Cam path controlling feed is arranged in three steps so that after each withdrawal the center drills go in to a greater depth, reaching full depth at the last advance. Two drill spindles are mounted in preloaded ball bearings inside quills, which are actuated by a rack and pinion feed through spring-resilient levers.

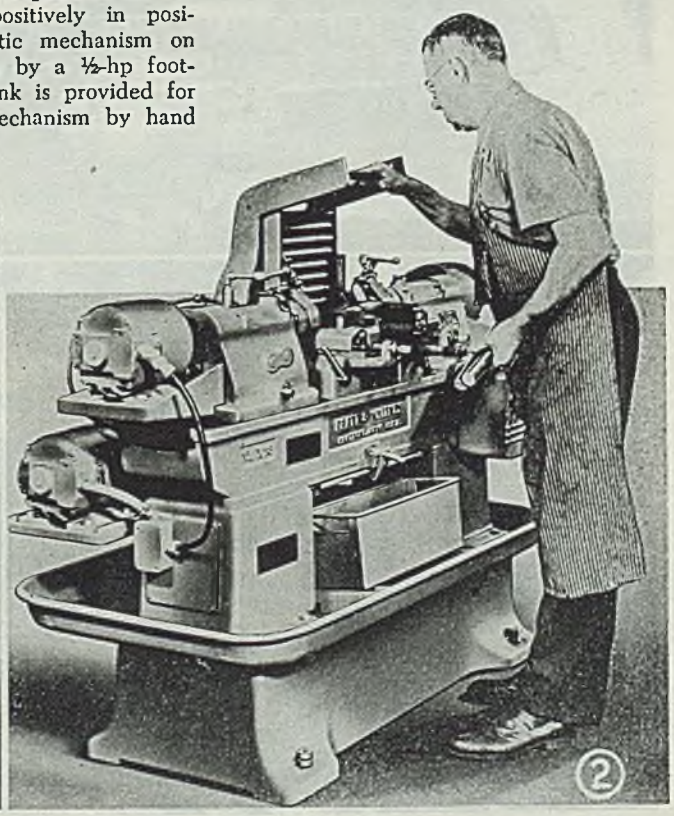
Both drill heads can be adjusted on the bed to any desired position and then positively clamped, according to the manufacturer, Pratt & Whitney Division, Lees-Bement-Pond Co., West Hartford, Conn. Each is driven by a ½-hp foot-mounted motor which permits easy motor replacement. Oil is supplied continuously to drills from a gear pump, and surplus oil drains to a tank underneath. Magazine holds work and allows it to feed down by gravity to transfer slides. Magazine ways have adjustable guides to accommodate work ranging from ⅜-in. up to 1⅜-in. diameter. Also, magazine may be set to accommodate a range of work varying from a minimum length of 3½ in. to a maximum length of 18 in. Transfer slides carry work forward from the magazine one piece at a time to centering drills, and hold it in correct position for accurate centering. Transfer plates on slides remain in contact all during centering operation. Transfer plates hold work in V-blocks and are actuated through adjustable toggle levers from a cam, making possible rigid clamping. Transfer slide can be adjusted for any length of stroke necessary.

A compensating arrangement on V-jaws automatically takes care of small variations in work diameter. Jaws also may be adjusted to drill holes out of center on one or both ends, such as short oil holes, or holes for driving pins used in grinding. Work transfer slides, magazine uprights, and work holding V-blocks all are mounted on bases which can be adjusted to any desired position on the bed and clamped positively in position. Entire automatic mechanism on rear of bed is driven by a ½-hp foot-mounted motor. Crank is provided for moving the entire mechanism by hand during setting up operation. Machine also is equipped with pushbutton control convenient to operator's right hand.

Length of stroke of drill spindle can be varied from ⅜ to 1¼ in., and maximum countersink diameter is ⅝-in. Stops are provided to limit forward movements of drill spindles and meet either of two conditions. They can be set to bear against end of work, holding predetermined dimension; or they can be reversed to engage lugs on drill head casting. This limits forward movement of spindles and brings center holes the same distance apart, regardless of variations in length of work.

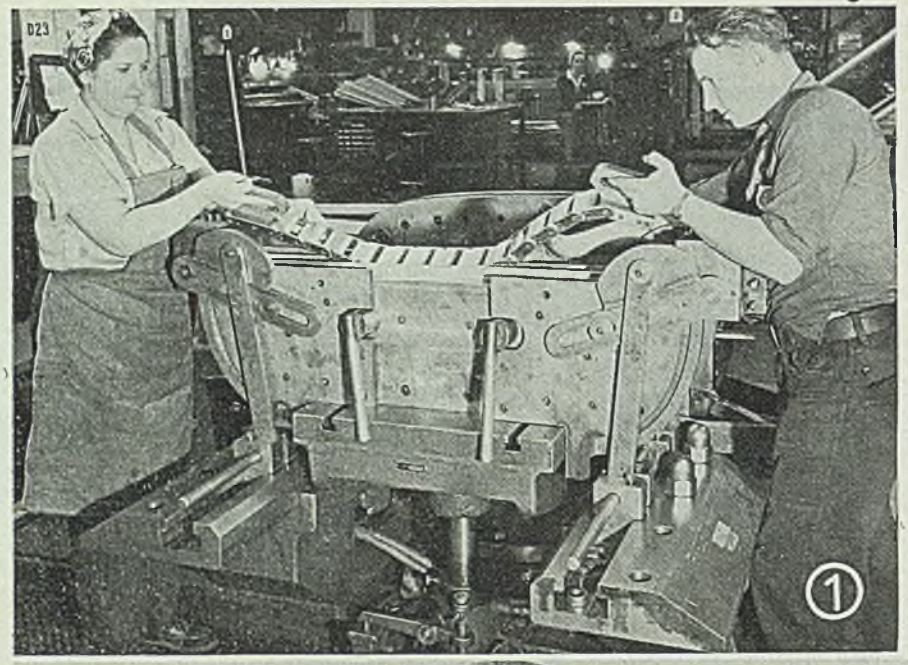
Machine is supplied with change gears providing four different camshaft speeds of 2.9, 4.3, 6.1, and 9 cycles per minute. Two sets of collets, ⅜-in. and 7/16-in., are provided, with other sizes available on order. This tool occupies a floor space 72 x 34 in., is 54 in. high, and weighs approximately 2000 lb.





STRETCH

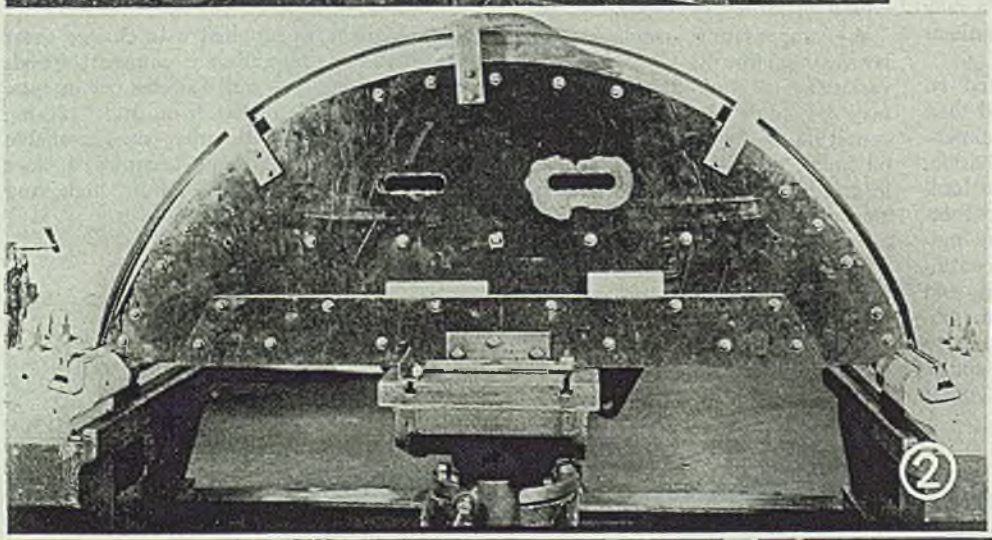
By AL JACOBSON
Seattle, Wash.

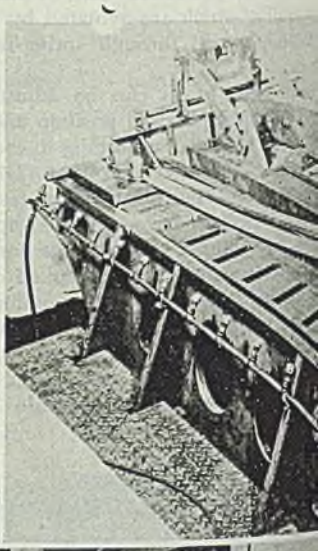


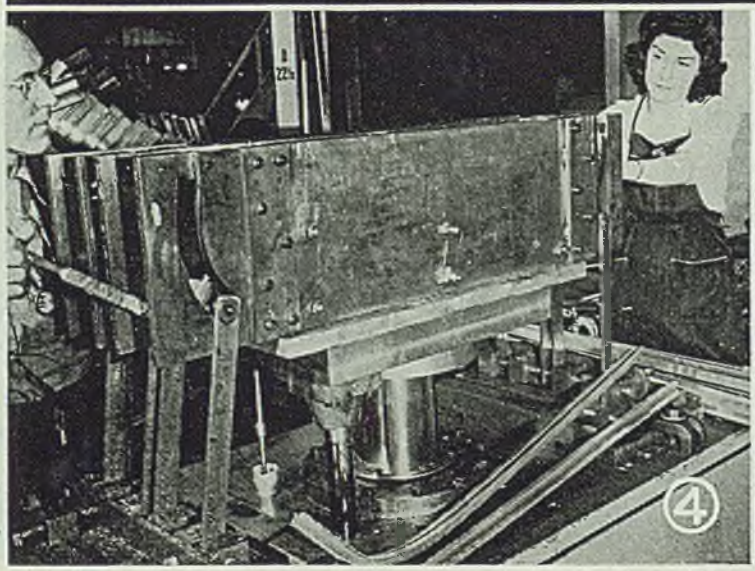
STRETCH-FORMING, the process o producing uniform and irregular curve in rolled or extruded shapes of aluminum alloy, reached a high degree of efficiency in building the B-17 Flying Fortress and accounted for further advancements i the construction of the B-29 Superfort ress. In view of its accomplishments o the past few years, a review of pro cedures and equipment at this time should not be amiss.

This process, as developed at Boein Aircraft Co., Seattle, has prescribed bending the material over a form of th required shape and elongating the meta until it stretched to a distance some where between the yield point and the ultimate strength. This elongation i accomplished by applying pressure tha places the rolled or extruded shape i direct tension either through hydrauli or pneumatic pressure or by mechani cal devices.

According to George Finney, stretch



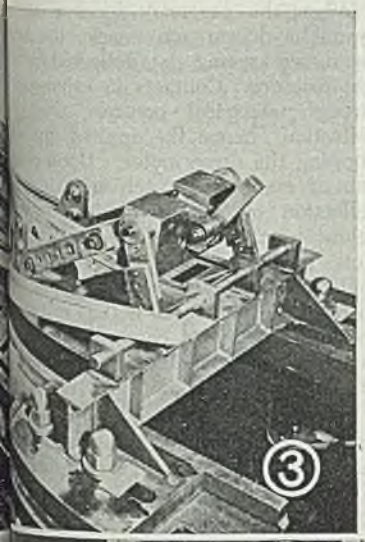


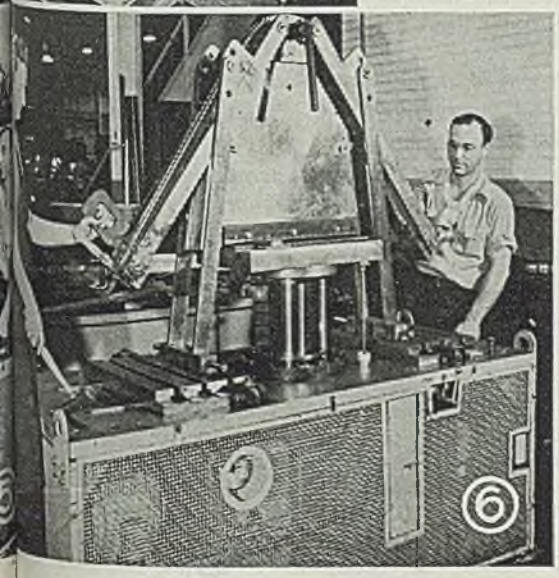


FORMING

Growing interest in light-weight structures makes timely this review of methods and machines for producing uniform and irregular curves in rolled or extruded aluminum shapes

rming foreman at Boeing, users of the retch-forming process should take into nsideration two factors: (1) When a echanical method alone is used, the rcount the metal is stretched is con-rollable, even though pressure is not; nd (2) when the process is accom-plished by the use of either a hydraulic r pneumatic cylinder and without as-isting mechanical help, the pressure pplied can be controlled but not elonga-ion of the material. Boeing was able o overcome the weakness of these two eans of applying direct tension by using achines utilizing hydraulic pressure for ending operation together with cam- or ver-controlled devices for stretching nd holding formed sections to required utlines without "springback."





While various metals can be stretch-formed, best results are obtained by confining the process as much as possible to heat-treated duralumin sections. It was found that the stretch-forming possibilities of any section depend principally upon its differential elongation, together with the ultimate tensile strength. Normally, any shape can be strength-formed if the material is uniform throughout its length, if the section is not to be formed into reverse contours, and if the differential elongation is less than 8 per cent.

Differential elongation is arrived at by measuring the length of the top and bottom fibers and dividing the difference between the two by length of the bottom fiber. The result is the percentage of elongation. If part is to be bent to one radius only, the differential elongation is determined by dividing the depth of the section by the radius of the bottom fiber and translating the value into percentage.

First step taken in designing a stretch-form block is to lay out the work piece in order to determine the differential elongation and then develop an involute curve of the bottom fiber. This involute is an arc along which every point represents another point on the bottom line or fiber of the part, and is the basis for computations of elongation. It is used to develop a route for movement of the jaws on the machines which grip the ends of the rolled or extruded shape during stretch-forming.

In laying out the involute, the neutral axis or centroid is extended beyond the end of the stretch-form block. A cam constructed like the arc causes the corresponding gripping jaw to produce stretching strains on the work. Neither stretching or compression occurs along the bottom fiber of the shape if the gripping jaws of the machine are made to follow the involute accurately. Any percentage of stretch is obtainable at any point along the bottom fiber of the section if the jaw path is properly laid out from the involute. Gripping jaws are made to follow the desired route by cams or levers in operations such as the one shown in Fig. 4. A 10-ton hydraulic press, with gripping jaw levers in the horizontal, or loading position, is shown in Fig. 5. In Fig. 6, gripping-jaw levers are in the position assumed at the end of the operation. Vertical ram is fully extended at end of stroke.

In order to straighten the material before it enters grooves in the stretch-form block and to eliminate any slippage of the shape in the jaws during the stretch operation, it often is necessary to pre-stretch shapes before forming is started. Complete stretching is accomplished before the forming is started when the part is to be formed to a shallow contour. This step usually is necessary in order to elongate the metal enough to eliminate any springback after the short stroke that is required in producing the shallow-formed work.

Total elongation given to a part consisted of the pre-stretch, the differential elongation, and an additional amount required to eliminate springback. This point is reached when the material had been stretched from 8 to 10 per cent of its original length. In most instances, a desirable jaw path is obtained with an ordinary pivot arm setup, but, if the contour of the part is unusually irregular, a cam sometimes is required to give more stretch in areas formed in short radii or to make the gripping jaws follow the involute more closely than is possible by lever action alone.

At Boeing, parts having a considerable depth of contour frequently became

(*Please turn to Page* 144)

Fig. 1—A filler of aluminum links is loaded into channel of heavy extruded section to prevent collapse of channel walls during stretch-forming

Fig. 2—Bent angle sections are formed on this 100-*ton press. Degree of angle is variable on this part*

Fig. 3—Tools and adapters on this 300-*ton press form right and left-hand parts together—in this instance, a wing center-section inspar*

Fig. 4—In this operation movement of gripping jaws is controlled by cam slots on stretch block and hold-down arms anchored to machine table. Press ram of stretch-forming machine is at top of stroke

Fig. 5—Gripping-jaw levers on this 10-*ton hydraulic press are in horizontal or loading position*

Fig. 6—Here gripping-jaw levers shown in Fig. 5 *are in positions assumed at end of operation*

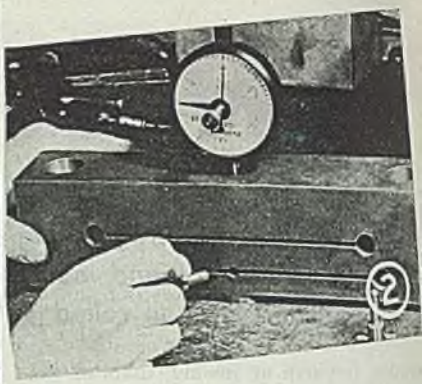


Fig. 1—Mr. Manjoine changing the range of a weighing bar on an automatic creep testing machine

Fig. 2—Force measuring bar with two ranges. Pins, such as those in the operators hands, are placed in the holes in the slots both in front and in back of the bar

Adjustable FORCE-MEASURING BEAM

provides rapid, accurate stress deflections over wide range of loads

RECENTLY developed force-measuring beam provides comparable deflections under such widely divergent load ranges as 0 to 4000 lb, 0 to 20,000 lb and the maximum, 0 to 100,000 lb.

In most testing machines it is necessary to change the force measuring system to maintain accuracy when testing materials requiring widely varying loads. This new measuring beam, designed by M. J. Manjoine of Westinghouse Research Laboratories, has a stiffness which can be varied in accordance with the desired load range.

One conventional type of equipment used in testing materials in tension is shown in Fig. 3. Screw-jack exerts force on bottom of the slotted force-measuring beam. Extensometer is mounted on top of the bar and extends down through a vertical hole drilled in the bar and rests against top of lower section. Any change in the force exerted against this low section by screw-jack moves this prob and the change is registered on exte someter.

When the necessary force is appli by motor-driven screw-jack, the forc measuring spring is deflected a ce tain distance. Contacts in extensomet through electrical controls, limit th deflection (hence the applied force) stopping the drive motor. Upon elong tion of material to such an extent th deflection of the weighing bar dro below a preset figure, electrical co tacts again activate the motor-star controls and re-establish original for on bar. Constant force is thus maintain on the beam and a constant load on t specimen material. This force-measuri spring is shown in detail in Fig. 4.

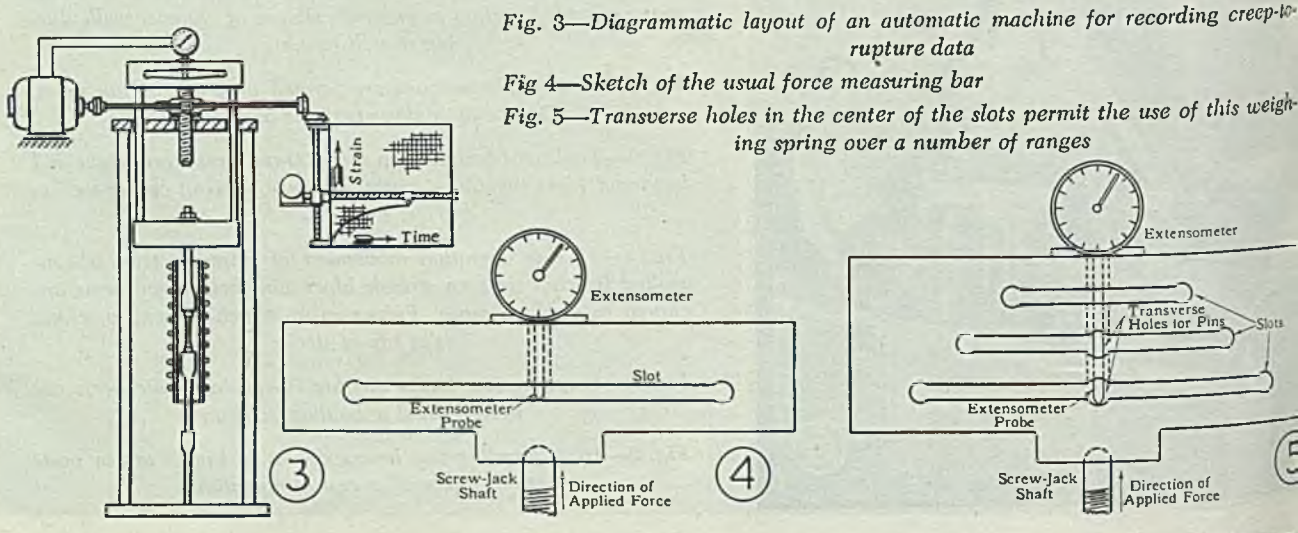
The spring with easily varied sti ness is shown in Fig. 5 and is similar the one shown in Fig. 4, except that thr slots are used instead of one. Transve holes have been drilled in center of tw

(*Please turn to Page* 148)

Fig. 3—Diagrammatic layout of an automatic machine for recording creep-to-rupture data

Fig 4—Sketch of the usual force measuring bar

Fig. 5—Transverse holes in the center of the slots permit the use of this weighing spring over a number of ranges



Engineering NOTES

Spraying Aluminum

Spraying of aluminum on magnesium is reported to have been under development in Germany during the war. Several specimens treated by this process have been discovered, although detailed technical information is not yet available. The Mahle plant in Germany also sprayed aluminum paint on magnesium castings for protective purposes, but they did not actually spray metal.

o o o

Zinc Extrusions

Zinc ordinarily is thought of in terms of protective coatings for steel, as sheet or strip or die castings produced in a wide variety of shapes. However, zinc extrusions now are available in various cross-sections, promising wider applications for this useful metal.

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Tool Engineering

"The tool engineering profession is beginning to achieve the recognition it deserves in the educational field. Rochester Institute of Technology is about to institute a regular tool engineering course. At the University of Dayton, a tool engineering course is being launched. Ohio State University is making a survey to determine its course of action. Reports from Atlanta state that Georgia Tech hopes to offer a tool engineering course in the near future."—C. V. Briner, President, ASTE.

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Steel Wool

Crush-dressed grinding wheels apparently will find a new application in the steel wool industry. Steel wool is produced by cutting or shaving long, silky, resilient steel fibers from round wire in coils. Most machines for producing steel wool are of the shave-block type, cutting up to seven grades or sizes from the same wire. Extremely fine serrations in the shave blocks can be ground at high speed through use of crush-ground wheels, it has been found.

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"Electronic Finger"

Almost anything that can be cut with a motor-driven tool from pattern or template can be produced accurately and completely automatically when the machine tool is equipped with a versatile device created by General Electric engineers and known to them as the "electronic finger". Finger feels its way around angles and curves of a pattern to control operation of the cutting tool. Tracing stylus comprises two magnetic bridges, each consisting of two identical magnetic circuits, one pair mounted on an axis at right angles to the other. The four magnetic poles are assembled on a diaphragm fastened to stylus, which is a finger-like projection. In operation, stylus of the tracing head is moved against side of the contour on the pattern to be produced.

o o o

Textile Machinery

Textile industry is expected to utilize large amounts of magnesium in its machinery, reaching 6 million pounds in the near future. The metal will be used in the form of die-castings, castings, extruded shapes and other forms to replace various wooden parts such as warp beams, needle and guide bars and cloth rolls. Magnesium has been found to stand up under high compression which heavily taxes wood parts and also is suited for parts moving at extreme speeds, such as shuttles and bobbins.

o o o

An Engine From Stampings

The Taylor engine, developed on the West Coast and under license to Crosley, is being watched closely since it represents radical departures in the use of materials. The engine is designed to utilize steel stampings and tubing for the block, assembled by copper brazing. Unit, now being readied for production, is reported exceptionally light.

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Precision Heat Treatment

Precision heat treatment of stainless steels by the "Super Scottsonizing" process has been extended to the 410 and 440 series. The 302 and 320 series may be treated by the same process. The method produces a case of 0.003 to 0.005-in. but darkens the parts. Wear of moving parts is increased several fold. Parts remain hot even when red hot.

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Contour Forming

It is calculated that if heavy gage steel bus bumpers now formed on 25-ton contour-forming machine built by Cyril Bath Co., Cleveland, were shaped on press, it would require a 1000-ton piece of equipment. Roll forming process is said to overcome resistance of material only in a limited area at a given time. When compression forming materials more ductile than steel, the contouring machine wipes or rolls given shape into contour block. Nature of die depends upon quantity to be produced. Method is best suited to materials in which depths of section provide assurance that material is carried sufficiently beyond its elastic limit to maintain a set.

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Spot Test For Vanadium

Colorimetric test is based on the fact that the yellow color of slightly acid vanadate solutions is intensified by presence of tungstates. Method consists of mixing a drop of solution on a spot plate with a drop of 85 per cent phosphoric acid, and a drop of 10 per cent sodium tungstate. Appearance of a yellow to orange color indicates presence of vanadium.

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"Cold-Rolled" Parts

Machines developed originally for the rolling of threads now are assuming growing importance in the "cold-rolled" production of a wide variety of parts which formerly were form turned. This sort of work no longer is confined to tubing, powerful machines with "balanced" rolls surrounded by ring cams now making it possible to roll-form solid bar stock to close tolerances.

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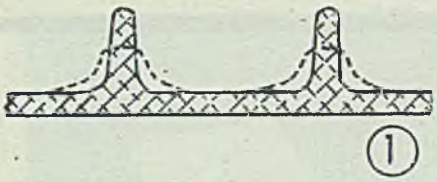
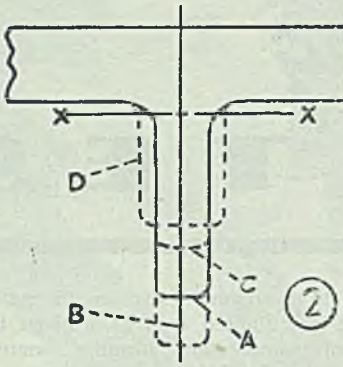
Welding Trend

Capacitator discharge welding equipment designed primarily for aluminum welding can be used to weld mild steel and the cost of the equipment be reduced with the elimination of the special features which are not necessary for the latter application, state H. J. Bichel and J. R. Parsons in the November, 1945 *Welding Journal*. Many localities for some time to come will have a limited supply of electrical power therefore, capacitator discharge welders will probably be used in the future for welding materials other than aluminum.





Developing PARTS FOR

DESIGNING machine parts subject to high repeated loading near the limits of the elastic range of the material is one of the most difficult jobs for the design engineer. To guard against fatigue failure from such repeated loading, it becomes necessary to avoid concentrations of stresses as it is at these points that fatigue failures start—and stress concentrations are not easy to predict either as to their location or amount.

What really complicates the situation is that fatigue strength of a newly designed part cannot be calculated but must be found by testing. And this work is not something that can be done quickly like a tensile test but instead involves a long tedious process. Then, too, every change in the part, no matter how small, must be followed by additional testing to determine effect on fatigue strength. It was in an effort to avoid this long drawn out process that Greer Ellis, then with the Massachusetts Institute of Technology and now with Magnaflux Corp., Chicago, developed the brittle lacquer method called Stresscoat. (Stresscoat materials, strain gages, etc. are made and distributed by Stresscoat Division of the Magnaflux Corp.)

In this method, the test specimen is coated with a brittle lacquer which cracks as the part is stretched during testing, showing not only the location of points of maximum strain but also the direction and amount of principal strain. It may be accurate to within plus or minus 10 per cent of actual strain values.

Because the method has been found exceptionally valuable in speeding the

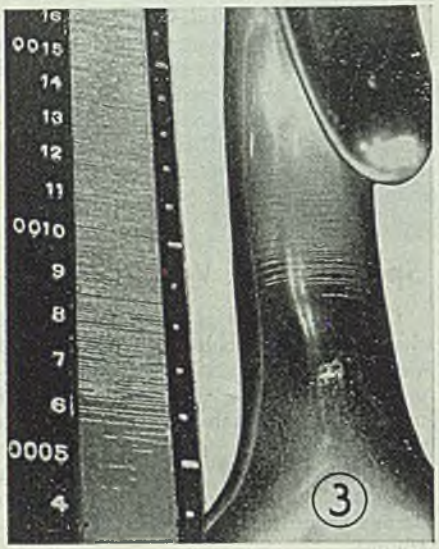


Fig. 1—By providing more uniform stress distribution, section indicated by the dotted outline gave much greater resistance to fatigue failure than the cross hatched section enclosed by solid lines. Same amount of metal in both cases

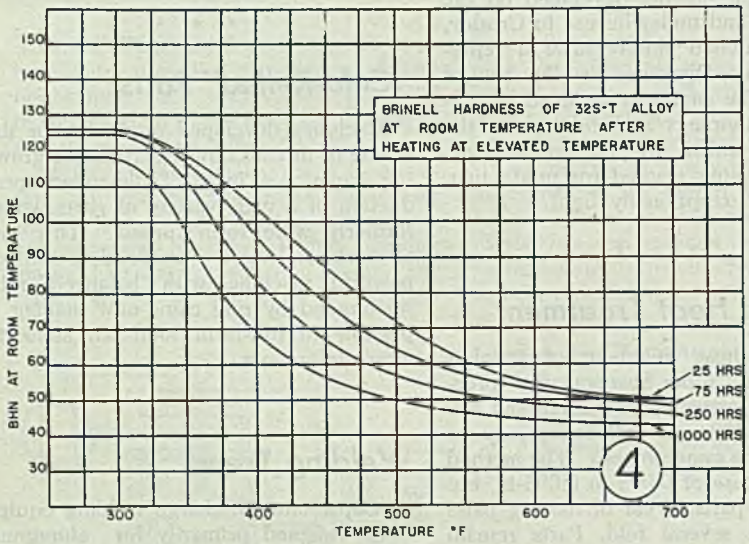
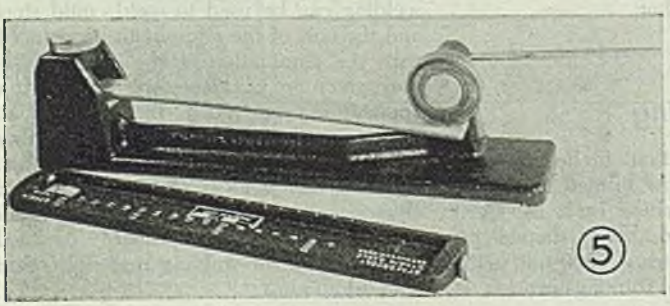
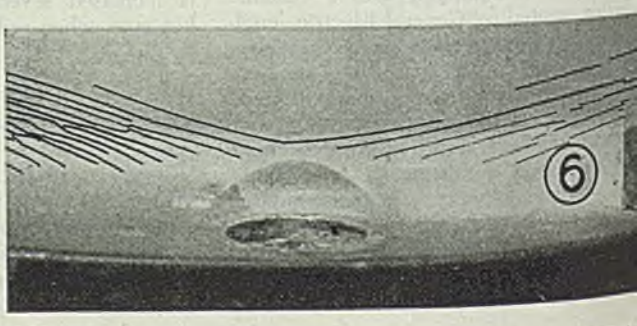


Fig. 2—Proportions of T-sections greatly influence fatigue life. Cross hatched contour indicated by A, generally used, is not necessarily increased in fatigue strength by going to B. C may strengthen it considerably, while D is almost sure to greatly increase fatigue strength

Fig. 3—Stresscoat calibration strip in strain scale shows sensitivity. Strain pattern formation (first cracks) start at 0.0005-in. per in. Quantitative evaluation of strain patterns on inside of adjacent hook is made by comparing with similar patterns on calibration strip. Accuracy is plus or minus 10 per cent in region where cracks have just started to form. For this reason various loadings are used to obtain optimum condition (first crack formation)

Fig. 4—Showing how various temperatures and periods affect hardness of 32S-T alloy, thus permitting working temperature of a part to be determined from hardness tests





PRODUCTION

By G. W. BIRDSALL
Associate Editor, STEEL

Brittle lacquer method of stress analysis helps to short circuit much expensive and time-consuming testing required by older methods, thus permits developing new and improved machine parts much faster. Twenty years' development now telescoped into single year

Design and testing of parts for aircraft engines at the stress analysis department of the Cleveland Research and Development laboratory of the Aluminum Co. of America, the technique worked out for using the process there will be detailed and some of the special equipment for stress analysis by this method described. But before doing that, let's examine briefly some of the features of the method that are making it of increasing importance wherever stress analysis work is being undertaken.

"One-Horse Shay"—The Ideal Structure: In a recent interview, R. G. Anderson, engineer in charge of stress analysis, Development Division, Aluminum Co. of America, Cleveland laboratories, pointed out that the ideal structure from the standpoint of resistance to fatigue failure would be one in which all portions were stressed uniformly. Then it would stand up in service the maximum length of time, at the end of which period it would completely disintegrate like the famous "one-horse shay", which had no part weaker than any other.

However, Mr. Anderson points out that the practical approach realizes full well that this ideal condition can never be obtained and seeks only to avoid high stress concentrations, thereby extending service life. Or where stress concentrations cannot be avoided, they are lowered so they are well within the capacity of the material employed.

Correct Distribution of Stresses: This leads up to the observation that most failures in machine parts occur because the stresses are not distributed properly rather than because the part has insufficient metal in it to carry the load. Figs. 1 and 2 illustrate typical cases.

The section through two stiffening ribs of a crankcase diaphragm shown cross hatched and enclosed by solid lines in Fig. 1 was found much less satisfactory than that indicated by the dotted outlines, in that the latter form gave improved fatigue life. While the same amount of metal is involved, proper placement of the metal changed the stress distribution and improved fatigue strength.

Other T-sections like those in Fig. 2 are often found in machine structures. Here, too, proportions of the rib greatly affect fatigue life. The contour indicated by the cross-hatched area (contour A) shows the proportions generally used. Adding metal to produce proportions indicated by contour B does not necessarily increase the fatigue strength of the part, whereas reducing the section to contour C often strengthens the part considerably.

Changing to section shown by contour D which utilizes the same amount of

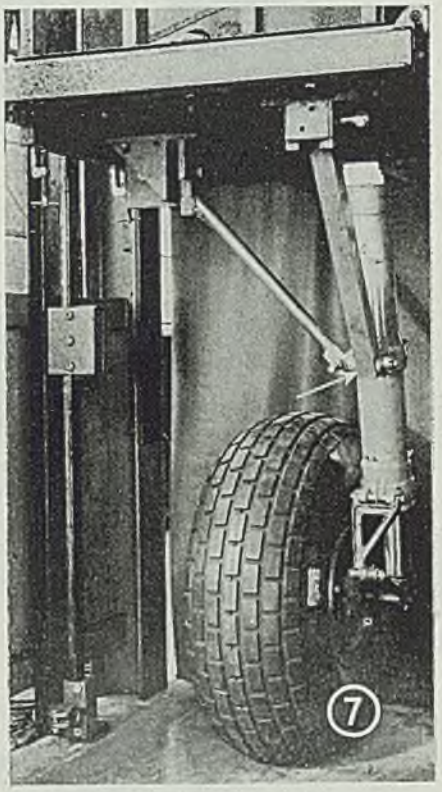


Fig. 5—Calibration strip, coated and dried under same conditions as work, is deformed predetermined amount in this instrument. Resulting cracks in coating indicate strain values when placed in accompanying strain scale. See closeup of portion of strain scale in Fig. 3

Fig. 6—This Stresscoat pattern in the fillet on wall of an aircraft engine cylinder was obtained for the case where one stud was missing. Note stress is concentrated in small area where fillet just blends into the thinner wall of the cylinder. With little increase in metal content, proper redesign will provide a gradual thickening of cylinder wall from point about 1-in. above fillet down to flange itself, will easily double strength of cylinder in this area. Figs. 3, 5 and 6 from Magnaflux Corp.

Fig. 7—Drop test of aircraft landing gear strut where employs Stresscoat at troublesome area indicated by arrow. Test was to determine whether service failures were caused by poor material, poor workmanship or localized stresses. Results clearly indicated localized high stresses as cause. Redesigns along lines indicated by these tests cured service failures. Bendix Aviation Corp. photo

Fig. 8—Cross section through a fatigue failure where principal strain in specimen was compressive in nature. Note wedge-shaped piece forced out of surface and general wedge shape of fatigue crack. Alcoa photo

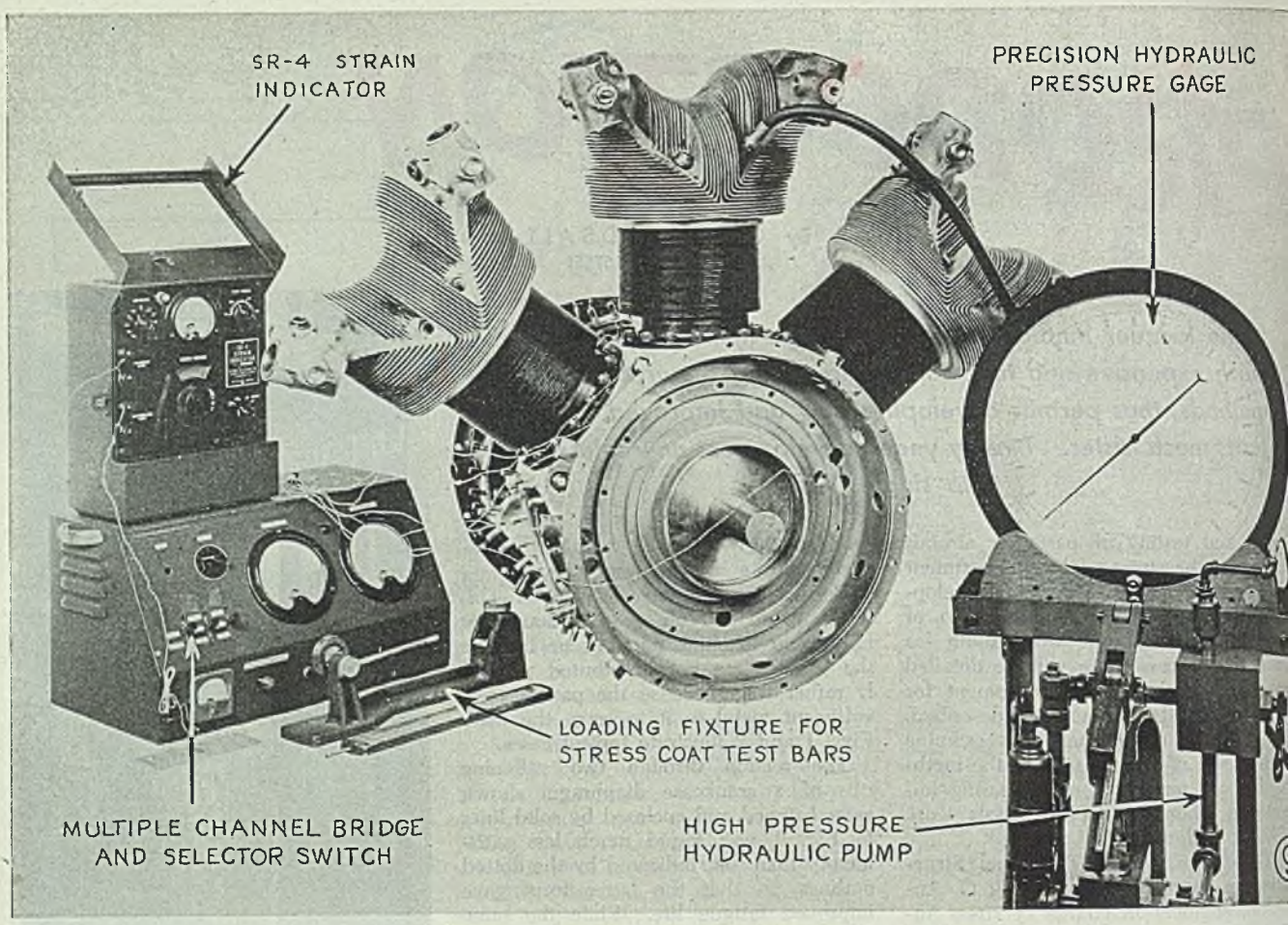


Fig. 9 — Portion of radial engine set up at Alcoa for strain analysis. Loading is done hydraulically, strains indicated by Stresscoat and resistance wire strain gages

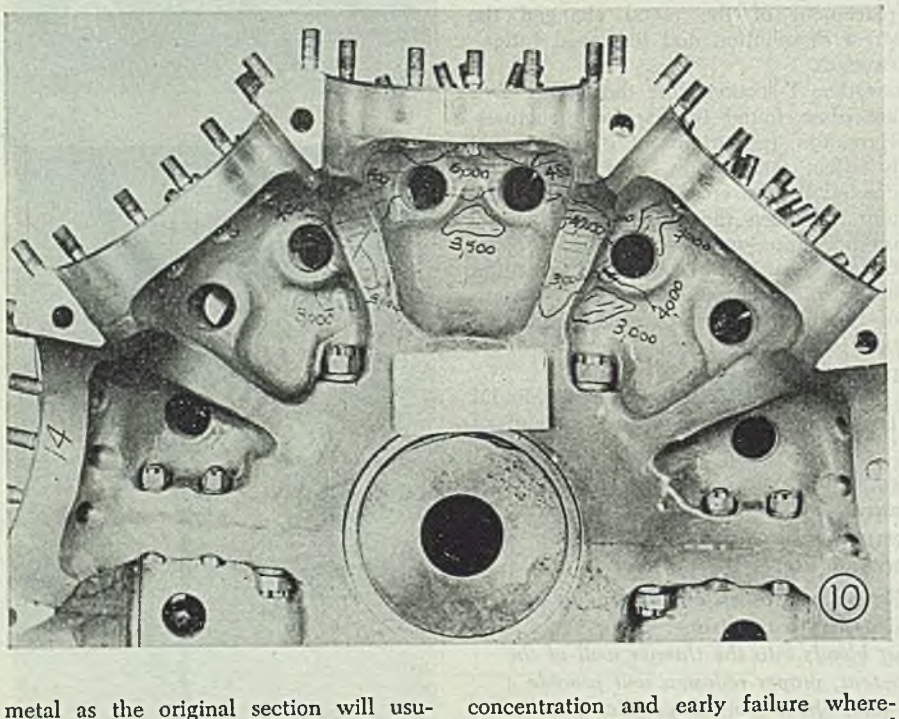


Fig. 10—Closeup of casting of radial aircraft engine showing method of marking Stresscoat patterns at Alcoa before photographing them for record

metal as the original section will usually result in greatly increased fatigue strength.

Less Metal—Greater Strength: These examples indicate it often is a mistake to add metal to correct fatigue failures, because distribution of load stresses usually varies with relative stiffness through different sections of the part. Thus a heavy rib may be called upon to take the entire load. In this manner more metal may often produce excessive stress concentration and early failure whereas less metal might effect improved stress distribution and longer life.

Short-Cut to Optimum Design: Conventional method of designing parts subject to high cyclic stressing is to lay out the part according to mathematical analysis of strength requirements, followed by building a full-sized part and running it in service or under conditions closely duplicating service conditions until it fails. Then it is redesigned and tested again, this being repeated till an efficient result is secured.

Such procedure may consume an enormous amount of time and effort, especially when producing a new and highly complex machine such as a 2000-hp radial aircraft engine. . . . And there is no assurance that the end result is the best possible.

Moreover, stress calculations often may be entirely impractical because of mating parts, sharp radii, complicated shapes of sections and the like. Design of such parts can only be based on experience or laborious "cut-and-try" methods.

A short-cut that has been found extremely valuable for speeding up the stress analysis of all types of machine parts is to apply a brittle coating to the cleaned surfaces of a sample part. Then when the part is loaded, strains are indicated by cracking of the coating, in turn pointing out stress concentrations. Using these as a guide, the part is then revamped for more uniform stress distribution.

Twenty Years in One: It has been

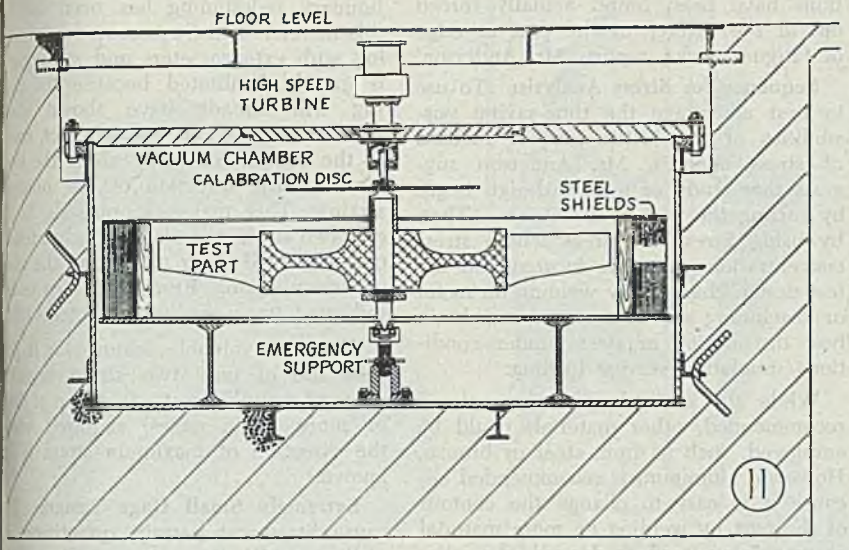


Fig. 11—Cross section through special whirl pit used at Alcoa for stress analysis of such items as turbine rotors. Speeds up to 60,000 rpm are available

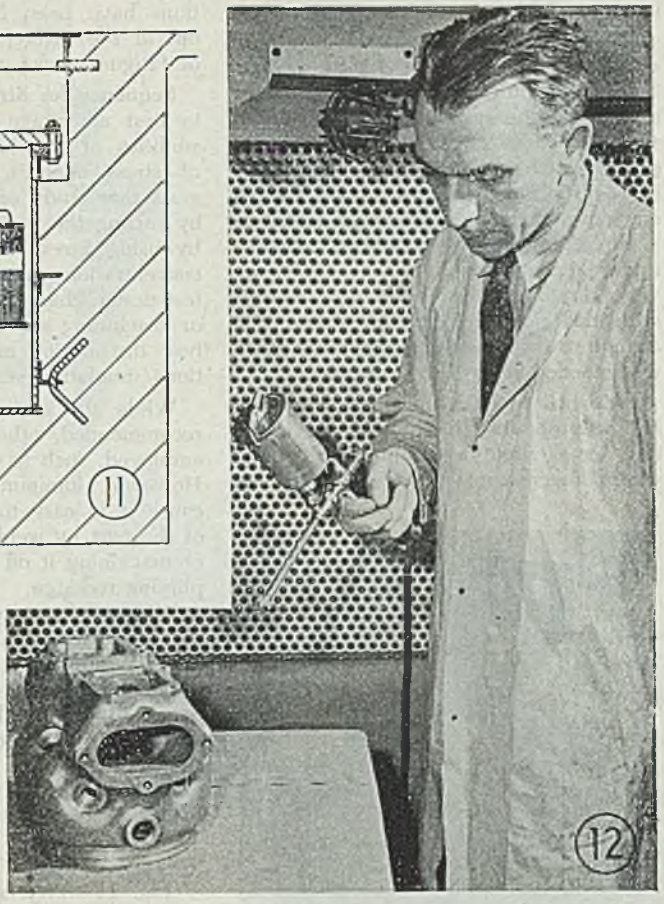
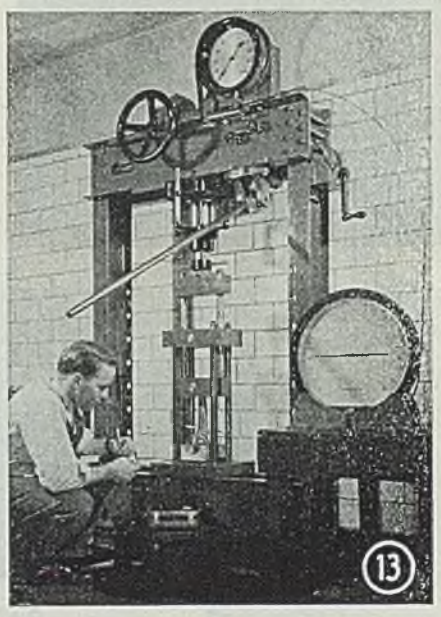


Fig. 12—Stress laboratory spray room features powerful exhaust system to remove lacquer vapors which are poisonous and explosive. Alcoa photo

Fig. 13—Measuring strains by means of Stresscoat and photoelectric extensometer in stress laboratory of Alcoa's development division



REMEMBER. . . .

STRESS refers to force, is measured in pounds per square inch.

STRAIN refers to deformation or change in dimension produced by applicatton of stress and is measured as a fraction of an inch, per inch.

ated that design short-cuts permitted the brittle lacquer method of stress alysis have made it possible for new ternal combustion engines to be de-gned and pass their type tests within a gle year, whereas conventional meth-ds have required as long as 20 years developed the same advanced designs. Gas turbine impellors, airplane turbo-perchargers and similar turbine equip-ent have been greatly advanced by plication of Stresscoat in stress an-ysis work. Important savings in de-lopment time are also reported.

Up to the beginning of World War II, ny fatigue tests have been run on ll models due to lack of facilities to st full size unit. But recent years ve seen the fatigue testing of full ze units. Connecting rods for internal combustion engines, for example, are utinely fatigue tested to failure on pres-nt-day equipment, such as the units in e Alcoa laboratory described in the ter part of this article.

Many Advantages: The method is ceptable to controls whereby strains n be determined within an accuracy of plus or minus 10 per cent. The method is fairly simple and the processing can be done rapidly. Accurate interpretation of results is comparatively simple.

In addition, photographs can easily be made of the stressed samples, affording permanent record of the tests.

Fatigue Failures in Compression: Repeated tests on the same sample make it possible to segregate tension and compression strains and analyze them separately, since the Stresscoat coating cracks only when stretched. It does not crack in compression, but when held under compression for several hours, it will take a "set" that will result in cracking to show a measure of compression strains when the loading on the specimen is removed and it "stretches" back to its original dimensions.

This ability to segregate tension and compression strains can be important, as Mr. Anderson reports their experience indicates that not all fatigue failures are due to tensile stresses but that parts can fail in fatigue by compression stresses as well, even though some authorities insist that all fatigue failures are caused by tension and not by compression.

In this connection, Mr. Anderson says, "Our explanation of fatigue failures in compression is as follows: Fatigue failures in compression do not occur at as low a stress as in tension, and may always require at least microscopic plastic deformation. This plastic deformation occurs as slips on planes approximately 45° with the axis of a specimen carrying axial compression and is generally located at the surface of the specimen. Such microscopic slip then would be progressive and would finally cause

macroscopic deformations to be produced.

"These deformations may result in either of two types of fractures; one, a localized bulging or the formation of a ridge on the specimen, and the other, the formation of small wedge-shaped pieces which are forced out of the side of the specimen. Fig. 8 shows fatigue crack produced in a specimen tested in a direct stress fatigue testing machine under repeated compression. We are very certain that in none of our tests with this machine did the stress ratio change so that tension was applied when we intended it to be compression."

Evidence to back up this explanation has been obtained in study of specimens that have failed in compression fatigue where macroscopic wedge-shaped sections have been found actually forced out of the surface of the part at edge of fatigue cracks, reports Mr. Anderson.

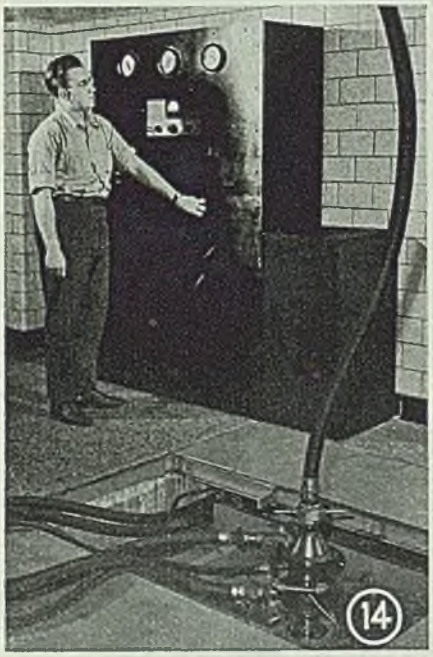
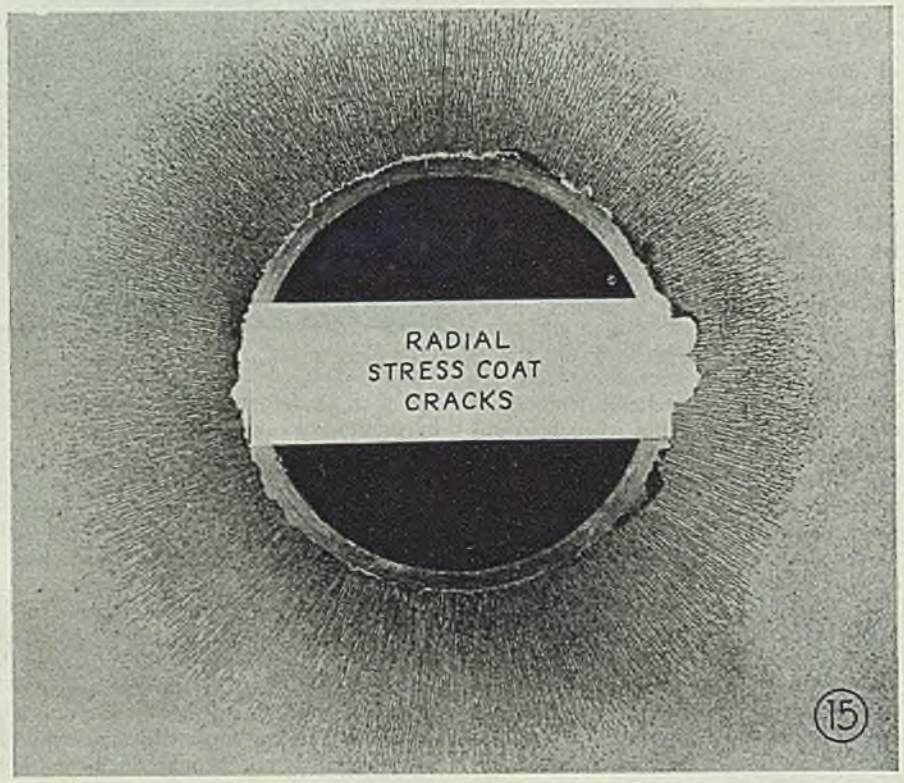


Fig. 14—View of Alcoa whirl pit with special air turbine that revolves specimens at speeds up to 60,000 rpm. Work is suspended from turbine shaft. Control panel in background

Fig. 15—Radial Stresscoat cracks indicating tangential stress as a result of centrifugal forces set up in a rotating disk tested in the whirl pit, Figs. 11 and 14. Alcoa photo



Sequence for Stress Analysis: To use to best advantage the time-saving possibilities of the brittle lacquer method of stress analysis, Mr. Anderson suggests that study of a new design begin by casting the part in aluminum. Then by using Stresscoat, areas where stress concentrations exist are located and the test design changed by welding on metal or machining off as required to obtain best distribution of stress under conditions simulating service loading.

While the cast aluminum sample is recommended, other materials could be employed, such as iron, steel or bronze. However, aluminum is recommended because it is easy to change the contour of the part by welding on more material or machining it off as desired, thus simplifying redesign.

Wherever service loads are known, they are used as a basis in making the test. Where not known in amount, the direction at least is known. So it is possible to apply a load on the test specimen, find weak spots and strengthen or change the design to correct the condition.

Can Predict Failures: After the preliminary redesigning has been done in this manner with Stresscoat, further testing with extensometers and strain gages is greatly facilitated because the coating will already have shown where stress concentrations exist. In fact, cracks in the coating not only show the location but the direction of the principal strain. This makes it possible to locate two strain gages so that when tested, one gage will show maximum, the other minimum strain. From these two values, indicated stress can be computed easily.

This is a valuable feature for it permits use of only two strain gages in place of a strain rosette (a group of three or more strain gages) required where the direction of maximum strain is not known.

Extremely Small Gage Length: Because Stresscoat permits quantitative as well as qualitative determinations, it is extremely useful in giving strain indications on irregularly shaped surfaces or on small or confined areas where it is not practical to use conventional strain gages because of these shape or space limitations. Mechanical strain gages require an appreciable space to work in since their readings are obtained by mechanical amplification through leverage systems, thus limiting their adaptability.

Where a gage length of ½-in. or greater is available, the Huggenberger type of strainometer can be used. For shorter gage lengths down to 1/16-in. the photoelectric strain gage developed by General Motors Research Laboratories is suitable.

Resistance wire strain gages similar to the Baldwin Southwark SR4 are practical for gage lengths as short as ⅛-in. and new gages of this type are being developed for still shorter gage lengths. See Fig. 9.

Stresscoat, on the other hand, offers a minimum gage length much smaller than any other method. Mr. Anderson reports successful use where there is only 0.008-0.010-in. clearance. This is the smallest practical instrument in commercial use as no other method of gaging strains can operate in such a confined space, it is said. Nearest approach to it in shortness of gage length is the photoelectric extensometer which utilizes a 30,000: 1 ratio to get readings in a minimum gage length of some 0.060-in.

High Sensitivity: In early attempts to locate stress concentrations, mill scale, a coat of plaster of paris, paints and certain lacquers were tried. However, these were not sensitive enough to give indications while stressing the part in the elastic range. It usually was necessary to increase the loading until the part distorted in the plastic range in order to get an indication. And of course such indications might be quite different than those occurring in the elastic range.

With Stresscoat, normal range of sensitivity is such as to show indications of strain of only 0.0005-0.0006-in. per inch, maximum sensitivity is around 0.0004—that is, the sample need only stretch

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A farmer on a tractor platform . . .

A policeman on a manhole cover . . .

The Captain on the Bridge . . .

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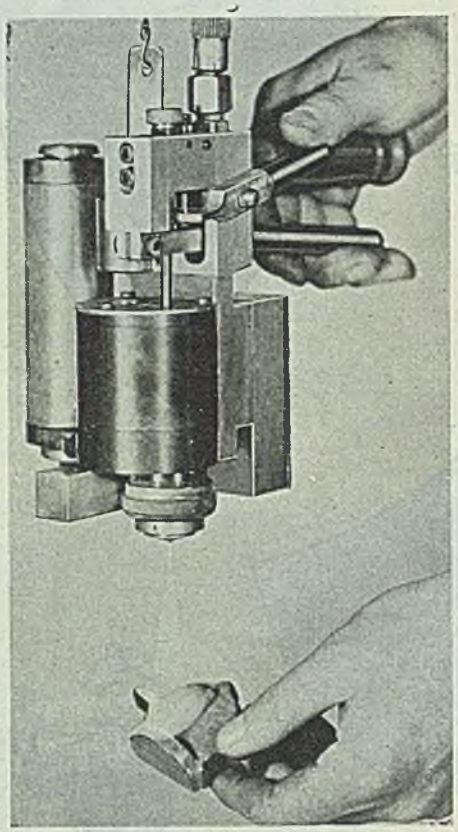


ALLOY SPRAYER: Either intermittent or production spraying of selenium rectifier cells and disks, coating wood patterns, and work requiring spraying with finely atomized metal is made possible by this unit, which melts and sprays metals and alloys from 100 to 600° F. The sprayer, made by Alloy-Sprayer Co., Ann Arbor, Mich., has three-stage spray control, with varying degrees of fineness, coarseness or rate of pour. Although designed for spraying downward, being suspended on a chain or similar support, it can be swung out to spray almost horizontally

that much of an inch in a total length of an inch. Not only that, but the sensitivity is controllable over a considerable range, so it can be adjusted to that desired.

It is not practical to use greater sensitivities than these because the brittleness of the coating is affected by temperature and humidity changes. (A temperature rise of 8°F may increase the strain required for rupture as much as 0.0010-in. per inch.) If greater sensitivities are attempted, the coating is likely to develop fine hairline cracks in all directions (known as crazing) due to excessive internal stresses set up in the brittle coating as its contraction is greater than that of the metal.

Accurate Calibration: At the same time the specimen is coated, a set of calibration bars is also given an application of Stresscoat and dried under identical conditions of temperature and humidity as the test specimen. After drying, the calibration bars are placed in a special fixture and deflected a predetermined amount by means of a cam as shown in Fig. 5. Result is a crack pattern is formed, graduated as to crack spacing and conformity of pattern. With bar length, thickness and deflection known, tensile strain at every position along the surface can be determined. In actual use, this is determined directly by placing the bar in the Stresscoat strain scale calibrated to the test conditions and shown in Figs. 3 and 5.

By matching crack spacing in the calibration bar with similar crack spacings on the specimen tested, it is possible to accurately determine strains in the specimen. It is not difficult to obtain imposed strain values within plus or minus 10 per cent of indicated values, reports Mr. Anderson.

Wide Application Range: The fact that Stresscoat indications are effective in extremely short gage lengths means that the method is suitable for investigating small springs, levers, gears and the like—parts whose size makes application of conventional strain gages impractical. Its use on small springs and instrument parts with crack comparison done under the microscope is proving exceptionally valuable in revealing stress information heretofore inaccessible.

At the same time, large size is no limitation for the method has been employed successfully on even the largest locomotive parts. In studying rail tracks and bridge elements, Stresscoat is applied, and after the desired drying interval, a train is run over the track section to provide the stresses. Subsequent study is reported as yielding results obtainable in no other way.

What Is Stresscoat? Brittle "lacquers" may be made from limed K wood resin dissolved in carbon disulphide. Addition of plasticizers during formulation adjusts the strain required to rupture the film to the range of temperature and humidity values to be used in the tests at hand. Being a brittle resin treated lacquer, the coating formed is very brittle, the resulting crack sensitiveness providing the ability to show up minute movements of the metal surface to which it is applied, and so making it extremely useful in strain measurements.

Some 12 different standard formulations of Stresscoat are available, each particularly suited to a specific range of testing requirements.

Practice At Alcoa: Because Stresscoat has been used with such excellent results at the Cleveland Research and Development laboratory of the Aluminum Co. of America, the technique employed there is worthy of a detailed description. This laboratory has done outstanding work in developing and testing aircraft engine components, especially cylinder heads, pistons, wrist pins, connecting rods, crankcases and the like.

Facilities there include many machines designed and constructed especially for this laboratory. Some of the most interesting are described further on in the article.

Preparing the Surface: It is important that the surface be perfectly clean, for the "short oil" lacquer is "crying" for plasticizer. Any wax, oil, etc. acts as plasticizer. Even fingerprints contain enough oil to affect the cracking characteristics of the coating. So Alcoa employs a careful cleaning sequence starting with rough cleaning with normal solvents to completely remove dirt, paint, etc. Final cleaning is done with Stresscoat thinner itself. All handling is done by workmen wearing clean canvas gloves to leave no marks on the work. Bare hands must never touch the specimen as every fingerprint may show in the stress pattern.

Next step is to spray on a thin coat of Stresscoat undercoating, containing fine powdered aluminum. See Fig. 1. This coat is very thin, barely thick enough to cover the metal. Its purpose is to serve as a reflecting medium to make cracks in the Stresscoat more easily seen and so aid their interpretation.

Then a Stresscoat formulation chosen to best meet the conditions encountered is sprayed on the specimen. Since the vapors are poisonous and explosive, the spraying is done in a booth having exceptionally strong suction in the ventilating system, assuring effective exhausting of all vapors.

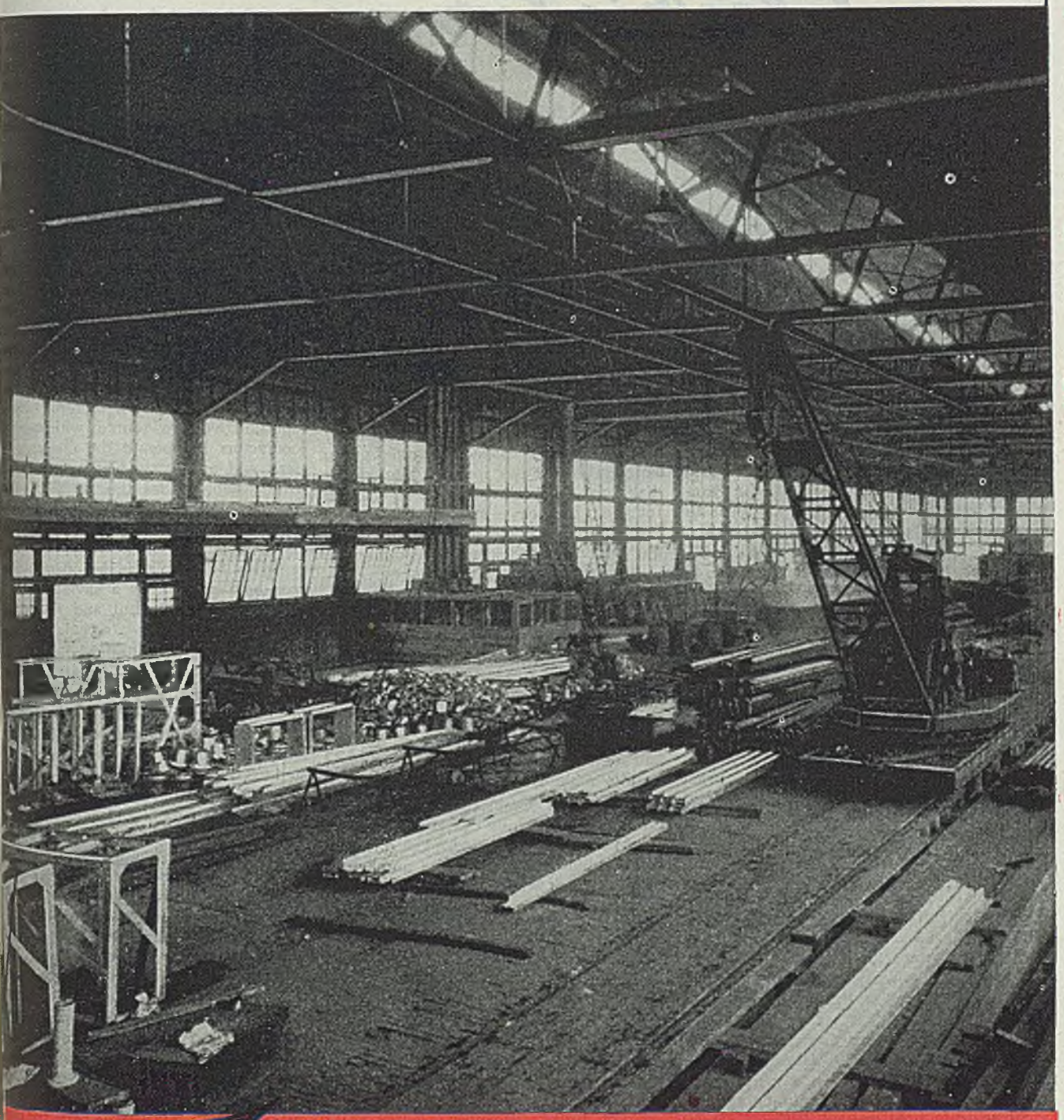
Coat must be fairly uniform as thickness influences cracking characteristics. Minimum distance between cracks is approximately five times the coating thickness. This influences selection of coating thickness to be used. Coating thickness range is from 0.003 to 0.008-with 0.005-in. generally regarded as the optimum. A long extension nozzle is used on the spray gun, Fig. 12, lacquer being applied in short spurts of the gun.

Air for the spray gun is obtained from the normal plant air supply but is especially filtered and fed through exceptionally accurate pressure controls to assure uniform spraying. Pressures used range from 12 to 25 psi, the pressure for a particular job being determined by experience.

Drying Is Critical: Precise control of temperature and humidity in drying and testing is essential since the coating is extremely sensitive to slight changes

(*Please turn to Page* 150)

A SECTION OF THE WORLD'S LARGEST and Fastest JOB GALVANIZING PLANT



In the heart of the STEEL INDUSTRY

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Pittsburgh, Pennsylvania

Electric Furnacemen

Exchange Ideas on Shop Practice

Preparation of scrap affords recovery of alloys and removal of tramp elements. Savings in operating time, power, and cost and maintenance of electrodes are attributed to automatic electrode control. Less erosion at the joint in ladle linings is reported by laying brick dry without clay dip

PITTSBURGH has been chosen for the fourth annual Electric Furnace Steel Conference sponsored by the Electric Furnace Steel Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, to be held December 6-7, 1946. Attendance at this year's conference at Hotel Statler, Cleveland, Dec. 4-5, was 450 compared with 569 last year and 429 in 1943, the decrease being attributed to adverse transportation conditions.

Important details of basic electric furnace practice brought out at the various technical sessions are as follows:

Preparation of Scrap: This is important according to G. A. Barker Jr., Bethlehem Steel Co., because it permits large recovery of molybdenum and nickel with a saving, affords the removal of tramp elements such as copper, tin, lead, etc., and insures against high incidentals. Turnings at the speaker's plant is sampled like coal. They are melted in an induction furnace, cast into ingots, drilled and analyzed. Preparation of scrap includes shearing, torch cutting for large cumbersome pieces, blasting for heavy castings, crushing or tearing stringy turnings, bundling of light scrap, briquetting, burning to embrittle stringy turnings and breaking of skulls with a large steel ball. Charges made up of 50 per cent heavy melting, 30 per cent medium melting and 20 per cent light melting scrap give sufficient weight for the maximum production with one loading. Turnings are limited to 10 per cent or less of the charge. Heavy melting scrap is charged first followed by medium and light grades. It is essential that the heavy scrap be kept on the bottom of the furnace, the speaker pointed out.

H. B. Schultz, Superintendent Electric Furnaces, Carnegie-Illinois Steel Corp., South Chicago, Ill., in explaining his practice when making alloy steel stated that 50 per cent of the heavy melting scrap is charged on the bottom followed by 70 per cent of the light scrap. Power then is applied and later 30 per cent of the light scrap is back charged. On stainless grades the speaker pointed out that light 18-8 stainless steel is charged followed by heavy stainless slabs, and then ordinary low-carbon scrap. After the meltdown 18-8 scrap is back charged.

With high-chrome alloys, the presence of lead, tin and zinc is dangerous as pointed out by H. M. German, Metallurgical Assistant to the President, Driver-Harris Co., Harrison, N. J. Whenever lead goes up around 0.003 per cent, it gives trouble. The lead content in nickel scrap must not exceed 0.0025 per cent to avoid difficulties. Scrap should be dry and free from rust and scale to avoid trouble with hydrogen.

Charging of Scrap: Consensus of opinion is that with chute charging, the scrap must be carefully selected. Use of heavy loaded chutes cuts down the number of lifts by crane which otherwise are necessary.

When loose turnings are charged, the recovery at one plant is 85 per cent. At another plant where tungsten turnings had been set afire and rendered into a solid mass, this was mixed with calcium tungstate and charged and the recovery was around 92 per cent.

Where briquetted turnings are charged, the recovery is about 94½ per cent.

C. W. Briggs, Technical Advisor, Steel Founders' Society of America, Cleveland, stated that the Germans were using fast melting on their 18 to 40 ton electrics, the entire charge being made up of light scrap and turnings. The furnaces were rotated manually through 30° from the horizontal in order to obtain a larger area for the electrodes to go through the scrap and thus prevent melting along the electrodes. The central opening to the bottom of the furnace was larger and the scrap was rocked toward the center of the furnace. Another speaker pointed out that the Germans did not use as much transformer capacity as employed under American shop practice.

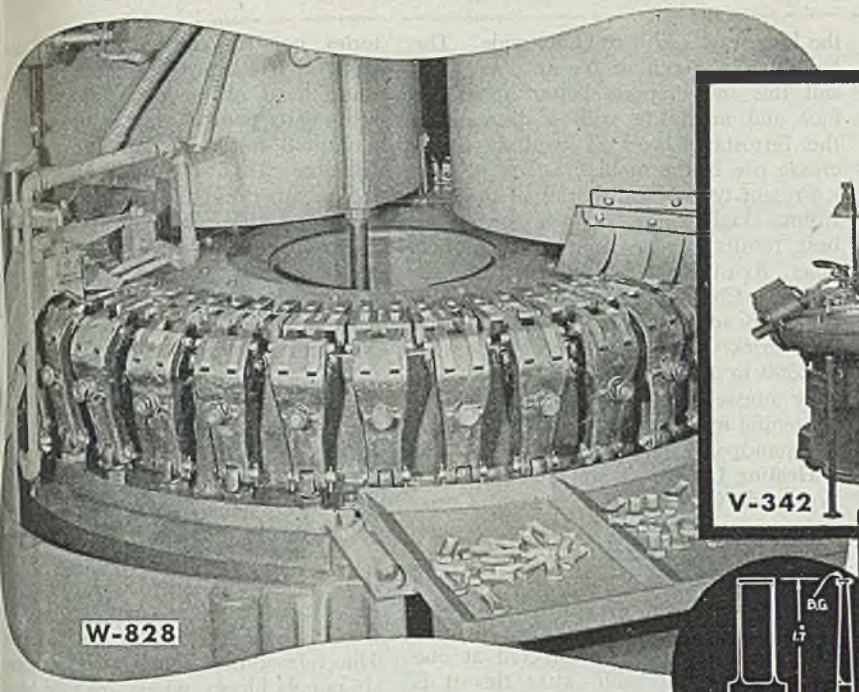
Operating Results with Automatic Electrode Control: At one electric furnace shop where three furnaces are equipped with automatic electrode control, a saving of 5 kwhr per ton and per cent in the overall time is reported.

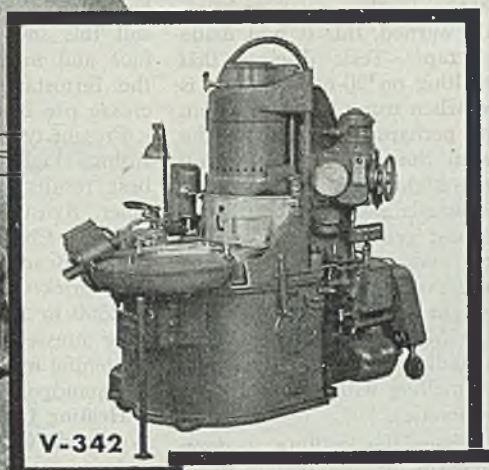
A comparison between an old style balanced beam type of control using constant voltage source with reversing contactors to operate the electrode motors, and a new type of automatic control which applies the variable voltage to the electrode motors was presented by W. J. Reagan, Copperweld Steel Co., Warren, Ohio. On one test, he reported a saving of 23 min in the operating time per heat as well as a saving in power of about 2½ per cent and in electrode consumption of 5½ per cent.

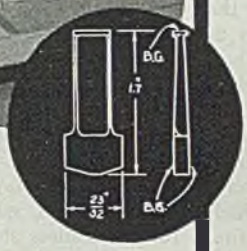
At a plant in the Buffalo district where 5-ton furnaces are on automatic control, the time saving ranging between 8 and 9 per cent and the power saving between 5 and 6 per cent. Electrode consumption and maintenance costs were reduced. At another plant, automatic electrode control afforded 26 per cent longer life in roofs and linings. A steel foundry in the Chicago district reported a 6 per cent saving in kwhr per ton, a pickup of one heat in 18 hr, a 7 per cent lower kilowatt demand and a reduction in the maintenance cost.

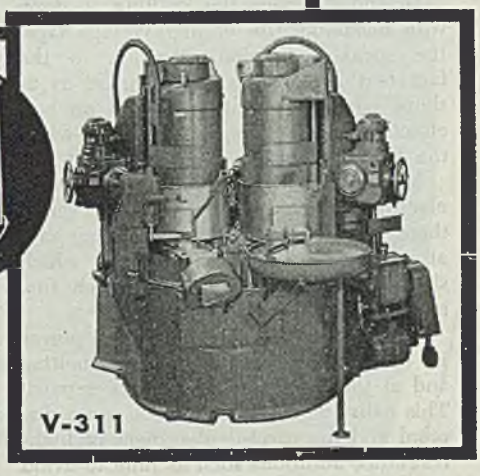
Power Control from Melter's Standpoint: H. W. McQuaid, Manager, Process and Development Division, Republic Steel Corp., Cleveland, suggested that the electrical department should determine for the furnace operator the maximum economical arc amperage for a given tap, and set the controls so that the given furnace can be supplied with the maximum possible power from the transformer. In many cases, he continued, the electrician bends over backwards in an effort to prevent overloading of the transformer. However, more output could be obtained from many of the furnaces without sacrificing arc power.

Importance of the proper voltage tap selection for fast melting was emphasized by the speaker. High voltage is of value to force the current through high resistance scrap and the tap selection should be governed by the type of scrap and its disposal in the furnace. For best results, Mr. McQuaid stated, heavy scrap is best charged near the bottom and cen-









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ter of the furnace and light scrap last. Where recharge is the usual practice, Mr. McQuaid warned, this is best made from light scrap. Tests disclose that the fastest melting on 20-ton furnaces is accomplished when using No. 5 tap from the start with perhaps No. 4 tap for the first ½-hr until the electrodes are well down. If the highest tap is used with the highest possible power input to the arc then the heat generated will be over a greater area and will be more intense with a resulting speedup in melting. A recharge of light scrap will protect the roof from the high-voltage arc and the walls may actually pay dividends in promoting faster melting without an adverse effect in refractories.

In shops where the melting is done with maximum use of high-voltage taps, the speaker directed attention to the fact that roof life is just as good as in shops where great stress is laid on bad effects of high taps on roof life when the bath is formed.

Mr. McQuaid found that for every electrode circle and with usual scrap, there should be the fastest melting rate at a certain minimum voltage which should be determined to suit each furnace and its power connection.

The operator should get as much power in the arc as possible during melting and at the least cost for furnace repairs. This calls for careful study of scrap disposal and the careful placement of high-resistance additions such as lime to avoid the cost of overcoming this resistance. In conclusion, the speaker pointed out that the use of light scrap recharged to protect the sidewalls and the roof calls for study as well as the maximum amperage for heating the bath.

Ladles: Shop practice at various plants discloses that bottom courses of refractories determine the lining life. Laying brick dry without clay dip gives a better joint and less erosion at the joint. At the Copperweld Steel plant ladles of the following dimensions are used: At the top, 9 ft 5 in. the long way, and 7 ft 8 in. wide; at the bottom, 8 ft 8 in. the long way, and 6 ft 11 in. wide. The ladle has a depth of 6½ ft. As a result this shop reports better ingot surface and mold life with a decrease in the ferrostatic head as well as a decrease rise in the mold.

Present type of ladle brick of the low-fusing, high-expansion type gives the best results in the opinion of Gilbert Soler, Assistant General Superintendent, Quality Control Department, Timken Roller Bearing Co., Canton, O. Any ladle brick with a 40 per cent expansion at 2500 to 2600° F is satisfactory. Mr. Soler stressed the importance of physical tightening up of joints by expansion from the standpoint of ladle brick life.

Heating Ladles: Practice at the South Works of Carnegie-Illinois Steel Corp., Chicago, as explained by H. B. Schulz, Superintendent Electric Furnaces, is not to have the ladles seemingly hot before tap but merely dry. Heat is applied for 1½ hrs before tap. During the first half hour, the flame is directed at one side of the ladle well; after this it is placed over the well. Care should be exercised to have an oxidizing flame; otherwise soot will result and this is harmful to stainless steel. Newly lined ladles are subjected to slow heat for 10 hrs in order to avoid spalling and damage to the ladle brick.

E. J. Chelius, Superintendent Electric Furnaces, Carnegie-Illinois Steel Corp., Duquesne, Pa., adheres to the following practice. The ladles are scraped with a wire brush before taken to the upright stand immediately after the cast of a heat. A fan is employed to permit the man to get into the ladle as early as possible. Nozzles are preheated at 450° F. They are set in place, rammed with loam and this is followed by facing the well. About 3 in. of sillimanite is employed. The well then is cut out with a mallet and cleaned. Beneath the ladle a gas burner with a low flame fires through the nozzle which acts as the chimney.

A. J. Scheid Jr., Chief Metallurgist, Columbia Tool Steel Co., Chicago Heights, Ill., in speaking on ladle refractories, pointed out that most tool steels have high fluidity and because of the static head of metal in the ladle, the first ingots poured may come up in the mold too fast and thus set up a turbulence. High ferrostatic head in the ladle can cause cutting of mold bottoms and thus result in poor life and inclusions in the steel. Increasing the diameter of the ladle and making it cylindrical shaped instead of tapered, will remedy the difficulty caused by static pressure.

The speaker explained that in changing from 4 to 7-ton heats ferrostatic pressure in a large ladle is no greater than in smaller ladles. Such a change over resulted in reduced turbulence in the molds, increased mold life and afforded metal of increased cleanliness and soundness.

To secure this advantage, the speaker stated, refractories were utilized that would be impractical in tapered ladles. The refractories being used at present are cupola blocks, which are hard burned and dense fire brick. This material, the speaker pointed out, has high resistance to metal and slag washing. Because of the size, the amount of joint area is considerably reduced. The speaker asserted that the use of this material has increased ladle lining life by about 3 per cent. In the speaker's opinion rammed ladle lining of basic material appears to offer additional benefits.

Sleeves and Nozzle Refractories: Morriss Corbman, Refractory Engineer, Bethlehem Steel Co., Bethlehem, Pa., did not consider high alumina refractories practical for ladle nozzles inasmuch as they do not soften until they reach a temperature of about 3000° F. He pointed out that the range of apparent porosity of high alumina refractories is from 18 to 23 per cent; the porosity of clay nozzles range from 11 to 15 per cent. The denser the nozzle, he stated, the more mechanical strength the nozzle will have. However, he warned that where the nozzle is too dense (less than 11 per cent) its resistance to thermal shock is decreased so that spalling and cracks in the nozzle result.

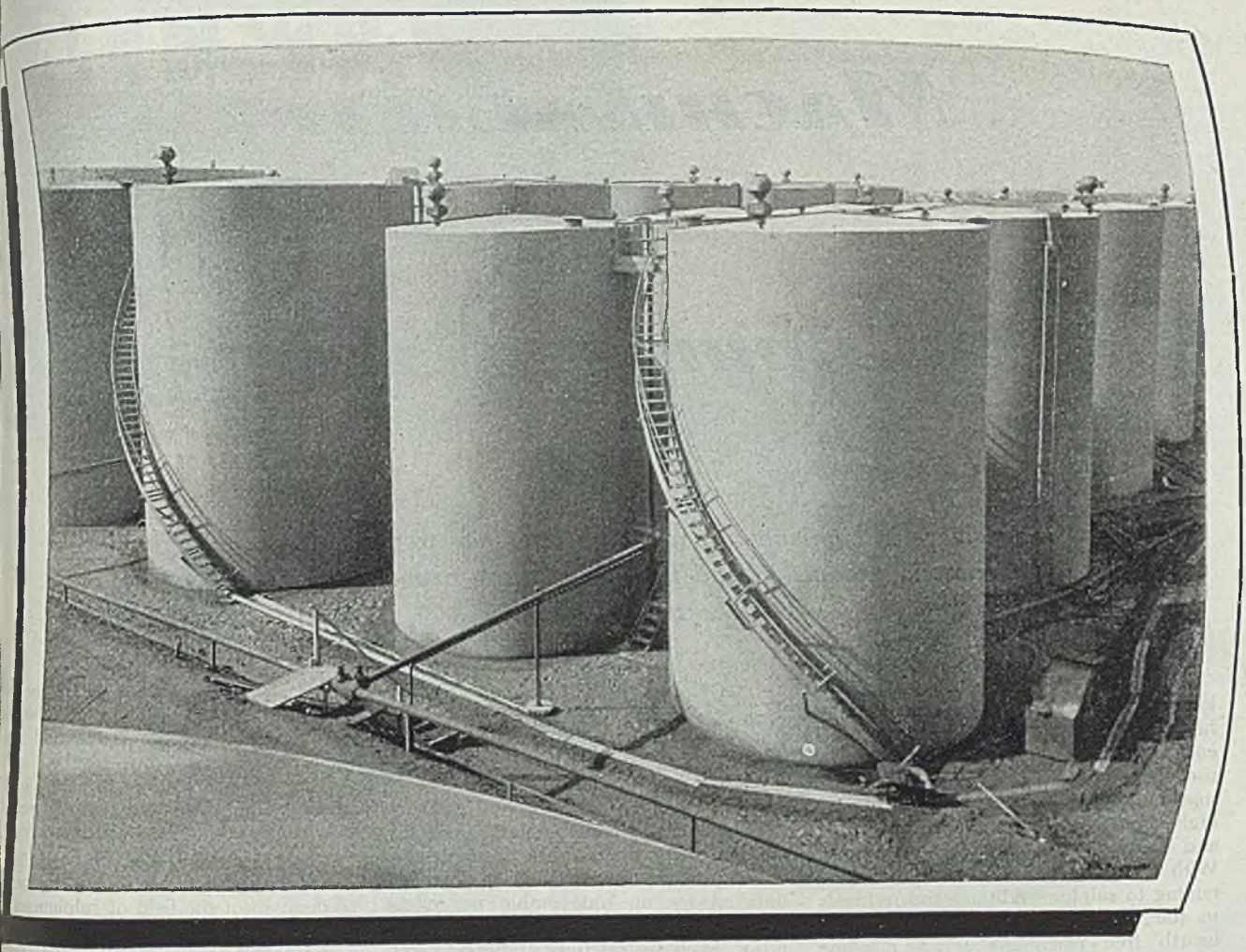
For all purposes, clay nozzles of more over PCE23 (2876° F) porosity ranging from 11 to 15 per cent, are satisfactory. Nozzles made of magnesite are mechanically weak and have poor spalling resistance. The speaker recommended that sleeve refractories should be at least PCE26 (2900° F) as dense as possible without spalling.

Sleeves of porosity between 11 and 15 per cent have given better results than those greater than 15 per cent porosity. He warned that spalling occurs when the porosity is below 11 per cent because of high density.

Successful practice resulted when using sleeves made by mixing clay with a certain per cent of carbon and burning in a reducing atmosphere. One about half as much erosion occurs with a standard sleeve. Carbon retar

(*Please turn to Page* 160)

WIRE CORD TIRE: Four plies of medium carbon steel, hard drawn wire replace 10 plies of rayon cord in this tire developed by Firestone Tire & Rubber Co., Akron, for heavy-duty truck and bus use. Individual wire filaments are 0.0058-in. in diameter, and usual construction is 7x3—three filaments twisted together to form a strand and seven strands twisted to form a cable. Tests indicate 200 per cent greater strength than rayon, and tire runs about 30° cooler because of thinness due to high cord strength and quicker dissipation of heat



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Machinability of Sulphurized Steels

Experience in high speed machining of sulphite treated alloys shows that increases in production and tool life may be expected with this form of sulphur addition

By H. M. CLARKE
Metallurgical Engineer
Bliss & Laughlin Inc.
Harvey, Ill.

REQUIREMENTS of management for lowered direct costs and increasingly higher quality parts has forced serious consideration and eventually increased use of sulphurized alloy steels for many machining applications — particularly high speed screw machine consumption, and shaving and hobbing operations. With the existing background then pertaining to sulphur additions and residuals to the well-known Bessemer and open hearth free-machining screw machine steels, it was only natural that sulphur became one of the more widely used additives (though lead, selenium and others were also used) to alloy steel for the purpose of improving finish, or increasing production and tool life.

Since the sulphur content generally credited with imparting the desirable machining characteristics was also generally indicted for an unfavorable net effect upon heat treatment and resultant properties, such as ductility, fatigue, notch sensitivity and the like, production of sulphurized constructional alloy steels tended to maintain the total residual and added sulphur close to or within the maximum sulphur content considered commercially permissible and reproducible for alloy steels. These limitations of sulphur co tent—commonly specified at 0.040 p cent maximum, often 0.045 and som times 0.050 maximum—resulted in t drafting of specifications imposing a ma imum sulphur content usually varyi between 0.060 and 0.080 per cent f sulphurized alloy steels.

Eventually, technical and commerc recognition of the field of sulphurized loy steels resulted in maximums of 0.0 and 0.100 per cent sulphur and appl able price extras were established.

These apparently insignificant sulph additions, as compared to sulphur rang commonly specified for free machini steels (0.10-0.15 per cent for C-111 0.16-0.23 per cent for B-1112, etc drew the increased attention of ste manufacturers and users alike to the fe tures of particle shape and size, and d persion and composition of the total (re idual plus additive) included sulph In turn, the manufacturers' efforts to d velop new or improved means of sulph additions to accomplish or satisfy desir conditions of particle shape, size, co position and dispersion, resulted in a ho of special practices, secret methods a patented or patentable inventions relati to the addition of sulphur in one form another to alloy or carbon steels.

Typical of these are the two patent methods covering the addition of m lybdenum-sulphide[1, 2] and claiming as result of their use, an extraordinarily u form distribution of desirable sized a shaped sulphur particles. Other metho of sulphur addition, including some n patented, likewise presumed special me and desirable results.

With the advent of World War I greatly intensified demands for produ tion of alloy steel and fabricated parts any cost or price stimulated past effor to improve the machinability of allo steels. Again, sulphur additions we utilized, but in one instance in a novel not new manner.

Sulphur introduced by means of a

TABLE I

CHEMISTRY	C	Mn	P	S	Si	Ni	Cr	Mo
NE-8640	0.38-0.43	0.75-1.00	0.040 Max.	0.040 Max.	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
NE-8640 (Stick S)	0.36	0.83	.021	0.044 (check 0.043)	0.27	0.55	0.54	0.22
NE-8640 (Sulphite)	0.38	0.81	.031	0.040	0.24	0.46	0.47	0.18

Grade:	NE-8640	NE-8640 (stick sulphur)	NE-8640 (sulphite treated)
Quantity:	Production	1800 lb (a)	2700 lb (b)
Bar size:	0.968-in. Rd.	0.968-in. Rd.	0.968-in. Rd.
Structure:	Annealed to 70% min. lamellar pearlite and C.D.	Annealed to 70% min. lamellar pearlite and C.D.	Anneale to 70% min. lamellar pearlite and C.D.
Approx. BHN:	212-229	212-229	212-229
Part machined:	Standard screw machine part (1.2 in. long)	Standard screw machine part (1.2 in. long)	Standard screw machine part 1.2 in. long)
Type machine:	1¼ in. Gridley (4 spindle)	1¼ in. Gridley (4 spindle)	1¼ in. Gridley (4 spindle)
Cycle (sec):	33	25 (c)	22
SFM:	88	111	111
Tool life: (Critical Opr.)	2½ hr per grind (form tool)	3¾ hr per grind (form tool)	5 hr per grind (form tool)
REMARKS:	Practice established on NE-8640 over two years production	12% increase in production of parts accompanied by 50% increase in tool life	50% increase in production accompanied by 100% increase in tool life

(a) Fifty-two bars or 13 machine loads.
(b) One hundred and eighteen bars or 29 machine loads.
(c) Cam setting same as for NE-8640 sulphite treated; however, as initial machine load indicated short tool life was to be expected, reduced feed adjustments were made resulting in longer cycle.

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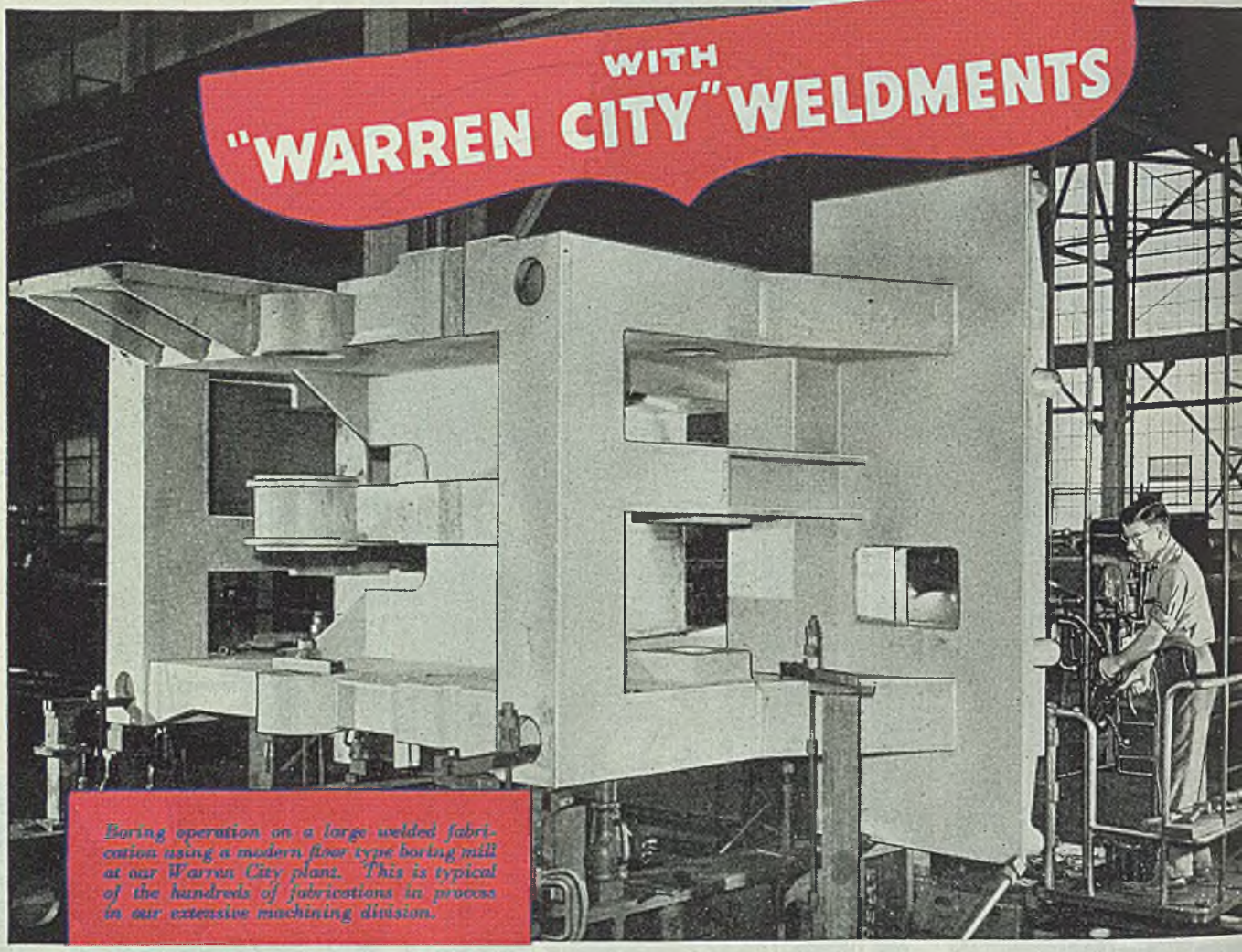

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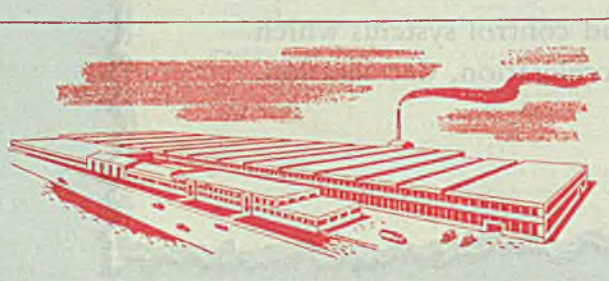
Our ability to redesign heavy steel castings of many types into practical, modern weldments has effected vast savings in weight, bulk and cost, plus substantial gains in strength, production speed, freedom from flaws and ease of testing.

Indicative of our high standards of quality was the recent comment of an extensive user to the effect that Warren City weldments were the finest he had ever seen. Despite outstanding quality our prices are competitive.

Our cooperative engineering staff will gladly help with any problems from product development to quantity production without obligation to you. Call, wire or write us details of your problems.



WARREN CITY MANUFACTURING COMPANY ★★★

DEPARTMENT D

WARREN, OHIO

Wholly Owned Subsidiary of
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ydrous sulphite[3, 4], as compared to e more conventional stick or sulphide dditions, has resulted in claims and re- rts of not only the usual improvement machinability and finish of parts fabri- ted from steels so treated, but in a eel of more normal rolling characteris- s as compared to other sulphur earing steels which are considered ore or less troublesome in rolling. A urth advantage claimed is that a tool fe greatly superior to that normally ex- ected for an equivalent sulphur con- nt may be experienced.

The basis of this last advantage is the vidence that decomposition of the sul- hite upon addition to either ladle or mold sults in a washing action of the steel d a consequent removal (in the slag) f considerable amounts of refractory brasive) inclusions. Both slag analysis d reports of increased tool life in ma- hining are said to support this belief.

Some recent experience in machining lphite treated alloys has been quite vorable, both as compared with un- eated and stick sulphurized steels. A pical example is shown in Table I.

Reduction In Cycle

Preliminary experimental machining ork done on the example of sulphite eated steel reduced the cycle from 33 27 sec on one machine load of 4 bars; d indicated that a further substantial duction in the cycle could be made. he foregoing results were obtained after several hour period of cut and try for ditable cam adjustment to allow both measurable increased tool life and a ecreased cycle. Subsequent production as eased the cycle somewhat with a oss increased production of parts of bout 30 per cent. Tool life, however, emains doubled and the overall efficiency as risen sharply.

Results obtained on the run of stick lphur treated steels compare favorably ith the exception of tool life where omparison with the sulphite-treated trial ould appear to support the contention of e patentees that increased tool life ay be expected as a result of the removal refractory materials.

A second example, Table II, of screw achine experimentation with sulphur- ed alloy brought out that like increases tool life could be expected with sul- hite treated alloys over non-sulphurized eel in another typical National Emer- ency analysis. These two lots were run sequence in the same bank of machines d resulted in an indicated increase in art production of 38 per cent and an in- ease in form tool life of over 300 per nt; drill life improved over 100 per nt.

Efficiency of machine operation in the se of the second example was dependent pon drill changes and overall did not crease in an amount which might be pected from a consideration of form ol life and increased production.

By way of comparison the same part as fabricated from a portion of a heat NE-8642 sulphurized with stick sul- ur as shown in Table III. Stick sul- ur permitted increased spindle speeds

TABLE II

CHEMISTRY	C	Mn	P	S	Si	Ni	Cr	Mo
NE-9442	0.43	1.25	0.021	0.031	0.27	0.45	0.42	0.15
NE-9442 ..... (Sulphite)	0.43	1.22	0.020	0.045	0.27	0.45	0.42	0.15

Grade:	NE-9442	NE-9442 (sulphite treated)
Quantity (c):	31,000 lb (a)	6000 lb (b)
Bar size:	0.968-in. Rd.	0.968-in. Rd.
Structure (d):	90% lamellar pearlite	90% lamellar pearlite
Approx. BHN:	187-192	192-202
l art machined:	Standard screw machine part	Standard screw machine part
Type machine:	1 in. Acme (6 spindle)	1 in. Acme (6 spindle)
Cycle (sec):	40	29
SFM:	85	100
Tool life:	7 hr. (form tool)	24-26 hr (form tool)
(Critical Operation)	2 hr (drill)	4-5 hr (drill)

(a) Three hundred and sixty bars or 60 machine loads.
(b) Ninety-six bars or 16 machine loads.
(c) Both quantities of steel were obtained from same heat which had several ingots sulphite treated.
(d) Same furnace cycle and charge for both quantities of steel.

TABLE III

CHEMISTRY	C	Mn	P	S	Si	Ni	Cr	Mo
NE-8642 . .	0.40-0.45	0.75-1.00	0.040 Max.	0.040 Max.	0.15-0.30	0.40-0.70	0.40-0.60	0.15-0.25
NE-8642 (Stick sulphur)	0.42	0.95	0.013	0.043	0.31	0.63	0.59	0.26

Grade:	NE-8642	NE-8642 (stick sulphur)
Quantity:	Production (a)	7695 lb
Bar size:	0.968-in. Rd.	0.968-in. Rd.
Structure:	75% lamellar pearlite, C.D.	75% lamellar pearlite, C.D.
Approx. BHN:	197	202
Part machined:	Standard screw machine part	Standard screw machine part
Type machine:	1 in. Acme (6 spindle)	1 in. Acme (6 spindle)
Cycle (sec):	35 (b)	25
SFM:	88	98
Tool life:	6 hr (form tool)	19 hr (form tool)
(Critical operation)	1½ in. (drill)	2½ in. (drill)

(a) With elimination of 9400 series from list of steels this application was established as NE-8642.
(b) In changing from NE-9442 to NE-8640, production was increased by about 13% without impairing efficiency.

TABLE IV

CHEMISTRY	C	Mn	P	S	Si
NE-1340	0.38-0.43	1.60-1.90	0.040 Max.	0.040 Max.	0.20-0.35
NE-1340 ..... (Sulphite)	0.42	1.79	0.019	0.042	0.30

Grade:	NE-1340	NE-1340 (sulphite treated)
Quantity:	Production	11.000 lb
Bar size:	2.65 in.	2.65 in.
Structure:	Hot rolled (turned, ground and polished)	Hot rolled (turned, ground and polished)
Approx. BHN:	228	231
Part machined:	Pin	Pin
Type machine:	#5 Warner & Swasey (2nd Oper.) 6 in. Straddle Mill	#5 Warner & Swasey (2nd Oper.) 6 in. Straddle Mill
Cycle (sec):	31 min	15 min
SFM:	97	97
Tool life:	Roller box mill 0.0029 in. feed (2nd Oper.) Slot milling 4.25 in. feed/min	Roller box mill 0.0065 in. feed (2nd Oper.) Slot milling 6 in. feed/min

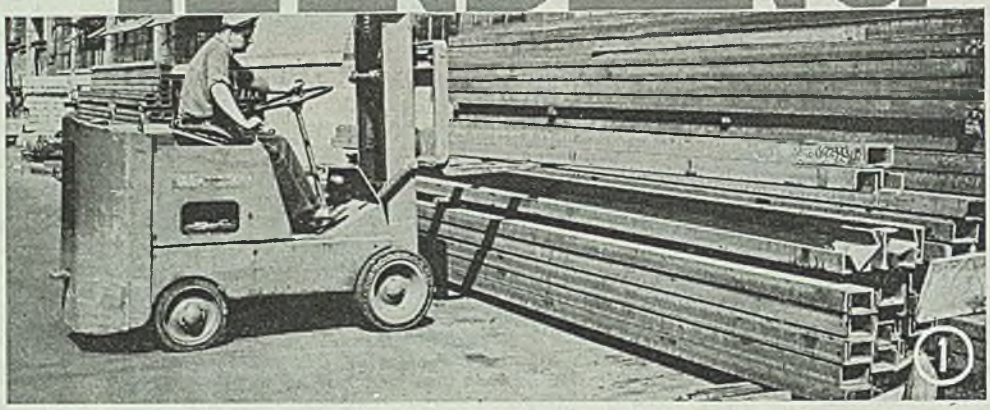
resulting in an increased production of approximately 40 per cent with from 66 per cent (drill) to 210 per cent (form) longer tool life.

A last example of a sulphite treated steel resulted in over 50 per cent increased production on a limited quantity of 11,000 lb of 2.65 in. rounds fabricated as shown in Table IV. Sulphite-treated NE-1340 permitted increased feeds resulting in equivalent tool life, a reduced cycle and increased production of approximately 100 per cent.

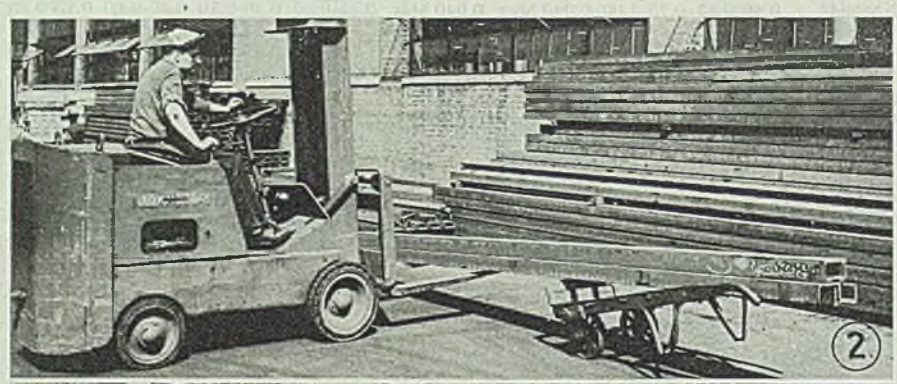
Of the preceding four instances, two have become production applications of sulphite treated alloys, one has been changed to sulphite and/or stick sulphur

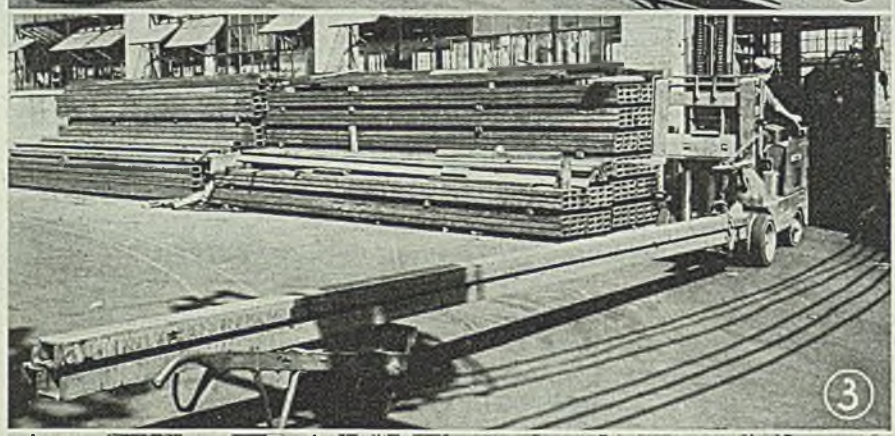
(*Please turn to Page* 162)

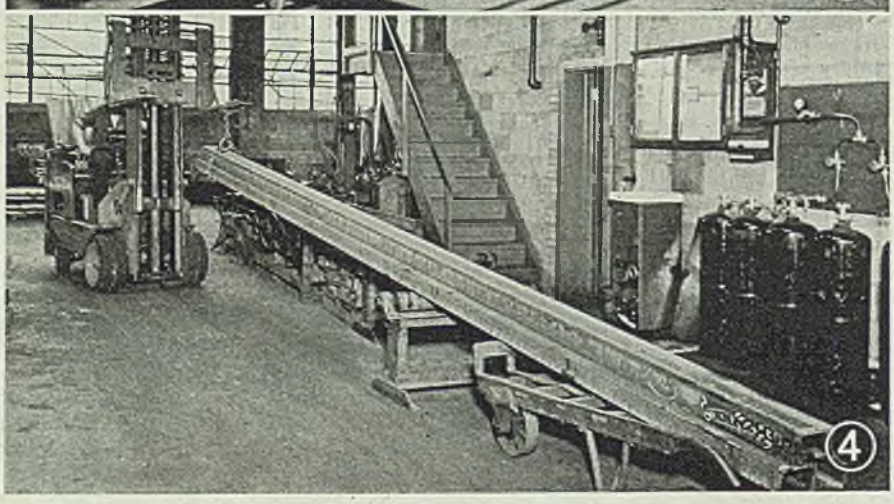
HANDLING Long Loads



Problems encountered in handling long steel channels, bar stock tubing, sheets and similar materials may be surmounted by use of a power truck, a hand truck, and a few simple fixtures







A LONG load is usually a heavy loa This makes it a real problem to handl because (1) the length results in its bei difficult to maneuver through narro aisles and doorways, and (2) a numb of men are required to move it by ha because of the weight.

This problem often occurs in handli lumber, steel bar stock, tubing, pip sheet steel, veneers and plywood. A sol tion has been found in the factory Towmotor Corp., Cleveland, manufa turer of industrial power trucks.

Illustrations show the way a load four 21-ft lengths of 7-in. steel cha nels weighing approximately 1900 are speedily moved about the plant wi less manpower and fewer hazards safety than time and manpower-consum ing hand methods. The Towmot trucks are easily adapted to practical all plant handling requirements.

When the job was done by hand, fo men were required to carry the length one at a time, from the storage area the yard to the roller bed of the flam cutter—a distance of about 100 ft. T slowness and the hazards of such manu handling are apparent.

Figs. 1 through 6 show the prese mechanical handling method, with t power truck bearing the brunt of t burden,. thus greatly speeding up t operation and making it safer.

First of all it will be noted that t truck handles four lengths on each tri a tremendous saving in time. Fig. 1 show the operator picking up a load of four 2 ft lengths. The load is picked up at lateral center so it will balance on t forks.

In Fig. 2 the operator is setting th load down, one end resting on the groun the other on a two-wheel hand truc The next step, not shown here, is one i which the operator or a helper fastens

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Besides requiring less attention, the battery truck is also economical to operate. It uses power most efficiently because it starts instantly, accelerates rapidly, and consumes no power during stops. The current used for charging its battery is the lowest-cost power available.

Because of these inherent advantages, the battery truck is therefore a most dependable and efficient material handling unit . . . especially when powered by Edison Alkaline Batteries. With steel cell construction, a solution that is a preservative of steel, and a foolproof electrochemical principle of operation, they are the longest-lived, most durable and most trouble-free of all industrial truck batteries. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada: International Equipment Co. Ltd., Montreal and Toronto.

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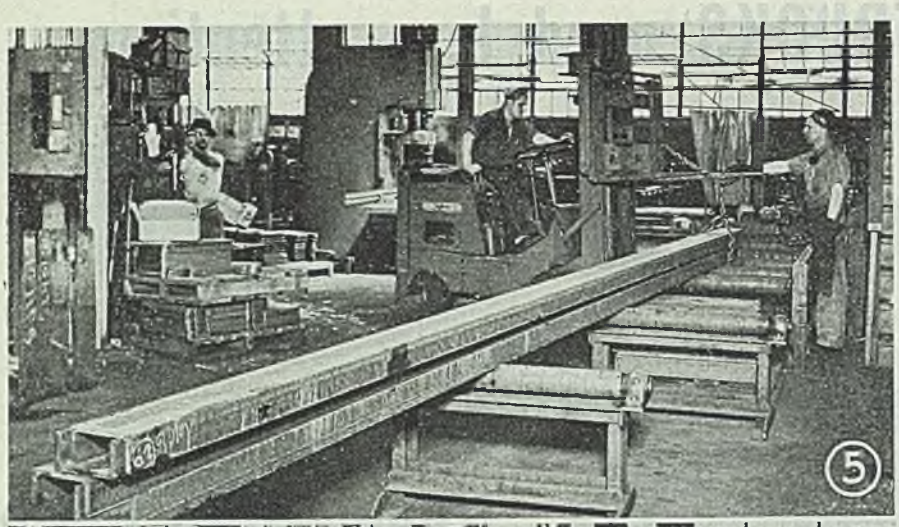
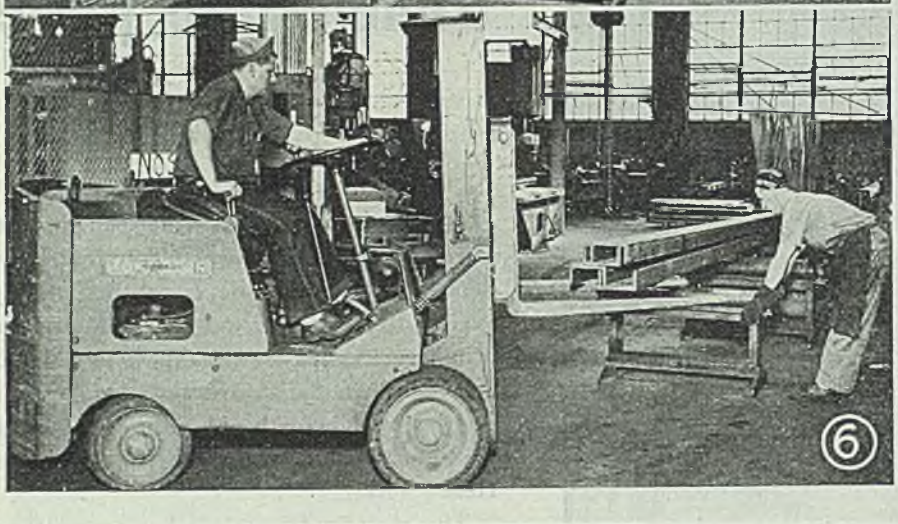




chain around the end which rests on the ground.

Fig. 3 shows the operator backing into the door of the assembly plant, after having fastened the end of the load to one of the forks by means of the chain. The other end rides nicely on the hand truck.

Next step, as shown in Fig. 4, takes place after the operator has towed the load up to the roller bed of the flame cutter, inside the factory. Here the load is being set down on the roller bed. Note that operator has raised one end of the load, by means of the lifting mechanism, so that it will clear the tops of the rollers.

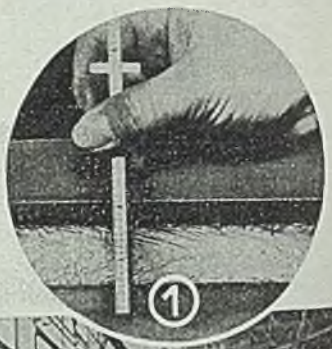
In Fig. 5 the hand truck has been removed and the operator is positioning the load on the roller bed. The operator of the flame-cutting machine is about to release the chain.

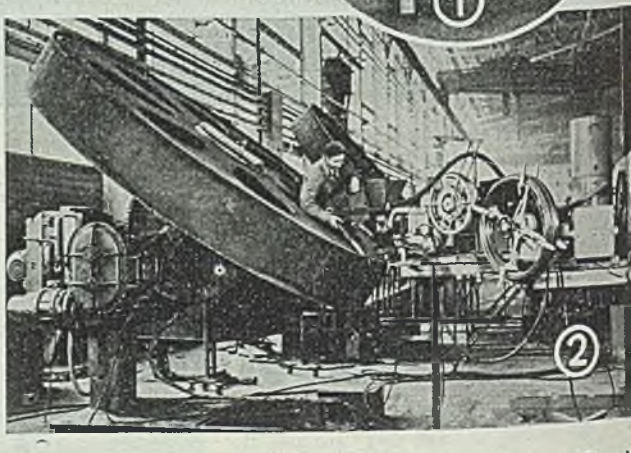
In Fig. 6 the operator is positioning the other end of the load on the roller bed, while the machine operator moves one of the rollers (which had been moved forward a little to aid in setting down the load as shown in Fig. 4) back into position in line with the other rollers.

With the aid of a simple forked-end hand tool, the lengths can then be turned into the proper positions on the roller bed. One man and a truck can do the entire operation in an average time of 3 min, with one helper to fasten and unfasten the chain, place and remove the hand truck, and position the lengths on the roller bed. By old-fashioned hand methods, it would require four men and take an average time of 15 min to do the same job.

Automatic Welding Action...

—insures speed, quality, clean welds, and freedom from stress





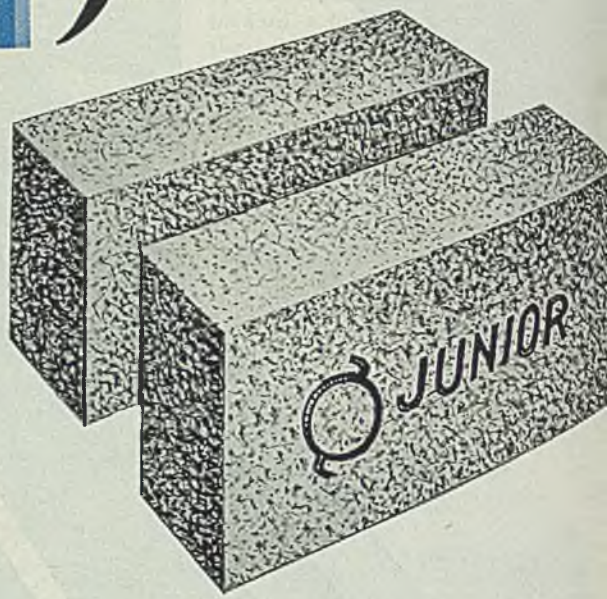
WELDING INSTALLATION used by a manufacturer of heavy marine propulsion equipment has contributed greatly to the speedy production of such machinery without sacrificing the weld quality specified by the American Bureau of Shipping as well as the ASME.

Shown in Fig. 2 is a 12 ft marine turbine reduction gear under construction. The heavy stiffening webs on each side of the gear are being fillet-welded to the rim by apparatus to the right of the operator. In this installation a Unionmelt Type UE-21 welding machine, mounted on a cantilever platform is used as a stationary unit while the work is revolved by the welding positioner. The reel in the foreground supplies the welding rod from 150 lb coils to the machine.

Each fillet weld, measuring about 1⅛ in. across the face and 36 ft in length, is made in only one pass, with deep and complete penetration. Welding at the high speed afforded by this process allows but little heat to be dissipated into the zones adjacent to the weld, thereby minimizing distortion and stress in the structure. The closeup, Fig. 1 shows the weld to be clean and uniform in appearance—no machining or spatter removal will be necessary before putting it in service.

According to Linde Air Products Co., New York, welding is fully automatic. Quality does not depend upon operator skill. This eliminates one of the greatest variables. The welding is done beneath a layer of special granulated material with no visible arc or flame; this reduces operator fatigue by making it unnecessary to wear a welding shield or gloves. The operator, Fig. 2, is removing the unfused granulated "Unionmelt" with a vacuum melt recovery machine for re-use.

B&W JUNIOR FIREBRICK INCREASE STEEL OUTPUT 4½ TIMES



Recently reported production figures demonstrate the remarkable results that are being realized with B&W Junior Firebrick—results like increasing furnace output 4½ times before rebricking was required.

In a furnace heating billets up to nine inches square, a suspended roof, built of first quality firebrick, had to be replaced after 45,000 tons of steel were put through. When the roof was rebuilt, B&W Juniors were used—and the roof stood up during a run of 207,000 tons! The roof then was thin, but otherwise in good condition.

B&W Junior Firebrick can help you increase steel output and save money by reducing refractory replacement rate, cutting cost of brick per ton of steel heated, and by eliminating charges for outages during refractory replacements.

Your local B&W Refractories Engineer will gladly supply additional information.

R-2

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By CHARLES E. AGNEW
Consultant
Blast Furnace and Sintering Plant Operations
Cleveland

Principles of IRON ORE BENEFICIATION *and Their Effects on Blast Furnace Operation*

In this the fourth and concluding installment the author discusses the influence of silicate composition of slags on the thermal conditions to the hearth and bosh. Importance of the ratio of coke ash slag constituents to the slag constituents of the ore mix is stressed

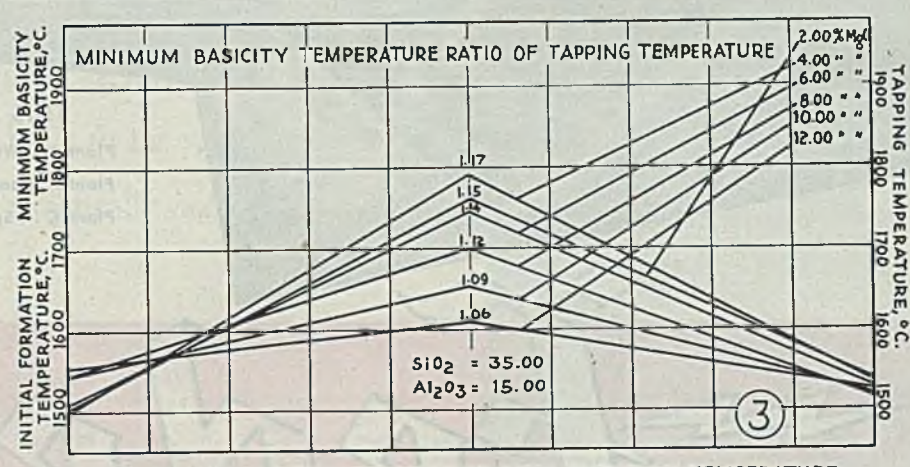
STUDY of the calcium orthosilicate percentage of Tables I and II clearly indicates its effect upon slag temperature and the advantage of confining its information to the lower bosh. When formed in the initial slags the zone of high temperature is deepened in the bosh with the disadvantage of heat drainage as the gas leaves the bosh. When calcium orthosilicate is permitted to pass from the furnace in the tapping slag excess heat is drained from the furnace, but when confined to the lower bosh the higher its percentage the more effective will be the concentration of heat in that zone.

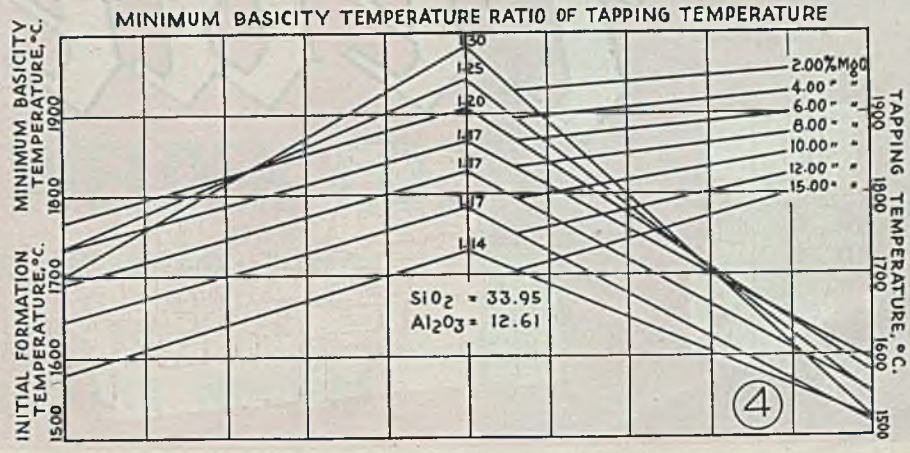
The percentage of calcium orthosilicate, which can be confined to the lower bosh, appears to be governed by the percentage of ash in the coke, the ratio of silica (SiO_2) to calcium oxide (CaO) in the slag constituents, and the ratio of the other slag constituents to the SiO_2/CaO ratio. Enough bases must be carried through the bosh to flux the ash of the coke when it is released for assimilation by the slag in the coke combustion zone at the tuyeres. With proper ratio of bases to acids in the mix the release of the coke ash acids will neutralize the basicity of the bosh slag, the ash will be assimilated, and the heat of the bosh slag will be efficiently and economically used. However, if the percentage of coke ash is excessively high the bases, which must be carried in the upper part of the bosh, will cause the calcium orthosilicate to be formed there with an adverse effect upon the initial formation temperature of the slag.

There is a critical percentage of coke ash most advantageous to the furnace operation with regard to conservation and concentration of heat in the bosh. The best coke practice of the four actual soft ore furnace operations previously described indicates that an 8.00 to 9.00 per cent ash content is ideal since with it there is a surplus of hearth and bosh heat which calls for low blast temperature. Low fuel consumption of the Eastern furnace sinter operations also is obtained. But the importance of the ratio of the coke ash slag constituents to the ore mix slag constituents is emphasized when a comparison is made of the composition at dif-

TABLE VI
SLAG ANALYSIS CALCULATED TO ITS SILICATE COMPOSITION

Slag number	1	2	3	4
Constituents, %				
SiO_2	40.44	34.90	35.95	37.89
Al_2O_3	0.21	0.23	2.61	8.52
CaO	47.32	51.66	48.75	42.08
MgO	10.73	11.72	11.19	10.01
	98.70	98.51	98.50	98.50
Tetrahedron, No.	7	14	7	8
Silicate compounds, %				
Akermanite	65.41	....	13.19	68.69
Tricalcium disilicate	....	....	....	4.51
Monticellite	4.63	38.31	36.09	....
Gehlenite	0.56	0.62	7.13	23.27
Calcium orthosilicate	29.44	59.02	42.87	3.68
Magnesium oxide	....	2.02	....	....
	100.04	99.97	99.99	100.15
Calculated temp., °C.	1659	1894	1770	1516
Ratio to tapping temp.	1.09	1.24	1.16	
Viscosity—poises	2	—3	—2	





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This seems like a good time to be practical about New Year's Greetings to you who turned in such a tremendous job of production for war and now face the no less critical problem of producing of "goods for the good of man".

The most practical way we know to back up any wish for a happy and prosperous year is to re-state our ability and eagerness to provide means to improve production... tools that cut the corners of cost and time in metal fabrication... that is the sort of aid to happiness and prosperity on which we can personally deliver.

All of us, from the factories where Federal Resistance Welding Machinery is made, and from the many branch offices through which we wish to serve you, recognize the immensity of the challenge ahead. At the same time, we DO wish you a Happy New Year... practically *and* sentimentally.

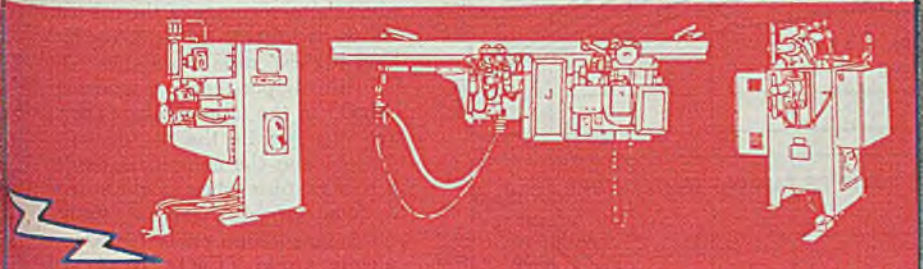

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TABLE VII

CONDENSED DATA ON SLAGS SHOWING EFFECTS OF SUBSTITUTING MgO FOR CaO

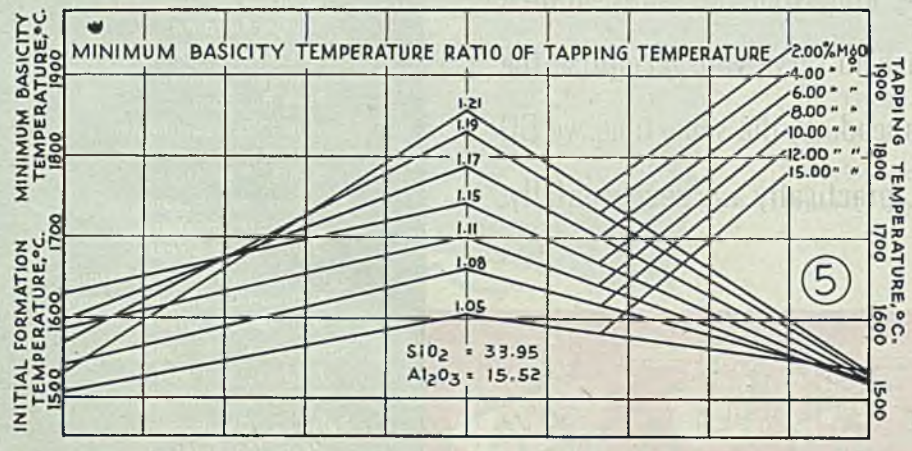
Calculation	A				B			
Slag No.	1	2	3	4	1	2	3	4
Tetrahedron No.	6	7	8	6	6	14	7	6
Calcium orthosilicate, %	....	68.55	38.98	....	...	60.42	43.85	....
Calculated temp., °C	1502	1951	1762	1535	1497	1903	1791	1530
Ratio to tapping temp.	0.98	1.27	1.15	....	0.98	1.24	1.17	....
Viscosity—poises	3	—5	—4	4	3	—4	—3	4

Calculation	C				D			
Slag No.	1	2	3	4	1	2	3	4
Tetrahedron No.	8	14	7	6	8	14	7	2
Calcium orthosilicate, %	2.52	52.28	36.24	....	8.15	44.15	28.67	....
Calculated temp., °C	1509	1860	1745	1525	1544	1817	1699	1513
Ratio to tapping temp.	0.99	1.22	1.14	....	1.02	1.20	1.12	....
Viscosity—poises	2	—3	—3	4	2	—3	2	4

Calculation	E				F			
Slag No.	1	2	3	4	1	2	3	4
Tetrahedron No.	7	14	7	5	7	14	7	5
Calcium orthosilicate, %	7.76	36.04	21.05	....	0.39	27.90	13.50	....
Calculated temp., °C	1542	1762	1652	1515	1554	1732	1607	1521
Ratio to tapping temp.	1.02	1.16	1.09	....	1.02	1.14	1.06	....
Viscosity—poises	2	—2	2	4	2	1	1	4

ferent stages of formation of a low alumina (Al_2O_3) content tapping slag with those of the more general alumina range shown in Tables I and III. In all coke furnace operations the coke ash is the source of a relatively high percentage of alumina (Al_2O_3) in the final slag. For purpose of comparison the average slag analysis for a 3-day period from an actual operation was calculated to its silicate composition by the same procedure used in the calculations of Table I. Data of the calculation is condensed in Table VI.

The effect upon the silicate compositions from substituting magnesium oxide (MgO) for alumina (Al_2O_3), and the thermal effects due to the silicate compositions are the observations of principal interest in the comparison of this calculation with those of Table I. The high magnesia and low alumina percentages produce a fluid tapping slag at a temperature lower than the tapping slags of Table I, and the ratio of the minimum basicity temperature to the tapping temperature is the same as the ideal slag of calculations B-C, Table I. However, the seemingly apparent advantages are restricted, if not nullified, by the high initial formation temperature of the No. 1 Slag (1657°C) which is 9.67 per cent higher than the initial formation temperature (1494°C) of calculation B-C, Table I. The difference is caused by the deficiency of alumina in the initial stages of slag formation which results in a relatively high percentage of calcium orthosilicate to be formed there. Since the coke ash is the principal source of alumina in the slag calculated the only chance for correction of the high initial formation temperature of the slag would be an ore mix of a higher alumina content.



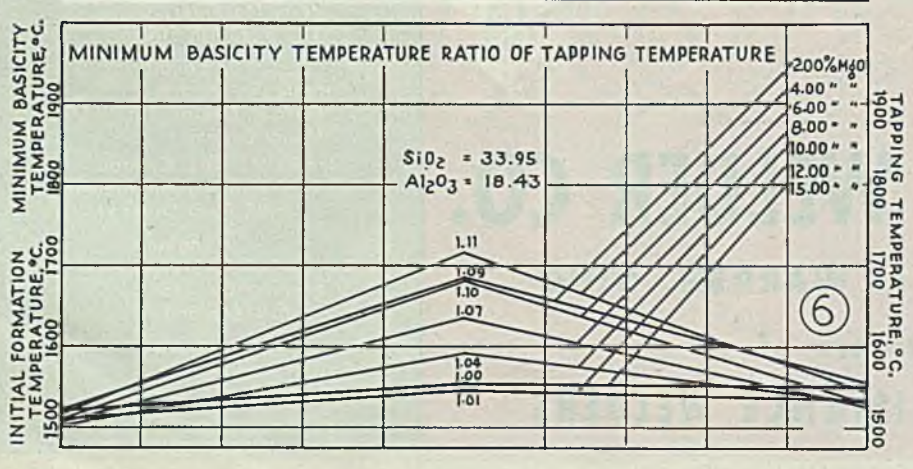


Table VII contains the condensed data from a calculation similar to that of Table I in which the same weight of materials have been used as in Table I but the constituent percentages have been arranged to show the effect of substituting magnesium oxide (MgO) for calcium oxide (CaO). In the six calculations the silica (SiO_2) and alumina (Al_2O_3) percentages have been held constant in their ratio to each other and their sum is 3.00 per cent greater than the sum of the bases. The maximum ratio of minimum basicity temperature to tapping temperature occurs when the percentage of the calcium orthosilicate is highest in the lower bosh slag. This highest ratio occurs in calculation B with 4 per cent magnesium oxide (MgO) in the tapping slag. The progressive changes in the tetrahedron classifications and the complementary changes in temperature ratios of the several slags to their respective tapping temperatures as the magnesium oxide (MgO) replaces calcium oxide (CaO) is of particular interest in Table VII. Chart 3 shows the effects graphically.

Again as in Table I a critical condition of temperature ratios is approached and passed. Calculation B has a minimum basicity temperature (No. 3 Slag) of 1791°C and a tapping temperature (No. 4 Slag) of 1530°C, a ratio of 1.17:7.00. Slag No. 3 of calculation F has a minimum basicity temperature of 1607°C and a tapping temperature (No.

(*Please turn to Page* 164)

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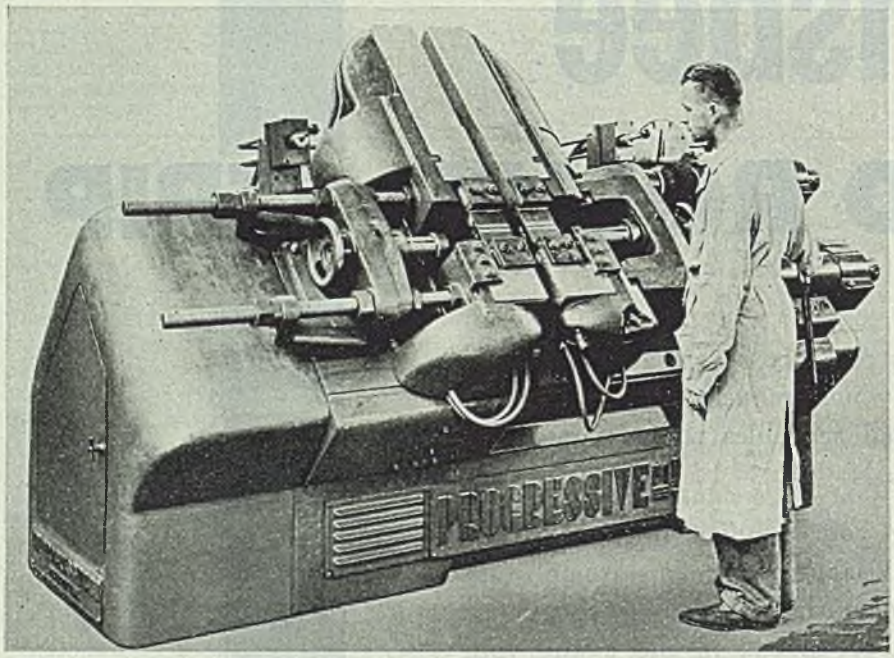
INDUSTRIAL EQUIPMENT

Flash Welding Machines

Development of a line of butt-flash welding machines in five standard sizes embodying numerous new design and operating features to provide maximum flexibility, ease of maintenance and operation, safety and reliability has been announced by Progressive Welder Co., 3050 East Outer drive, Detroit 12. Machines range in electrical capacities from 20 to 250 kva. The five basic sizes are classified and rated according to recommended specifications of the Resistance Welder Manufacturers Association.



Design of machines permits them to be furnished for hand, air, hydraulic or motor operation, as desired. Also work clamping fixtures can be operated by one method and platen traverse by the same or another method. Thus, work clamping can be air-operated and flash and upset can be hydraulically operated on the same machine without change in the basic design of the machine. According to nature of work to be done, machine may be manually controlled, semiautomatic or fully automatic.

In the full hydraulic operation — through a single self-contained hydraulic unit available on the larger models— unit is mounted within frame of machine and can be removed without disassembly for inspection or service. It contains (1) a rotor blade pump for platen traverse; (2) a gear type pump for clamping work to electrodes; and (3) a piston pump to furnish pressure for the upset action. Latter actuates a direct-acting traverse feed piston and thereby eliminates all need for mechanical linkage to furnish pressure for upsetting work pieces. Adjustments required by the hydraulic system thus are greatly simplified, compared with use of mechanical linkages, thereby reducing set-up and change over time. Drive of the pumps through high load capacity cone-drive gears assures maximum power utilization through a compact unit and long trouble-free life. This compactness also permits mounting hydraulic unit inside frame thereby eliminating external piping and reducing the floor space required by the machine to a minimum.

Large, flat T-slotted platens are designed to accommodate a wide range of interchangeable, standardized and/or special dies for holding virtually any size or shape work piece within machine capacity. Hand wheels engaging screws mounted in sturdy C-frame back-up plates provide quick adjustment for work length on both stationary and movable platens. The three larger machines are available with platens mounted in either the standard horizontal position or mounted at an angle of 45°. Design enables ready mounting of all manner of special horizontal and vertical acting clamping fixtures and tooling. All clamping fixtures are fully adjustable in two planes, permitting universal alignment.

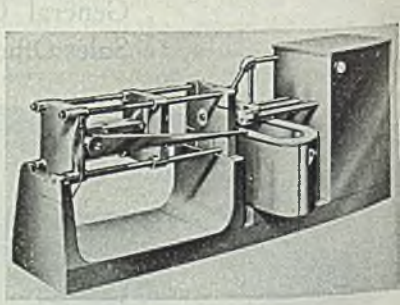
Hand lever, with pushbutton control of welding current mounted at its tip, enables operator to control all stages of the welding cycle from one position. Rate of platen travel follows movement of hand lever in both forward and reverse directions, and both this rate and position of platen are indicated on large calibrated dial. Full automatic control is initiated by pressing platen traverse button; machine then carries through the approach, flash and upset, and return cycle. Semiautomatic control provides manual approach with automatic flash and upset. During any phase of either type of control, platen travel may be stopped or reversed by moving the hand lever. Additional pushbuttons control feed, motor on-off and weld-no-weld. Adjustment of welding voltage from ranges from 50 to 100 per cent of maximum. Transformer, mounted within machine, secondary leads and die holders are water cooled. Lubrication points are conveniently located for ease of maintenance. Both hydraulic and timing adjustments are readily accessible through a tamper-proof door.

Die Casting Machine

First of the new series of die casting machines announced by the H. L. Harvill Mfg. Co., Vernon, Calif., is model HD-1AM1 for casting tin, lead and zinc alloys. This machine is for the production of small to medium-sized castings and embodies metal injection and operating features normally found in larger equipment, except that operation of the movable die platen is accomplished by a hand lever. Production rates of 300 to 400 cycles per hour have been attained by efficient personnel without undue physical exertion.

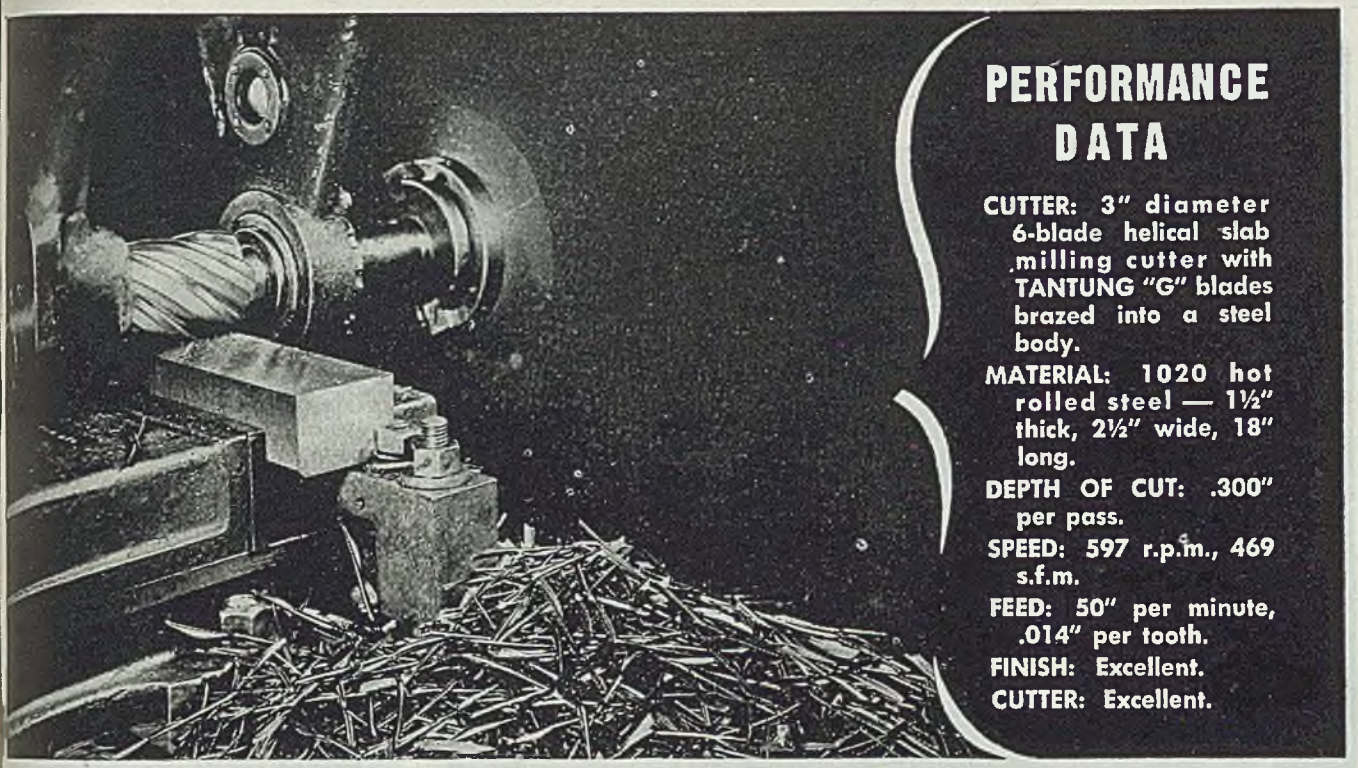
The HD-1AM1 machine will accommodate dies having a vertical dimension of 8 in. and a horizontal dimension of 12 in. The travel of the movable platen permits a dimension of 6¼ in. between the die faces, the dies having a maximum thickness of 14 in. Construction of the die mounting platens permits die of greater horizontal dimension, provided that the cavity arrangement allows for metal flow. When oversize dies are used, die overhangs platen and, if excessive in weight, requires auxiliary support.

Injection of the metal is accomplished by a horizontal ram similar to those used



in cold chamber equipment rather than the "gooseneck" injection assembly. A continuous feed from a gas or oil-fired furnace is an integral part of the machine and constantly supplies the injection chamber with molten metal. Each "shot" injects up to 3 lb zinc under normal circumstances, the maximum in the case of oversize dies being 6.1 lb of zinc. When less than 3 lb of zinc is injected or an equivalent volume in tin or lead, using a small injection piston,

(All claims are those of the manufacturer of the equipment being described.)



PERFORMANCE DATA

CUTTER: 3" diameter 6-blade helical slab milling cutter with TANTUNG "G" blades brazed into a steel body.

MATERIAL: 1020 hot rolled steel — 1½" thick, 2½" wide, 18" long.

DEPTH OF CUT: .300" per pass.

SPEED: 597 r.p.m., 469 s.f.m.

FEED: 50" per minute, .014" per tooth.

FINISH: Excellent.

CUTTER: Excellent.

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TOOL MANUFACTURERS...

- More and more tool manufacturers are using TANTUNG to improve their products.
- This helical slab mill with six TANTUNG blades, brazed to an ordinary steel body, is removing metal at a rate of speed 300 to 400 per cent greater than has ever been possible with steel cutters.
- TANTUNG, a strong, tough, abrasion and corrosion-resisting alloy will give similar performance in your product. Write us today. Our experience and complete engineering facilities are at your service

TANTUNG Bits, Single Point Tools, Cut-Off Blades and Shell End Mills are distributed by VASCOLOY-RAMET CORPORATION, North Chicago, Illinois, a Fansteel Affiliate

TOOL USERS...

The TANTUNG slab mill shown in this picture will be available through leading milling cutter manufacturers, whose names will be furnished upon request.

TANTUNG Rotary Files, Drills, Gages, End Mills and Milling Cutter Blades are obtainable from leading tool manufacturers.

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a pressure of 1200 psi is exerted on the metal in the die cavity. The minimum metal pressure, using a large piston to accommodate the maximum metal injected, is 600 psi. Impetus to the injection ram is supplied by compressed air, the reservoir requiring 1 cu ft of air per minute at 150 psi to sustain 400 cycles per hour. Items of standard auxiliary equipment are furnished with the machine.

Shovel on Wheels

Type 10 model 105, is a recent development in pneumatic-tired combination crane-shovel-dragline equipment by General Excavator Co., Marion, O.

Compactly-built middleweight version of the General Supercrane, one of the first machines in the pneumatic-tired self-propelled crane field, the new model is

rated at ½-yard as a shovel. It has quickly convertible front-end attachments for a complete range of construction, excavating and materials handling jobs. Optionally equipped with either four or six 10.00 x 20 tires, or with 14.00 x 20 rib-tread tires for off-the-road service and featuring air booster steering, the new rig is capable of highway cruising speeds of more than 20 mph. It conforms to major highway regulations and in most states needs no permit to travel over the roads.

Fully, independent travel, swing and boom—on finger-tip control activated by safe, positive, metered air—make it possible to perform any of the functions independently or simultaneously at will. Optional are such advancements as 4-wheel drive; 4 speeds forward and reverse; easily accessible independent assemblies; self-counterweighting machin-

10 TYPES OF OZALID PRINTS!

and some ways to use them:

With Ozalid you can do jobs which are far beyond the scope of any other technical reproduction process.

Also, routine work can be copied more efficiently because you always get a positive print direct from your original—on the type of Ozalid material you prefer.

You have a choice of 10 types of prints instead of 1 because OZALID employs a DRY DEVELOPMENT technique which greatly simplifies printmaking . . . and permits use of a variety of sensitized papers, cloths, foils, and films which you process in the same manner, in seconds.

Here are the ten Ozalid "types" and some ways in which you'll save time, labor, and material by using them:

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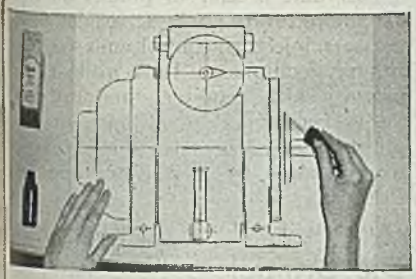
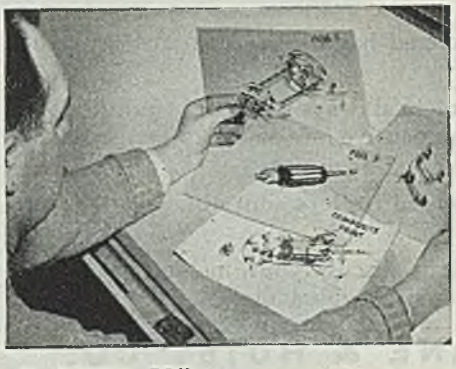
2. OZALID BLUE-LINE
3. OZALID RED-LINE

For routine prints in the drafting room, shop, or office.

Anything drawn, typed, or printed on translucent material can be reproduced with sharp, easy-to-read images on a white background.

By assigning identifying colors, you can distinguish prints of different departments . . . recognize checked from unchecked prints, etc.





4. OZALID TRANSBLACK
5. OZALID SEPIA-LINE
6. OZALID TRANSPARENT CLOTH

For "intermediates" which may be substituted for originals in subsequent print production. Important savings in time and labor can be realized when design changes are necessary: Obsolete lines are removed with Ozalid Corrector Fluid; changes drawn in and required number of prints made from "new" masters.

7. OZALID FOIL

For composite prints: Details can be printed on individual foils . . . and overlaid to produce a print showing the separate details in relation to each other.

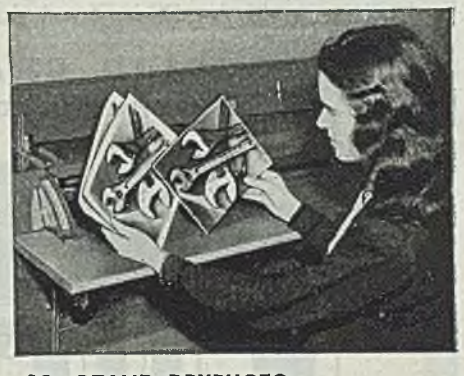
OZALID FOIL also produces faster-printing intermediates from old or worn originals, since it intensifies line detail.

8. OZALID CHARTFILM

For lustrous black-line reproductions on white plastic base, ideal for wiring diagrams, instrument panels, etc. No protective covering is needed; may be cleaned with a damp rag.

9. OZALID OPAQUE CLOTH

For extremely durable prints for shop use, files, etc.



10. OZALID DRYPHOTO

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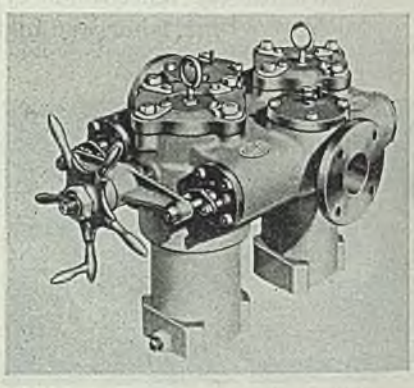
Pipeline Strainer

A duplex vertical chamber disk type pipeline strainer has been designed to assure continuous flow in pipelines, and is operated by a large handwheel that reverses valves simultaneously with minimum pressure drop. Capacity flow is assured at all positions of the operating handwheel.

Another feature is the eccentrically located strainer basket with respect to the basket chamber, thus providing a flow section proportional to the flow needs at all points. Removable covers pro-



vide ready access to the basket chamber and permit easy and complete cleaning. Large handholes above each valve assembly permit servicing of the valves without removing the strainer.

This unit is said to protect all types of pumps, traps, valves, regulators, aperators, injectors, control units and other primary equipment. It is made in cast bronze, steel, semisteel, and cast iron; the basket, of perforated brass, Monel or other specified metals. The strainer is manufactured by J. A. Zurn Mfg. Co., Erie, Pa.

Die Grinder

Designed and built to deliver more power than usual, Master Power die grinder is of all-steel construction, with 1-piece shaft and three standard size SAE high-speed bearings to minimize vibration. Automatic lubricator provides continuous flow of atomized oil to entire tool. All major wearing parts are hard chromium plated to give up to three times normal life. Steel nut over front of wheel end handle provides added protection from wear. Handle is sliding sleeve type.

Model M-602 has free revolutions per minute of 17,000 or 20,000, depending upon wheel type and size and spindle size and length Capacity of the latter is 1½ and 1¼-in. for vitrified wheels; 2 and 1½ in. for organic wheel; spindle size is ⅜-24, with length of 1 1/16 in.

Grinder is suited for rough or precision grinding of dies, for small cone grinding of light castings having small

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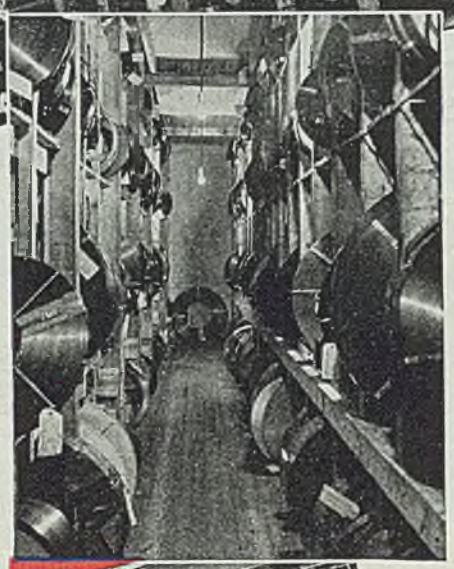

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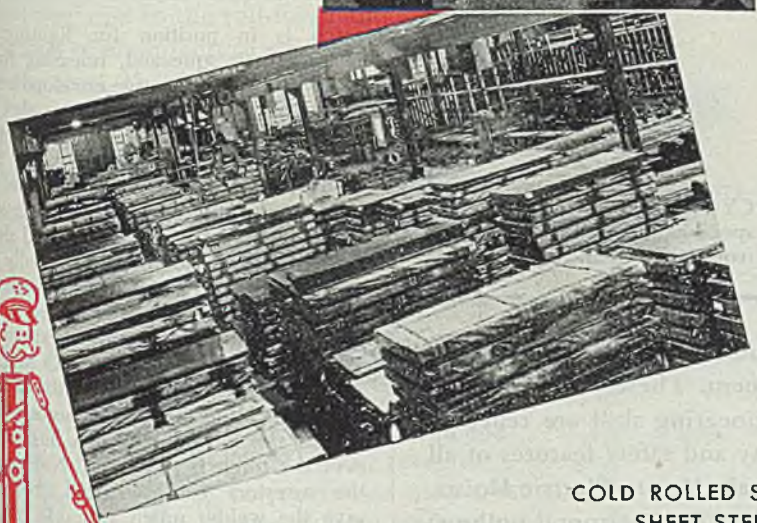

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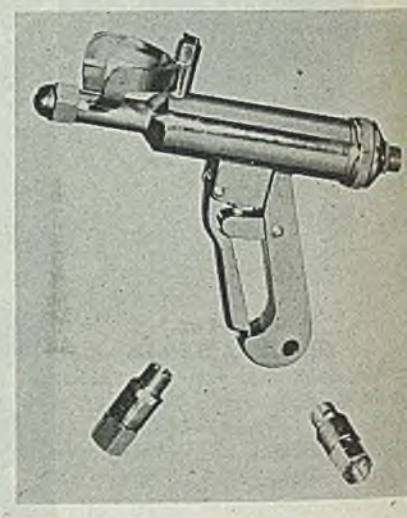
fillets, for burring with rotary cutters and files, and for a wide range of polishing work. When equipped with wheel-end adapters, it can be used to do many otherwise inaccessible jobs. Grinders are made by Master Tool Co. Inc., 5605 Herman avenue, Cleveland 2.

Torch Lighter

Developed for the United States Navy by the JO Mfg. Co., South Gate, Calif. the Diamond S underwater torch lighter used in salvage and repair work on government craft, is now available.

The lighter is connected to the air line and works on any air pressure from 30 to 120 lb without electrical connections. When the diver wishes to light his torch, he places it against the lighter in the position indicated by the guide. Guide is the horseshoe shaped bar on top of the nozzle. When the



torch is in position for lighting, the pistol grip is squeezed, releasing the air which forms a protective envelope around the torch as a strong spark is shot out.

While the high chrome finish of the lighter enables the diver to see it more readily in the underwater gloom, the guide insures the correct placement of the torch even when water darkened depths prevent clear vision. It is ruggedly constructed of corrosion resistant alloys.

The Diamond S flashback arrestors are another innovation in underwater welding equipment made by the JO Mfg. Co. They are attached between the welding torch and the hose, and automatically cut off the fuel and oxygen lines whenever the torch is removed. Not only do the arrestors conserve fuel, but they save the welder much valuable time, as he is not required to return to the tank to shut off the two lines when using the Diamond S flashback arrestors.

Plastics Grip

Special plastics grip of 5000-lb capacity on the Templin principle for use with the universal testing machine is announced by Baldwin Locomotive Works, Pittsburgh. It weighs only 4½ lb and is self-aligning, swiveling and laterally. Basic principle makes it particularly good for gripping glassy surfaces of plastics.

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Work Starts on Brazilian Steel Plant Foundry

Dual purpose facility to cost $1,850,000 and will be one of most unusual foundries in the Western Hemisphere

CONSTRUCTION of a foundry—one of the most unusual in the Western Hemisphere—for the large Brazilian National Steel project at Volta Redonda, Brazil, has been started.

The foundry, according to Roy I. Jones, head of the Industrial Engineering Division of Giffels & Vallet Inc., L. Rossetti, associated engineers and architects, Detroit, who designed the complete foundry project, will produce ingot molds and stools, iron grain and chilled rolls, steel rolls, miscellaneous iron, steel and nonferrous castings. The foundry which will cost approximately $1,850,000 will pioneer in many ways the reduction of hand labor and the improving of working conditions in the Brazilian foundry industry.

The foundry is a dual purpose facility. Half of the space is devoted to highly mechanized production systems for the regular supply of ingot molds and stools. The remaining half of the foundry is primarily for production of castings to keep the mill equipment in constant operation, and has facilities and equipment capable of producing any casting in the entire steel mill.

The foundry is designed so that ingot molds may be poured with hot blast furnace metal direct from the open-hearth mixers. Its equipment includes a cupola, air furnace, electric furnace, monophase furnace, nonferrous metal furnace, annealing furnaces, pit type ingot mold ovens, a completely mechanized sand conditioning and distribution system, casting and cleaning equipment, roll turning lathes, and ingot mold milling equipment.

The jobbing nature of this foundry's operations requires that it be, in addition to an ingot mold foundry, a steel foundry one week, an iron foundry the next, and perhaps a roll foundry the following week. This gave rise to the requirement that, in addition to the charging of the cupola, the arc furnace and air furnace would need to be charged at various times both with cold charges and with hot charges for duplexing.

The foundry has been designed for ready expansion to provide an additional 150 per cent capacity. Construction of the foundry is expected to be completed in about nine months, about the time when the main portion of the steel mill will be completed.

Reprinted from STEEL Magazine

Steel Packaging

(*Continued from Page 98*)

drilled to receive fastening bolts, which pass through holes in flange at base of cylinder, forms a pedestal whose dimensions conform to inside diameter of container. A flanged steel strap, slotted to accomodate studs in cylinder head and a shield-shaped wooden board with holes for smaller bolts and nuts that hold it to top of strap are the only other accessories required to complete this package. Cover goes on with gasket inside, locking ring is drawn tight, and the cylinder is ready for shipment.

Most of the dunnage shown in photos — wood blocking, mats and special molded products—have been approved and are in use at present. A number of manufacturers of equipment bought by the Army Air Forces are shipping instruments, etc., for export in containers of this kind, where specified by the AAF. However, there are some variations in material considered for interior packing where bulk is needed.

Use of Wood Blocks

An extended drum adapted for packing long-barreled range finders appears in foreground, Fig. 10, along with other types of steel drum containers and wood blocking presented in an exhibit. Note flange-type wood blocks which keep shaft free from damage by shifting inside drum.

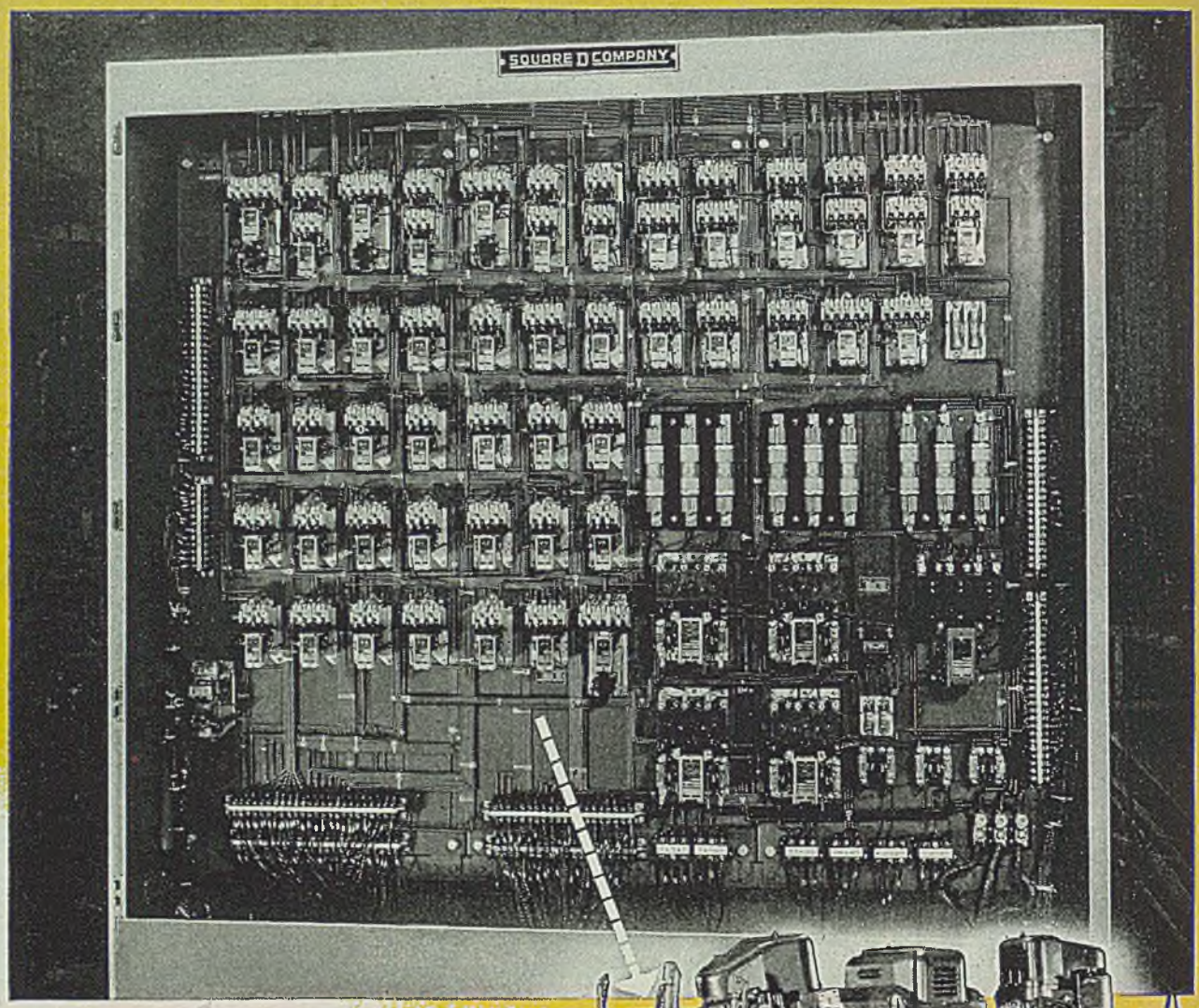
From an engineering standpoint, round metallic containers offer a great deal more strength for their weight than square or rectangular construction and require a minimum number of welded joints. Range of sizes can be increased by varying the height of drum, which readily can be accomplished by a very moderate increase in manufacturing cost. Another feature worthy of note is that as much value will be derived from long-time preservation of this AAF equipment, when sealed in containers of this kind, as was evidenced by their record as shipping containers.

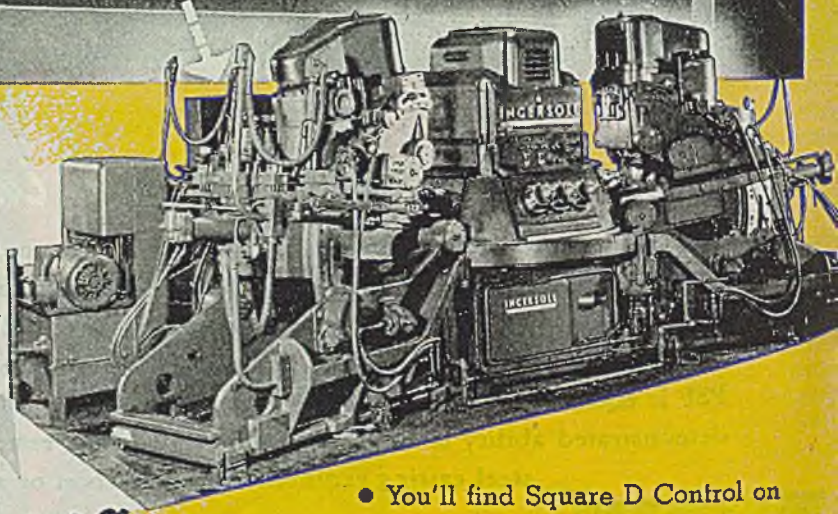
Present Army Air Force specifications cover two types of steel shipping containers. The first type is covered by AAF specification 41061: "Container, Interior, Reusable, Resealable, Metal, Shipping." The second is covered by Army-Navy Specification AN-C-152: "Container, Steel, Shipping".

The specification for the first type covers seven sizes with full removable covers and interior dimensions as shown in table on page 98. Metal gage must be such as to withstand performance tests required under this specification. Each container must be capable of being opened and reclosed, accomplishing a hermetic seal with each closure.

Performance requirements for this type container are as follows:

1. Ability to withstand a 15 psi hydrostatic test when applied to the inside of each container through a special water connection for a period of not less than 5 min. There shall be no evidence of leakage.
2. Each container shall withstand a





Judge MOTOR CONTROL by the company it keeps...

...and Vice-Versa

• You'll find Square D Control on machine tools of America's outstanding builders. They value the counsel of Square D Field Engineers and the sound engineering built into an unusually complete line of control units and accessories.

SQUARE D COMPANY

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psi air leak test and shall show no leakage when submerged so that top surface of container is not more than 1 in. under water.

3. Each container, with a properly cushioned dummy load, shall be capable of withstanding a free fall drop test, once on the chime and once on the rim of cover from heights of 6, 12, 18, 24 and 30 in. After each pair of drops from each height, air leakage test shall be repeated.

4. After this test, container shall be opened and reclosed, and shall then be subjected to the air leakage tests in order to check for reclosure and hermetic seal.

Further requirements are placed on these containers as shipped from the equipment manufacturer's plant and detailed in the referenced specification.

Second specification deals with the exterior type, reusable, resealable metal container. Design of this product is covered by Army-Navy Specification AN-C-152 showing the following sizes:

Size	ID Inches	No. of Roller Hoops	Capacity (Gal)
I	10½	2	4
I-A	10½	3	6
II	13-13/16	2	9
III	15-3/8	2	15

Detailed in Army Air Force drawings:

Size	No.
I	45K16010
I-A	45K16011
II	45K16012
III	45K16013

Utilization of these exterior, reusable, resealable metal containers is adequately covered in AAF Specification 40839A and manufacturer and user are referred to this specification for complete details. Design specifications will be issued for steel shipping containers for the coventional types of aircraft engines, for turbosuperchargers, jet propulsion engines, and for many other uses.

All drums shipped contain the desiccant, Protek-Sorb silica gel, which takes up the moisture within the common air sealed within the container and also takes up the film of invisible moisture on the inside of container and on the item itself. Maker of this product, Davison Chemical Corp., says it is capable of taking up and holding more than 45 per cent of its weight in water from saturated air. It does not become damp or sticky and when fully saturated, it looks and feels dry, remaining clean and in its original granular form. The combination of a moisture-vapor barrier in the form of an airtight container and silica gel in this way insures maintenance of relative humidity below 30 per cent within the package.

Actual service of the metallic containers has exceeded all expectations, even to the extent that the receiving and using agencies in the theaters of operation took time to write back their appraisal of this type of packaging.

Figs. 1 and 2 in this article are from Photographic Laboratory Unit, Robbins Field, Georgia; Fig. 5 is by courtesy of

Jack & Heintz Inc., Cleveland; Figs. 3 4, 6, 7, 8 and 9 are from Forest Product Laboratory, Materials Container Division Madison, Wis.; Fig 10 is by courtesy o Davison Chemical Corp., Baltimore.

Cast Iron Thermocouple Tubes Offered

Cast iron thermocouple protecti tubes that will meet requirements of t chemical, metallurgical and die ca ing industries have been introduced Brown Instrument Co., Philadelphi division of Minneapolis-Honeywell Re ulator Co.

Tubes have a uniform wall thickne to within plus or minus 1/32-in. and ha better surface finishes. They are ca with both ends open, permitting po tive support for the core at each en One end is closed with a cast iron plu welded in place with a cast iron fill rod, the opposite end being thread for a 1-in. standard pipe.

Tubes have an inside diameter 13/16-in.; outside diameter of 1⅜ i wall thickness of 9/32-in.; a minimum t thickness of 9/32-in.; and weigh lb.

Bibliography of Metal Cutting in New Edition

Bibliography on Cutting of Metals, Orlan W. Boston; fabrikoid, 547 pag 5½ x 8½ inches; published by Americ Society of Mechanical Engineers, N York, for $6.50.

Finding the need for information cutting of metals as an aid to his o work the author started in 1919 to c lect references to various processes, whi have been published by the ASME three volumes, as the material was ma available. Recently it was determined the society to publish the material as single list, the present volume being result.

It covers years from 1864 to the end 1943 and contains 4124 references, p lications of each year being grouped der that date. Arrangement under ea year is alphabetical, with reference the publication in which each appea and a brief outline of the subject matte

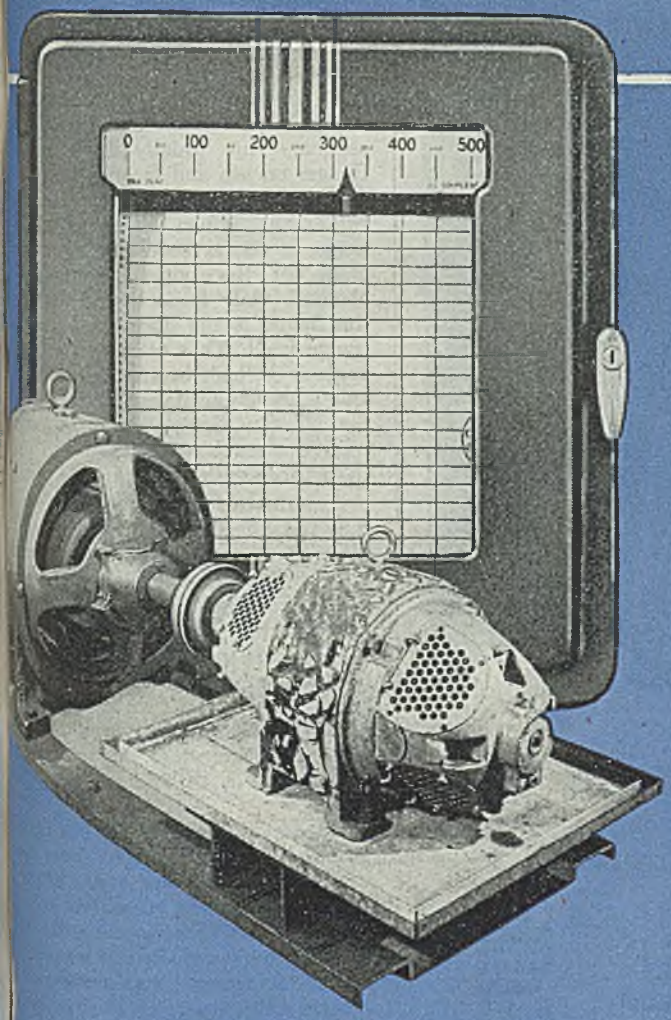
Indexing is especially thorough, authors and by subject, with reference the serial number of each entry, the nu bering starting with those published 1864 and extending down to the latest.

—o—

A 16-page catalog, CMA 10, on recently announced Model C Milwaul automatic boring machine has been p lished by Kearney & Trecker Produ Corp., subsidiary of Kearney & Trec Corp., Milwaukee. Illustrations and tailed explanations cover features, ope ting data applications and setups, complete accessories lists and spec cations make it useful as an informatio and working guide book.

DOW CORNING

SILICONES increase permissible operating temperatures by more than 100°C.



Today many accepted engineering limitations are being swept away by revolutionary new Dow Corning silicone materials. Designers are making major product improvements—coupled with important economies—never before possible.

Here's a specific example. Dow Corning varnishes and resins—because of their unique resistance to high temperatures—make it possible to redesign or rewind electrical equipment for increased horsepower output per unit weight. At the same time they greatly prolong equipment life under adverse operating conditions and reduce overload failures and fire hazards.

The recent development of DC 996, a Silicone Varnish which cures at 300°F., enables any electrical maintenance or rewind shop to secure the greater operating economies of Silicone Insulation.

In other industries Silicone materials also make possible operations which were previously impossible or very expensive. Consult Dow Corning for particulars.

IN THE ELECTRICAL INDUSTRY, FOR EXAMPLE

This test motor wound with Silicone Insulation has been alternately saturated with moisture and operated at 310°C. (590°F.) by resistance, for a total of 2,000 hours with no sign of failure. Silicone Insulation means reliable and continuous operation under most adverse conditions.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
NEW YORK OFFICE: EMPIRE STATE BUILDING

Dow Corning
FIRST IN SILICONES

Stretch Forming

(*Continued from Page* 101)

work hardened before the stretch-form was completed and were quite apt break or possess too much springb This was especially true when there a short radius near the center of part. In order to produce these s radius parts, two-operation form sometimes was used.

A typical stretch-formed piece in aircraft industry is a channel, ei male or female. (See parts in foregrou Fig. 4) In the case of the female stre form part, a form with grooves to ceive the material (a filler) is use the channel to hold the channel s snugly against the walls of the groo preventing dishing or bulging. straight filler block is used when section is shallow but more freque the filler is constructed of links s can be bent with the part. Use of l as fillers in forming a much larger is shown in Fig. 3.

Forming "Hat" Sections

A common form of channel ex sively bent and stretched is the " section. This usually is formed flanges on top and frequently has an of various degrees between flanges side walls. When changing the fla angle, it also is necessary to change angle of the bottom section of channel. Only force that tends to c the flange is the downward pull of flange itself. Thus reduction of a fla angle is difficult by stretch-forming. side edge of the flange touches the f first if the flange angle is increa with the result that downward pul the entire section acts to form the an

Experience at Boeing indicates it is not advisable in stretch-forming try to increase a flange angle more t 5 or 6°. Bending action which oc when a flange angle is increased not take place in the bent corners in the area adjacent to them, beca the original rolling of the section duces local strain hardening at th points. A sharp bulge forms if this ta place in the channel side walls, and it happens in the flange, the latte dished.

Sometimes a channel or hat sectio formed with the flanges down ove stretch-block of male type. When happens, the same conditions exist regard to closing or opening the fla as when the section is bent around the male forms except that the angles are creased easier than they are increased. was found that side walls close tow each other, as the body of the sec contracts laterally in proportion to P son's ratio of the metal. Because of t thickness of the form between side w of the material is reduced in regions the maximum amount of stretch. Dis tion of the body and side walls ta place if no allowance is made for lat contraction.

Satisfactory stretch-forming dema proper jaw design. The most import requirement is that jaws give a strai

pull on the section without permitti any slippage of the work. If slipp occurs, wrinkles appear from the co pressive forces and the section is elongated sufficiently.

Basic wedge-type grips with serra and hardened gripping surfaces o a wide choice of jaw designs, althoug is important that the section be grip in a manner causing as little deforma as possible. It was found, for insta that a channel can be gripped s factorily on the side walls alone if tongue or a filler part is placed ins preventing side-wall collapse. In o to obtain a sufficient amount of grip surface, some of the more complic extrusions demand involved jaw desi These gripping surfaces should be c pactly arranged to give as much are possible without excessive length so center will fall approximately on neutral axis of the section.

Jaw serrations approximately 0. in. deep and 0.032-in. apart give results in gripping light gage section to 0.040-in. in thickness. For section heavier gage, serrations are made 0. in. deep and about 0.050-in. apart, length of the jaw gripping surfac from two to two and one-half times width—width being approximately depth of the section.

Use of Line, Knurl Serrations

Line and knurl serrations are on gripping jaws, the type selected pending upon the amount of grip surface available. If only a small grip area is used, knurl serrations are ployed; but if the area is large enc combined knurl and line types us are adopted. The paramount consi tion in jaw design is adequate grip power, and it is essential to make serrations sufficiently effective. I easier to open the gripping jaws at end of the operation with the se in tension when working with serrations.

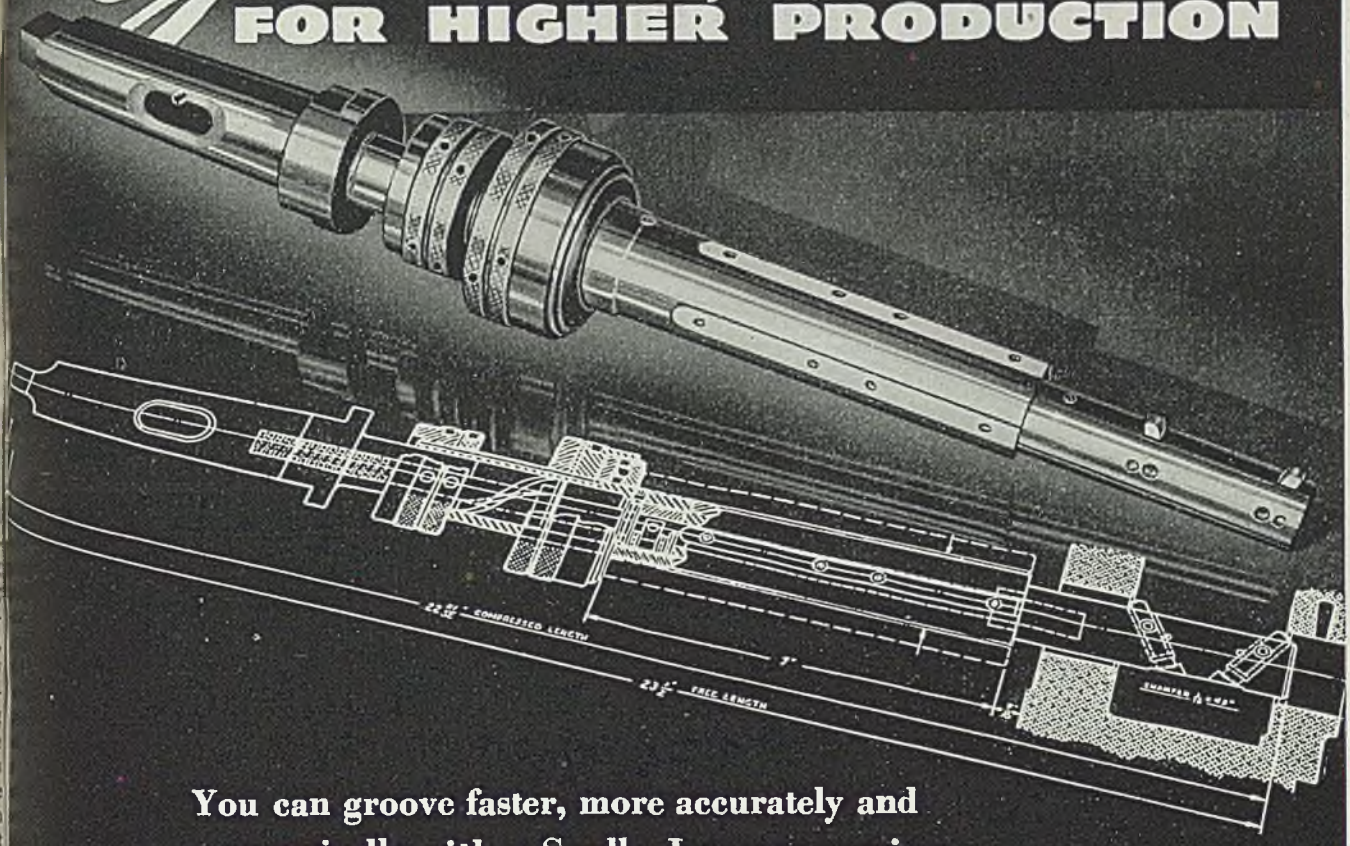
Boeing has used seven different t of stretch-forming machines in pro ing B-29 Superfortress parts. A 300 Erco machine has been employed forming large skins and heavy extrusi such as the one shown in Fig. 2, in up to 10 ft long. Two 100-ton (Fig. 2) have been used for skins u 60 x 120 in., and in forming a va of lighter sections in pairs or singl to 11 ft long. One 60-ton Sheridan trusion machine has formed light tions of greater lengths (up to 2 long). A 90-ton Sheridan has prod the long, narrow skins, 48 x 168 in., heavy extrusions formed satisfactori single lengths up to 20 ft. Two 1 stretchers of Boeing design (show Figs. 5 and 6) have given good se in forming extrusions and rolled sec of light weight in lengths up to 8 f

—o—

United States Navy is expected t up many ships in dry storage with aid of a new hot plastic anti-fo paint used on hulls. Stripable co to protect deck equipment also has devised. Both serve to protect the sels against the effects of moisture.

STE

AUTOMATIC *Grooving Tools* FOR HIGHER PRODUCTION



You can groove faster, more accurately and economically with a Scully-Jones recessing tool. These automatic tools are suitable for production work on Turret Lathes, Automatic Screw Machines, Drill Presses or Horizontal Boring Mills for grooving, undercutting, recessing, necking and facing.

Adjustment is provided for the tool bit after grinding as well as location of groove and correct depth setting to control the diameter of recess. Send us blueprint or sketch of your recessing problem for a quotation.

Scully-Jones AND COMPANY

1901 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.

Force Measuring Beam

(*Concluded from Page 102*)

slots. Lower slot is long and relativ close to bottom of the beam. This the most easily deflected portion of beam.

Should force involved exceed re tance of this section, short steel pins be inserted into the drilled-out pla in center of slot. Thus, lower section firmly coupled to middle section utilizes the stiffness of both. Should ditional stiffness be required, pins serted in the hole of second slot cau force to be opposed by three secti of the beam thereby providing the sired maximum stiffness.

Weighing bar permits tests on s widely dissimilar materials as st copper, porcelain and plastics and secu in each class the same degree of accur in measuring stresses. By matching stiffness of beam of the forces requi by different tests, approximately same degree of deflection is secu in each case and accuracy of the res are comparable.

Catalog Describes Metal Cleaning Equipment

A revised edition of "The Ameri Line," a 24-page reference catalog the entire line of products manuf tured by American Foundry Equipm Co., 555 South Byrkit street, Mi awaka, Ind., summarizes each of following products: Wheelabrator less blast cleaning equipment; T blasts, tables and special cabinets; blast rooms, cabinets, accessories supplies; Wheelapeening (shot peeni equipment for improving the fati life of stressed parts; metal wash equipment; Dustube cloth bag type d collectors; sandcutters for condition foundry sand; rod straightener and sh machine; and airblast Long Lyfe n zles.

Also included are operating views typical installations, and a section is voted to brief descriptions of the m chanics, application and advantages the airless Wheelabrator method abrasive blast cleaning.

Using Fuel Efficiently

Efficient Use of Fuel, cloth, pages, 5½ x 8½ inches; published Chemical Publishing Co., 26 Court Brooklyn 2, N. Y., for $8.50.

This text covers use of all fuels industrial purposes. Composition properties of all types of fuel theories and principles of combust are explained. Equipment used in bu ing all types, coal and other solid fu fuel oil and industrial gases is detail

The text was prepared under dir tion of the education subcommittee the fuel efficiency committee of Ministry of Fuel and Power of Gr Britain. The American edition has foreword by John C. Olsen of the Po technic Institute of Brooklyn.

For decades plate has been sharply bent — or curved — corrugated — punched — and formed into various shapes. But can you think of any ONE method or machine prior to the development of the bending press, that could perform all of these operations speedily and easily?

In this modern world where efficiency is becoming ever more important, no one working with plate in thickness up to an inch can afford to be without a bending press. As applied to metal forming, it is a lathe, a shaper, a planer, a boring mill and drill press, all rolled up into one.

Sweeping curves and sharp bends are only a few of the many operations that can be performed on a Steelweld. With dies available, and simple ones that are easily made, the kinds of work that can be produced are practically limitless.

Now, more than ever before, it is important that you be keyed up to do all kinds of forming work with dispatch and accuracy. We urge you to get the facts on this modern tool.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Stress Analysis

(*Continued from Page* 110)

in either value. At Alcoa, a specia room is provided for drying and testing in which the specimens are placed imme diately upon spraying. Here air tem perature is maintained exactly at 70°F plus or minus no more than 1°. Hu midity is held at 50 per cent with varia tion of less than 3 per cent plus o minus, this control being accomplishe by removing water from the air and the returning just the amount desired wit steam.

Air conditioned laboratory is approx mately 50 x 70 ft and is at ground leve Ventilating and air conditioning equip ment serving it occupies a much large space on the floor just above. Air condi tioning equipment supplies a large vo ume of air to facilitate drying. Norma drying time at Alcoa is 16 hr.

Temperature is particularly critica as a 3° drop in temperature may caus the Stresscoat to become so sensitiv that it will crack at random. How ever, this change in sensitivity with tem perature makes it possible to contro sensitivity by varying the room tempera ture slightly, a small rise lowering an a small drop increasing sensitivity.

Obtaining Assembly Stresses: Alco engineers utilize Stresscoat for severa purposes in addition to obtaining dat on working stresses. One of these for obtaining tensile prestress informa tion. In making any assembly, par are stressed as bolts are tightened, o sections pressed or shrunk together, et Since these stresses influence allowabl working stresses, it is important to know their amount, direction and distributio throughout the part.

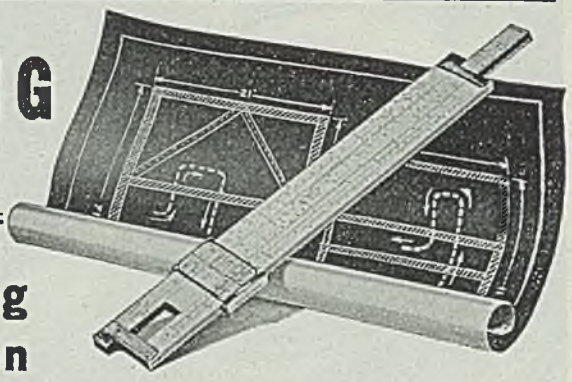
In studying a crankcase, for instance Alcoa engineers will assemble the cas just as fast as possible after the Stress coat has dried. Cracks in the coatin then will show distribution and amoun of *tensile* strains set up by *assembl* forces. After quickly dismantling, th same test parts can be used for additiona investigations by marking with a colored crayon the areas showing the *assem bly tensile strains* or they may b dyed a certain color.

Compressive prestress is found i a similar manner. Reassembled an held for 3 hr minimum, the coatin will flow plastically to take a new "set so that subsequent disassembly will re veal *compressive prestress* by new cracks These areas then can be marked off b a crayon or dye of different color and th same test parts used for finding workin stresses by assembling and applyin forces simulating normal loading. Ad ditional cracks found on again dismant tling the assembly will then show amount and distribution of *imposed ten sile strains.*

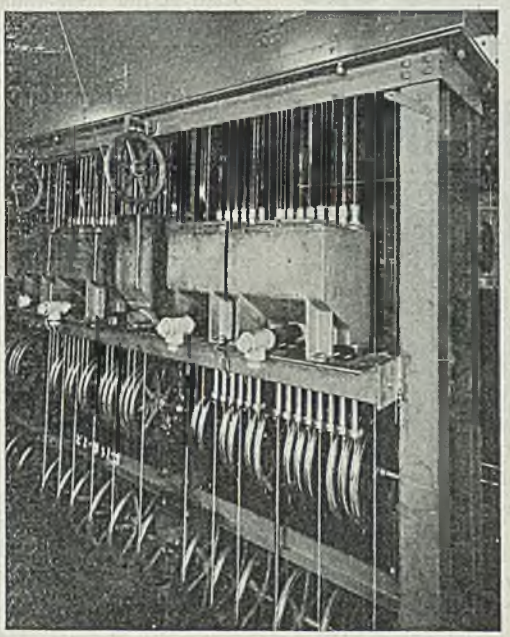
For *imposed compressive strains* par is loaded, held 3 hr for plastic flow to a new "set," then released to show *compressive imposed strains by new* cracks.

In this manner, it is possible to sep

OVEN ENGINEERING NEWS



Country's Largest Strand Coating System Features Constant Tension and Variable Speed Handling



Multi-coat ing system xing arrange- nt of coating and driving eeves.

THE coating equipment shown on this page, designed and built by **IOE** engineers, is the biggest installation of its type in the country, having a total capacity of 40,000,000 feet of production per month through 21 consecutive continuous resin coats. In designing and building this equipment the previous processing time of several hours for a complete operation was reduced to minutes, effecting a tremendous saving in time and money.

This equipment not only makes 21 consecutive coats or dips continuously and at very high speeds but is capable of applying any different types of coatings, including lacquers, varnishes, solvent resins, water dispersed resins, and latex, through any number of coats up to and including twenty-one.

The intermittent high speed drying between successive coats is accomplished by direct gas fired convection heater units which are designed to handle highly explosive solvents or plasticizers.

This particular equipment handles eight consecutive ends which operate independently of each other although having a common drying unit. Speeds are independently variable and depend on the material, the type of coating and the diameter of the cord being processed. Each end of the cable or cord is equipped with its own constant tension variable speed takeup unit.

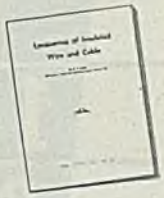
An installation such as this has a wide number of uses, being capable of processing wire, cord, cable, rope and other continuous filament materials of similar cross section within wide limitations of size, material and process.

All types of finishes, either organic or inorganic, water soluble or solvent soluble, can be applied at high speeds and with accurate coating build-up.

This type of high speed coating equipment is typical of many special duty installations we have made. We have likewise designed and built a number of similar systems that have proven unusually economical to operate because they have always been rigidly engineered with an eye to operating and maintenance economies and to exact processing requirements.

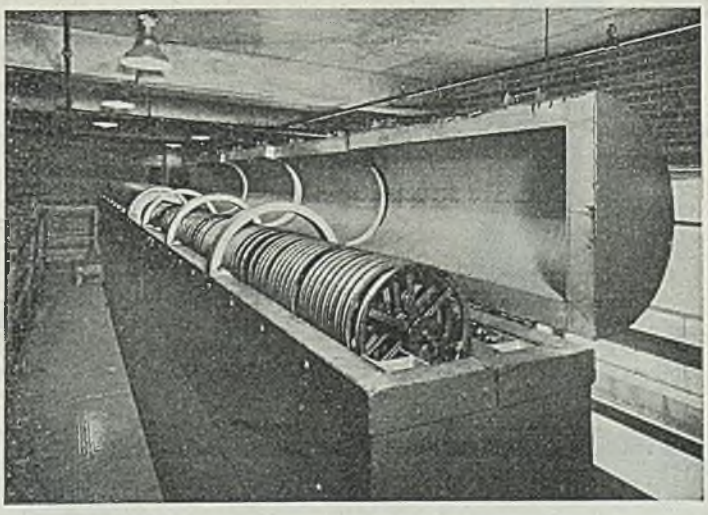
You'll Find These Useful

For the last four months, our advertisements have been describing different types of recent installations we have made. These and a copy of "Lacquering of Insulated Wire and Cable" an easily comprehended description of the four basic types of continuous wire finishing systems, profusely illustrated, (a reprint of our 16-page article in *Wire and Wire Products*,) are available for your scrutiny and profitable study.



In the coming battle of costs, you cannot afford to be without such basic information. Send for this material today.

Below: Accessory sheaves make easy threading.



(This is No. 24 of a series. Reprints of previous advertisements sent free upon request)

IOE ENGINEERING VERSATILITY

THE INDUSTRIAL *Oven Engineering* **COMPANY**

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Engineering Representatives in Principal Industrial Areas

★ ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON, W. 1, ENGLAND ★

arate various stresses and learn m about the different forces acting o part of assembly.

Usually in finding effects of work loads, full simulated loading is applied immediately but a series studies is made at various percent of maximum load. Main objectiv usually to find direction and loca of maximum strains, those points b readily identified by the closely spa cracks in the coating as the spacing tween cracks is the indication of am of strain—the closer together the cra the greater the strain.

For actual quantitative determina the calibration bar previously refe to is utilized, this bar being coated dried at the same time as the test p and under the same conditions of perature and humidity. Spacing degree of uniformity of crack patt on the calibration bar then indicate value of strains for similar patterns the tested part.

Separate bars are used for ten and compression. For compression, is stressed and held for plastic flow, released with the specimen.

For maximum accuracy, load is plied in increments and read at indication of cracks, since first cr ing of the coating is more sensitive therefore most accurate point.

Dynamic Tests: Stresscoat is also ful in making dynamic tests on run parts. Examination then is unde stroboscope while running, or by etching to show the cracks after ning. Staining is necessary to show the cracks because they may close tig after running the part.

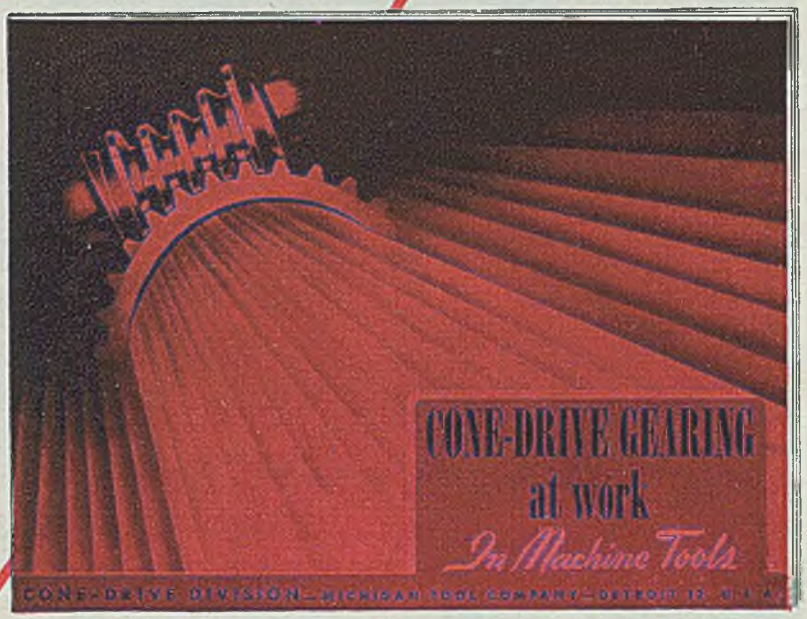
Of course, it must be realized the results shown by Stresscoat strains, the numerical values obta from the calibration bar being a tion of an inch, per inch. To con these to stress values, the strain v is multiplied by the modulus of ticity of the material at hand, gi apparent stress. Mr. Anderson emp sizes that this is *apparent* stress wh can vary 30 per cent from indica stress but usually is much closer, so thing like 10 per cent.

Supervision Follow-Through: Mr. derson advises that best overall test sults are obtained with Stresscoat by ing one man responsible for the en sequence of surface preparation, sp ing, drying, loading and interpreta of results on a test specimen.

While the investigator may help actually doing the various operations, his duty to supervise them. This has b found particularly important for e when operators attempt to precisely plicate another's work, slight differen in technique and interpretation may c fuse results. For that reason, each in tigator follows through completely on pieces he is studying.

Temperature Affects Fatigue: Since e vated temperatures affect mechan properties of materials, high work temperatures are accompanied by lo

How POST-WAR MACHINE TOOLS will get their



Many major producers are using CONE-RIVE gearing to obtain these three attrib-es in machines designed for Post-War use. he story is told in a new booklet now ailable from the CONE-DRIVE DIVISION.

The reasons so many machine tool manu-churers are turning to CONE-DRIVE gearing e inherent in that gearing itself:

1. Large actual area contact between gear teeth and more teeth in contact, resulting in vastly higher load carrying capacity and smoother power flow.

2. Ability to generate gears that have the *exact* amount of backlash desired.

3. Ability to resist wear. CONE-DRIVES tend to wear "in" instead of "out". They actually become *quieter with use.*

4. Greater compactness by virtue of the greater load carrying capacity for a given size.

SPEED
POWER
SMOOTHNESS

We will be glad to send you a copy of this booklet. Ask for Bulletin #632— CONE-DRIVES IN MACHINE TOOLS

CONE-DRIVE DIVISION **MICHIGAN TOOL COMPANY**
7171 E. McNichols Road, Detroit 12, U.S.A.

fatigue strength. Therefore it is imp tant to know the operating temperat at various points throughout the vari portions of parts. While most import applications of the method of temp ture determination described below h been in development of superior des for cylinder and piston head assemb for aircraft engines, it is equally ap cable to any machine where high ope ing temperatures are involved.

Use of thermocouples or other con tional methods for measuring temp ture of such rapidly moving parts as tons and connecting rods involves ous difficulties in placing and connec the thermocouples since their pres may interfere with normal functionin the part.

Alcoa engineers found that the h ness of heat-treatable aluminum alloy known analysis and heat treat could correlated with length of time they been subjected to a given temperatu or knowing the time, the tempera throughout any section desired could found by brinelling the piece cut to veal that section desired, after runn While the method is limited to h treatable aluminum alloys which s substantial hardness changes on reh ing, it is admirably suited to wro aluminum alloys 32S and 18S as we cast alloy 142, materials well fitted use in estimating the working temp ture of engine parts.

Fig. 4 shows a typical set of cu connecting brinell hardness values working temperatures for various ope ing periods from 25 to 1000 hr.

Special Equipment: Alcoa's air-co tioned stress-analysis laboratory roo used only for the drying, testing and terpretation of stressed parts. No eq ment not actually being used is st there. All supply lines for gas, air, electric power, etc. are under the or behind walls to keep entire room clear of any obstructions.

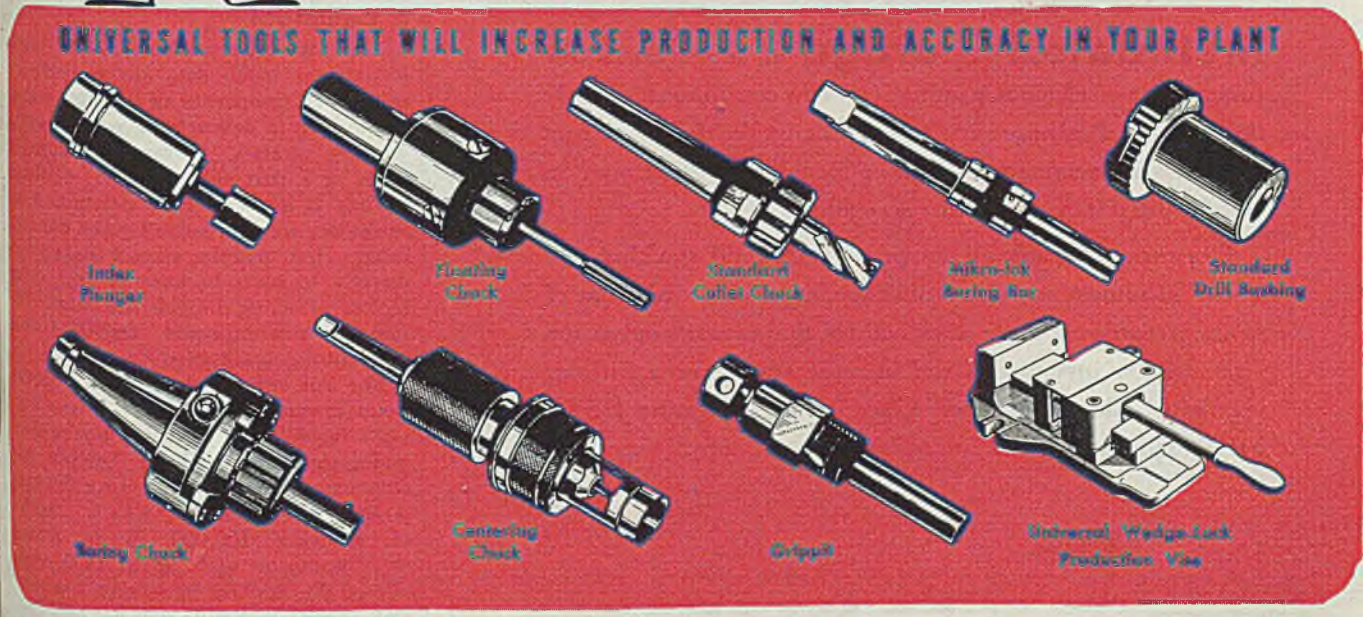
As soon as a part has been sprayed dried, it is mounted on a suitable fix and loaded by hydraulic jacks positio to simulate service loading. See Fig and 13. The hydraulic jacks are oper through hand pumps and calibrated cision gages with large scales for reading so loads are controlled care and known accurately at all times.

Special Centrifugal Test Setup: Per the most unusual machine found in laboratory is a special centrifuge signed not for testing parts to failure to apply controlled and measured trifugal forces to stress parts subjec this type of loading such as tur rotors, impellors and fans. This un located in a pit below the floor of air conditioned laboratory room. See 11 and 14.

The pit is about 5 ft deep and 5 diameter. A part or assembly within t dimensional limits and weighing up to lb can be rotated on its axis. Speeds to 60,000 rpm are available by mean two air turbines that power the mach

UNIVERSAL CENTERING CHUCKS AND ADJUSTABLE STOP CHUCKS

Universal Centering Chucks make a centering machine of practically any medium size drill press. Furnished with collets and bushings to hold and guide a wide variety of center drills. Bushings are beveled to form conical surface that fits firmly over ends of shafts to be centered. Depth of drill penetration easily regulated within few thousandths. **Universal Adjustable Stop Chucks** control the depth of holes and countersinks on hand feed machines. Revolving stop arrangement operates on ball bearings, eliminating excessive wear to stop portion and preventing damage to machined surfaces when work itself is used as stop. Collet firmly grips either flute or shank of jobber's or straight shank drill. Write for complete information.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, . MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

A remote control electronic speed indicator in conjunction with the turbine indicates and records revolutions per minute continuously. Parts to be tested from the turbine shaft.

At these high rotational speeds it is important to evacuate the test chamber to reduce the power consumed in turning the test piece. For example, a 13-in. diameter impeller wheel may require 175 hp to turn it in air at 25,000 rpm whereas only a fraction of a horsepower is required in a vacuum. For this reason, the pit is sealed and evacuated, pumping capacity available being capable of exhausting the air to a pressure equivalent to 10-in. of mercury in 10 sec. Usually a pressure equivalent to 5 in. of mercury is sufficient for most testing, although much lower pressures can easily be pumped when necessary.

Heavy steel snubbing rings—25,000 lb of them—from the wall of the pit. These rings are not complete circles but have a break at one point to allow the ring to expand and absorb the shock upon even the test specimen flies apart during testing. Inside of the rings is lined with wood to minimize the damage to broken pieces from the test specimen as it is important to save the parts for examination when a specimen fails. Strain levels are obtained by means of a calibration disk also coated with Stresscoat and dried along with the specimen to be tested. The disk is spun with the test part, producing a series of cracks in the coating at various strain levels, depending upon the rotational speed. See Fig. 15. Cracks then indicate sensitivity of the coating, thus enabling strains in the specimen to be determined.

Fatigue Testing: Having determined maximum stresses, the range of cyclic stresses, working temperatures and number of cycles of operation, it is necessary to establish whether or not the stresses are within the safe working limits of the material.

This is relatively simple for static loading, as much data are available on mechanical properties of various materials to help in determining safe allowable working stresses. However, allowable stress of a part subjected to repeated loading is not so readily determined, as laboratory rotating-beam tests on standard fatigue test samples cannot be applied directly to parts because of the many factors affecting fatigue life that the standard rotating-beam test does not take into consideration.

For this reason, there is a distinct trend toward use of direct fatigue testing using full size parts and testing them under simulated loading. Special machines have been developed for this purpose. One of these at Alcoa is capable of applying 100,000 lb in tension or compression with up to 1400 reversals of the applied force every minute. This special hydraulic unit not only duplicates cylinder pressures in testing heads and pistons and similar engine parts but is capable of stimulating the rate of pressure rise found in actual engines. This feature is particularly important.

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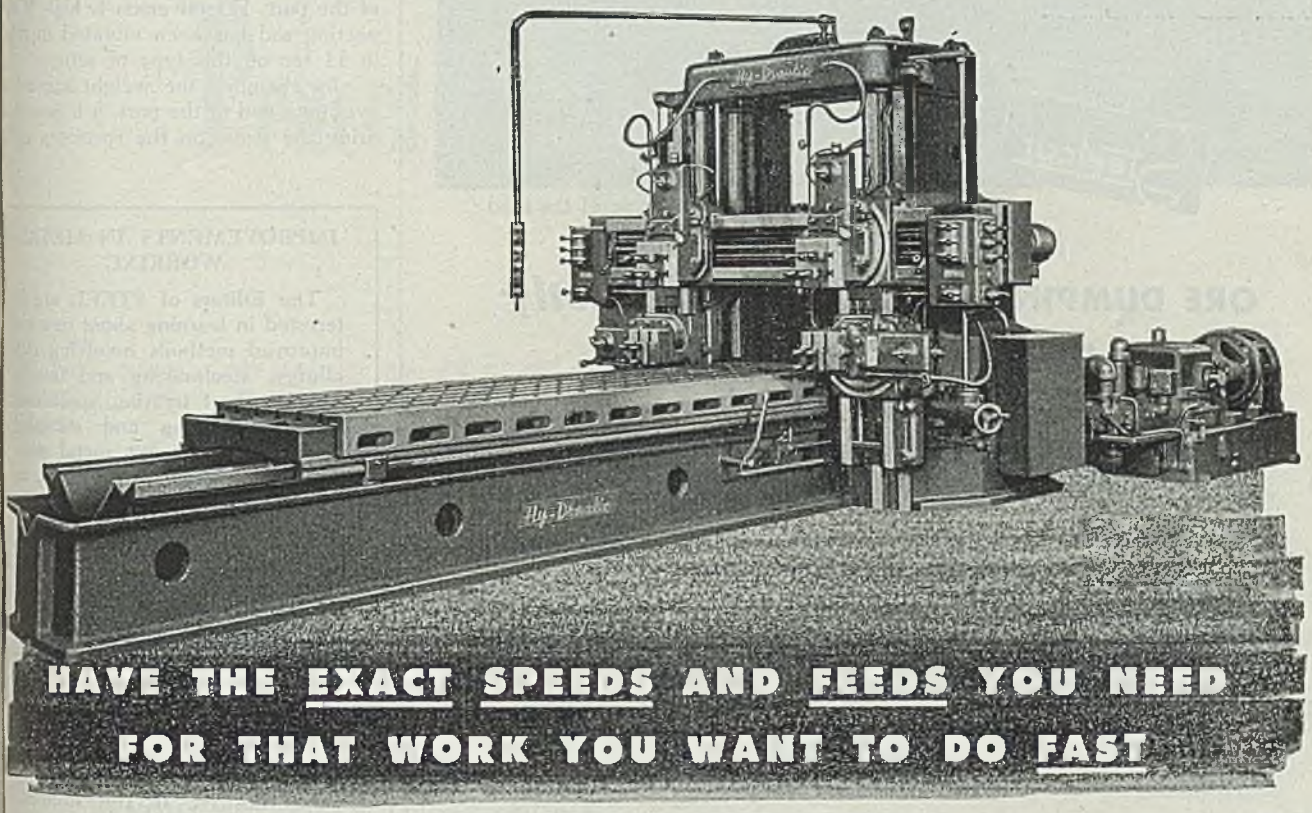

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New hydraulic testing machines are now being developed without hydraulic lines, thus enabling the new units to reach greater pressure rise limits than existing equipment.

Vibrating Tables: Many other full sizes parts are fatigue tested on vibration tables. Here the work is clamped at one end to a table top that is hinged, a cam causing the other end of the table to travel back and forth through a certain distance at a speed determined by the speed of the shaft driving the cam.

This type of setup is especially useful Varying the vibration speed, it is possible to reach the natural period of vibration of the part. Effectiveness is high. A connecting rod has been vibrated to failure in 11 sec on this type of setup.

By changing the weight applied a overhung end of the part, it is possible to bring the stress on the specimen up to

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The Editors of STEEL are interested in learning about new and improved methods involving metallurgy, steelmaking and foundry practice, heat treating, machining, forging, drawing and stamping, welding and brazing, metal cleaning and finishing, die casting, assembly and materials handling methods, more effective use of materials and other subjects relating to metalworking. Payment will be made for articles prepared exclusively for STEEL. Write to: Engineering Department, STEEL, 1213 West Third Street, Cleveland 13, O.

the level desired. In this manner, S curve (stress values plotted against number of cycles) can be obtained to sho life at various stress values. Also, the stres value at which infinite life can be ex pected can be predicted by extending the curve.

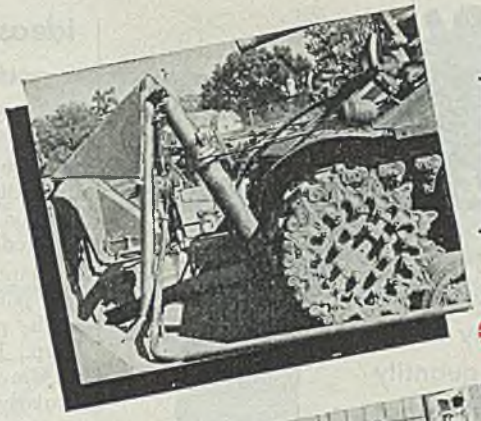
Other special equipment for stre investigations include high speed cathod ray oscilloscopes for visual and phot graphic recording of dynamic stress valu and other dynamic phenomena reveal by electric gages of the resistance wi type.

Much other advanced electron testing equipment is also found the revealing a profound knowledge of ele tronics and vacuum tube circuits a eliciting the opinion that much n knowledge in the realm of stress analy may be expected to come from th laboratory.

—o—

A 32-page booklet entitled "In W . . . In Peace, Republic Stainless a Heat-Resisting Steels" has been pr duced by Republic Steel Corp., 31 East 45th street, Cleveland. It is illu trated and graphically tells role of the metals in war effort.

War-born Ideas for Peacetime Products:



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TA-1344

Ideas on Shop Practice

(*Concluded from Page* 114)

the rate of erosion so that the stopper rod is protected. He mentioned that practice is improved by using clay graphite, sodium silicate mix in all the joints of the rod assembly and that this practice has reduced the erosion of joints.

Graphite nozzles long have been used for pouring tungsten high-speed steel at the plant of the Braeburn Alloy Steel Corp., Braeburn, Pa., according to J. S. McGraw, Melting Superintendent, particularly on 8-ton heats which pour 34 seven-inch ingots weighing 475 lb each. The speaker cited two advantages of this type nozzle: (1) The nozzle never has to be lanced because it holds it hardness and does not mushroom under pressure of the stopper at each shutoff. (2) No variation in diameter, nor washing of clay to get trapped in the steel. The speaker warned that a poor seat, which allows a slight leak, can rarely be stopped. To offset this, a slight oxidation of the seat and stopper during the preheat is decidedly helpful.

L. H. Nelson, Mill Metallurgist, Republic Steel Corp., South Chicago, Ill., emphasized that on alloy heats the charge should contain as much of the desirable alloy content as possible. Any alloy recovered from scrap is of economic advantage, he stated. When the bath obtains the alloy from the charge, such alloy has the following value:

Every 0.10 per cent:

Mn is worth $0.16 per n.t. ingots
Cr is worth $0.24 per n.t. ingots
Ni is worth $0.60 per n.t. ingots
Mo is worth $1.60 per n.t. ingots
V is worth $5.40 per n.t. ingots

Benefits that can be derived from flushing a poor basic slag amount to as high as 30 per cent saving in basic fluxes and also in time and power according to R. J. McCurdy, Melt Shop Superintendent, Republic Steel Corp., South Chicago, Ill. He mentioned three stages of the reducing period when alloys are added to the bath as follows: (1) After slag-off period on the bare bath; (2) immediately after the final chemical test is taken; (3) when results of the final chemical test are known.

A completely melted heat, fairly hot at slag-off is desirable in any case if the proper deoxidation and alloy adjustment are to be made. The practice of adding all alloys after the results of the final test, Mr. McCurdy explained, produces well deoxidized heats but sacrifices considerable time in doing so. This method is advantageous when a heat is low in temperature or high in sulphur and a delay cannot be avoided. Both temperature and slag conditions, he stated, can be adjusted more closely because of the additional time spent waiting for laboratory results and equilibrium conditions in the bath. The slag line usually requires more attention after tapping than is necessary in the quicker deoxidization practices.

Sulphurized Steels

(*Concluded from Page* 119)

addition and the fourth remains as a standard unsulphurized analysis.

Continued experimentation and more widespread examination, investigation, and machining of sulphurized alloys will be required before definite conclusions can be advanced, but these and similar preliminary reports of the increased tool life, machinability or production realized with sulphite treated alloys, and sulphurized alloys, indicate that a measurable contribution has been made toward improved machinability of the constructional alloy steels.

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Business Directory of New England Manufacturers

Directory of New England Manufacturers 1946; 770, pages, 7½ x 10½ inches; published by George D. Hall Co., Boston 9, for $25.

This is the tenth annual edition, published with editorial co-operation of the New England Council. In addition to general information of value to businessmen it presents an alphabetical section listing all detailed information New England manufacturing companies, with names of president, treasurer, partners or proprietor; a geographical section, listing manufacturers by city or town in which they are located, with description of products; a product section, listing manufacturers under products they make; a brand name section, listing brand and registered trademark names used by New England manufacturers, of help when the product name is familiar but the maker unknown.

Other sections contain information on the New England Council and its purposes; advantages of industrial locations in New England; engineering societies of that area; a product section index and catalog section.

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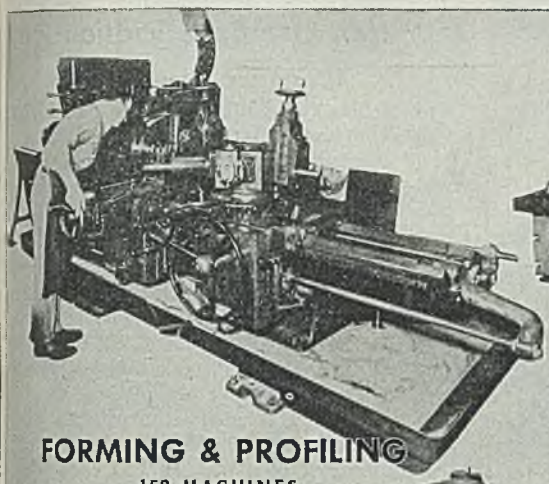
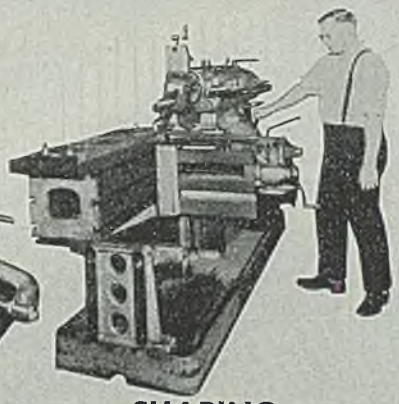
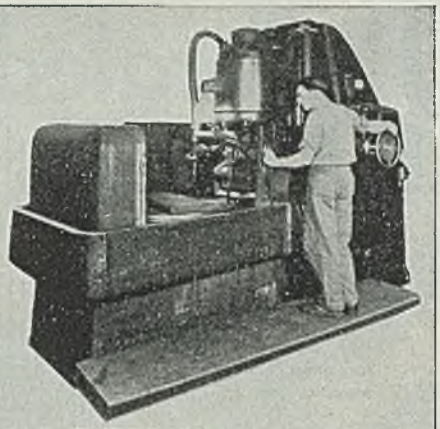


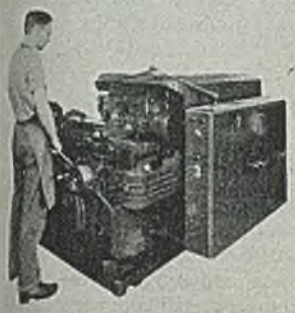
FORMING & PROFILING
150 MACHINES



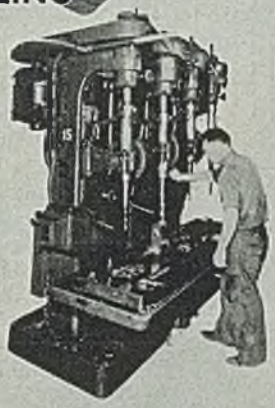
SHAPING
11 MACHINES



ALL TYPES OF GRINDING
233 MACHINES

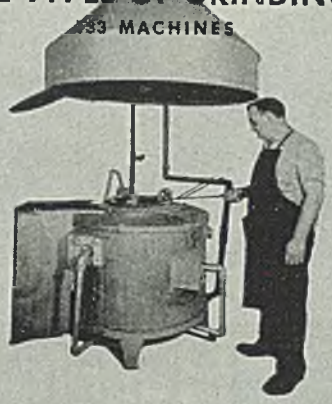


THREAD GRINDING
4 MACHINES

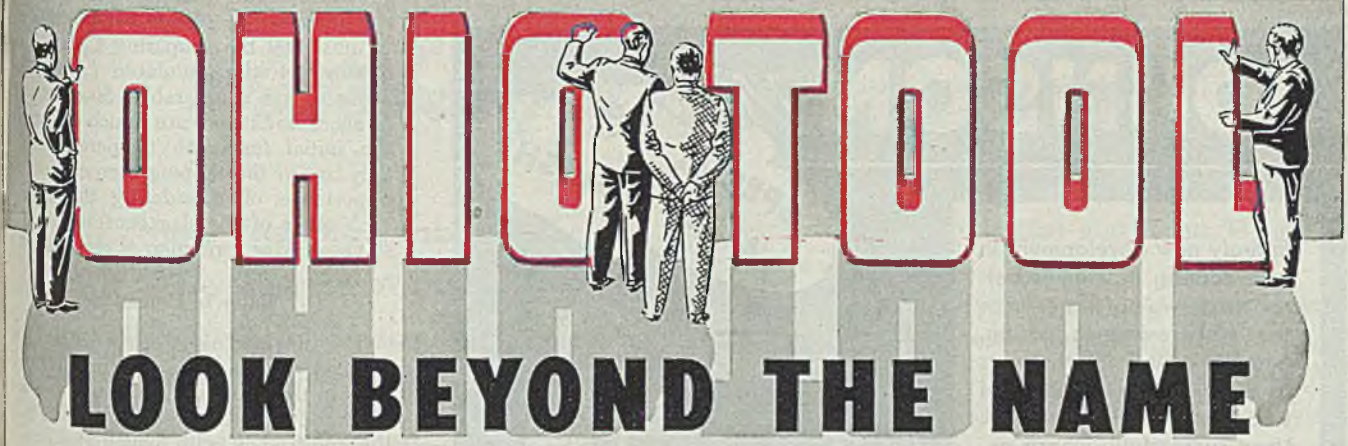


DRILLING
39 MACHINES

MILLING OPERATIONS
47 MACHINES



HEAT TREATING
14 FURNACES



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Iron Ore Beneficiation

(*Continued from Page* 128)

4 Slag) of 1521°C, a ratio of 1.05:1.00. The loss of 10.20 per cent of heat concentration in the lower bosh and only 0.58 per cent decrease in heat taken from the furnace with the tapping slag is shown.

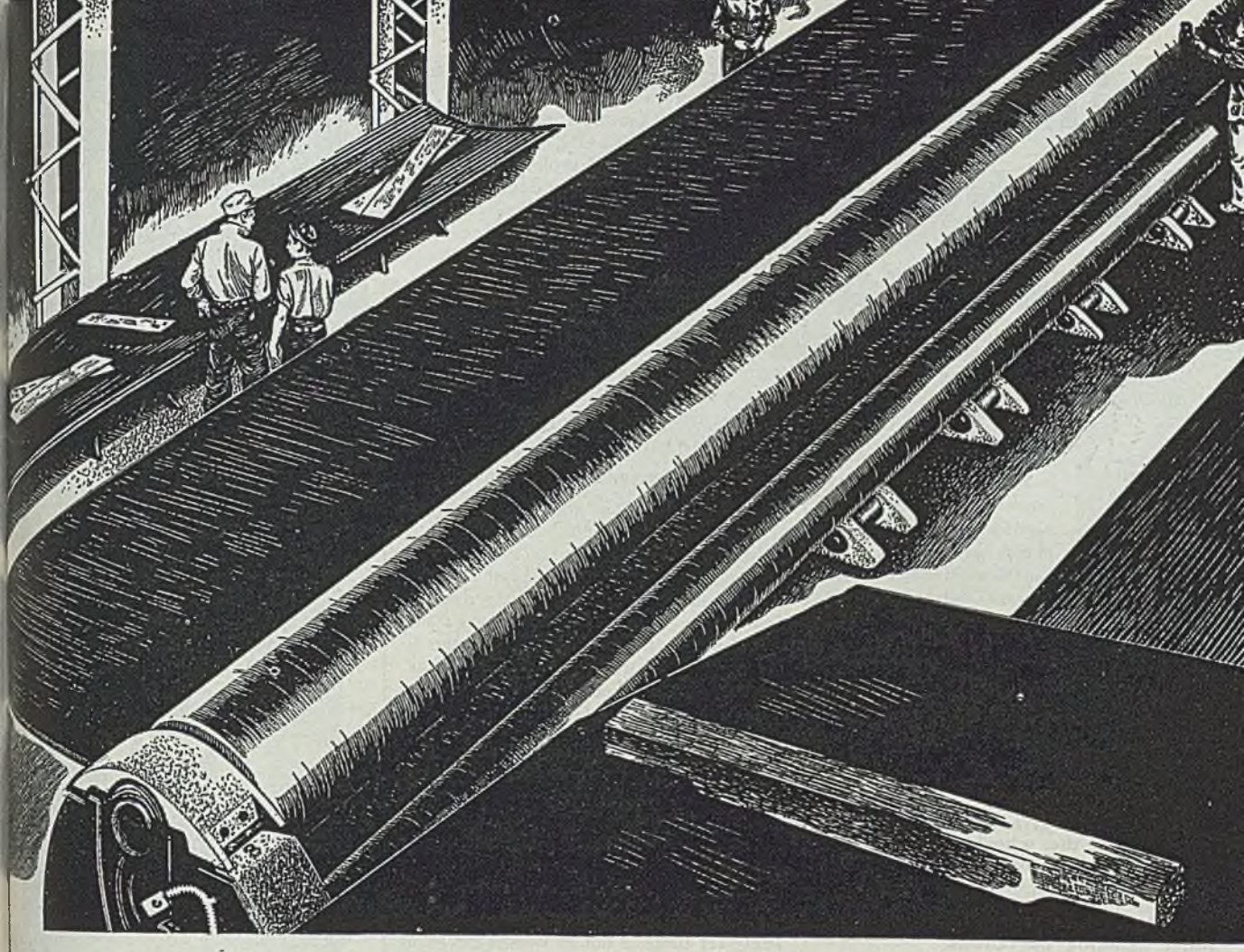
Charts 4, 5, 6 show graphically the thermal effects of various slag constituent ratios calculated in the same manner as those of Table I. Each chart represents a series of calculations in which silica (SiO_2) and alumina (Al_2O_3) have been held constant; the calcium (CaO) and magnesium (MgO) oxides varied in multiples of 2 per cent. In each calculation the four constituents totaled 97 per cent. Charts Nos. 4 to 6 show the alumina (Al_2O_3) as progressively increased and the calcium oxide (CaO) decreased in multiples of 3 per cent.

In this series of calculations 33.95 per cent silica (SiO_2) was used because the conversion of that percentage from the 97 to 100 per cent oxide total causes it to be 35 per cent in the 100 per cent total. In Table VII the silica (SiO_2) of the 97 per cent oxide composition is 35 per cent which when converted to the 100 per cent total becomes 36.08 per cent. This difference of 1.05 per cent in silica (SiO_2) content in the base calculation causes a marked effect upon the silicate compositions of the slags and emphasizes McCaffery's teachings regarding such effects from minor changes in constituent percentages. The thermal effects due to the difference in silicate composition may be observed by comparing Charts 3 and 5 in which the aluminum (Al_2O_3) percentages are comparable. Since the differences indicated are much greater in the initial formation temperatures than they are in the tapping temperatures the importance of considering the ratio to each other of the slag constituents at all stages of slag formation is emphasized.

Ratio Is Consistent

The outstanding effect of silicate composition of slag upon the thermal conditions in the blast furnace hearth and bosh indicated by the six charts appears to be the consistency with which the ratio of lower bosh to tapping temperature is lowered as the percentage of magnesium oxide (MgO) increases in the slag—within the range of silica (SiO_2) and alumina (Al_2O_3) used in the calculations. The range of slag analyses compared is believed to be representative of the slag of most American coke furnaces. The calculations show that high alumina (Al_2O_3) percentages with high magnesia (MgO) percentages is detrimental to thermal economy in the hearth and bosh of the furnace because with that combination magnesia (MgO) must replace calcium oxide (CaO) or silica (SiO_2) and the SiO_2/CaO ratio will not permit the formation of the calcium orthosilicate in the percentage necessary to concentrate heat in the lower bosh.

It is of interest that in the calculation of the low alumina (Al_2O_3) slag, Table



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Thermit Welding

Grinding Questions Answered

By ALLEN STEELE
Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

Presented as a practical aid in the solution of many common grinding problems. Readers are invited to send in their own grinding questions, without obligation. All questions will be answered by mail or in this column.

Continued from Previous Issues

32 Q. *"What are the factors which determine how soft or hard a wheel should be in thread grinding?"*

A. In thread grinding, the grade or hardness of the wheel is chiefly determined by the size of grain or grit to be used. As a rule, the finer the grain or grit, the harder the grade which is just opposite the rule usually followed in other grinding operations.

33 Q. *"What is the best type of coolant to use when grinding gear teeth?"*

A. Like so many other questions which arise in practically all grinding operations, the type of coolant best suited for the grinding of gear teeth is often a matter of personal choice or opinion. There are shops where a mixture of soluble oil and water is used. Some use a soda water coolant. Still others prefer a "grinding oil." The latter is probably the most widely used and appears to be steadily gaining new converts.

IV, the ratio of minimum basicity to tapping temperature is comparable to the ratio of those temperatures in Table I. In the low alumina slag calculation the magnesia (MgO) replaces alumina (Al_2O_3) and consequently does not effect the SiO_2/CaO ratio. However, the deficiency of alumina (Al_2O_3) in the early stages of the slag formation in relation to the bases carried to flux the coke ash causes a high percentage of calcium orthosilicate to be formed in the initial stage of formation and consequently a high temperature in the upper bosh emphasizing the importance of the ratio of the ore mix slag constituents to the coke ash slag constituents.

How Composition Is Verified

Conclusion: The silicate composition of tapping slag (tetrahedron No. 6) shown to be the most favorable to the thermal reactions of the blast furnace hearth and bosh operation, in the description of the six actual furnace operations using raw materials of a wide range in chemical composition and physical characteristics, is checked by the silicate composition of slag (Calculations B and C, Table I) shown by the theoretical calculations to be the most favorable to those reactions. The preferred thermal conditions in the hearth and bosh can be obtained only when there is the proper relation to each other of the different stages of slag composition from the initial formation to the tapping stage. With the exception of the 3 per cent basic slags of Table III there is not as wide a range in the temperatures of the tapping slags of the other calculations as there is in their initial formation and basicity compositions, thus indicating that the variable effects of slag composition upon the economy of the hearth and bosh operation are greater in the stages of composition preceding the tapping stage than they are in the tapping stage. The control of the stages of slag composition lies in the ratio to each other of the slag forming constituents of the burden charged into the furnace. The calculations (B and C, Table I) indicate the preferred constituent ratios at the different stages of composition and consequently indicate a standard for those ratios which could be used as a guide for a nonvolatile gangue specification in the beneficiation of iron bearing materials for the blast furnace burden.

The indicated standard might be looked upon as an answer to the question sometimes asked by the ore producer, "What does the blast furnace operator want?" The slag volumes produced in the respective six actual furnace operations described varied considerably but again the actual figures are not given because the figures are not pertinent to the discussion of the principal involved, which is the chemical composition of slag most favorable to the thermal work of the hearth and bosh. Even though the volumes varied between the six operations the same classification of slag in silicate composition proved to be the best for the respective operating conditions.

Obviously the minimum slag volume

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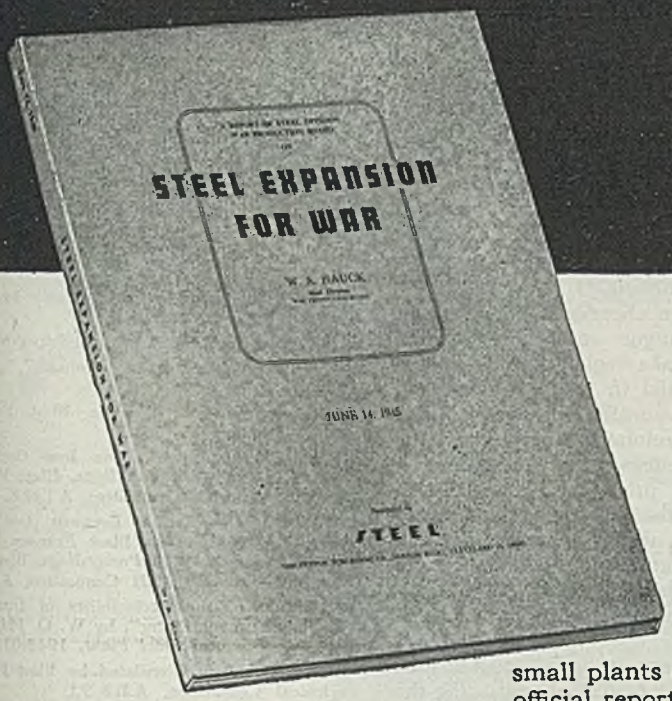

By W. A. HAUCK

[An official report by Mr. Hauck for the War Production Board]

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• Mr. Hauck has been with the Steel Division since its inception in June, 1940, then under the National Defense Advisory Commission (predecessor to WPB). Assigned to the task of expanding and balancing steel capacity for war, Mr. Hauck has inspected both large and small plants all over the United States. He prepared several official reports which lead to the addition of 10,000,000 tons of integrated steel capacity, plus over 5,000,000 tons of capacity by the expansion of existing facilities.

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consistent with a smooth furnace operation and the amount of sulphur to be carried is the most desirable but if the only available mix gives a high slag volume again obviously it is better to have a chemical composition of slag which will consume the least amount of heat for its removal from the furnace.

That such a program is metallurgically practical has been proved by the practice of some Eastern District furnace operations where for the past decade and more hematite ores from Newfoundland, Spain, Morocco, Algeria, Greece, and Australia, by-products of the chemical industry, soft hematite ores from the Lake region, and the magnetite ore concentrates from Pennsylvania, New York, and New Jersey, have all from time to time been blended in various percentages as the needs required and sintered into a uniform product most desirable for the blast furnace burden. The hematite and taconite deposits of the Lake region would blend equally as well.

The range in chemical composition of nonvolatile gangue constituents in the ores of the Lake region would provide the raw material to produce a blended product to the specification desired. Because the heretofore existence of the naturally rich ores has not required a comprehensive program of beneficiation does not alter the fact that as the industry approaches the need for beneficiating lean ores the opportunity presents itself for beneficiating the nonvolatile gangue constituents as well as the metallic constituents.

If the foregoing study is accepted then the teachings of McCaffery regarding the effect of the ratios of the various gangue constituents to each other upon the silicate composition of the slag formed from them, and the effect of the silicate composition upon heat consumption in the furnace operation, indicated by the calculations presented in this article, become doubly important because the cost of beneficiation must justify itself and the opportunity for justification lies in a reduction of the fuel rate for smelting as well as in an increase in production.

The thermal effects of chemical composition of gangue constituents are factors which are subject to the principles of material beneficiation and any correction in composition of excessively lean ores must be made before the materials containing the composition are charged into the furnace. Such correction can be made only by concentration and/or blending as a primary step in beneficiation. In this phase of the subject sintering, nodulizing, briquetting, or pelletizing, are all secondary steps in beneficiation and the products of each have different characteristics heretofore described and a selection of a second step process to complete beneficiation must be based upon the effect of these different characteristics upon the blast furnace operation.

Changes in material character effected by beneficiation may affect the thermal principles of the shaft operation of the blast furnace without affecting those principles of the hearth and bosh operation. To get full benefit from ore beneficiation the method and program selected must serve both the shaft and the hearth and bosh operations of the blast furnace.

In a study of the problems of iron ore beneficiation the different principles which govern the three different operations of the ore treatment, the blast furnace shaft, and the blast furnace hearth and bosh, should not be confused. It is believed that too frequently answers are sought in the beneficiation process which are to be found only in the divisions of the blast furnace operation.

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(5)Bureau of Mines Technical Paper No. 442—"The Blast Furnace Stock Column", by S. P. Kinney.

(6)Smelting Sinter in the Blast Furnace. STEEL, February 15, 1943.

(7)"Agglomeration of Fine Iron Ores", by C. V. Firth, 1944 *Proceedings*, Blast Furnace and Raw Materials Committee, A.I.M.E.

(8)"Some Comparison Between Iron Ores, Sinter, and Nodules as Blast Furnace Feed", by T. L. Joseph—1944 *Proceedings*, Blast Furnace and Raw Materials Committee, A.I.M.E.

(9)"Study of the Reducibility of Iron Ores and Blast Furnace Sinter", by W. O. Philbrook. *Blast Furnace and Steel Plant*, 1943-31.

(10)Unpublished. Circulated by Blast Furnace Technical Committee, A.I. & S.I.

(11)Prof. Richard McCaffery and Co-workers. A.I.M.E., 1931, Year Book.

(12)Bureau of Mines Technical Paper No. 425—"Production of High Alumina Slags in the Blast Furnace", by T. L. Joseph, S. P. Kinney, and C. E. Wood.

Papers on Stress Analysis

Experimental Stress Analysis, Vol. 3 No. 1; 154 pages, 8½ x 11 inches; published by the Society for Experimental Stress Analysis, Central Square Station, Box 168, Cambridge, Mass., for $5.

This volume contains papers presented in a recent meeting of the Society for Experimental Stress Analysis, twelve in number. The papers are highly technical and deal with various phases of the use of strain gages and other applications to testing methods on a number of industrial materials.

New Zinc Alloy Finish

A new zinc alloy finish for wire has been announced by Johnson Steel & Wire Co. Inc., Worcester, Mass. It has been used successfully where extreme acid or gas fumes are prevalent, and is claimed to give two to three times the rust resistance of tin, with a finish that acts as a lubricant. This coating does not affect the physical properties of the wire, and, being zinc, solders better than tin.

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Latrobe ELECTRIC STEEL COMPANY

S-6 MAIN OFFICES and PLANT • • LATROBE • PENNSYLVANIA

THE BUSINESS TREND

Pent-up Demand for Goods Steadies Industrial Pace

THE TREMENDOUS strength of the pent-up demand for commodities is counteracting to a considerable extent the depressive effects of disturbed labor relations on industrial activity.

Although the recent uptrend in industrial production has leveled off, the trend currently shows not only the ability to avoid a decline despite all unfavorable effects of labor unrest but exhibits an inclination to rise.

Steel ingot production on a percentage of capacity basis remains steady in the low eighties, and daily average output of bituminous coal in the week ended Dec. 1 was 2,050,000 tons, one of the highest rates this year.

AUTOS—Although the strike-bound General Motors Corp. plants produced no cars in the week ended Dec. 8, total auto assemblies of 14,580 units exceeded those of the previous week by 1440 as other firms, notably the Ford Motor Co. and the Nash Motors Division, increased their output.

CONSTRUCTION—Meanwhile, civil engineering construction volume in the United States in the week ended Dec. 6 was 35 per cent above that of the previous week and 343 per cent above that of the corresponding week in 1944. The latest week's total is 22 per cent above the previous four-week moving average.

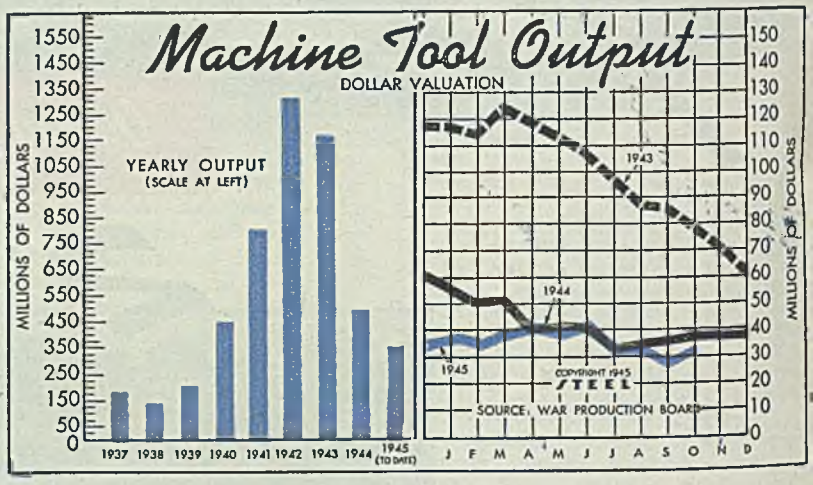
BANK CLEARINGS—Expanding sharply in the week ended Dec. 5, bank clearings for 24 leading United States cities reached $15,250,658,000, highest total recorded this year and the highest level since Nov. 7, 1929. The current figure is 54.6 per cent above the previous week and 18.9 per cent above the like week a year ago.

PRICES—Primary market prices, recently at their highest levels in nearly 25 years, continued to advance slowly in the week ended Dec. 1 because of increases for industrial commodities, the Bureau of Labor Statistics reports.

LIVING COSTS—Increases in cost of clothing and sundries boosted living costs for the average family of wage earners and lower-salaried clerical workers in the United States 0.1 per cent in October, according to the National Industrial Conference Board.

COKE—Reflecting effect of the bituminous coal miners' strike on coal supplies in October, production of coke that month dropped sharply to the lowest rate of the year. October output of by-product coke decreased 21.1 per cent from September while beehive coke fell off 33.5 per cent.

STEEL CASTINGS—Shipments of steel castings during September dropped to 110,631 tons, lowest for the year, and 11 per cent below August. Unfilled orders at the end of September totaled 503,745 tons, lowest mark for this year, and 8 per cent under August.



Machine Tool Shipments

(000 omitted)

	1945	1944	1943	1942
January	$37,353	$ 56,363	$ 117,384	$ 83,547
February	36,018	50,127	114,594	84,432
March	39,977	51,907	125,445	98,358
April	40,170	41,370	118,024	103,364
May	39,825	41,819	113,859	107,297
June	41,040	41,471	108,736	111,090
July	32,504	32,753	97,428	113,596
August	32,500	35,177	87,405	117,342
September	27,300	35,876	85,842	119,883
October	31,100	37,516	78,300	130,008
November	.....	36,277	71,811	120,871
December	.....	36,782	60,861	131,960
		$497,438	$1,179,689	$1,321,748

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	83.5	83.5	76	96.5
Electric Power Distributed (million kilowatt hours)	4,097	4,043	3,948	4,538
Bituminous Coal Production (daily av.—1000 tons)	2,050	1,718	2,078	2,004
Petroleum Production (daily av.—1000 bbls.)	4,469	4,448	4,451	4,704
Construction Volume (ENR—Unit $1,000,000)	$80.3	$59.6	$45.8	$18.1
Automobile and Truck Output (Ward's—number units)	14,580	13,140	32,225	20,340

*Dates on request.

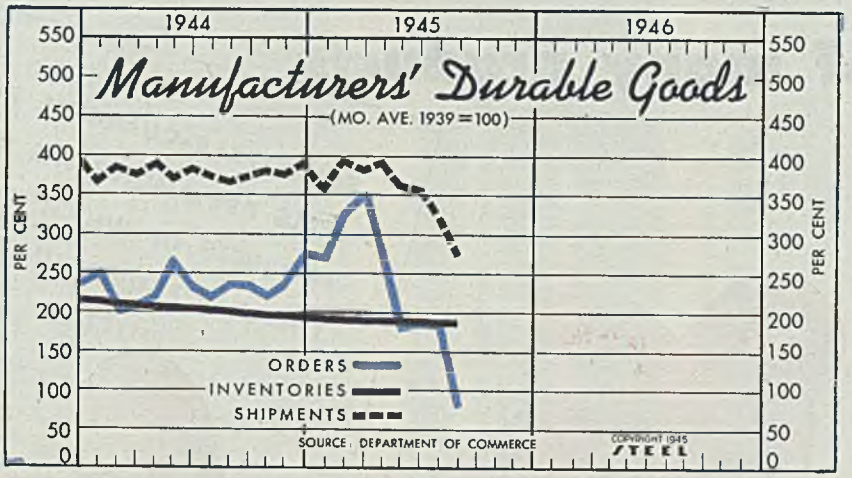
TRADE				
Freight Carloadings (unit—1000 cars)	790†	804	838	794
Business Failures (Dun & Bradstreet, number)	14	15	17	10
Money in Circulation (in millions of dollars)‡	$28,279	$28,169	$28,137	$25,107
Department Store Sales (change from like week a year ago)‡	+7%	+9%	+10%	+13%

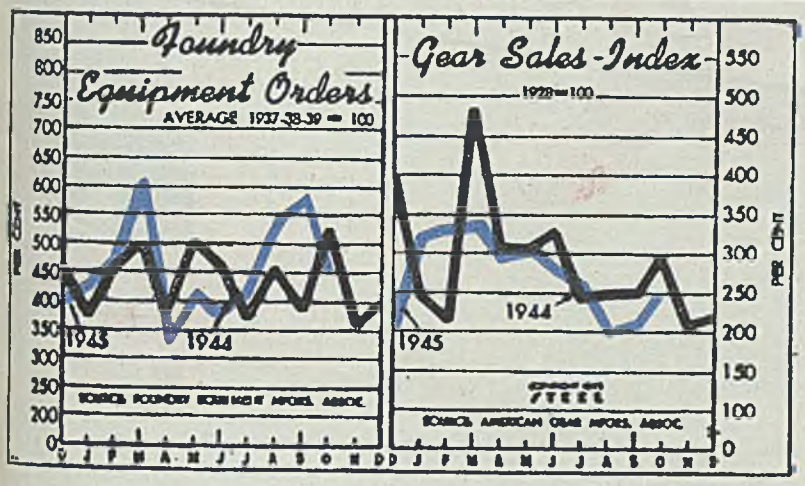
‡Preliminary. †Federal Reserve Board.

Index of Manufacturers' Durable Goods

(Mo. Ave. 1939 = 100)

	Orders		Shipments		Inventories	
	1945	1944	1945	1944	1945	1944
January	267	248	354	364	190	212
February	326	195	394	384	189	209
March	351	202	382	377	189	207
April	267	215	389	389	189	205
May	177	265	361	371	189	204
June	182	227	356	383	189	204
July	180	213	320	373	187	202
August	77	231	274	366	187	201
September	...	230	...	372	...	199
October	...	214	...	380	...	197
November	...	232	...	374	...	195
December	...	276	...	390	...	192
Average	...	229	...	377	...	202



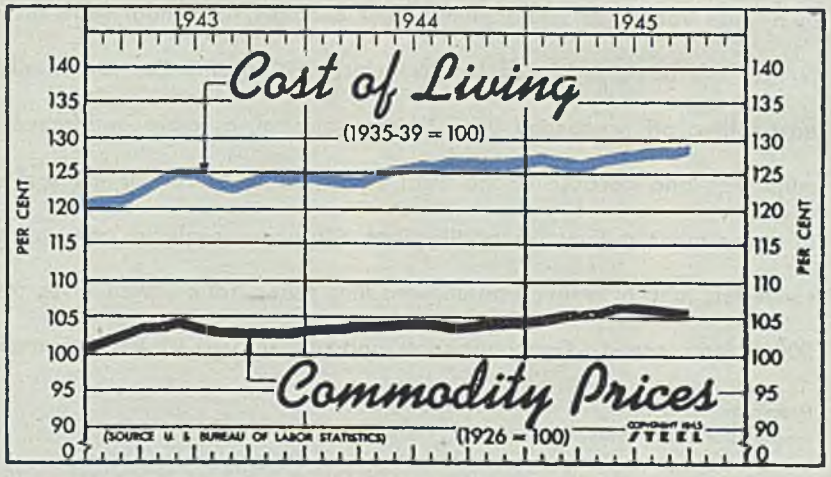


Foundry Equipment Orders and Gear Sales

	Foundry Equipment Orders Index (1937-38-39=100)			Gear Sales Index (1928=100)		
	1945	1944	1943	1945	1944	1943
Jan.	422.4	378.3	429.8	323	246	268
Feb.	465.3	456.8	399.5	331	214	303
Mar.	604.7	498.4	562.7	339	485	334
Apr.	325.0	385.7	362.7	296	308	240
May	404.7	503.9	348.9	309	305	342
June	375.4	466.1	413.6	271	328	401
July	411.7	375.8	379.4	264	242	374
Aug.	532.2	450.5	390.4	205	247	312
Sept.	577.2	388.0	346.6	213	248	320
Oct.	457.8	526.5	436.6	251	293	368
Nov.	....	369.5	388.0	...	209	387
Dec.	....	397.4	442.8	...	219	387
Ave.	....	433.1	408.4	...	279	336

Wholesale Commodity Price—Cost of Living Indexes

	Commodities (1926=100)			Living Cost (1935-39=100)		
	1945	1944	1943	1945	1944	1943
Jan.	104.9	103.3	101.9	127.1	124.2	120.6
Feb.	105.2	103.6	102.5	126.9	123.8	120.9
Mar.	105.3	103.8	103.4	126.8	123.8	122.8
Apr.	105.7	103.9	103.7	127.1	124.6	124.1
May	106.0	104.0	104.1	128.1	125.1	125.1
June	106.1	104.3	103.8	129.0	125.4	124.8
July	105.9	104.1	103.2	129.4	126.1	123.8
Aug.	105.7	103.9	103.1	129.3	126.4	123.2
Sept.	105.2	104.0	103.1	128.9	126.5	123.9
Oct.	....	104.1	103.0	....	126.5	124.4
Nov.	....	104.4	102.9	....	126.6	124.1
Dec.	....	104.7	103.2	....	127.0	124.4
Ave.	....	104.0	103.2	....	125.5	123.5



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$15,251	$9,864	$10,326	$12,829
Federal Gross Debt (billions)	$270.0	$265.4	$262.8	$226.4
Bond Volume, NYSE (millions)	$40.9	$41.8	$32.4	$67.8
Stocks Sales, NYSE (thousands)	12,375	9,959	8,949	8,071
Loans and Investments (billions)†	$62.4	$62.1	$60.9	$55.1
United States Gov't. Obligations Held (millions)†	$45,501	$45,550	$45,142	$42,874

†Member banks, Federal Reserve System.

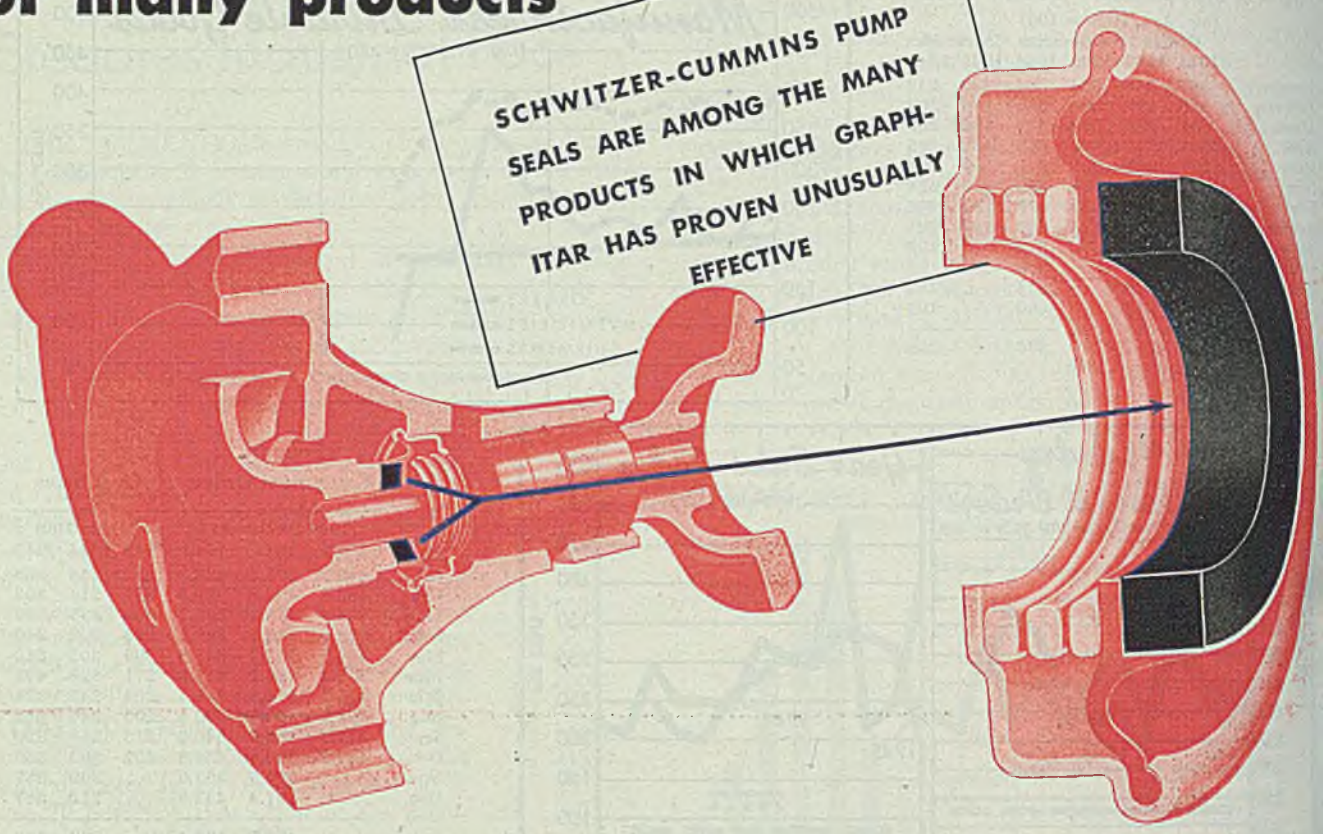
PRICES

STEEL's composite finished steel price average	$58.27	$58.27	$58.27	$56.73
All Commodities†	106.8	106.7	105.9	104.2
Industrial Raw Materials†	120.1	120.2	118.2	114.4
Manufactured Products†	102.5	102.3	101.9	101.3

†Bureau of Labor Statistics Index, 1926 = 100.

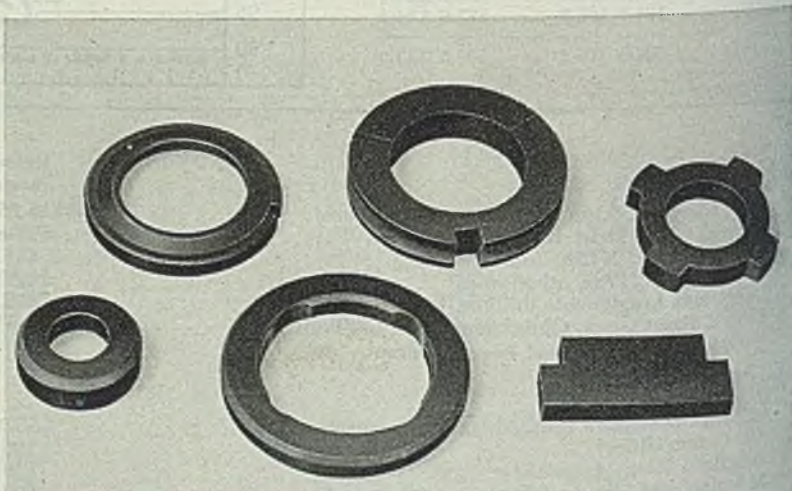
GRAPHITAR seals improve performance of many products

(CARBON-GRAPHITE)



The unique characteristics of Graphitar, the unusual carbon-graphite material, make it effective for seals in a wide variety of liquid pumps. For example, Graphitar seals are standard in the latest type automotive pump seals being produced by the Schwitzer-Cummins Co. for installation in many new automobile models now rolling off production lines. Water, alcohol, or other anti-freeze cannot leak through a Schwitzer-Cummins seal, and because of the wear resistance of Graphitar the seal will usually last for the life of the car. In many other automotive applications, Graphitar seals are proving equally efficient. In fluid couplings, torque converters, and hydraulic transmissions they retain hot oil even under 60 lb./sq. in. pressures at 350° F. and 500 ft./min. speed. Graphitar seals and blades hold air under extreme pressure in automotive brake systems.

Graphitar has a versatility which has won widespread acceptance throughout industry. Because it will not melt or fuse at any temperature, Graphitar makes exceptionally serviceable diabolos, molds, and carrying pads for glass-making operations. It is chemically inert—resists hydrochloric acid, sodium hypochlorite acid and other corrosive solutions. Graphitar is extremely resistant to wear, hence makes ideal bearings and piston rings. Light-weight, yet mechanically strong, Graphitar can be machined to almost any shape and can be ground to tolerances as close as .0005" in small sizes. For complete information on how Graphitar may solve some problem confronting you, WRITE TODAY FOR NEW 44-PAGE ILLUSTRATED CATALOG.



THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN

As you swing into the highly competitive market on strip, remember that M-H rolls with their greater resistance to indentation assure a better quality of finish for your product . . . and because these rolls have a deeper hardness penetration, they can be used down to scrap diameter without rehardening. Thus M-H rolls mean strip with greater sales attraction at a lower average cost.

MACKINTOSH-HEMPHILL CO., Pittsburgh and Midland, Pa.

Makers of the rolls with the red wabble

the Happiness of this Christmas

more than ever rests upon A FOUNDATION OF STEEL

It was ★ the steel in the hands of fighting men ★ steel in all kinds of weapons ★ that won the Victory which makes this Christmas so filled ★ with good cheer and happiness. The boys are coming home ★ in steel ships ★ on steel rails and in airplanes that depend upon ★ steel for engines and many other parts. Their presence gives this holiday ★ that old-time family reunion flavor ★ makes it the gayest yuletide we've known for many, many years. For this we raise our voices in thanks, in the old familiar ★ carols of spontaneous song ★ In all humility, ★ we are proud of the service we have been able to provide to help make this Christmas gay.

INLAND STEEL COMPANY
38 SOUTH DEARBORN STREET
CHICAGO 3, ILLINOIS

INLAND STEEL

Rumor Steel Allocations Given Some Consideration

Strike threat spurs pressure for delivery . . . November ingot best since July . . . Pig iron, scrap scarcity not relieved

RESUMPTION of government allocations, at least on a partial basis, last week was reported under consideration. Confirmation was lacking, but it was said the Civilian Production Administration has under consideration allocation of 4,000,000 to 5,000,000 tons of steel for export to Europe.

Further, according to gossip, supply pinches in the domestic market in such products as pig iron, semifinished steel, bars, plates, electrical sheets, galvanized sheets and certain sizes of light structurals, have resulted in consideration of at least limited allocation by the government of these products. As talked in the trade, such allocation, if decided upon, would possibly be by the steel companies themselves, under direction of the American Iron & Steel Institute, acting as agent for the government as government personnel has been trimmed to the point it would be impractical for the Civilian Production Administration's Steel Division to handle allocation procedure to any appreciable extent.

With the steel strike date set for less than a month ahead consumers of steel and pig iron are pressing still more actively for deliveries in an effort to build up inventories before the stoppage. Orders placed now have no chance of being filled by Jan. 14, date for the walkout, and pressure is for tonnage already on order, in many cases overdue.

Particularly in sheets and in somewhat less degree in bars and some other products sellers generally are behind about a month on commitments, with maintenance of production increasingly difficult because of slowdowns, absenteeism and similar disturbances. Should the strike threat appear increasingly serious it is likely that mills, a week or 10 days before the strike date, will start holding back shipments of scrap, coke and other raw materials to avoid cars being tied up at plants under heavy demurrage. Railroads also may declare embargoes to prevent cars becoming strikebound.

DISTRICT STEEL RATES

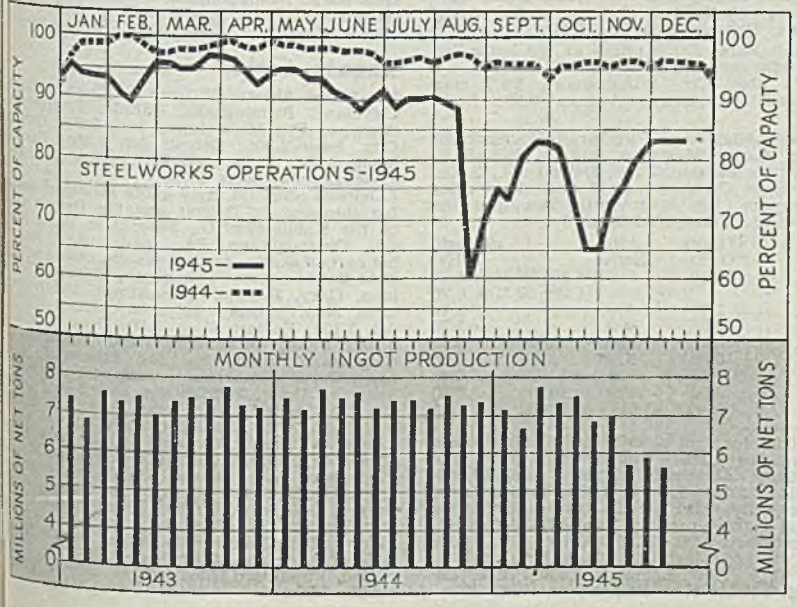
Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Dec. 15	Change	Same Week 1944	Same Week 1943
Pittsburgh	78.5	—0.5	91	99
Chicago	90	—0.5	100.5	101
Eastern Pa.	80	None	95.5	93
Youngstown	81	+1.	90	89
Wheeling	95	None	92	99
Cleveland	85	—1	93	92
Buffalo	88.5	None	88	86
Birmingham	95	None	95	95
New England	80	—3	90	95
Cincinnati	67	None	82	84
St. Louis	65.5	—2.5	75	89.5
Detroit	89	None	87	88
Estimated national rate	83.5	None	96.5	98

*Based on steelmaking capacities as of these dates.

With various small changes in production activity in the several districts the estimated national steel rate last week held unchanged at 83½ per cent of capacity for the third week. Youngstown advanced 1 point to 81 per cent. Chicago dropped ½-point to 90 per cent, Pittsburgh ½-point to 78½, St. Louis 2½ points to 65½, Cleveland 1 point to 85 and New England 3 points to 80. Rates were unchanged as follows: Eastern Pennsylvania 80, Cincinnati 67, Wheeling 95, Birmingham 95, Detroit 89, Buffalo 88½.

Scrap and pig iron scarcities persist, though current needs are being met by careful distribution. However no inventories can be accumulated for winter and unless the steel strike eventuates and decreases consumption the winter promises to be a hard period for mills and foundries. Scrap users are paying the limit in springboards and higher freight to obtain scrap from remote areas and premium scrap continues to be bought to replace cheaper grades in open hearths. Pig iron is being rationed by producers since government allocation was abandoned.



Steel production in November regained the losses caused by the coal strike in October and for the first time since July was more than 6,000,000 tons, reaching 6,246,759 net tons. While this is a good gain over the preceding three months it is less than any of the first seven months. It also is far below production in November, 1944, which was 7,278,719 tons. Indications are that ingot output for the year will be a little short of 80,000,000 tons, compared with 89,641,575 tons in 1944.

Lake Superior iron ore shipments lapped over into December, 71,035 tons being loaded after the usual Dec. 1 deadline. This brought the season's movement to 75,714,750 gross tons, compared with 81,170,538 tons for the 1944 season.

Average composite prices of steel and iron products hold steadily at ceiling, finished steel at $58.27, semifinished steel at $37.80, steelmaking pig iron at $24.80 and steelmaking scrap at $19.17.

COMPOSITE MARKET AVERAGES

	Dec. 15	Dec. 8	Dec. 1	One Month Ago Nov., 1945	Three Months Ago Sept., 1945	One Year Ago Dec., 1944	Five Years Ago Dec., 1940
Finished Steel	$58.27	$58.27	$58.27	$58.27	$58.27	$56.73	$56.73
Semifinished Steel	37.80	37.80	37.80	37.80	37.80	36.00	36.00
Steelmaking Pig Iron	24.80	24.80	24.80	24.80	24.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	18.95	21.40

Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; other gross tons.

COMPARISON OF PRICES

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

Finished Material

	Dec. 15, 1945	Nov., 1945	Sept., 1945	Dec., 1944
Steel bars, Pittsburgh	2.25c	2.25c	2.25c	2.15c
Steel bars, Philadelphia	2.57	2.57	2.57	2.47
Steel 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	2.25	2.25	2.25	2.10
Plates, Philadelphia	2.30	2.30	2.30	2.15
Plates, Chicago	2.25	2.25	2.25	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.20	2.20	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.70	3.70	3.70	3.50
Sheets, hot-rolled, Gary	2.20	2.20	2.20	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.70	3.70	3.70	3.50
Bright bess., basic wire, Pittsburgh	2.75	2.75	2.75	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.90	2.90	2.90	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$36.00	$36.00	$36.00	$34.00
Slabs, Pittsburgh, Chicago	36.00	36.00	36.00	34.00
Rerolling billets, Pittsburgh	36.00	36.00	36.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.15	2.15	2.15	2.00

Pig Iron

	Dec. 15, 1945	Nov., 1945	Sept., 1945	Dec., 1944
Bessemer, del. Pittsburgh	$26.94	$26.94	$26.19	$25.19
Basic, Valley	25.25	25.25	24.50	23.50
Basic, eastern del. Philadelphia	27.09	27.09	26.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	26.44	26.44	25.69	24.69
No. 2 foundry, Chicago	25.75	25.75	25.00	24.00
Southern No. 2, Birmingham	22.13	22.13	21.38	20.38
Southern No. 2 del. Cincinnati	26.05	26.05	25.30	24.30
No. 2 fdry., del. Philadelphia	27.59	27.59	26.84	25.84
Malleable, Valley	25.75	25.75	25.00	24.00
Malleable, Chicago	25.75	25.75	25.00	24.00
Lake Sup., charcoal del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.94	25.94	25.19	24.19
Ferromanganese, del. Pittsburgh	140.00	140.00	140.33	140.33

Scrap

Heavy melting steel, No. 1 Pittsburgh	$20.00	$20.00	$20.00	$19.75
Heavy melt, steel, No. 2, E. Pa.	18.75	18.75	18.45	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	16.70
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$7.50	$7.50	$7.50	$7.00
Connellsville, foundry ovens	8.25	8.25	8.25	7.75
Chicago, by-product fdry., del.	13.35	13.75	13.75	13.35

STEEL, IRON RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941, Feb. 4, 1942 and May 21, 1945. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table. Finished steel quoted in cents per pound.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.
(Empire Sheet & Tin Plate Co., Mansfield, O. may quote carbon steel ingots at $33 gross ton, f.o.b. mill Kaiser Co. Inc., $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop, $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $36; Detroit, del. $38; Duluth (bil) $38; Pac. Ports, (bil) $48. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co., $34 Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co., Kaiser Co. Inc., $58.64. Pac. ports.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $42, Detroit, del. $44; Duluth, billets, $44; forg. bil. f.o.b. Pac. ports, $54.
(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excl., $54.00; 18-in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54, del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $36. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, 5—⅝ in. inclusive, per 100 lbs., $2.15 Do., over ⅝—47/64-in., incl., $2.30; Galveston, base, $2.25 and $2.40, respectively. Worcester add $0.10; Pacific ports $0.50 (Pittsburgh Steel Co., $0.05 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3: Pittsburgh, Youngstown, Chicago Gary, Cleveland, Buffalo, Birmingham base 20 tons one size, 2.25c; Duluth, base 2.35c; Detroit, del. 2.35c; Eastern Mich. 2.40c; New York del. 2.59c; Phila. del. 2.57c; Gulf Ports, dock 2.62c; Pac. ports, dock 2.90c. (Calumet Steel Division. Borg-Warner Corp., and Joslyn Mfg. & Supply Co., may quote 2.55c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis. Phoenix Iron Co., 2.50c.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit del., 2.80c. (Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		4100 (.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

* Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.75c; Detroit 2.80c; Toledo 2.90c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City, New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago Gary, Cleveland, Buffalo, base 3.35c; Detroit del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c Eastern Mich. and Toledo 2.30c; Gulf ports dock 2.50c.

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary Cleveland, Birmingham, Buffalo, Youngstown Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Detroit, del. 2.37c; New York del. 2.44c; Pacific ports 2.75c.
(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O., base; Alan Wood Steel Co., Conshohocken, Pa., may quote 2.35c on hot carbon sheets, nearest eastern basing point.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.70c; Granite City, base 3.80c; New York del. 3.94c; Phila. del. 3.78c; Pacific ports 4.25c.
(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.36c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific ports 4.25c; copper iron, 3.90c; pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 2.85c; Granite City, base 2.95c; Detroit, del, 2.95c; eastern, Mich. 3.00c; Pacific ports 3.50c; 20 gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.45c; Detroit del. 3.55c; eastern Mich. 3.60c; Pacific ports 4.10c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.30c	4.05c	3.30c
Armature	3.65c	4.40c	3.75c
Electrical	4.15c	4.90c	4.25c
Motor	5.05c	5.80c	5.15c
Dynamo	5.75c	6.50c	5.85c
Transformer			
72	6.25c	7.00c	....
65	7.25c	8.00c	....
58	7.75c	8.50c	....
52	8.55c	9.30c	....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c.

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.25c.

Cold Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.25 lb. tin, $4.35; 0.50 lb. tin, $4.50; 0.75 lb. tin $4.65; Granite City, $4.45, $4.60, $4.75, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed, 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. $14.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.25c; New York, del. 2.44c; Phila., del. 2.30c; St. Louis, 2.49c; Boston, del. 2.57-82c; Pacific ports, 2.80c; Gulf ports, 2.60c.

Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C.

Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles.

Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.50c; Pacific ports, 4.15c; Gulf ports, 3.85c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c; Gulf ports, 2.45c.

Phoenixville Iron Co., Phoenixville, Pa., may quote the equivalent of 2.45c, Bethlehem, Pa., for the general range and 2.55c on beams and channels from 4 to 10 inches.)

Steel Piling: Pittsburgh, Chicago, Buffalo, 2.95c; Pacific ports, 2.95c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham to manufacturers in carloads.

Bright basic, bessemer wire ..... °$2.75

Spring wire ..... °†$3.35

Wire Products to the Trade:

Standard and cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, $2.90; Pac. ports, $3.40; galvanized, $3.55 and $3.05, resp.

Annealed Merchant quality wire, 100-lb. Pittsburgh, Chicago, Cleveland, Birmingham ..... ††$3.20

Galvanized Merchant quality wire, 100-lb. Pittsburgh, Chicago, Cleveland, Birmingham ..... ††$3.55

Chain fence, 15½ gage and heavier, per base column 67

Fence wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 72; twisted barb wire, column 72.

Add $0.10 for Worcester, $0.05 for Duluth; add $0.50 for bright, annealed, galvanized and $0.70 for other finishes for Pacific ports.

Same bases as for bright basic except Birmingham.

† Add 10 cents for Worcester; 50 cents for annealed, bright basic and 70 cents for all other finishes for Pacific ports.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
⅛	56	33	¼	24	3½
¼ & ⅜	59	40½	⅜	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
2	61	49½	1¼	23	3½
2½-3	64	54½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½-3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
¾"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2½"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Rails, Supplies ....

Standard rails, over 60-lb., f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $45.00.

°Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-$33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates $46 net ton, base, Standard spikes, 3.25c.

°Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels ....

Tool Steels: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung.	Chr.	Van.	Moly.	Base, per lb.
18.00	4	1	....	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	3	54.00c
6.40	4.15	1.90	5	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
°316	40.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
°°410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	.....	§§18.00	19.00	.....	.....

°With 2-3% moly. ‡With titanium. †With columbium. °°Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago Birmingham

Structural 3.75c

⅛-inch and under ..... 65-5 off

Wrought, Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ..$2.75-3.00 off

Bolts, 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	65½ off
Do., ⅜ and ⅝ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages with nuts separate 71-10 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
⅛-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10, smaller	70 off

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extra mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	°7.50
Connellsville, foundry	8.00- 8.50
New River, foundry	9.00- 9.25
Wise county, foundry	7.75- 8.25
Wise county, furnace	7.25- 7.75
By-Product Foundry	
Kearney, N. J., ovens	13.05
Chicago, outside delivered	13.00
Chicago, delivered	13.75
Terre Haute, delivered	13.50
Milwaukee, ovens	13.75
New England, delivered	14.65
St. Louis, delivered	†13.75
Birmingham, delivered	10.90
Indianapolis, delivered	13.50
Cincinnati, delivered	13.25
Cleveland, delivered	13.20
Buffalo, delivered	13.40
Detroit, delivered	13.75
Philadelphia, delivered	13.28

°Operators of hand-drawn ovens using trucked coal may charge $8.00; effective May 26, 1945.

†14.25 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c
Per lb. f.o.b. works	
Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.25c
Do., tank cars	11.50c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbls., to jobbers	8.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$20.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.224[14]	4.744[14]	4.244[21]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.203[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.203[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[3]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[15]	4.872[25]	4.172[21]	4.772	5.816[23]	5.880[23]
Baltimore	3.802[1]	3.759[1]	3.594[1]	5.252[1]	3.394[1]	3.902[1]	4.252[1]	4.894[1]	4.852[25]	4.152[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.796[1]	5.341[1]	3.596[1]	4.041[1]	4.391[1]	5.196[17]	4.841[20]	4.141[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[17]	4.965[24]	4.265[21]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.63[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[15]	4.40[16]	3.85[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[13]	4.30[16]	3.75[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[13]	4.40[24]	3.85[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[13]	4.30[24]	3.75[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.588[1]	3.40[1]	5.188[1]	3.35[1]	3.60[1]	3.60[1]	4.877[13]	4.40[24]	3.85[21]	4.45[21]	5.60[23]	5.85[23]
Cleveland (country)	3.25[1]	.....	3.30[1]	.....	3.25[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.75[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[13]	4.500[24]	3.900[21]	4.659	5.98[23]	5.98[23]
Omaha (city, delivered)	4.115[1]	4.165[2]	4.165[2]	5.765[1]	3.865[1]	4.215[1]	4.215[2]	5.608[19]	5.443[24]	4.543[21]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[2]	4.065[1]	5.665[1]	3.765[1]	4.115[1]	4.115[2]	5.508[19]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	3.691[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[13]	4.475[24]	4.111[21]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[13]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[16]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[13]	4.20[24]	3.85[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.637[1]	3.687[1]	3.687[1]	5.287[1]	3.387[1]	3.737[1]	3.737[2]	5.272[15]	4.337[24]	3.987[21]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.63[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[13]	4.568[24]	4.08[21]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[3]	3.81[3]	3.81[3]	5.41[3]	3.51[3]	3.86[3]	3.86[2]	5.257[15]	4.46[24]	4.461[21]	5.102	6.09[23]	6.19[23]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[13]	5.172[15]	4.347[24]	4.131[21]	4.931	6.131[23]	6.231[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	4.215[5]	5.265[13]	4.78[24]	4.43[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[15]	4.852[24]	4.64	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[20]	5.079[20]	4.70[21]	5.429	.....	.....
Houston, Tex.	3.75[3]	4.25[3]	4.25[3]	5.50[3]	3.763[3]	4.313[4]	4.313[3]	5.313[20]	4.10[16]	3.75[21]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.60[4]	4.95[4]	6.75[4]	6 00[13]	7.20[6]	5.683[22]	5.613	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[15]	7.30[15]	5.433[21]	7.333	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.30[27]	5.75[15]	6.60[15]	5.633[21]	.....	.....	.....
Tacoma	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.60[15]	5.883[21]	.....	.....	8.00[23]
Seattle	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.05[15]	5.883[21]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.
NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 33 to Revised Price Schedule No. 49. Deliveries outsid above cities computed in accordance with regulations.

BASE QUANTITIES

[1]400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundle [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pound [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pound [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, bar [27]— 300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural) 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, units, del. E. Pa.

Foundry and basic 56-63% contract	18.00

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.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.
(S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	33.65
48% 3:1 lump	43.50

Rhodesian

45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50

Domestic (seller's nearest rail)

48% 3:1	52.80

less $7 freight allowance

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Col 91.0c; prices include duty on i ported ore and are subject to pr miums, penalties and other pro sions of amended M.P.R. No. 2 effective as of May 15. Price basing points which are also poi of discharge of imported mang nese ore is f.o.b. cars, shipside, dock most favorable to the buy

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Basic open-hearth Electric furna

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Bille per G
NE 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25	$0.65	$13.00	$1.15	$23.
NE 8720	.18-.23	.70-.90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.65	13.00	1.15	23.
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30	1.30	26.00	1.80	36.
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quot on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, and Oct. 22, 1945. Exceptions indicated in footnotes. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$26.75	$26.25	$27.75	$27.25
Newark, N. J., del.	28.28	27.78	29.28	28.78
Brooklyn, N. Y., del.	29.25	.....	.....	29.75
Birdsboro, Pa., base	26.75	26.25	27.75	27.25
Birmingham, base	22.13	20.75	26.75	.....
Baltimore, del.	27.36	.....	.....	.....
Boston, del.	26.89	.....	.....	.....
Chicago, del.	25.97	.....	.....	.....
Cincinnati, del.	25.81	24.48	.....	.....
Cleveland, del.	25.87	24.99	.....	.....
Newark, N. J.	27.90	.....	.....	.....
Philadelphia, del.	27.21	26.71	.....	.....
St. Louis, del.	25.87	24.99	.....	.....
Buffalo, base	25.75	24.75	26.75	26.25
Boston, del.	27.25	26.75	28.25	27.75
Rochester, del.	27.28	.....	28.28	27.78
Syracuse, del.	27.83	.....	28.83	28.33
Chicago, base	25.75	25.25	26.25	25.75
Milwaukee, del.	26.85	26.35	27.35	26.85
Muskegon, Mich., del.	28.94	.....	.....	28.94
Cleveland, base	25.75	25.25	26.25	25.75
Akron, Canton, del.	27.14	26.64	27.64	27.14
Detroit, base	25.75	25.25	26.25	25.75
Saginaw, Mich., del.	28.06	27.56	28.56	28.06
Duluth, base	26.25	25.75	26.75	26.25
St. Paul, del.	28.38	27.88	28.88	28.38
Erie, Pa., base	25.75	25.25	26.75	26.25
Everett, Mass., base	26.75	26.25	27.75	27.25
Boston, del.	27.25	26.75	28.25	27.75
Granite City, Ill., base	25.75	25.25	26.25	25.75
St. Louis, del.	26.25	25.75	.....	26.25
Hamilton, O., base	25.75	25.25	.....	25.75
Cincinnati, del.	26.19	26.36	.....	26.86
Neville Island, Pa., base	25.75	25.25	26.25	25.75
Pittsburgh, del. No. & So. sides	26.44	25.94	26.94	26.44
Provo, Utah, base	23.75	23.25	.....	.....
Sharpsville, Pa., base	25.75	25.25	26.25	25.75
Sparrows Point, base	26.75	26.25	.....	.....
Baltimore, del.	27.74	.....	.....	.....
Steelton, Pa., base	.....	26.25	.....	27.25
Swedeland, Pa., base	26.75	26.25	27.75	27.25
Philadelphia, del.	27.59	27.09	.....	28.09
Toledo, O., base	25.75	25.25	26.25	25.75
Youngstown, O., base	25.75	25.25	26.25	25.75
Mansfield, O., del.	27.69	27.19	28.19	27.69

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. § For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa, Sl; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenbridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

6.00-6.50 per cent (base)	$31.25		
6.51-7.00	$32.25	9.01- 9.50	37.25
7.01-7.50	33.25	9.51-10.00	38.25
7.51-8.00	34.25	10.01-10.50	39.25
8.01-8.50	35.25	10.51-11.00	40.25
8.51-9.00	36.25	11.01-11.50	41.25

F.o.b. Jackson county, O., per gross ton. Buffalo base $1.25 higher, whichever is most favorable to buyer. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Electric Furnace Ferrosilicon: Sil. 14.01 to 14.50%, $45.50; each additional .50% silicon up to and including 18% add $1; low impurities not exceeding 0.05 Phos., 0.40 Sulphur, 1.0% Carbon, add $1.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. $33.00 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $25.25
Valley base 25.25

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Buffalo, N. Y., $31.25 base; $32.49, del. Philadelphia. Intermediate phos., Central Furnace, Cleveland, $28.25.

Switching Charges: Basing Point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differential: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton.

Refractories

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

Fire Clay Brick

Super Duty

Pa., Mo., Ky. $68.50

First Quality

Pa., Ill., Md., Mo., Ky.	54.40
Alabama, Georgia	54.40
New Jersey	50.35
Ohio	47.70

Second Quality

Pa., Ill., Md., Mo., Ky.	49.35
Alabama, Georgia	40.30
New Jersey	52.00
Ohio	38.15

Malleable Bung Brick

All bases 63.45

Silica Brick

Pennsylvania	54.40
Joliet, E. Chicago	62.45
Birmingham, Ala.	54.40

Ladle Brick

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

Dry Press	32.90
Wire Cut	30.80

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	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded Magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net tons, carloads, CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. After Aug. 29 base price any grade $30.00 war chemicals.

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, $135 f.o.b. cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer; Rockdale or Rockwood, Tenn.; where Tennessee Products Co. is producer; Birmingham, Ala., where Sloss-Sheffield Steel & Iron Co. is producer; $140 f.o.b. cars, Pittsburgh, where Carnegie-Illinois Steel Corp. is producer; add $6 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c; 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 20.30c; 2000 lb. to c.l., 24.40c; medium 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa., $36; Pittsburgh, $40.50; Chicago, $40.60.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central 81c and 82.50c; western 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l. 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome; Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l. max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65 for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones: For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom: 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed 14.45c, ton lots 14.90c, less 15.40c, eastern, freight allowed: 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium, 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c, 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed, 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c. 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western; spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max. sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract ton lots, $1.89, less $2.01, eastern; freight allowed; $1.903 and $2.623, central, $1.935 and $2.055 western; spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract. 5 tons or more, $1.90, 1 ton to 8 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max. sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide approx. 10% and calcium oxide, approx. 2%, or Red Cake; Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed per pound vanadium oxide contained; contract carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309 central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20% mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 18.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.) per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c eastern freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c, and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all f.o.b. Bridgeville, Pa., usual freight allowance.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c; 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c f.o.b. shipping point, freight allowed. Price per lb. contained silicon.

Manganese Metal: (96% min. manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 30c, 2000 lb. to c.l., 32c, central, 30.25c, and 33c; western 30.55c and 35.05c.

Ferrotungsten: Spot, carlots, per lb. contained tungsten, $1.90; freight allowed as far west as St. Louis.

Tungsten Metal Powder: Spot, not less than 97 per cent, $2.50-$2.60; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40 eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per net ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6.8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15% net ton to carload, 8c lb. f.o.b. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferro titanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern contract, carlots bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads, bulk per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern contract basis, carloads in bulk, package, per lb. of alloy 14.00; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75c; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each Si, Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

Borosil: 3 to 4% boron, 40 to 43% Si., $6.25 lb. cont. Bo., f.o.b. Phila. O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 1 of Sept. 4, 1944, issue of STEEL. Quotations are on gross tons.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Mixed Borings, Turnings	13.75
Machine Shop Turnings	13.75
Billet, Forge Crops	23.75
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turnings	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	14.50
Short Shovel Turnings	16.50
Mixed Borings, Turnings	14.50
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	13.50-14.00
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06
No. 2 Heavy Melt. Steel	14.06
No. 1 Bundles	14.06
No. 2 Bundles	14.06
No. 1 Busheling	14.06
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel Turnings	11.06
Chemical Borings	13.31
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

Boston Differential 99 cents higher, steel-making grades; Providence $1.09 higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Mach. Shop Turnings	15.00
Mixed Borings, Turnings	15.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	22.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	22.50

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	15.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails Random	18.50
Rerolling Rails	20.50
Angle Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
Baled Mach. Shop Turn	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	13.75
Mix. Borings, Sht. Turn.	13.75
Short Shovel Turnings	15.75
Cast Iron Borings	14.75
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	14.25
Short Shovel Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	15.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	12.32
Short Shovel, Turnings	14.32
Cast Iron Borings	13.32
Low Phos. Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	16.50

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	17.00
Machine Turnings	10.
Shoveling Turnings	12.
Rerolling Rails	21.
Steel Car Axles	21.50-22.
Steel Rails, 3 ft.	21.
Steel Angle Bars	21.
Cast Iron Wheels	20.
No. 1 Machinery Cast	20.
Railroad Malleable	22.
Breakable Cast	16
Stove Plate	19.
Grate Bars	15.
Brake Shoes	15.
(Cast grades f.o.b. shipping point	
Stove Plate	18

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.
No. 2 Heavy Melt. Steel	18.
No. 1 Comp. Bundles	18.
No. 2 Comp. Bundles	18.
Machine Turnings	9.50-10.
Shoveling Turnings	11.50-12.
Cast Iron Borings	11.00-11.
Mixed Borings, Turnings	10.50-11.
No. 1 Cupola Cast	20.
Breakable Cast	16.
Low Phosphorus	21.00-21.
Scrap Rails	20.50-21.
Stove Plate	16.00-16.

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.
No. 2 Heavy Melt. Steel	13.
No. 1, 2, Deal. Bundles	12.
Machine Turnings	4.
Mixed Borings, Turnings	4.
No. 1 Cast	20.

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.
No. 2 Heavy Melt. Steel	14.
No. 1 Busheling	15.
No. 1, No. 2 Bundles	13.
No. 3 Bundles	9.
Machine Turnings	7.
Billet, Forge Crops	15.
Bar Crops, Plate	15.
Cast Steel	15.
Cut, Structural, Plate, 1", under	18.
Alloy-free Turnings	7.
Tin Can Bundles	14.
No. 2 Steel Wheels	15.
Iron, Steel Axles	23.
No. 2 Cast Steel	15.
Uncut Frogs, Switches	15.
Scrap Rails	15.
Locomotive Tires	15.

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12,12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Castings, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 13.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester, Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less through 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.) 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B-107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing, screening, barrelling, handling, and other preparation charges, 23.50c. Price for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1¼c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impuritiese, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224 lb.; and 2c for 224 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: Open market, spot, New York, $108-$110 per 76-lb. flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 70.625c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.48c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c; Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlot 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%; Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2%, 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c f.o.b. Niagara Falls.

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 or more.

Scrap Metals

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.785
Commercial bronze 90%	9.375	9.125	8.625
Commercial bronze 95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz Metal	8.000	7.750	7.250
Nickel Sil, 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	8.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Price f.o.b. point of shipment, truckloads of 5000 pounds or over; Segregated solids, 2S, 3S, 5c lb., 11, 14, etc., 3 to 3.50c lb. All other high grade alloys 5c lb. Segregated borings and turnings, wrought alloys, 2, 2.50c lb. Other high-grade alloys 3.50, 4.00c lb. Mixed plant scrap, all solids, 2, 2.50c lb. borings and turnings one cent less than segregated.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings 7.25c, old zinc 5.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more. New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross; die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 176

Sheet inquiry still is heavy, especially from buyers seeking tonnage from other than regular suppliers. Regular customers are not as insistent as recently, evidently appreciating that under the quota system they will be cared for as well as possible. Deliveries promised on current buying are well extended and numerous producers refuse to accept further business, being filled for months.

New York — Sheet sellers assert they are receiving plenty of inquiry from new buyers, but that demand from their regular customers has leveled off noticeably. This is ascribed to the fact that their own customers know rather well where they stand under present restrictions and consequently see no point in pressing for further tonnage. Nevertheless, they are still checking the mills with respect to possible suspensions because of the automotive strike, but they have not received much encouragement so far, for not only have there been relatively few suspensions, but most mills are behind anywhere from three to four weeks on current commitments.

Because of cutting off supply of semi-finished, certain nonintegrated mills have asked their customers to relieve them from their commitments. They wish to be relieved indefinitely for they do not know when they will be able to resume production, if at all. At least one of these producers is understood to have offered his plant for sale. These requests have affected commitments on galvanized sheets as well as hot-rolled.

Where producers are not operating on a quarterly quota basis, but are continuing to accept limited amounts, they are booked late into next year on hot and cold-rolled and galvanized sheets and in certain instances through the year. The latter producers claim they could also book tonnage for 1947 were they so disposed. Stainless steel sheet deliveries are now running well into second quarter, with polished stainless into third quarter and beyond.

Boston — Delivery pressure for sheet and strip is unabated, but schedules are so far extended on basis of quota distribution that new buying has eased slightly. A tightening supply of semi-finished, including hot narrow strip for converting, is a mounting production factor. Narrow cold strip producers are filled through first half in most cases with outlook for hot strip supply over that period more uncertain. Fabricators pinched most for steel are those with recent contracts, notably for new products for which new specifications are required. Unable to get stock where wanted from mills, they comb warehouse, surplus and other sources for tonnage. Polished stainless sheets are in heavier demand.

Cincinnati — Local sheet mills have ignored possibility of strike cancellations of sheets and strip in making up rolling schedules for January and preliminary work on first quarter rollings. So far tonnage has moved as allotted. Persistent demand leads to belief sheets may prove the bottleneck in reconversion. Fabricators on former lines want more than prewar tonnage and new interests are introducing new products. In face of this expanded demand this district has less rolling capacity.

St. Louis — Sheet production was off slightly last week but the general upward trend continues. Labor supply is improving, mainly by former servicemen in skilled and semiskilled jobs. Demand is strong with virtually all output for 1946 allocated. Inquiries are slackening, probably due to indefinite deliveries. Expectation of increased production early in 1946 is diminishing because of continuing wage-price squeeze.

Birmingham — Sheet orders continue to come in heavily, from miscellaneous sources. Production is better than 80 per cent of capacity but is not able to meet needs.

Chicago — Buying of sheet and strip continues unabated. Some customers are so pressed they are willing to accept seconds and wasters in lieu of primes if they can be obtained quicker. The sheet delivery schedule of a leading producer indicates that in one month's time deliveries have moved back from January to February on hot-rolled, March on cold-rolled, April on hot-rolled pickled and galvanized, and May on strip mill sizes. The situation on strip is even tighter, having gone from February to April on hot-rolled and hot-rolled pickled, July on narrow and August on wide.

Cleveland—Threat of a general steel strike has had no effect on rolling or shipping schedules already set up by leading producers. Consumers have an added incentive for desiring prompt and increased shipments but are unable to

obtain such revisions. Practically all mills are on a strict quota basis with responsibility on branch managers to arrange distribution. Markets, especially flat-rolled, are described as tightest in history, with unscheduled tonnages in most instances sufficient to cover all 1946 operations. Shipments are still being made regularly on General Motors accounts but storage facilities are filling rapidly. There have been few shifts in specifications from carbon to alloy grades as most consumers are unable to pay higher prices under existing ceilings for finished products.

Philadelphia — Adding to sheet scarcity is action by some small independents, suddenly cut off from sheet bar supply, in asking release of sheet commitments. This, in turn, has thrown various consumers into the market for nearby tonnage, which they find virtually impossible to obtain, notably in galvanized. Where producers are on a quota system they generally are not scheduling beyond first quarter and as they are booked solidly for that period they are out of the market. Where sheet mills are not on such a system, although applying restrictions in other ways, they are booked ahead a number of months. These have little hot-rolled for delivery before early third quarter and are booked well beyond that on cold-rolled and galvanized.

Pittsburgh — In contrast to expected delay of shipments to General Motors Corp. plants and suppliers, in a few instances efforts are being made to obtain more tonnage than is now on producers' books. Warehouses and temporary depots are taking on steel for transfer when automotive labor disputes are settled. The proposed steel strike early next year has increased the pressure for prompt deliveries for practically all steel consumers are without inventories. Most mills are not setting up production schedules further than first quarter, but tonnage already accepted is said to represent capacity output into third quarter, while on such items as electrical and galvanized sheets sellers are booked through 1946.

Steel Bars . . .

Bar Prices, Page 176

While steel bar consumers seek to buy far into next year most producers are finishing acceptance according to their quota plans. General Motors strike has not diverted much tonnage, partsmakers taking shipments to build inventory. Deliveries are promised for late first and second quarter on larger diameters, while small sizes are sold well past mid-year.

New York — Carbon bar consumers, in the majority of instances, are specifying as far ahead as the mills will permit them. Most producers of hot carbon bars have little to offer before late in second quarter, excepting for some very large sizes, and certain sellers are not fully booked well into second half but well beyond. Cold drawers are quoting second quarter and beyond, with the larger sizes available in April and May, and the smaller sizes well in the third quarter in several instances. Hot alloy bars can be had in February and because of their relatively good position, are being specified for plain carbon bars by some consumers.

Pittsburgh—No significant tonnage yet has been diverted because of delays by General Motors parts suppliers. Wherever possible, these are attempting to build inventories. Cold-rollers' operations have recovered from the slower pace during the coal strike, when mill shipments were sharply reduced. Stocks of hot-rolled bars, however, were depleted at some plants and there has been little chance to rebuild inventories. Delivery promises on cold-drawn bars are somewhat more extended due to heavier demand and in some instances reduction in allotments of hot carbon bars. Hot-rolled alloy bar delivery promises are also somewhat more extended as consumers change from carbon to alloy in an effort to get better deliveries. Alloy bar promises generally fall into February. Mill openings on larger carbon bars are available for late February-March delivery, but smaller sizes are extended into fourth quarter.

The Pittsburgh Navy Department Material Redistribution and Disposal Office will take bids Dec. 18 on about 800 tons of carbon steel billets, located at the National Supply Co.'s Ambridge, Pa., plant. On Dec. 20 the same office will close bids on 5000 pounds of stainless steel rounds and 60,000 pounds of cold-drawn steel bars located at the Aero Supply Mfg. Co., Corry, Pa.

Boston — Further reductions in hot carbon bar allocations for second quarter follow drastic screening of orders and backlogs by some producers; both warehouses and fabricating consumers are

affected. Monthly delivery quotas have also been pared as carbon stock and cold-finished schedules become more extended. Some mills have closed books or make no promises beyond second quarter, although substantial tonnage in small sizes is offered for that period. Some volume is being switched to low alloys, notably when delivery is a factor. Hot-rolled alloys have moved generally into February. Postwar decline in alloy buying, accompanied by some swing back to former grades, is emphasized by increased capacity, but alloy demand in normal channels, notably the automobile industry, has yet to develop at what might be considered normal level. Slack in new buying is the result of extended deliveries in carbon grades.

St. Louis — Bar demand from consumer goods manufacturers continues undiminished. Cold drawers report potential demand is twice mill capacity. Deliveries are extended to June and beyond. Output is expected to gain substantially after Jan. 1. Most pressure is on smaller sizes, notably 1½-inch and under and on all flat bars. Unexpected demand is coming from farm implement manufacturers, power line builders, warehouses, mining and railroads.

Chicago — Alloy bars are in about the easiest position of all steel products, delivery-wise. Virtually all grades can be had in January. Carbon bars, on the other hand, range from January, 1946, to January, 1947, depending upon size and grade. Demand has moved the carbon grades up to a tightness closely approximating sheets. As a result, consumers are substituting grades wherever possible, to get better delivery.

Philadelphia — Hot carbon bar shipments fall well into second quarter and beyond. Small sizes are quoted by some mills for late third and fourth quarter. Cold-drawn carbon bar deliveries are spread over second quarter, larger sizes being more available than smaller. Alloy bars are in easy supply with some producers still quoting January and seeking business.

Cleveland—Demand for bars continues heavy and in excess of production. No cancellations or suspensions have been received as a result of strikes. Deliveries extend well into the latter part of next year, subject to operating conditions. Mill openings for hot-rolled bars range from March on some 12 and 14-inch mills to late second quarter on 10-inch and to third quarter on 8-inch mills.

Steel Plates . . .

Plate Prices, Page 177

Platemakers generally are booked through second quarter, with some exceptions. Replacing ship work, leading consumer during the war, is strong demand for tanks and fabricated pipe, while railroad car builders and other consumers are buying steadily.

New York — Most plate producers are booked through second quarter, although some tonnage is available in March. Despite continued decline in ship work, producers report active demand increasingly diversified. Tank fabricators are more active, with emphasis still on light fuel oil tanks, and railroad requirements are mounting. There is a spurt in fabricated pipe work and export demand continues brisk.

Pittsburgh — Plate demand and production, though well below wartime levels, are still well sustained. Most backlogs extend through April. Little improvement in production is indicated as long as mill production emphasis is on sheets and tin plate, which give a better return. Barge work is increasing at some centers and municipal projects for tanks are appearing in greater volume.

Boston — While demand for plates exceeds expectations, unbalanced demand in size and gage accounts for wide spreads in deliveries and tight spots; the latter center heavily in light gages, on which some producers are filled well into second quarter, with heavier material available for March. Welded tanks take larger tonnages of light gages with miscellaneous industrial demand somewhat stronger. Efforts to maintain warehouse shipments around 45-day lead time lag by 15 days on medium sizes and more on lighter stock. Carbuilding requirements will be heavier next quarter, but the nature of backlogs at the Worcester shop, street cars and trolley coaches predominating, will require lighter plates and a relatively high ratio of heavy sheets. For Cleveland, Chicago and Boston 310 street cars are on order, also 402 trolley coaches for various municipalities.

St. Louis — Plate demand continues heavy, almost equaling that for sheets. No deliveries are promised before October. Most demand is for tank plates from 3/16-inch to 1¼-inch. Easier labor supply permits enlarged finishing operations.

Seattle — Brewery expansion in this

area provides considerable tank business. Interstate Brewery Co., Vancouver, Wash., has let contract to George H. Buckler Co., Portland, Oreg., for a seven-story plant. The same contractor has contract for plant expansion for the Great Western Malting Co., Vancouver. Sick Brewing Co., Seattle, plans a $300,000 plant at Salem, Oreg., half for equipment.

Chicago—Substantial plate business is coming from welded pipe makers, who have booked heavy commitments. While a major portion is for domestic lines, large quantities are for export. Some steelmakers are considerably irked because while they are declining orders for export, in view of the crying domestic demand, substantial tonnage of plates they sell find their way into pipe lines for foreign use. One mill reports that new business on universal and narrow sheared plates now commands February delivery, while wide sheared range into April.

Birmingham — Plate demand holds steady and production is as large as allotments of ingots will allow. Much of current buying is for tank manufacture. Shipyards at Pascagoula are taking tonnage consistently for shipbuilding and other construction.

Philadelphia — Plate demand is brisk and diversified, with most producers offering little before second quarter. Light gages are quoted for May and June in some instances.

Wire . . .

Wire Prices, Page 177

Pittsburgh — Steady buying exceeds output in most instances. Some open equipment is available on ¼ to ¾-inch basic wire, but mills are booked through March on most items, with light coated galvanized stock extending into third quarter. Deliveries on merchant items are promised for late second quarter, with exceptionally heavy demand for fence and nails. Production of fencing and most manufacturers' wire has been substantially increased since V-J Day, with one company reporting output of fencing up 25 per cent. However, despite lifting of restrictions on output of nails and barbed wire, there has been relatively little improvement in production since the end of the war due to the relatively small profit margin or even losses under present ceilings. The export steel market is active, with about 50,000 tons of wire rods asked for France. An inquiry from France is also reported for 5000 tons of manufacturers' wire, and another for about 15,000 tons of manufacturers' wire.

New York — Wire mills are allocating most products as fabricators seek position on schedules for heavy volume. Drawn wire capacity, with few exceptions, is taken up for first half; openings created by drop in rope wire buying are taken for spring wire. Furniture spring stock continues among tightest. There has been a sharp decline in welding wire, but gaps have been closed with other items on which deliveries are extending steadily. Rods are scarcer; some mills are not selling rods and when available, deliveries range into third quarter. Orders are also being rescreened, but there has been slight evidence of widespread duplication. Holding close to allocated quotas which are frequently subjected to pressure for heavier shipments, some mills are not taking on new accounts. More selectivity as to scheduling of products is apparent, affecting galvanized, nails and less profitable items. As surplus 2,416,031 feet of plow steel rope, hemp center, mostly 1¼-inch is offered, mostly at Voorheesville, N. Y.

Boston — Rod supply is becoming tighter as wire mills strive to reduce carryovers and maintain schedules with minimum of revisions. Filled for first half on numerous items, others are being booked for third quarter and beyond. Growing scarcity in rods results from tightness in raw materials, manpower and withdrawal of some producers, in part at least, from territory in the Worcester base. Trend among producers is to draw more wire from their rod production, thus reducing the overall supply. While some acid rods are available with one eastern producer, more have no open-hearth carbon rods beyond their own requirements. For the nonintegrated mill this is becoming more serious.

Tin Plate . . .

Tin Plate Prices, Page 177

Chicago — Tin plate mills here are sold through first quarter, 1946. Current operations are up to the maximum under the tin allocation schedule. One producer which has experienced difficulty in shipping its product during recent weeks now reports marked improvement in car supply. It is understood the

government would like to arrange for directives for production of tin plate for export, but in view of strong domestic demand, producers do not favor the suggestion.

Rails, Cars . . .

Track Material Prices, Page 177

New York — Domestic freight car awards in November involved 1650 units, which brings the total for 11 months to 41,316, compared with 37,976 in the corresponding period of last year.

According to present trade estimates the carryover of domestic freight cars into next year will be about 40,000, new orders between now and Jan. 1 being likely to balance production. This, however, would represent a relatively small portion of freight car building capacity, commercial car builders having a capacity of 160,000 cars per year and railroad shops, 50,000 to 75,000 cars.

Other comparisons follow:

	1945	1944	1943	1942
Jan.	7,200	1,020	8,365	4,253
Feb.	1,750	13,240	350	11,725
March	2,500	6,510	1,935	4,080
April	1,120	4,519	1,000	2,125
May	1,526	1,952	870	822
June	670	1,150	50	0
July	3,500	795	4,190	1,025
Aug.	7,240	3,900	8,747	0
Sept.	12,840	400	6,820	1,863
Oct.	1,320	2,425	5,258	0
Nov.	1,650	1,065	870	0
Dec.		16,245	2,919	135
Total		53,221	41,355	26,028

Locomotive buying is featured by placing of 80 steam engines by the French Railway Commission, the order reported going to Lima Locomotive Works, Lima O. This follows the recently noted award of 320 locomotives, divided equally between American Locomotive Co. New York, and Baldwin Locomotive Works, Philadelphia.

The French are reviving their large ca inquiry of a few months ago, with 36,00 being figured now as against approximately 38,000 originally.

Structural Shapes . . .

Structural Shape Prices, Page 177

Boston — Smaller sizes, more piece per ton, limited semifinished supply an brisk demand combine to maintain tigh situation in plain structural shapes. Mos fabricating contracts placed call fo medium or smaller sections; angles an channels are in June. Numerous project eventually taking heavier sections ar held in abeyance and bridge inquir is light. Of late contracts placed fo fabricated steel by district contractor for work outside this area have bee heavier than New England lettings. On engineer has closed on two contract 3100 tons. Warehouses are pressing fo structurals, and miscellaneous tonnag going into reconversion, jigs, fixture and alterations is substantial.

New York — Outstanding is an in quiry for 4000 tons of shapes for th Governors Island shaft of the Brooklyn Battery tunnel, on which bids close Dec. 11. The New York Port Authorit is inquiring for 600 tons of shapes fo unloading facilities in Brooklyn. Var ous fairly sizable jobs are also pending Actual awards at the moment are feature less.

Seattle — Fabricators have a fair ton nage in small lots, no large projects be ing up for figures. Washington stat will take bids Dec. 27 for 220 tons fo a bridge in Cowlitz County. Bureau o Reclamation, Denver, has postponed t Dec. 26 bids for penstock coaster gate for Coulee Dam. Bids will be calle within 60 days by Port of Seattle for $6 million project at the Seattle-Tacom airport, including hangars, maintenanc shops and administration building.

Cleveland—Structural fabricators ar accepting a large volume of new bus ness, chiefly for heavy manufacturin buildings and additions. Practically n highway, multiple housing or publi works projects have reached the marke With plain material deliveries extendin about three months, fabricated struc turals are being promised in about fiv months, barring interruptions in preser operating schedules.

Philadelphia — While some produc ers can take standard shapes for Apr others have nothing available befo May and June and one seller has n wide flange tonnage for shipment be fore June and July. Considerable struc tural inquiry is accumulating, with ac tual orders spotty, because of uncertain ties as to future costs and deliveries.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 177

Chicago — Feature of concrete ba activity in this district within the pas few days was the placing with a local mill by the Chicago Sanitary District o 4750 tons for an intercepting sewer. Thi

is the largest single award since early war plant construction days. Delivery will spread over many months. Considerable bar business is going begging with suppliers restricted by mill quotas. New inquiries come out steadily. Most jobs require less than 100 tons, but the aggregate is substantial.

Pittsburgh — Leading producers report bookings to date this month are slightly below the comparable period in November. This reflects uncertain delivery promises and uncertain wage rates. In a number of instances, bids have far exceeded estimates. Latest available figures of bookings for producers east of the Rockies show that November orders of 123,000 tons were off seasonally from the near record bookings of 150,000 tons during October and compare with the average monthly orders during first half of about 60,000 tons. Mills report that order backlogs at the present rate of output (which is restricted due to the exceptionally heavy demand for small carbon bars) represent about five months output. Present monthly output, however, is about double the average monthly total for last half of 1944. Contractors are pressing for early deliveries in an attempt to build up stocks in anticipation of the steel strike and in expected sharp increase in construction activity next spring.

Seattle — Reinforcing demands are limited to small lots, though potential volume is promising and is expected to develop early in the year. Bids are pending on several important jobs on which costs are considered, being higher than expected. Washington state has called bids Dec. 27 for a bridge in Cowlitz County, requiring 109 tons. Permanente Cement Co. has let contract to Kuney-Johnson Co., Seattle, for several large cement silos.

Pig Iron . . .

Pig Iron Prices, Page 179

Continued tightness prevails in pig iron, with easing labor in foundries bringing larger demand. Practically all producers ration output among regular customers. Winter inventory is short and supply of cast scrap is also deficient.

Pittsburgh — Despite a tight situation in coke and manpower, pig iron production in this district continues to edge upward, with 48 of 54 units now active, compared with 24 at one time during the coal strike. Foundry interests report no shipping delays of significance have resulted from the General Motors strike. Slight easing in the labor situation has made possible a somewhat higher level of foundry operations in this area. While supply of pig iron is in close balance with requirements, no foundries have had to curtail operations for lack of iron. From the foundry viewpoint, shortage of cast scrap currently is a more important factor.

New York — Pig iron consumers are specifying freely, with little consideration for the usual year-end inventory reason. Melters generally are fairly swamped with work and are endeavoring to build as much inventory as possible under the present government 30-day limitation, especially with winter virtually at hand. Because of a slight betterment in manpower, the melt shows further gain for the third consecutive month. Producers are rationing output and in practically all cases endeavor to limit trade to regular customers.

Boston — Melters are placing first quarter pig iron requirements; some are unable to place slightly heavier tonnages for the period, and limited supply holds commitments close to current quarter levels. Until blast furnaces build up some reserve, no substantial increase in melt will be possible. There is nothing to indicate this in near future. Meanwhile shipments are from current production and consumers with inventories under 30 days can ill afford delays on scheduled deliveries. Labor situation has improved slightly and the district cast pipe foundry has enlarged operations somewhat, but no early increase in iron is in prospect.

St. Louis — Pig iron supply is tight. Inquiries from new melters are dwindling but overall demand is steady. Melters' inventories are low, with slight prospect of improvement. Few have more than 20 days' supply. All deliveries are under unofficial allocation. One blast furnace down for repairs is expected to resume soon after Jan. 1.

Philadelphia — Pig iron sellers are receiving heavy specifications, especially from foundries, which see a good chance for continuing production for a while,

even should the steel industry, to whic they look for their iron, be shut down There is even good demand for basic de spite the fact that steelmakers woul be forced to suspend immediately i event of a steel strike. This is ascribe to the fact that some steelmakers de pending on outside sources for basi seek to have as much as possible on han to use after the strike before pig iro production resumes fully. Meanwhil producers concentrate heavily on grade yielding heaviest output. An instanc is a large producer of foundry grad centering output on lower silicon grade 2.50 and under.

Chicago — Pig iron continues shor partly as a result of loss of productio suffered during the coal strike. Withi the last week or so output of foundr iron has increased, easing the distribu tion problem somewhat. Nevertheles sellers must adhere to some form of vo untary quota system to keep foundrie operating uniformly. Somewhat bett manpower supply is enabling a few foun dries to increase melt, and with scra scarce pig iron must bear the brunt. Fea of a steel strike in January is causin foundries to press for iron aggressively Inland Steel Co. returned its No. 4 bla furnace at Indiana Harbor to productio last week, thereby making 35 of the dis trict's 41 stacks active.

Cleveland — Pig iron producers ar filling first quarter books rapidly, as con sumers hasten to cover needs in antici pation of a possible steel strike. Pro ducers expect a larger output in firs quarter than in the current period, operations are not interrupted. Althoug production is practically at capacity, onl a DPC furnace being down, output wa curtailed in October by a fuel shortage Shipments during that month were be low schedule but those for the fina three months will approximate producer commitments. Some curtailments an suspensions of shipments have been re ceived from foundries, due to the Gene al Motors strike and to slowdowns i other plants but these have not bee sufficient to relieve pressure from othe quarters.

Cincinnati—Pressure for delivery o foundry iron continues as melters see to expand production and improve in ventory as a hedge against possible ship ping delays. Most district melters aske more iron in December but supply tight and it is doubtful if requests can b fully met. Automobile suspensions ha slight effect on castings demand, whic has exceeded production.

Birmingham—Pig iron production somewhat curtailed, Tennessee Coa Iron & Railroad Co. having two stack out for repair and Woodward Iron Co one. This leaves 15 stacks active in thi district, six being on merchant iron. De mand for iron is heavy and supply fairly even.

Scrap . . .

Scrap Prices, Page 180

No easing in scrap is apparent, melter seeking every ton possible to find. Dis tance and additional freight is no obsta cle if material is available and premium grades are readily taken in place of usua scrap, notably low phos for use in open hearths. Appearance of bad weather i hampering preparation.

Cleveland—Tightness is the keynote

of the steel scrap market, with all consumers seeking tonnage for current use and reserves. Heavy snow in this district promises interference with transportation and hampers yard preparation. Buyers are paying springboards for remote material and are buying premium grades at higher than their usual grades. Industrial scrap continues slow as reconversion work lags. Cast scrap is far below requirements.

Boston — Demand for steel making and cast scrap is strong and shipments, notably of prepared yard material, are lower. Alloy-free scrap supply for wire making is especially tight and bundled scrap schedules have slipped. Market is being combed for cast with little in sight. Production of industry scrap is disappointingly slow and also metal from contract terminations, although the latter tends to mount.

Small tonnage is available to Pennsylvania consumers seeking unprepared heavy melting in this district, as well as low phos for open-hearths, for which full differentials are paid. Consumer stocks of cast vary widely. Some yards are bare while others have close to the 60-day inventory; two in the Worcester district can take no additional spot tonnage, stocks being at the limit. One explanation of the variance in cast reserves is that suppliers of certain types of machinery, textile and shoe included, normally take in old tools as scrap when the unit is replaced by new equipment.

Cincinnati — Melters are fairly well supplied with scrap for current needs and are anxious for shipments, to stop drain on reserves. Local users so far have avoided premium tonnage. Prices are strong on local buying and on inquiry from other districts willing to pay for longer haul. Yard reserves are low and preparation is hampered.

St. Louis — Pressure for scrap is increasing as shipments decline because of bad weather and labor shortage. Brokers are reaching further into remote areas. Demand for heavy melting steel has increased notably. Termination scrap is not available in expected quantities, due to lack of processing labor. All prices are at ceiling.

Pittsburgh — Despite willingness of consumers to pay $1 more freight equalization on open-hearth grades, there has been little improvement in supply. Consumers are now paying $2.50 freight equalization on open-hearth grades, $1 on machine shop and short shoveling turnings and $5.50 springboard on cast scrap. Overall scrap supply shows no improvement. The Third Service Command, Frederick, Md., will close bids Dec. 21 on 5000 tons of overseas unprepared scrap. Bethlehem Steel Co. was highest bidder recently at $13.03 on a similar tonnage. Bids were taken Dec. 13 on 10,000 tons of landing mat scrap by the director of Regional Disposal Center, Fort Euster, Va. Pennsylvania Railroad's recent list, closing Dec. 17, included 4000 tons of No. 1 heavy melting steel; 2500 tons of No. 1 rails; 1000 tons of car bodies.

Philadelphia — In spite of strong demand for scrap, actual movement is slowing and is likely to be curtailed the remainder of the year, with cold weather, supply generally becoming scarce and dealers devoting more time to checking yearend inventories. Practically all con-

sumers of heavy melting steel, borings, turnings and cast grades want far more tonnage than they are receiving.

Chicago — Demand for scrap exceeds supply. With local scrap falling short of requirements, some tonnage is being brought in from remote points, but the volume is difficult to ascertain since the purchases are made direct by mills. There can be little doubt that the reduction of about $2.50 in the freight rate from Pacific Coast points, effective Dec. 28, will operate to increase flow of material from that area in periods of heavy demand and short nearby supply.

Warehouse . . .

Warehouse Prices, Page 178

New York—To meet inquiry approaching wartime peak, steel warehouses are getting less steel to maintain inventory. Only in alloys, and to some degree in plates, are distributors stocked sufficiently. There is a mild improvement in alloy buying. An exception to the balance in alloy stocks is polished sheets for which demand is heavy, with mill deliveries in third quarter. Most sellers have nothing in galvanized sheets.

Chicago — Demand is maintained at a high rate and far above ability of distributors to accommodate with their steadily shrinking inventories. Flat-rolled products, principally sheets, but also including plates, are in critical shortage. Carbon bars and structurals also are in short supply, while alloy bars are comparatively easy.

Iron Ore . . .

Iron Ore Prices, Page 178

Shipments of Lake Superior iron ore in December totaled 71,035 gross tons, according to the Lake Superior Iron Ore Association, Cleveland. This total was made up of 43,798 tons from Escanaba, and 27,237 tons from Superior. This brought the season total to 75,714,750 tons, compared with 81,170,538 tons for the 1944 season, a loss of 5,455,788 tons. This was the lowest total since 1940. Shipments for 1943 were 84,404,852 tons; for 1942 they were 92,076,781 tons and for 1941 they totaled 80,116,360 tons. The 1940 total was 63,712,982 tons.

Steel in Europe . . .

London — (*By Radio*) — Export orders for finished steel from Great Britain are increasing. Sheet mills are filled for six months and plate and rail mills are fully engaged. Light castings are in heavy demand for the building industry.

Seek Means for Averting Scheduled Steel Strike

(*Concluded from Page 68*)

they called the "sheer arrogance" of the steel companies and condemned their "adamant refusal" to meet the union's wage demands for the present impasse.

Meanwhile, indications developed that the steel companies will, when negotiations with the union are resumed, ask for new guarantees of the union's responsibility. This is an issue which has developed in the automotive industry negotiations and is being talked with increasing frequency by steel men.

In a radio broadcast on the steel wage dispute last week, C. M. White, president of Republic Steel Corp. and a director of the American Iron & Steel Institute sponsor of the broadcast, cited that 197 unauthorized steel strikes occurred during 1942, 1943, and 1944—all wartime years—despite a national no-strike pledge given by the unions and despite no-strike provisions in many of the contracts.

"In my opinion," said Mr. Grace, a strike in the face of this agreement would shatter any confidence in the validity of union contracts."

"Wildcat" strike last week at the LaBelle Works of the Crucible Steel Co. of America in Pittsburgh was not related to the general wage dispute. The walkout, at least on the surface, was due to a dispute over transfer of a non-union finisher to the 24-in. mill.

Labor, Management Watch Oil Panel's Procedure

(*Continued from Page 69*)

be fixed, to conduct cross examination.

Then—and this is where the panel will establish precedents for proceedings of this kind—the panel "on its own initiative will use its discretion in developing any facts from government sources which it considers pertinent to the inquiry."

After that, the panel will submit the record to both parties for such comments as they may care to make. Finally the panel will conclude its activities by reporting and making recommendations to Secretary Schwellenbach.

The panel can approve the collection and publication of much information which has been submitted by the oil industry to various government agencies and which hitherto has been protected by the seal of secrecy — information whose publication might materially weaken the petroleum refiners in the collective bargaining position.

The union has requested the panel to secure the following information from the federal agencies named:

1—From Department of Commerce: Estimate of the volume in 1946, and the extent of utilization of capacity; data on relative profitability of product-mix in 1946 as compared with 1944 and 1945; the extent to which the major oil companies dominate the industry, and the present trends.

2—From the Bureau of Labor Statistics, Department of Commerce: A table showing straight-time hourly earnings for 1936 through September of 1945, basic wage rates from January of 1941 through September of 1945, the increase resulting from non-basic wage rate changes, the increase due to extended vacations, the increase due to shift differentials and the increase due to upgrading; estimated distribution of workers by average hourly earnings; an estimate of overtime hours

worked over 40 at time-and-a-half rates and for the year ended September of 1945, as compared with the year ended June of 1942.

3—From the Federal Reserve Board: A revision of their index on petroleum refining to show a correct index of output per man-hour in the petroleum refineries; productivity index of output of the refineries.

4—From the Department of the Interior, Bureau of Mines: Present outlook for technological advances in the immediate postwar years; an estimate of volume in 1946 and of the extent of utilization of capacity.

5—From the Department of Justice: The extent to which the major oil companies dominate the industry, and the present trends; the extent to which such monopolistic control enables them to bear wage increases.

6—From the Office of Price Administration: Data submitted by companies in request for price increases and the basis of OPA's denial of such requests; data on price increase of petroleum and its products since 1936 and their best estimate of prices in 1946; data on relative profitability of product-mix in 1946 as compared with 1944-45; estimate of profits in 1946.

7—From the Petroleum Administration for War: Estimate of volume in 1946.

8—From the Treasury Department: Data bearing on the aggregate depletion allowances of the oil industry, and their estimate of what depletion would be if it were based on cost; an estimate of the money saved by the industry in 1944 as compared with 1945 by the elimination of the excess profits tax, and the reductions in the corporate income tax, assuming the same level of profits as in 1945; the estimated extent to which the industry will benefit through accelerated amortization of facilities and the redemption of outstanding postwar refund bonds for the war years; the estimated extent to which the profit position of the oil industry is guaranteed through the carry-back provision for excess profits tax purposes.

9—From the Smaller War Plants Corp.: The extent to which the major oil companies dominate the industry, and the present trends.

10—From the Reconstruction Finance Corp.: A summary of cost and profit data; the best estimate as to the extent to which private interests will use privately and federally financed facilities built during the war; the best estimate as to the extent to which the industry will benefit through the accelerated amortization of facilities; estimate of volume in 1946, and extent of utilization of capacity; estimate of profits in 1946; cost data and realization on a cents per barrel basis for the nation as a whole and for the principal refining districts and areas, for the years 1941 to date, on (a) average cost of crude at the refinery, (b) refining costs, (c) refinery labor costs, and (d) realization.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

2870 tons, du Pont office building, Wilmington, Del., to American Bridge Co., Pittsburgh, through Turner Construction Co., New York.

1300 tons, warehouse for American Cyanamid Co. at Pearl River, N. Y., to American Bridge Co., Pittsburgh.

350 tons, dormitory at Merrymount College, Tarrytown, N. Y., to Bethlehem Steel Co., Bethlehem, Pa.

245 tons, store building, F. W. Woolworth Co., Haverhill, Mass., to Bethlehem Steel Co., Bethlehem, Pa.

210 tons, building for National Paper Co., Ransom, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

200 tons, Induction Equipment Co., Gettysburg, Pa., to William Christianson, York, Pa.

Unstated, tower steel for Troutdale station for Bonneville Power Administration, to Bethlehem Pacific Coast Steel Co., $5703.

Unstated tonnage, wind tunnel, Daingerfield, Tex., to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, $1,529,530, Bureau of Yards and Docks, Navy department.

STRUCTURAL STEEL PENDING

10,500 tons, vertical lift bridge, Terminal Island, Calif.; use of Navy funds disapproved by Department of Yards and Docks.

1000 tons or more, steel siphons and structures,

1000 tons, power plant for Staten Island Edison Corp., New York City; bids Dec. 21 to Gilbert Associates, Reading, Pa.

San Diego aqueduct, 11th naval district; Haddock-Engineers Ltd., Oceanside, Calif., $640,856, general contractor.

780 tons, Navy addition at White Oak, Md.; Dyker Building Co., Washington, low.

315 tons, powerhouse for Luzerne County Gas & Electric Co., Hunlock Creek, Pa.; United Engineers & Constructors Inc., Philadelphia, engineer in charge.

300 tons, building for E. I. du Pont de Nemours & Co., Wilmington, Del., at Edgemoor, Del.

250 tons, plant additions, Magnus Metal division, National Lead Co., Fitchburg, Mass.

250 tons, plant building, H. K. Porter Inc., Somerville, Mass.

220 tons, Coweeman river state bridge, Cowlitz County, Washington; bids to Olympia, Dec. 27.

110 tons, plant addition for Heintz Mfg. Co., Philadelphia.

Unstated, penstock coaster gates for Coulee; bids to Denver, Dec. 26.

Unstated, caisson for Coulee spillway; Consolidated Steel Co., Los Angeles, low on Item I, $38,982.

REINFORCING BARS . . .

REINFORCING BARS PLACED

255 tons, storage building, General Ice & Cold Storage Warehouse Co., New Bedford, Mass., to Concrete Steel Co., Boston.

REINFORCED BARS PENDING

500 tons, power station, Tyrone, Ky., for Kentucky Utilities & Power Co.; Bates & Rogers Construction Corp., Chicago, contractor; bids Dec. 10.

475 tons, engineering building, Highland Park, Mich., for Chrysler Corp.,

300 tons, for Loose-Wiles Biscuit Co., at

Dayton, O.

175 tons, Paducah, Ky., for United States Engineers.

160 tons, bridge over New Haven railroad, Wallingford, Conn.; M. A. Gammino Co., Providence, R. I., contractor.

130 tons, paving, Pocahontas county, Iowa.

120 tons, for Terminal Cold Storage & Ice Co., at Dayton, O.

109 tons, Coweeman river bridge, Cowlitz County, Washington; bids to Olympia, Dec. 27.

100 tons, highways and bridges, Vermont; bids in.

Unstated, silos for bulk cement, Seattle, for Permanente Cement Co.; Kuney-Johnson Co., Seattle, general contractor.

PLATES . . .

PLATES PLACED

Unstated tonnage light ship, U. S. coast guard, to Defoe Shipbuilding Co., Bay City, Mich., $398,800, delivered July 1, 1946.

PIPE . . .

CAST IRON PIPE PENDING

2000 tons, Eighth Ave. S.W. project, Seattle; M. Moschetto & Co., Seattle, general contractor, low at $254,934.

900 tons, for city of Portland; bids in, award pending.

500 tons, city of Tacoma; bids opened Dec. 10.

Unstated, Aloha Huber water district, Portland, Oreg., bids for steel and cast iron pipe to C. E. Carter, Portland, Dec. 18.

RAILS, CARS . . .

RAILROAD CARS PLACED

Great Northern, 500 combination steel and plywood box cars, program expected to be completed at its own shops at St. Cloud, Minn., and Superior, Wis., by early next year.

RAILROAD CARS PENDING

Donora Southern, 40 seventy-ton copper steel gondolas; pending.

Newburgh & South Shore, 100 alloy steel gondolas; bids asked.

LOCOMOTIVE PLACED

Carnegie-Illinois Steel Corp., four 275-horsepower diesel-electric locomotives, to Whitcomb Locomotive Co., Rochelle, Ill.

Chicago & North-western, seven 1500-horsepower and four 2000-horsepower diesel-electric locomotives, to Electro-Motive Division, General Motors Corp., La Grange, Ill.

French Railway Mission, Washington, 80 steam locomotives, reported placed with Lima Locomotive Works, Lima, O.; this follows award of 160 each to American Locomotive Co., New York, and Baldwin Locomotive Works, Philadelphia.

Sourocabana Railway, Brazil, 11 electric locomotives for freight and passenger service, electrical equipment to be built by Westinghouse Electric Corp., East Pittsburgh, Pa., and locomotives by the General Electric Co., Schenectady, N. Y.

Texas & Pacific, two diesel-electric switch engines, to Electro-Motive Division, General Motors Corp., La Grange, Ill.

RAILS PLACED

Central of Georgia, 15,000 tons, to Tennessee Coal Iron & Railroad Co., Birmingham, Ala.

Bessemer & Lake Erie, 4500 tons, to Carnegie-Illinois Steel Corp., Pittsburgh.

Reading, 15,000 131-pound rail, to Bethlehem Steel Co., Bethlehem, Pa.

CONSTRUCTION AND ENTERPRISE

OHIO

AKRON—B. & M. Metals Corp. has bee corporated with 250 shares no par sto do metal stamping by Carl Borden, of den Automobiles Inc., and associates.

CANTON, O.—Bowdil Co., 1000 Boylan SE, has let contract to F. C. Haffner struction Co. for a one-story plant, incl machine shop, to cost about $50,000.

CLEVELAND—Melin Industries, man turer of screw machinery, Stan B. manager, 4311 Mayfield Rd., will bu two-story 90 x 100-foot factory and building costing about $50,000.

CLEVELAND—Titan Valve & Mfg. Co., liam F. Bentley, president, 9913 Elk will build a one and two-story plant office building on East 222nd St., Euclid, O.

CLEVELAND—Royal Brass Mfg. Co., Regan, president, 1418 East 43rd St., pl ing supplies, will build a one-story plant dition 47 x 95 feet.

CLEVELAND—Atlas Steel & Supply Maurice B. Abrams, president, 4401 Tru Ave., will build a one-story 60 x 200 warehouse costing about $500,000.

CLEVELAND—White Motor Co., Rober Black, president, 842 East 79th St., spend $9 million for new buildings, e ment and machinery in the next 18 mo

CLEVELAND—Asco Corp. has been inc rated with $500 and 200 shares no par to manufacture machines, tools and i ments by Edward T. Slabe, presiden Slabe Machine Products Co., 874 East St.

ELYRIA, O.—Millford Rivet & Machine J. A. Sharkey, general manager, West St., will build a one-story plant 40 x 240

NORWALK, O.—Nelson Machine & Mfg. C. B. Nelson, president, 7609 Grand manufacturer of electrical appliances, a one-story 70 x 280-foot plant and o on site to be selected.

SANDUSKY, O.—New Departure Division eral Motors Corp., Bristol, Conn., ha contract to National Concrete Firepro Co., Citizens Bldg., Cleveland, for a story 600 x 600-foot ball bearing plan x 480-foot service building, incinerator, age disposal plant, and other structures cost about $1 million.

TOLEDO, O.—Plaskon Division Libbey-O Ford Glass Co., Nicholas Bldg., has let tract for design and construction of se multistory manufacturing buildings on dale Ave., estimated to cost about $5 mil

MASSACHUSETTS

FITCHBURG, MASS.—General Electric Pittsfield, Mass., has let contract to J. Bishop Co., 109 Foster St., Worcester, M for a four-story plant addition, to cost a $55,000. Charles T. Main, 18 Oliver Boston, is engineer.

NEW BEDFORD, MASS.—New Bedford & Edison Light Co., 693 Purchase St., let contract to Theo. Loranger & Sons, Phillips Ave., for a utility plant 90 x feet, 100 feet high, boilerhouse addi and turbine room, estimated to cost a $2,500,000.

PENNSYLVANIA

PITTSBURGH—American Brake Shoe Co., Park Ave., New York, has let contract Ragner-Benson Inc., 1744 West Rice Chicago, for a plant costing about $1,500,0

MICHIGAN

ALMA, MICH.—Roths Industries, H.

Roths, Alpena, Mich., president, is building a one-story plant 80 x 208 feet. H. J. Mansell, industrial engineer, Davison, Mich., has been made works manager.

DETROIT—Chevrolet Motor Division of General Motors Corp., 3044 West Grand Blvd., has let contract to Darin & Armstrong, 2041 Fenkell St., for a die shop and office addition to cost about $150,000.

DETROIT—Metal Mouldings Corp., 14451 West Chicago Ave., has let contract to Cooper Construction Co., 572 Maccabees Bldg., for a one-story plant addition estimated to cost about $50,000.

DETROIT—Timken Detroit Axle Co., 100 Clark St., has let contract to Couse & Westphal Co., 12740 Lyndon St., for a one-story plant building estimated to cost about $100,000.

GRAND HAVEN, MICH.—Welded Steel Products Co. is building a one-story plant 65 x 120 feet.

GRAND HAVEN, MICH.—Wolverine Pressed Steel Co. is building a one-story plant 76 x 161 feet.

MINNESOTA

MINNEAPOLIS—Plews Oiler Co., R. G. Plews, president, 258 Sexton Bldg., has let contract to Leck Construction Co., 2834 Stevens Ave., for a one-story 80 x 137-foot plant, to cost about $60,000.

ILLINOIS

CHICAGO—International Harvester Co., 180 North Michigan Ave., has let contract to Erroll Williamson, 208 South LaSalle St., for a foundry addition, cupola and yard crane, estimated to cost about $45,000.

CHICAGO—Gerrard Steel Strapping Co., 2915 West 47th St., has bought 60,000 square feet adjoining its plant and will double manufacturing facilities and office space. Plans are by Mundie & Jensen, 39 South LaSalle St., general contractor Campbell-Lowrie-Lautermilch Corp., 400 West Madison St.

DE KALB, ILL.—Wurlitzer Co., manufacturer of pianos and other musical instruments, plans a one-story plant addition. Bradley & Bradley, Brown Bldg., Rockford, Ill., are architects.

WISCONSIN

ASHLAND, WIS.—Canfield Mfg. Co., Grand Haven, Mich., manufacturer of plywood products, plans factory here to manufacture laminated barrel staves.

BARABOO, WIS.—Gunnison Mfg. Co., manufacturer of street flushers and road oil distributors, plans a one-story plant addition 35 x 80 feet.

KENOSHA, WIS.—Ameson Foundry Co., 3303 66th St., has let contract for a one-story plant addition.

MADISON, WIS.—Gisholt Machine Co., manufacturer of machine tools, has let contract to J. F. Findorff & Son for a two-story engineering building 60 x 150 feet.

MARSHFIELD, WIS.—Lang & Scharmann Co., gray iron founder, has let contracts for a one-story foundry addition, 27 x 95 feet.

MILWAUKEE—Froedtert Grain & Malting Co., 3830 West Grant St., has let contracts for a malting plant 160 x 284 feet, 100 feet high, to cost about $1 million. V. K. Boynton, 647 West Virginia St., is engineer.

MILWAUKEE—Super Tool & Die Corp. has been incorporated to manufacture tools and dies, by Ralph Arndt, 3442 South Howell Ave., and associates.

MILWAUKEE—Milwaukee Saw Trimmer Corp., 612 East Clybourn St., printers' saws and cutters, has let contract for a one-story plant 120 x 120 feet, at 3902 North Second St.

MILWAUKEE—Modern Casting Co. has been incorporated by Thomas Armstrong, Richard Lapp and John Quincey, 2630 N. Fourteenth St.

MILWAUKEE—B. & F. Die & Tool Co. has been incorporated by Adolph Baudish, R. M. Fechner, 3822 North Frederick Ave.

MILWAUKEE—Barclay Foundry has been incorporated by George L. Heimerl, 122 S. 80th St., and associates.

MILWAUKEE—Capitol Stampings Corp., G. Schwibinger, proprietor, 728 East N. St., plans a plant addition.

MILWAUKEE—Machinery Engineering 743 North Fourth St., has let contract a one-story plant at 3720 West Pierce St.

MILWAUKEE—Delde Machine Works been incorporated by Irving L. Heller, 3 North Farwell Ave., and associates.

MILWAUKEE—Delta Mfg. Co., 620 Vienna Ave., manufacturer of indus power tools and small machine tools, has contract to Selzer-Ornst Co. for a one-s plant addition 144 x 290 feet.

MILWAUKEE—Western Sound & Electric L oratories Inc., 3512 West St. Paul Ave., p a one and two-story plant 73 x 145 f at 49th St. and West Edgerton Ave.

NEENAH, WIS.—Kimberly-Clark Corp. p addition to Lakeview paper mill, construc to start in February.

NEKOOSA, WIS. — Nekoosa-Edwards P Co. has let contract to Frank J. Henry, W consin Rapids, Wis., for a two-story P 125 x 150 feet, for manufacture of pa specialties.

WAUKESHA, WIS.—Alloy Products Co manufacturer of tanks, kettles and d equipment, plans a plant addition. Wa A. Sherman, 3522 North Fratney St., M waukee, is engineer.

WAUKESHA, WIS.—Industrial Clutch Co. let contract to Hunzinger Construction Milwaukee, for a one-story plant 100 x feet.

WEST ALLIS, WIS.—Allis Automatic Sc Products Co. has let contracts for a one-s plant addition 35 x 85 feet.

CALIFORNIA

LOS ANGELES—Columbia Water Heater Co has been incorporated with 2500 shares par value, represented by Elwood Bow 821 South Spring St.

LOS ANGELES—Miniature Motors Inc. been incorporated with $50,000 capital, r resented by Delvey T. Walton, 530 W Sixth St.

LOS ANGELES—Utility Motors Corp. has be incorporated with 100 shares no par val represented by A. W. Ball, 405 South Ra mond Ave., Pasadena, Calif.

LOS ANGELES—Columbia Iron & Metal C has building permit for a warehouse ad tion 64 x 75 feet, costing $15,000, at 7 East Slauson Ave.

LOS ANGELES—Kaycee Lumber Machines C has been incorporated with 5000 shares par stock, Francis F. Quittner, 215 West Fi St., representative.

LOS ANGELES—A. W. Anderberg, 3751 Sou Broadway Place, plans construction of new machine shop building 77 x 136 fe to cost about $25,000.

LOS ANGELES—American Can Co., 48 Santa Fe Ave., has let contract to Swinert & Walberg Co., 605 West Olympic Blvd for plant additions, including manufacturi building, warehouse, cafeteria and lock building. Estimated cost is $1 million.

LOS ANGELES—Atwood Machinery Co., 69 Santa Fe Ave., will build a storage buildin 50 x 100 feet, to cost about $15,000.

LOS ANGELES—Superior Sleeprite Corp., 620 Wilmington Blvd., will build a metal fu niture manufacturing plant, including manu facture of bedding, on a 3½-acre tract a cost of about $1 million.

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WANTED: MANAGER FOR CONSTRUCTION division to take full charge. Executive with ability to organize and get results. Must be experienced with oil refineries, chemical, steel construction, etc. Write stating age, education, experience, references and salary expected. Address Box 323, STEEL, Penton Bldg., Cleveland 13, O.

STRUCTURAL DRAFTSMEN WHO HAVE had experience in structural fabricating shops. Prefer complete experience and when available in first reply. Permanent position. Orleans Materials & Equip. Co., Inc., P. O. Box 87, New Orleans 1, La.

SALES REPRESENTATIVE: ABILITY TO read blue prints and knowledge of steel. Eastern territory. Give Age, Education, Experience, Reference. Salary Expected, and recent photo. Address Box 337, STEEL, Penton Bldg., Cleveland 13, O.

WANTED: PLANT MANAGER OR ASST. Plant Manager for metal stamping business. Must have production and mechanical experience. Address Box 335, STEEL, Penton Bldg., Cleveland 13, O.

Help Wanted

WANTED
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PLANT SUPERINTENDENT FOR SMALL EXpanding job and production machine shop in Cleveland area. In first letter give education, experience showing dates, age, salaries received, salary expected and personal data. Reply Box 336, STEEL, Penton Bldg., Cleveland 13, O.

WANTED: MACHINE DESIGNER. EXPERIenced in designing machine tools and single purpose special machinery. Permanent position with long established manufacturer if qualified. Apply by letter stating age, education, experience and expected salary. Address Box 611, Danville, Ill.

WANTED: CHIEF ESTIMATOR WITH welded steel plate and sheet fabricating experience, familiar with time study and production line methods. Locality, Los Angeles. Excellent opportunity. Address Box 341, STEEL, Penton Bldg., Cleveland 13, O.

WANTED: MANAGER FOR WAREHOUSE IN Cleveland specializing in stainless steel, cold finished bars and tool steels. In writing, please give full details. Address Box 344, STEEL, Penton Bldg., Cleveland 13, O.

Help Wanted

WANTED: DIRECTOR OF RESEARCH AND development. Executive with ability to take full charge of all research developing and engineering. Must be familiar with oil refineries, chemical equipment and construction, general plate construction, general process equipment. Location mid-west. Write stating experience, education, age, companies worked for, positions held, salary expected, references. Enclose picture. Address Box 340, STEEL, Penton Bldg., Cleveland 13, O.

TOOL DESIGNER — WITH CONTRACT OR job shop experience, capable of complete design and layout of tools, dies, jigs and fixtures for the Sheet Metal Industry. Old established firm. Permanent position. Write giving full resume of experience, education, references and salary expected to Box 342, STEEL, Penton Bldg., Cleveland 13, O.

WANTED: SALESMAN BY LARGE TUBING manufacturer of both seamless and welded in carbon, alloy and stainless steels. Must have Mechanical or Metallurgical Engineering college degree, or suitable alloy steel field sales experience. Give full details with application. Write Box 265, STEEL, Penton Bldg., Cleveland 13, O.

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Manufacturers of chain sprockets. Modern equipment, excellent personnel. Catalog on request.

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HEnderson 6620

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STEEL INDUSTRY Statistics

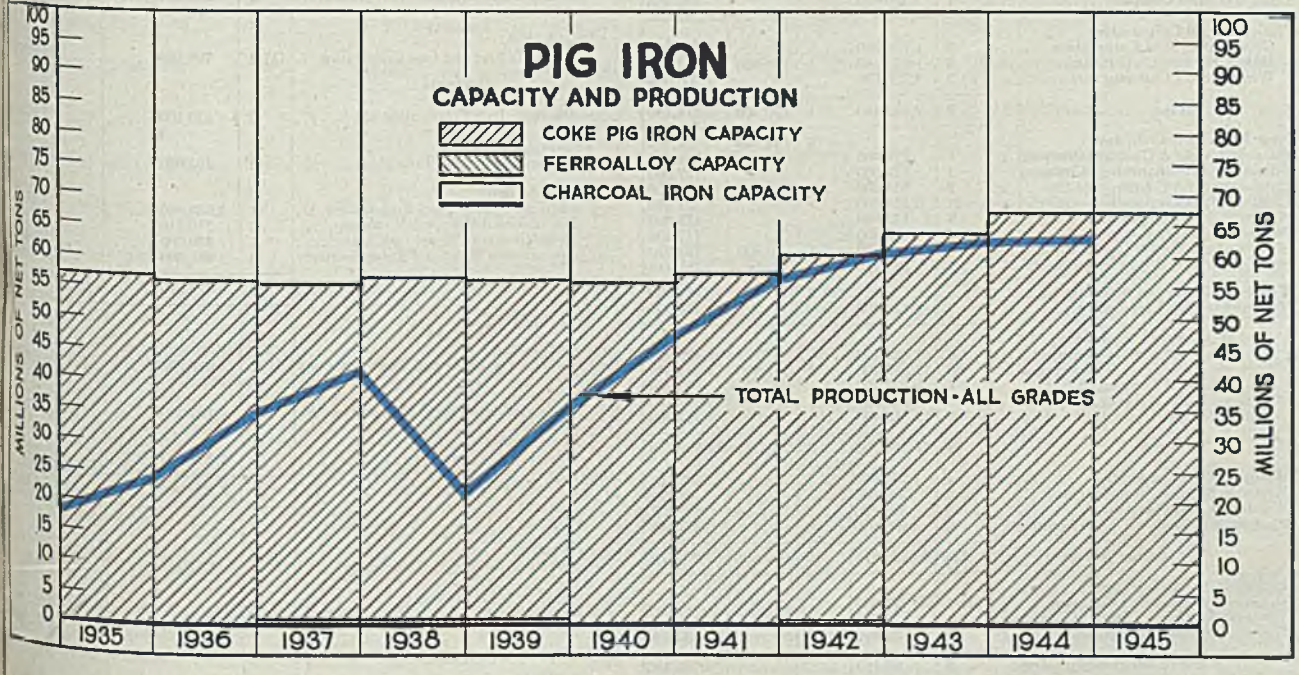
These figures compiled by the American Iron and Steel Institute and appearing in its new 1945 directory reveal the most complete statistical picture of the industry in seven years. Data include capacities by individual companies for production of pig iron, coke and steel ingots, as well as for finished products such as bars, plates, shapes, sheet, strip, tin plate, pipe, rails, car wheels and axles and bolts, nuts and rivets. Canadian statistics also reported

PIG IRON

Two hundred and forty-three stacks now have capacity for production of 67,313,890 net tons of pig iron and ferroalloys annually. Thirteen furnace operators dropped from list in seven years

PIG IRON producers in the United States emerged from World War II with the largest capacity and most modern facilities in history. These and other facilities of the steel industry are described in detail in the new 1945 Iron and Steelworks Directory prepared by the American Iron and Steel Institute. It is the first directory issued since 1938. The new directory lists 39 companies with 243 blast furnaces as of Jan. 1, 1945, capable of producing 66,321,290 net tons of coke and charcoal pig iron and 992,600 tons of ferroalloys or a combined total of 67,313,890 tons. This represents an increase of 36 per cent over the Jan. 1, 1938 capacity of 56,782,208 tons when the industry had 243 stacks owned by 52 companies. The 1945 figure actually is slightly lower than the capacity of 67,391,270 net tons recorded as of Jan. 1, 1944, but is attributable to the abandonment of several furnaces resurrected only for the war emergency along with other antiquated stacks no longer needed when the pressure for pig iron eased.

Six furnaces were abandoned or dismantled in 1944; two new furnaces were completed and three were under



construction. In the latter group, work on one financed by the Defense Plant Corp. for the Pittsburgh Steel Co. and another for the Inland Steel Co. was suspended. Twenty entirely new furnaces were constructed during the war, of which 11 were financed by DPC and nine by industry.

The tendency in recent years toward the use of larger and more efficient furnaces becomes especially conspicuous in comparing the data in the 1945 Directory with that in its 1938 predecessor. In the short span of seven years, 13 company names disappeared from the list of furnace operators, partly through mergers but for the greater part through the disposal of facilities which could no longer be operated profitably. Some 40 furnaces with 25 to 28-ft hearths are a far cry from the 6 and 9 footers of the days when all furnaces were operated on charcoal. Only a few of the smaller furnaces continue on the active list, some, in fact, giving up when iron demand was at wartime peak.

BLAST FURNACE CAPACITY

(Capacities as of Jan. 1, 1945
compiled by American Iron & Steel Institute; net tons)

BLAST FURNACES	Pig Iron		Ferro-Alloys		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Companies (coke furnaces):					
Alan Wood Steel Company	2	454,800			454,800
American Rolling Mill Company	5	1,320,000			1,320,000
Sheffield Steel of Texas	1	274,000			274,000
TOTAL	6	1,594,000			1,594,000
Bethlehem Steel Company	29	9,474,000	2	180,000	9,654,000
Brooke Iron Company (E. & G.)	1	137,890			137,890
Colorado Fuel and Iron Corporation	(a) 4	798,000			798,000
Crucible Steel Company of America	2	532,000			532,000
Eastern Gas and Fuel Associates	1	176,400			176,400
Ford Motor Company	2	504,000			504,000
Geneva Steel Company	4	1,450,000			1,450,000
Globe Iron Company			1	84,000	84,000
Inland Steel Company	6	2,236,000			2,236,000
Interlake Iron Corporation	6	1,332,500			1,332,500
International Harvester Company	3	719,710			719,710
Jackson Iron & Steel Company			1	90,000	90,000
Jones & Laughlin Steel Corporation	13	4,080,000			4,080,000
Kaiser Company, Inc.	1	388,800			388,800
Koppers Company, Inc.	2	465,000			465,000
Lavino & Company, E. J.			2	72,000	72,000
Lone Star Steel Company	1	399,850			399,850
National Steel Corporation:					
Great Lakes Steel Corporation	3	1,100,000			1,100,000
Hanna Furnace Corporation	3	594,180	1	120,000	714,180
Weirton Steel Company	3	1,200,000			1,200,000
TOTAL	9	2,894,180	1	120,000	3,014,180
New Jersey Zinc Company			2	134,400	134,400
Pittsburgh Coke & Chemical Company	1	291,600			291,600
Pittsburgh Ferromanganese Company	1	127,000			127,000
Pittsburgh Steel Company	2	554,000			554,000
Republic Steel Corporation	21	6,324,000			6,324,000
Sharon Steel Corporation	1	173,600			173,600
Shenango Furnace Company	2	417,300			417,300
Sloss-Sheffield Steel & Iron Company	3	386,470	1	36,800	423,270
Struthers Iron & Steel Company	1	181,440			181,440
Tennessee Products Corporation			(b) 3	21,900	21,900
Tonawanda Iron Corporation	1	171,000			171,000
United States Steel Corporation:					
American Steel & Wire Company	6	1,429,400			1,429,400
Carnegie-Illinois Steel Corporation	53	17,312,700	3	221,900	17,564,600
Columbia Steel Company	1	199,200			199,200
National Tube Company	9	3,012,400			3,012,400
Tennessee Coal, Iron & Railroad Co.	9	2,332,400	(c)	31,600	2,364,000
TOTAL	78	24,346,100	3	253,500	24,599,600
Wheeling Steel Corporation	5	1,275,000			1,275,000
Wickwire Spencer Steel Company	2	390,000			390,000
Woodward Iron Company	3	526,170			526,170
Youngstown Sheet and Tube Company	12	3,456,000			3,456,000
TOTAL (coke furnaces)	225	66,256,810	16	992,600	67,249,410
Companies (charcoal furnaces):					
McCrossin Engineering Company	(d) 1	(d) 27,000			
Newberry Lumber & Chemical Company	1	32,000			32,000
Tennessee Products Corporation	1	32,480			32,480
TOTAL (charcoal furnaces)	2	64,480			64,480
GRAND TOTAL	227	66,321,290	16	992,600	67,313,890

BLAST FURNACE CAPACITY

(Net Tons)

As of Jan. 1	Coke Pig Iron	Charcoal Pig Iron	Ferro-alloys	Total
1945	66,256,810	64,480	992,600	67,313,8
1944	66,344,780	56,190	990,300	67,391,2
1943	62,859,330	107,200	967,000	63,933,5
1942	59,211,850	106,560	1,075,570	60,393,9
1941	56,522,370	106,560	980,660	57,609,5
1940	54,635,740	95,580	992,320	55,723,6
1939	55,162,374	103,040	1,060,416	56,325,8
1938	55,618,752	103,040	1,060,416	56,782,2
1937	54,418,489	103,040	1,035,776	55,557,3
1936	54,803,720	103,040	947,520	55,854,2
1935	55,999,710	150,640	947,520	57,097,8
1934	56,209,620	150,640	883,008	57,243,2
1933	55,452,964	159,040	898,688	56,510,6

PIG IRON PRODUCTION

(Net tons; includes ferroalloys)

	Total		Total
1944	62,866,198	1937	41,582,5
1943	62,769,947	1936	34,752,6
1942	60,903,304	1935	23,937,4
1941	56,686,604	1934	18,075,2
1940	47,398,529	1933	14,947,0
1939	35,677,097	1932	9,835,2
1938	21,460,164	1931	20,637,5

Blast Furnace Capacity By Plant Location and Operating Company

	Pig Iron		Ferro-Alloys		To annu capac (N. T
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
ALABAMA					
Birmingham					
Republic Steel Corporation	2	376,000			376
Sloss-Sheffield Steel & Iron Company	2	281,230			281
Ensley					
Tennessee Coal, Iron & Railroad Co.	6	1,347,500	(c)	31,600	1,379
Fairfield					
Tennessee Coal, Iron & Railroad Co.	3	981,900			981
Gadsden					
Republic Steel Corporation	2	471,000			471
North Birmingham					
Sloss-Sheffield Steel & Iron Company	1	105,240	1	36,800	142
Woodward					
Woodward Iron Company	3	526,170			526
TOTAL	19	4,092,040	1	68,400	4,160
CALIFORNIA					
Fontana					
Kaiser Company, Inc.	1	388,800			388
COLORADO					
Pueblo					
Colorado Fuel and Iron Corporation	(a) 4	798,000			798
ILLINOIS					
Chicago					
Interlake Iron Corporation	2	520,100			520
Granite City					
Koppers Company, Inc.	2	465,000			465
South Chicago					
Carnegie-Illinois Steel Corporation	11	3,631,800			3,631
International Harvester Company	3	719,710			719
Republic Steel Corporation	1	450,000			450
Youngstown Sheet and Tube Company	3	681,000			681
TOTAL	22	6,473,610			6,473
INDIANA					
East Chicago					
Youngstown Sheet and Tube Company	2	619,200			619
Gary					
Carnegie-Illinois Steel Corporation	12	4,165,300			4,165
Indiana Harbor					
Inland Steel Company	6	2,236,000			2,236
Total	20	7,020,500			7,020
KENTUCKY					
Ashland					
American Rolling Mill Company	3	756,000			756
MARYLAND					
Sparrows Point					
Bethlehem Steel Company	7	2,712,000			2,712
MASSACHUSETTS					
Everett					
Eastern Gas and Fuel Associates	1	176,400			176

Blast Furnaces (Continued)

	Pig Iron		Ferro-Alloys		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
MICHIGAN					
Dearborn					
Ford Motor Company	2	504,000			504,000
Delray					
Great Lakes Steel Corporation	3	1,100,000			1,100,000
Newberry					
Newberry Lumber & Chemical Co.	(e) 1	32,000			32,000
TOTAL	6	1,636,000			1,636,000
MINNESOTA					
Duluth					
American Steel & Wire Company	2	449,400			449,400
Interlake Iron Corporation	1	127,000			127,000
TOTAL	3	576,400			576,400
NEW YORK					
Buffalo					
Hanna Furnace Corporation	3	594,180	1	120,000	714,180
Republic Steel Corporation	2	565,000			565,000
Lackawanna					
Bethlehem Steel Company	7	2,556,000			2,556,000
North Tonawanda					
Tonawanda Iron Corporation	1	171,000			171,000
Tonawanda					
Wickwire Spencer Steel Company	2	390,000			390,000
Troy					
Republic Steel Corporation	1	263,000			263,000
TOTAL	16	4,539,180	1	120,000	4,659,180
OHIO					
Campbell					
Youngstown Sheet and Tube Company	4	1,450,800			1,450,800
Canton					
Republic Steel Corporation	1	235,000			235,000
Cleveland					
American Steel & Wire Company	2	530,000			530,000
Jones & Laughlin Steel Corporation	2	480,000			480,000
Republic Steel Corporation	5	1,659,000			1,659,000
Hamilton					
American Rolling Mill Company	2	564,000			564,000
Hubbard					
Youngstown Sheet and Tube Company	1	200,400			200,400
Jackson					
Globe Iron Company			1	84,000	84,000
Jackson Iron & Steel Company			1	90,000	90,000
Lorain					
National Tube Company	5	1,764,400			1,764,400
Lowellville					
Sharon Steel Corporation	1	173,600			173,600
Martins Ferry					
Wheeling Steel Corporation	1	144,000			144,000
Massillon					
Republic Steel Corporation	1	238,000			238,000
Portsmouth					
Wheeling Steel Corporation	1	285,000			285,000
Steubenville					
Wheeling Steel Corporation	2	612,000			612,000
Struthers					
Struthers Iron & Steel Company	1	181,440			181,440
Toledo					
Interlake Iron Corporation	2	520,100			520,100
Warren					
Republic Steel Corporation	1	450,000			450,000
Youngstown					
Carnegie-Illinois Steel Corporation	6	1,837,800			1,837,800
Republic Steel Corporation	5	1,617,000			1,617,000
Youngstown Sheet and Tube Company	2	501,600			501,600
TOTAL	45	13,444,140	2	174,000	13,618,140
PENNSYLVANIA					
Aliquippa					
Jones & Laughlin Steel Corporation	5	1,800,000			1,800,000
Bethlehem					
Bethlehem Steel Company	7	1,920,000			1,920,000
Bridgeport					
Brooke Iron Company, E. & G.	1	137,890			137,890
Braddock					
Carnegie-Illinois Steel Corporation	8	2,954,390			2,954,390
Chester					
Pittsburgh Ferromanganese Company	1	127,000			127,000
Clairton					
Carnegie-Illinois Steel Corporation	2	528,700	1	77,000	605,700

Blast Furnaces (Continued)

	Pig Iron		Ferro-Alloys		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
PENNSYLVANIA (Continued)					
Donora					
American Steel & Wire Company	2	450,000			450,000
Duquesne					
Carnegie-Illinois Steel Corporation	6	1,577,600			1,577,600
Erie					
Interlake Iron Corporation	1	165,300			165,300
Etna					
Carnegie-Illinois Steel Corporation			2	144,900	144,900
Farrell					
Carnegie-Illinois Steel Corporation	2	511,200			511,200
Johnstown					
Bethlehem Steel Company	5	1,494,000	2	180,000	1,674,000
McKeesport					
National Tube Company	4	1,278,000			1,278,000
Midland					
Crucible Steel Company of America	2	532,000			532,000
Monessen					
Pittsburgh Steel Company	2	554,000			554,000
Neville Island					
Pittsburgh Coke & Chemical Company	1	291,600			291,600
Palmerton					
New Jersey Zinc Company			2	134,400	134,400
Pittsburgh					
Jones & Laughlin Steel Corporation	6	1,800,000			1,800,000
Rankin					
Carnegie-Illinois Steel Corporation	6	2,133,000			2,133,000
Sharpsville					
Shenango Furnace Company	2	417,300			417,300
Sheridan					
Lavino and Company, E. J.			1	36,000	36,000
Steelton					
Bethlehem Steel Company	3	792,000			792,000
Swedeland					
Alan Wood Steel Company	2	454,800			454,800
TOTAL	68	19,918,690	8	572,300	20,490,990
TENNESSEE					
Lyles-Wrigley					
Tennessee Products Corporation	(e) 1	32,480			32,480
Rockdale					
Tennessee Products Corporation			1	Idle	
Rockwood					
Tennessee Products Corporation			(f) 2	21,900	21,900
TOTAL	1	32,480	3	21,900	54,380
TEXAS					
Daingerfield					
Lone Star Steel Company	1	399,850			399,850
Houston					
Sheffield Steel of Texas	1	274,000			274,000
Rusk					
McCrossin Engineering Company	(d) 1	(d) 27,000			
TOTAL	2	673,850			673,850
UTAH					
Geneva					
Geneva Steel Company	3	1,150,000			1,150,000
Ironton					
Geneva Steel Company	1	300,000			300,000
Provo					
Columbia Steel Company	1	199,200			199,200
TOTAL	5	1,649,200			1,649,200
VIRGINIA					
Lynchburg					
Lavino and Company, E. J.			1	36,000	36,000
WEST VIRGINIA					
Benwood					
Wheeling Steel Corporation	1	234,000			234,000
Weirton					
Weirton Steel Company	3	1,200,000			1,200,000
TOTAL	4	1,434,000			1,434,000
GRAND TOTAL	227	66,321,200	16	992,600	67,313,890

(a) One furnace held as a spare, capacity of which is not included. (b) Two of these furnaces are idle, capacity of which is not included. (c) Furnace included under pig iron. (d) Charcoal furnace under construction, not included in total. (e) Charcoal furnace. (f) One of these furnaces is idle, capacity of which is not included.

COKE

Steel industry now has 11,488 by-product and 4694 beehive ovens capable of producing 60,856,040 net tons of fuel annually. Many new ovens added during war

THE large increase in pig iron capacity effected during the war made it necessary to provide additional supplies of blast furnace coke. This was accomplished partially by resorting to the expedient of rebuilding obsolete or abandoned beehive coke ovens and by constructing new beehive ovens. In Fayette County, Pennsylvania alone, 3592 ovens were rehabilitated to furnish 2,422,000 net tons of coke annually. Five hundred new back-to-back beehive ovens with an annual capacity of 300,000 tons were constructed in Utah to supply part of the requirements of the government-owned Geneva Steel Co. blast furnaces, but production in 1944 was only 12,505 tons.

The accompanying tables from the American Iron and Steel Institute's new directory show that the steel indust had 4694 beehive ovens as of Jan. 1, 1945 with a total c pacity of 3,446,350 tons, of which about 60 per cent we owned by U. S. Steel's H. C. Frick subsidiary and balan distributed among an even half-dozen other companies.

Of more enduring importance, was the construction du ing the war of over 1800 by-product coke ovens, of whi nearly 1000 were financed by the government and the ba ance by industry. In the tables below, by-product co ovens and capacity are listed under "other" since the wo "by-product" is no longer used by the Institute when r ferring to ovens of the type from which various distillat also are obtained. As of Jan. 1, 1945, 11,488 of the

COKE CAPACITY

(Capacities as of Jan. 1, 1945
Compiled by American Iron & Steel Institute; net tons)

COKE

	Beehive		Other		Total annual capacity (N. T.)
	No. of ovens	Annual capacity (N. T.)	No. of ovens	Annual capacity (N. T.)	
Companies:					
Alan Wood Steel Company			151	600,000	600,000
American Rolling Mill Company			85	516,000	516,000
Sheffield Steel of Texas			47	252,000	252,000
TOTAL			132	768,000	768,000
Bethlehem Steel Company			1,713	8,358,000	8,358,000
Colorado Fuel and Iron Corporation			192	675,000	675,000
Crucible Steel Company of America			100	474,000	474,000
Donner-Hanna Coke Corporation			216	1,200,000	1,200,000
Eastern Gas and Fuel Associates			204	1,112,000	1,112,000
Ford Motor Company			183	1,260,000	1,260,000
Geneva Steel Company	500	300,000	252	971,100	1,271,100
Inland Steel Company			419	2,143,400	2,143,400
Interlake Iron Corporation			437	1,564,500	1,564,500
International Harvester Company			133	600,000	600,000
Jones & Laughlin Steel Corporation	240	252,000	663	3,180,000	3,432,000
Kaiser Company, Inc.			90	340,000	340,000
Koppers Company, Inc.			49	435,000	435,000
Lone Star Steel Company			78	375,000	375,000
National Steel Corporation:					
Great Lakes Steel Corporation			130	996,600	996,600
Weirton Coal Company	136	120,000			120,000
Weirton Steel Company			150	920,000	920,000
TOTAL	136	120,000	286	1,916,600	2,036,600
Pittsburgh Coke & Chemical Company			70	500,000	500,000
Pittsburgh Steel Company	510	420,000	74	500,000	920,000
Republic Steel Corporation	296	215,000	961	4,863,000	5,078,000
Sloss-Sheffield Steel & Iron Company	94	60,600	120	678,000	738,600
Tennessee Products Corporation			44	268,000	268,000
United States Steel Corporation:					
American Steel & Wire Company			270	1,309,000	1,309,000
Carnegie-Illinois Steel Corporation			2,817	14,405,600	14,405,600
Columbia Steel Company			56	209,500	209,500
Frick Coke Company, H. C.	2,918	2,078,750			2,078,750
National Tube Company			208	1,050,000	1,050,000
Tennessee Coal, Iron & Railroad Co.			509	2,809,500	2,809,500
TOTAL	2,918	2,078,750	3,860	19,783,600	21,862,350
Wheeling Steel Corporation			253	1,175,000	1,175,000
Woodward Iron Company			228	885,490	885,490
Youngstown Sheet and Tube Company			580	2,784,000	2,784,000
GRAND TOTAL	4,694	3,446,350	11,488	57,409,690	60,856,040

Coke (Continued)

	Beehive		Other		Total annual capacity (N. T.)
	No. of ovens	Annual capacity (N. T.)	No. of ovens	Annual capacity (N. T.)	
ALABAMA					
Birmingham					
Republic Steel Corporation			57	370,000	370,000
Fairfield					
Tennessee Coal, Iron & Railroad Co.			509	2,809,500	2,809,5
Gadsden					
Republic Steel Corporation			102	493,000	493,0
Lewisburg					
Sloss-Sheffield Steel & Iron Company	94	60,600			60,6
North Birmingham					
Sloss-Sheffield Steel & Iron Company			120	678,000	678,0
Woodward					
Woodward Iron Company			228	885,490	885,4
TOTAL	94	60,600	1,016	5,235,990	5,296,5
CALIFORNIA					
Fontana					
Kaiser Company, Inc.			90	340,000	340,0
COLORADO					
Pueblo					
Colorado Fuel and Iron Corporation			192	675,000	675,0
ILLINOIS					
Chicago					
Interlake Iron Corporation			230	708,100	708,1
Granite City					
Koppers Company, Inc.			49	435,000	435,0
Joliet					
Carnegie-Illinois Steel Corporation			280	1,272,000	1,272,0
South Chicago					
International Harvester Company			133	600,000	600,0
Republic Steel Corporation			75	405,000	405,0
Youngstown Sheet and Tube Co.			70	444,000	444,0
TOTAL			837	3,864,100	3,864,1
INDIANA					
Gary					
Carnegie-Illinois Steel Corporation			1,055	5,676,600	5,676,6
East Chicago					
Youngstown Sheet and Tube Co.			120	648,000	648,0
Indiana Harbor					
Inland Steel Company			419	2,143,400	2,143,4
TOTAL			1,594	8,468,000	8,468,0
MARYLAND					
Sparrows Point					
Bethlehem Steel Company			422	2,124,000	2,124,0
MASSACHUSETTS					
Everett					
Eastern Gas and Fuel Associates			204	1,112,000	1,112,0
MICHIGAN					
Dearborn					
Ford Motor Company			183	1,260,000	1,260,0
Delray					
Great Lakes Steel Corporation			130	996,600	996,6
TOTAL			313	2,256,600	2,256,6

ovens, with an annual capacity of 57,409,690 tons were listed by the Institute. Roughly one-third or 3860 ovens with a capacity of 19,783,600 tons were owned by U. S. Steel Corp. subsidiaries. Bethlehem was second with 1713 ovens with a capacity of 8,358,000 tons.

New ovens added during the war as reported by W. A. Hauck of the Reconstruction Finance Corp. and financed by the industry itself were as follows: American Rolling Mill 25 at Hamilton; Bethlehem 70 at Steelton, 61 at Sparrows Point and 152 at Lackawanna; Interlake Iron Corp. 75 at Erie; Jones & Laughlin 106 at Aliquippa; Kaiser 90 at Fontana; National Steel 45 at Weirton; Pittsburgh Steel 74 at Monessen, Pa.; and U. S. Steel 146 at Fairfield, Ala., making a total of 804. The industry also expanded and rebuilt other coke facilities and built washing plants to improve the quality of coking coal.

New ovens financed by the government were: American Rolling Mill at Houston 47 ovens; Colorado Fuel & Iron at Pueblo 74; Geneva Steel Co. 252 at Geneva, Utah; Inland 146 at Indiana Harbor, Ind.; Koppers Co. 49 at Granite City; Lone Star Steel Co. 78 at Daingerfield, Tex.; Republic 65 at Gadsden, 75 at Chicago, 75 at Cleveland and 61 at Warren; and U. S. Steel 77 at Gary or a total of 999.

Combined capacity for the production of both beehive and by-product coke Jan. 1, 1945 was 60,856,040 net tons, compared with 59,910,980 a year earlier. Of the latter figure, 56,574,430 tons represented by-product and 3,336,550 tons beehive. Comparative capacity figures for the past several years follow. The Institute did not record capacities prior to Jan. 1, 1942.

Coke Capacity and Production

As of Jan. 1	By-product	Beehive	Total
1945	57,409,690	3,446,350	60,856,040
1944	56,574,430	3,336,550	59,910,980
1943	51,707,830	5,756,400	57,464,230
1942	50,291,830	4,239,975	54,531,805

The figures reported by the Institute include only the steel industry's coke capacity. Commercial plants and public utilities also have about 3500 by-product ovens with a capacity of some 17,000,000 net tons annually.

Coke (Continued)

	Beehive		Other		Total annual capacity (N. T.)
	No. of ovens	Annual capacity (N. T.)	No. of ovens	Annual capacity (N. T.)	
MINNESOTA					
Duluth					
American Steel & Wire Company			90	435,000	435,000
Interlake Iron Corporation			41	225,600	225,600
TOTAL			131	660,600	660,600
NEW YORK					
Buffalo					
Donner-Hanna Coke Corporation			216	1,200,000	1,200,000
Lackawanna					
Bethlehem Steel Company			383	2,022,000	2,022,000
TOTAL			599	3,222,000	3,222,000
OHIO					
Campbell					
Youngstown Sheet and Tube Co.			308	1,320,000	1,320,000
Canton					
Republic Steel Corporation			62	255,000	255,000
Cleveland					
American Steel & Wire Company			180	874,000	874,000
Jones & Laughlin Steel Corporation			100	360,000	360,000
Republic Steel Corporation			279	1,280,000	1,280,000
Hamilton					
American Rolling Mill Company			85	516,000	516,000
Lorain					
National Tube Company			208	1,050,000	1,050,000
Massillon					
Republic Steel Corporation			49	295,000	295,000
Portsmouth					
Wheeling Steel Corporation			108	475,000	475,000
Toledo					
Interlake Iron Corporation			94	365,800	365,800
Warren					
Republic Steel Corporation			125	695,000	695,000
Youngstown					
Republic Steel Corporation			212	1,070,000	1,070,000
Youngstown Sheet and Tube Co.			84	372,000	372,000
TOTAL			1,892	8,927,800	8,927,800
PENNSYLVANIA					
Aliquippa					
Jones & Laughlin Steel Corporation	240	252,000	203	1,224,000	1,476,000
Bethlehem					
Bethlehem Steel Company			416	1,680,000	1,680,000
Brownsville					
Republic Steel Corporation	296	215,000			215,000
Clairton					
Carnegie-Illinois Steel Corporation			1,482	7,457,000	7,457,000
Erie					
Interlake Iron Corporation			72	265,000	265,000

Coke (Continued)

	Beehive		Other		Total annual capacity (N. T.)
	No. of ovens	Annual capacity (N. T.)	No. of ovens	Annual capacity (N. T.)	
Isabella					
Weirton Coal Company	136	120,000			120,000
Johnstown					
Bethlehem Steel Company			362	1,884,000	1,884,000
Midland					
Crucible Steel Company of America			100	474,000	474,000
Monessen					
Pittsburgh Steel Company			74	500,000	500,000
Neville Island					
Pittsburgh Coke & Chemical Co.			70	500,000	500,000
Pittsburgh					
Jones & Laughlin Steel Corporation			360	1,596,000	1,596,000
Republic					
Pittsburgh Steel Company	510	420,000			420,000
Steelton					
Bethlehem Steel Company			130	648,000	648,000
Swedeland					
Alan Wood Steel Company			151	600,000	600,000
Various					
Frick Coke Company, H. C.	2,918	2,078,750			2,078,750
TOTAL	4,100	3,085,750	3,420	16,828,000	19,913,750
TENNESSEE					
Chattanooga					
Tennessee Products Corporation			44	268,000	268,000
TEXAS					
Daingerfield					
Lone Star Steel Company			78	375,000	375,000
Houston					
Sheffield Steel of Texas			47	252,000	252,000
TOTAL			125	627,000	627,000
UTAH					
Geneva					
Geneva Steel Company			252	971,100	971,100
Ironton					
Geneva Steel Company	500	300,000			300,000
Provo					
Columbia Steel Company			56	209,500	209,500
TOTAL	500	300,000	308	1,180,600	1,480,600
WEST VIRGINIA					
East Steubenville					
Wheeling Steel Corporation			145	700,000	700,000
Weirton					
Weirton Steel Company			156	920,000	920,000
TOTAL			301	1,620,000	1,620,000
GRAND TOTAL	4,694	3,446,350	11,488	57,409,690	60,856,040

STEEL INGOTS

Eighty-three companies with 990 open hearths, 262 electric and crucible furnaces and 41 bessemers can produce 95,505,280 net tons annually. Open-hearth and electric furnace capacities up sharply

DEMAND for unprecedented quantities of carbon and alloy steels in World War II necessitated the construction of entire new steel plants and the expansion and rehabilitation of practically every existing plant in the industry. Total steel ingot capacity as of Jan. 1, 1945 at 95,505,280 tons was more than 15,000,000 tons in excess of the total in 1938 when the Institute issued its last directory.

The 7-year period witnessed increases of approximately 265 per cent in electric furnace capacity and 18 per cent in open-hearth capacity, while bessemer and crucible ste capacities followed a previously-established trend of shrin ing further. Net increase for all grades was a shade le than 18 per cent.

Electric furnace capacity on Jan. 1, 1945 was placed b the Institute at 5,455,890 tons compared with 1,490,85 tons seven years earlier and might have been considerab higher had increasing demand for aircraft quality and oth alloy steels persisted. Some expansion programs, such the one conducted for the Defense Plant Corp. by the R public Steel Corp. at South Chicago, Ill. were not com pleted. Late in 1943, the War Production Board figur showed electric furnace capacity, existing and projecte at 6,248,470 tons.

Open-hearth capacity Jan. 1, 1945 was 84,171,590 ton

STEEL INGOT CAPACITY

(Net Tons)

As of Jan. 1	Open Hearth	Bessemer	Crucible	Electric	Total
1945	84,171,590	5,874,000	3800	5,455,890	95,505,280
1944	82,223,610	6,074,000	3800	5,350,880	93,652,290
1943	79,180,880	6,553,000	3800	4,554,980	90,292,660
1942	78,107,260	6,721,400	3800	3,737,510	88,569,970
1941	74,565,510	6,996,520	3942	2,586,320	84,152,292
1940	73,721,592	6,009,920	5354	1,882,630	81,619,496
1939	72,959,638	7,138,880	5354	1,725,086	81,828,958
1938	71,472,370	7,212,800	9610	1,490,858	80,185,638
1937	69,725,736	7,084,000	11,850	1,326,788	78,148,374
1936	68,946,829	8,058,400	11,850	1,147,221	78,164,300
1935	68,544,310	8,842,400	11,850	1,053,370	78,451,930

STEEL INGOT PRODUCTION

(Net Tons)

1944	89,641,600	1939	52,798,7
1943	88,836,512	1938	31,751,9
1942	86,031,931	1937	56,636,9
1941	82,839,259	1936	53,499,9
1940	66,982,686	1935	38,183,7

STEEL INGOT CAPACITY

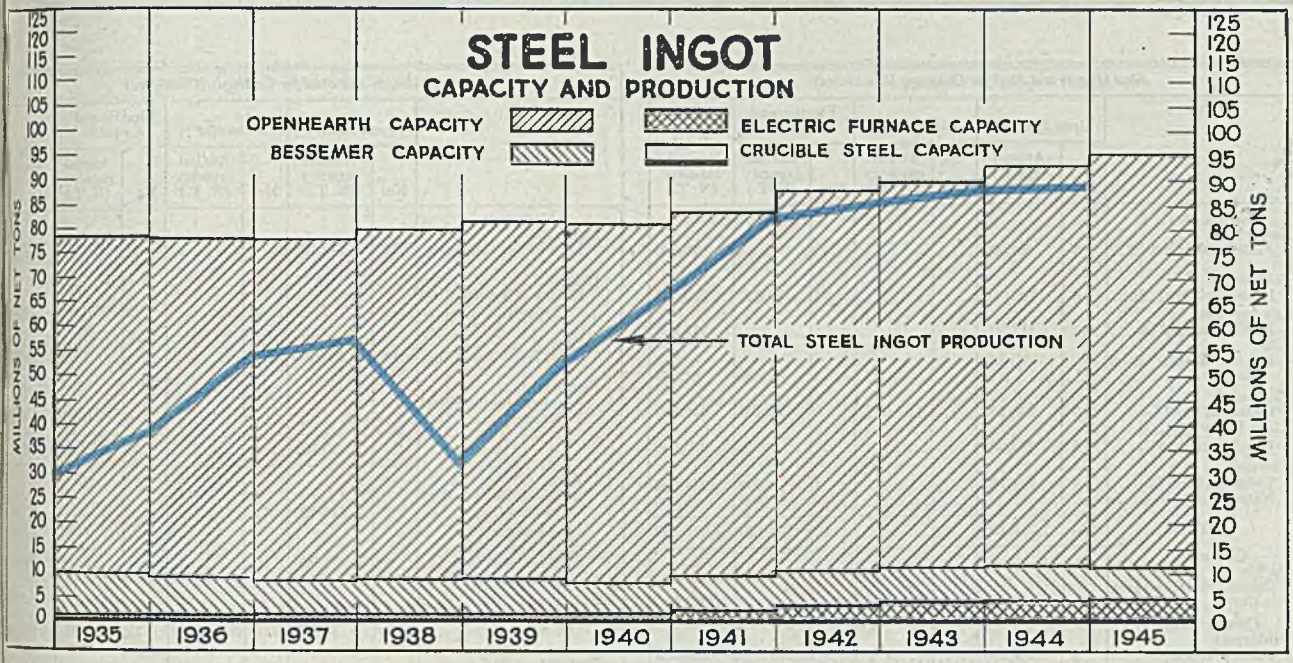
(Capacities as of Jan. 1, 1945 compiled by American Iron & Steel Institute; include ingots and steel for castings; net tons)

STEEL (Ingots and Steel for Castings)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Kinds:							
Open hearth—basic	940	82,611,730					82,611,730
Open hearth—acid	50	1,559,860					1,559,860
Bessemer			41	5,874,000			5,874,000
Electric					259	5,455,890	5,455,890
Crucible					3	3,800	3,800
Total	990	84,171,590	41	5,874,000	262	5,459,690	95,505,280
Steel for castings included above		336,130				222,080	558,210
Companies:							
Alan Wood Steel Co.	7	550,000					550,000
Allegheny Ludlum Steel Corporation	7	260,160			24	200,200	460,360
American Locomotive Co.	6	181,000					181,000
American Rolling Mill Co.	25	2,268,000			4	54,000	2,322,000
Sheffield Steel Corp.	6	480,000					480,000
Sheffield Steel of Texas	5	466,000					466,000
Total	36	3,214,000			4	54,000	3,268,000
Andrews Steel Company	7	413,100					413,100
Atlantic Steel Company	3	154,000					154,000
Babcock & Wilcox Tube Company					2	50,400	50,400
Baldwin Locomotive Works	5	169,910			(a) 1	20	169,930
Barium Steel Corporation	3	50,000					50,000
Bethlehem Steel Co.	133	12,242,000	6	500,000	9	158,000	12,900,000
Borg-Warner Corporation					3	24,000	24,000
Braeburn Alloy Steel Corp.					2	20,730	20,730
Byers Company, A. M.	2	75,000			2	75,000	150,000
Cabot Shops, Inc.					1	12,000	12,000
Carpenter Steel Company					6	74,880	74,880
Central Iron & Steel Co.	6	336,000					336,000

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Colonial Steel Company					1	7,020	7,0
Colorado Fuel and Iron Corporation	16	1,272,000					1,272,0
Columbia Tool Steel Co.					2	6,600	6,6
Connors Steel Company					2	60,000	60,0
Continental Steel Corp.	5	364,000					364,0
Copperweld Steel Co.					9	321,360	321,3
Crucible Steel Company of America	17	980,490			(b) 32	(b)527,280	1,507,6
Defense Plant Corp.					(c) 3	200,000	200,0
Disston & Sons Company, Henry					2	25,000	25,0
Edgewater Steel Co.	4	140,170					140,1
Empire Steel Corporation	6	318,540					318,5
Erie-Forge Company	3	80,000					80,0
Erie Forge & Steel Co.	2	128,950					128,9
Firth-Sterling Steel Co.					5	17,540	17,5
Follansbee Steel Corp.	4	126,000					126,0
Ford Motor Company	10	770,100			31	197,320	967,4
Geneva Steel Company	9	1,283,400					1,283,4
Granite City Steel Co.	13	703,200					703,2
Harrisburg Steel Corp.	3	100,750					100,7
Heppenstall Company	2	39,880			2	2,680	42,5
Hinderliter Tool Co.					1	9,450	9,4
Inland Steel Company	36	3,400,000					3,400,0
International Harvester Company	11	900,000					900,0
Isaacson Iron Works					2	104,400	104,4
Jessop Steel Company					7	50,000	50,0
Jones & Laughlin Steel Corporation	40	4,098,000	5	918,000	2	8,400	5,024,4
Joslyn Mfg. & Supply Co.					3	37,500	37,5
Judson Steel Corporation	3	76,500					76,5
Kaiser Company, Inc.	6	720,000			1	30,000	750,0
Keystone Steel & Wire Co.	3	302,400					302,4
Kilby Steel Company	2	54,000			2	20,400	74,4
Knoxville Iron Company					2	38,000	38,0
Laclede Steel Company	4	326,020					326,0
Latrobe Electric Steel Co.					4	12,000	12,0
Lukens Steel Company	13	624,000					624,0
Mesta Machine Company	4	85,000			1	20,000	105,0
Midvale Company	8	430,830			6	88,540	519,3
*National Forge & Ordnance Company					3	25,000	25,0



which does not quite represent the peak for World War II as some furnaces pressed into service to meet emergency needs have since been dropped from the Institute's lists. In addition to making the usual run of carbon and garden variety alloy steels, open-hearth furnaces were used during the war to make acceptable high-quality alloy steels. Open-hearth capacity Jan. 1, 1938 was 71,472,370 tons.

As will be seen by referring to the accompanying tables and charts, the downward trend in bessemer steel capacity was interrupted in 1941 but since that time has continued to drop off. Crucible steel capacity is down to three units operated by two companies and rated at a total of 3800 tons.

Although there has been a slight further geographical shift westward in the steel industry, Pennsylvania and Ohio, in No. 1 and 2 positions, continue to supply the bulk of the tonnage. Indiana, Illinois, New York, Maryland, Alabama and Michigan follow in order.

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
National Steel Corp.:							
Great Lakes Steel Corp.	16	2,050,000					2,050,000
Weirton Steel Co.	12	1,850,000	(d) 2				1,850,000
TOTAL	28	3,900,000	(d) 2				3,900,000
National Supply Co.					3	45,900	45,900
Newport News Shipbuilding & Dry Dock Co.					2	7,500	7,500
Northwest Steel Rolling Mills					2	32,400	32,400
Northwestern Steel & Wire Co.					3	321,000	321,000
Oregon Steel Mills					2	60,000	60,000
Pacific States Steel Corp.					5	88,820	88,820
Phoenix Iron Company	5	231,400					231,400
Pittsburgh Steel Co.	12	1,072,000					1,072,000
Republic Steel Corp.	81	7,956,000	2	700,000	20	1,135,000	9,791,000
Rodgers Sons Co., J. A.	9	253,000					253,000
Rotary Electric Steel Co.					2	170,000	170,000
Sharon Iron & Steel Corporation					6	114,000	114,000
Simonds Saw & Steel Co.	6	600,000			1	36,000	636,000
Stanley Works					3	21,600	21,600
Sun Steel Company	3	188,280					188,280
Timken Roller Bearing Company					2	22,320	22,320
Union Electric Steel Corp.	3	201,600			6	345,600	547,200
United States Steel Corp.:					2	25,200	25,200
American Steel & Wire Company	26	1,732,400					1,732,400
Carnegie-Illinois Steel Corporation	259	21,738,700	(e) 12	1,956,000	14	448,300	24,143,000
Columbia Steel Co.	13	594,900			3	32,700	627,600
National Tube Co.	15	2,250,000	5	894,000			3,144,000
Tennessee Coal, Iron & Railroad Company	20	2,660,000	(d) 3				2,660,000
TOTAL	333	28,976,000	20	2,850,000	17	481,000	32,307,000
Universal-Cyclops Steel Corporation					4	54,120	54,120

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Vanadium-Alloys Steel Company					3	11,910	11,910
Vulcan Crucible Steel Co.					2	9,600	9,600
Washburn Wire Co.	3	60,000					60,000
Wheeling Steel Corp.	21	1,624,000	2	336,000			1,960,000
Wickwire Brothers, Inc.	3	38,000					38,000
Wickwire Spencer Steel Company	4	180,000					180,000
Worth Steel Company	7	460,000					460,000
Youngstown Sheet and Tube Company	33	3,432,000	4	570,000			4,002,000
GRAND TOTAL	990	84,171,590	41	5,874,000	262	5,459,690	95,505,280

Steel Ingot Capacity by Plant Location and Operating Company

Plant Location and Operating Company:							
ALABAMA							
Anniston							
Kilby Steel Company	2	54,000			2	20,400	74,400
Birmingham							
Connors Steel Co.					2	60,000	60,000
Ensley							
Tennessee Coal, Iron & Railroad Company	9	1,565,000	(d) 3				1,565,000
Fairfield							
Tennessee Coal, Iron & Railroad Company	11	1,092,000					1,092,000
Gadsden							
Republic Steel Corp.	8	715,000					715,000
TOTAL	30	3,429,000	3		4	80,400	3,509,400

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
CALIFORNIA							
Emeryville							
Judson Steel Corp.	3	76,500					76,500
Fontana							
Kaiser Company, Inc.	6	720,000			1	30,000	750,000
Los Angeles							
Bethlehem Steel Co.	3	117,000					117,000
Niles							
Pacific States Steel Corp.					5	88,820	88,820
Pittsburg							
Columbia Steel Co.	9	393,200			2	23,400	416,600
South San Francisco							
Bethlehem Steel Co.	5	235,000					235,000
Torrance							
Columbia Steel Co.	4	201,700			1	9,300	211,000
National Supply Co.					3	45,900	45,900
TOTAL	30	1,743,400			12	197,420	1,940,820
COLORADO							
Pueblo							
Colorado Fuel and Iron Corp.	16	1,272,000					1,272,000
CONNECTICUT							
Bridgeport							
Stanley Works	3	188,280					188,280
DELAWARE							
Claymont							
Worth Steel Co.	7	460,000					460,000
GEORGIA							
Atlanta							
Atlantic Steel Co.	3	154,000					154,000
ILLINOIS							
Alton							
Laclede Steel Co.	4	326,020					326,020
Chicago Heights							
American Locomotive Co.	3	78,000					78,000
Columbia Tool Steel Co.					2	6,600	6,600
Granite City							
Granite City Steel Co.	13	703,200					703,200
Peoria							
Keystone Steel & Wire Co.	3	302,400					302,400
South Chicago							
Carnegie-Illinois Steel Corporation	31	3,755,000	3	500,000	8	270,000	4,525,000
Defense Plant Corp.					(f) 1	80,000	80,000
International Harvester Company	11	900,000					900,000
Republic Steel Corp.	12	1,131,000			2	170,000	1,301,000
Sterling							
Northwestern Steel & Wire Company					3	321,000	321,000
TOTAL	77	7,195,620	3	500,000	16	847,600	8,543,220
INDIANA							
East Chicago							
Defense Plant Corp.					(g) 2	120,000	120,000
Youngstown Sheet and Tube Company	9	1,116,000	2	330,000			1,446,000
Fort Wayne							
Joslyn Mfg. & Supply Company					3	37,500	37,500
Gary							
Carnegie-Illinois Steel Corporation	55	5,718,800	(d) 3				5,718,800
Indiana Harbor							
Inland Steel Company	36	3,400,000					3,400,000
Kokomo							
Continental Steel Corp.	5	364,000					364,000
New Castle							
Borg-Warner Corp.					3	24,000	24,000
TOTAL	105	10,598,800	5	330,000	8	181,500	11,110,300
KENTUCKY							
Ashland							
American Rolling Mill Company	8	783,000					783,000
Newport							
Andrews Steel Co.	7	413,100					413,100
TOTAL	15	1,196,100					1,196,100
MARYLAND							
Baltimore							
Rustless Iron & Steel Corporation					6	114,000	114,000
Sparrows Point							
Bethlehem Steel Co.	26	8,835,000	3	240,000			4,075,000
TOTAL	26	3,835,000	3	240,000	6	114,000	4,189,000
MASSACHUSETTS							
Worcester							
American Steel & Wire Company	6	280,000					280,000

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
MICHIGAN							
Dearborn							
Ford Motor Company	10	770,100			31	197,320	967,4
Detroit							
Rotary Electric Steel Company					2	170,000	170,0
Ecorse							
Great Lakes Steel Corp.	16	2,050,000					2,050,0
Ferndale							
Allegheny Ludlum Steel Corporation					5	3,000	3,0
TOTAL	26	2,820,100			38	370,320	3,190,4
MINNESOTA							
Duluth							
American Steel & Wire Company	7	610,400					610,4
MISSOURI							
Kansas City							
Sheffield Steel Corp.	5	426,000					426,0
NEW JERSEY							
Harrison							
Crucible Steel Company of America	1	30,000			12	180,000	210,0
Roebling							
Roebling's Sons Co., J. A.	9	253,000					253,0
TOTAL	10	283,000			12	180,000	463,0
NEW YORK							
Buffalo							
Republic Steel Corp.	9	850,000					850,0
Cortland							
Wickwire Brothers, Inc.	3	38,000					38,0
Dunkirk							
Allegheny Ludlum Steel Corporation					3	33,000	33,0
Lackawanna							
Bethlehem Steel Co.	30	3,120,000					3,120,0
Lockport							
Simonds Saw & Steel Co.					3	21,600	21,6
Syracuse							
Crucible Steel Company of America							
Halcomb Plant					8	54,000	54,0
Sanderson Plant					2	24,000	24,0
Tonawanda							
Allegheny Ludlum Steel Corporation					2	4,500	4,5
Wickwire Spencer Steel Company	4	180,000					180,0
Watervliet							
Allegheny Ludlum Steel Corporation					4	25,000	25,0
TOTAL	46	4,188,000			22	162,100	4,350,1
OHIO							
Campbell							
Youngstown Sheet and Tube Company	12	1,212,000	2	240,000			1,452,0
Canton							
Barium Steel Corp.	3	50,000					50,0
Republic Steel Corp.	6	480,000			18	965,000	1,445,0
Timken Roller Bearing Company	3	201,600			6	345,600	547,2
Cleveland							
Jones & Laughlin Steel Corporation	15	1,020,000			1	6,900	1,026,9
Republic Steel Corp.	14	1,570,000					1,570,0
Lorain							
National Tube Co.	12	1,350,000	2	594,000			1,944,0
Lowellville							
Sharon Steel Corp.	6	600,000			1	36,000	636,0
Mansfield							
Empire Steel Corp.	6	348,540					348,5
Massillon							
Republic Steel Corp.	9	610,000					610,0
Middletown							
American Rolling Mill Company	8	894,000			4	54,000	948,0
Portsmouth							
Wheeling Steel Corp.	10	616,000					616,0
Steubenville							
Wheeling Steel Corp.	11	1,008,000					1,008,0
Toronto							
Follansbee Steel Corp.	4	126,000					126,0
Warren							
Copperweld Steel Co.					9	321,860	321,8
Republic Steel Corp.	8	958,000					958,0

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
OHIO (*Continued*)							
Youngstown							
Carnegie-Illinois Steel Corporation	15	1,560,000	2	784,000			2,344,000
Republic Steel Corp.	15	1,650,000	2	700,000			2,350,000
Youngstown Sheet and Tube Company	12	1,104,000					1,104,000
TOTAL	169	15,350,140	8	2,318,000	39	1,728,960	19,397,000
OKLAHOMA							
Enid Springs							
Sheffield Steel Corp.	1	54,000					54,000
Tulsa							
Hinderliter Tool Co.					1	9,450	9,450
TOTAL	1	54,000			1	9,450	63,450
OREGON							
Portland							
Oregon Steel Mills					2	60,000	60,000
PENNSYLVANIA							
Aliquippa							
Jones & Laughlin Steel Corporation	5	1,182,000	3	582,000			1,764,000
Vulcan Crucible Steel Company					2	9,600	9,600
Beaver Falls							
Babcock & Wilcox Tube Company					2	50,400	50,400
Bethlehem							
Bethlehem Steel Co.	32	2,345,000			8	158,000	2,503,000
Brackenridge							
Allegheny Ludlum Steel Corporation	7	260,160			10	134,700	394,860
Braddock							
Carnegie-Illinois Steel Corporation	16	1,625,000	4	672,000			2,297,000
Buckeye							
Buckeye Alloy Steel Corporation					2	20,730	20,730
Bridgeville							
Universal-Cyclops Steel Corporation					4	54,120	54,120
Chatham							
Baldwin Locomotive Works	5	169,910			(a) 1	20	169,930
Butler							
American Rolling Mill Company	9	591,000					591,000
Clairton							
Carnegie-Illinois Steel Corporation	12	805,000					805,000
Clairton							
Union Electric Steel Corporation					2	25,200	25,200
Coatesville							
Lukens Steel Company	13	624,000					624,000
Donora							
American Steel & Wire Company	13	842,000					842,000
Duquesne							
Carnegie-Illinois Steel Corporation	32	1,974,000			4	172,800	2,146,800
Erie							
Erie Forge Company	3	80,000					80,000
Erie Forge & Steel Co.	2	128,950					128,950
Farrell							
Carnegie-Illinois Steel Corporation	15	1,050,000					1,050,000
Harmony Township							
Byers Company, A. M.	2	75,000			2	75,000	150,000
Harrisburg							
Central Iron & Steel Co.	6	336,000					336,000
Harrisburg Steel Co.	3	100,750					100,750
Irvine							
National Forge & Ordnance Company					3	25,000	25,000
Ivy Rock							
Alan Wood Steel Co.	7	550,000					550,000
Johnstown							
Bethlehem Steel Co.	21	1,640,000	3	260,000			1,900,000
Carnegie-Illinois Steel Corporation	2	18,900			2	5,500	24,400
Latrobe							
American Locomotive Company	3	103,000					103,000
Latrobe Electric Steel Company					4	12,000	12,000
Vanadium-Alloys Steel Company					3	11,910	11,910

Steel (Ingots and Steel for Castings) (Continued)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
PENNSYLVANIA (*Cont.*)							
McKeesport							
Firth-Sterling Steel Co.					5	17,540	17,540
National Tube Co.	3	900,000	3	300,000			1,200,000
Midland							
Crucible Steel Company of America	12	806,400			4	228,000	1,034,400
Monaca							
Colonial Steel Co.					1	7,020	7,020
Monessen							
Pittsburgh Steel Co.	12	1,072,000					1,072,000
Munhall							
Carnegie-Illinois Steel Corporation	69	4,732,000					4,732,000
Oakmont							
Edgewater Steel Co.	4	140,170					140,170
Philadelphia							
Disston & Sons, Inc., Henry					2	25,000	25,000
Midvale Company	8	430,830			6	88,540	519,370
Phoenixville							
Phoenix Iron Company	5	231,400					231,400
Pittsburgh							
Crucible Steel Co. of America (La Belle)					(b) 2	3,780	3,780
Crucible Steel Co. of America (Park)	4	144,000			4	37,500	181,500
Heppenstall Company	2	39,880			2	2,680	42,560
Jones & Laughlin Steel Corporation	20	1,896,000	2	336,000	1	1,500	2,233,500
Reading							
Carpenter Steel Co.					6	74,880	74,880
Steelton							
Bethlehem Steel Co.	11	740,000			1		740,000
Vandergrift							
Carnegie-Illinois Steel Corporation	12	500,000					500,000
Washington							
Jessop Steel Company					7	50,000	50,000
West Homestead							
Mesta Machine Co.	4	85,000			1	20,000	105,000
TOTAL	374	26,218,350	15	2,150,000	(h) 91	1,311,420	29,679,770
RHODE ISLAND							
Phillipsdale							
Washburn Wire Co.	3	60,000					60,000
TENNESSEE							
Knoxville							
Knoxville Iron Co.					2	38,000	38,000
TEXAS							
Fort Worth							
Texas Steel Company					2	22,320	22,320
Houston							
Sheffield Steel of Texas	5	466,000					466,000
Pampa							
Cabot Shops, Inc.					1	12,000	12,000
TOTAL	5	466,000			3	34,320	500,320
UTAH							
Geneva							
Geneva Steel Co.	9	1,283,400					1,283,400
VIRGINIA							
Newport News							
*Newport News Shipbuilding & Dry Dock Company					2	7,500	7,500
WASHINGTON							
Seattle							
Bethlehem Steel Co.	5	210,000					210,000
Isaacson Iron Works					2	104,400	104,400
Northwest Steel Rolling Mills					2	32,400	32,400
TOTAL	5	210,000			4	136,800	346,800
WEST VIRGINIA							
Benwood							
Wheeling Steel Corp.			2	336,000			336,000
Weirton							
Weirton Steel Co.	12	1,850,000	(d) 2				1,850,000
TOTAL	12	1,850,000	4	336,000			2,186,000
§ GRAND TOTAL	990	84,171,590	41	5,874,000	267	5,459,690	95,505,280

* Not described in this Directory.
(a) Crucible furnace.
(b) Includes 2 crucible furnaces, one of which is idle, annual capacity, 3,780 tons.
(c) Electric furnaces at South Chicago, Ill., and East Chicago, Ind., described under the respective plants of Republic Steel Corporation and Youngstown Sheet and Tube Company.
(d) Used in melting charge for open hearth furnaces.
(e) Includes 3 converters used only in melting charge for open hearth furnaces.
(f) Described under South Chicago Works of Republic Steel Corporation.
(g) Described under Indiana Harbor Works of Youngstown Sheet and Tube Company.
(h) Includes 3 crucible furnaces, total annual capacity 3,900 tons.

FINISHED STEEL

Hot rolled bars top list of finished products with 63 companies having capacity to produce over 23 million tons annually. Hot rolled sheets second, shapes third. New classifications added

LARGELY because of war requirements, finished steel capacity in the United States has been greatly increased in the seven years since the American Iron and Steel Institute issued its 1938 Directory.

The extent of this increase by individual companies or products cannot be determined precisely by comparing data from the 1945 Directory with that for 1938 since the Institute has revised its method of rating the capacities of finishing mills. Capacity figures now comprise the total tonnage of each product that could be produced under full operations, assuming exclusive use of all available facilities and without regard to the availability of ingots. For mills which produce more than one product, full capacity for each product is shown, regardless of the fact that these facilities do not have the capacity to produce the aggregate tonnage shown for all such products.

A number of changes in listings are noted in the 1945 Directory, some of which indicate the evolution which has been taking place in the steel industry in the past seven years, while others make the figures more useful. Tool steel bars, as an example, have been segregated from hot rolled bars. In the former group are listed 20 companies with capacity of 286,670 net tons and in the latter 63 with capacity of 23,011,440 tons. Included in the hot rolled bar figures are 24 concrete reinforcing bar producers wit capacity of 6,885,110 tons. Cold finished bar capacity 3,191,960 net tons divided among 37 companies as com pared with 1,721,606 tons and 30 companies in 1938.

The 1945 plate listing finds the addition of ten "Stri Mill" producers with capacity of 7,048,000 tons, plus a equal number of universal platemakers with capacity o 2,213,070 tons and 22 mills with capacity of 8,327,95 tons of sheared plates.

Four new classifications have been added under pipe and tubes, these including spiral weld, gas weld, condui and mechanical tubing. Four other classifications, butt lap and electric-weld pipe and seamless tubes, are con tinued but galvanized pipe, has been dropped.

Several changes are noted in the flat rolled categories Hot rolled, cold rolled and galvanized sheets and strip ar continued under six breakdowns. Black plate, as such, ha been dropped but has been replaced by chemically treate black plate. Institute finds it no longer necessary to dis tinguish between hot and cold reduced tin plate. New however, are the war-born electrolytic tin plate lines wit total capacity of 2,231,850 net tons.

Bale ties comprise a new listing under wire products supplementing the five groups previously carried. Plai

Hot Rolled Bars Other Than Tool Steel Bars

	Annual capacity (N. T.)		
	Steel	Iron	Total
Companies:			
Allegheny Ludlum Steel Corporation	42,000		42,000
American Car & Foundry Company		(a)50,700	50,700
American Rolling Mill Company:			
Sheffield Steel Corporation	390,500		390,500
Sheffield Steel of Texas	168,500		168,500
TOTAL	559,000		559,000
Ames & Company, W.	35,000		35,000
Atlantic Steel Company	145,360		145,360
Bethlehem Steel Company	2,893,000		2,893,000
Borg-Warner Corporation	67,000		67,000
Buffalo Bolt Company	132,000		132,000
Buffalo Steel Company	60,000		60,000
Byers Company, A. M.		(a)50,000	50,000
Colorado Fuel and Iron Corporation	353,600		353,600
Connors Steel Company	97,350		97,350
Copperweld Steel Company	292,000		292,000
Crucible Steel Company of America	627,600		627,600
Disston & Sons, Inc., Henry	24,500		24,500
Ewald Iron Company		12,000	12,000
Falls Hollow Staybolt Company		8,000	8,000
Ford Motor Company	320,000		320,000
Franklin Steel Works	50,400		50,400
Heller Brothers Company	7,800		7,800
Highland Iron & Steel, Inc.	24,520	23,580	48,100
Inland Steel Company	750,000		750,000
International Harvester Company	528,740		528,740
Janson Steel & Iron Company		(a)15,000	15,000
Jersey Shore Steel Company	30,000		30,000
Jones & Laughlin Steel Corporation	1,368,000		1,368,000
Joslyn Mfg. & Supply Company	32,000		32,000
Judson Steel Corporation	54,000		54,000
Kaiser Co., Inc.	180,000		180,000
Kilby Steel Company	24,000		24,000
Knoxville Iron Company	66,000		66,000
Laclede Steel Company	390,000		390,000
Lockhart Iron & Steel Company		(a)60,000	60,000
Logan Iron & Steel Company		44,800	44,800
Milton Mfg. Company	30,000		30,000
Missouri Rolling Mill Corporation	70,000		70,000
National Steel Corporation:			
Great Lakes Steel Corporation	396,000		396,000
Weirton Steel Company	126,000		126,000
TOTAL	522,000		522,000
Northern Steel Company	12,500		12,500
Northwest Steel Rolling Mills, Inc.	25,000		25,000
Old Dominion Iron & Steel Works, Inc.		5,000	5,000
Oregon Steel Mills	60,000		60,000
Pacific States Steel Corporation	54,600		54,600
Penn Iron and Steel Company		13,400	13,400
Phoenix Manufacturing Company	15,000		15,000
Phoenix Iron Company	35,000		35,000
Pollak Steel Company	66,000		66,000
Republic Steel Corporation	3,886,000		3,886,000
Rockaway Rolling Mill	15,000		15,000
Rotary Electric Steel Company	96,000		96,000
Rustless Iron & Steel Corporation	59,330		59,330
Simonds Saw & Steel Company	4,000		4,000
Simmons Company	22,800		22,800
St. Louis Screw & Bolt Company	15,000		15,000
Sweet's Steel Company	40,000		40,000
Texas Steel Company	58,500		58,500
Timken Roller Bearing Company	480,000		480,000
Tredegar Company		27,600	27,600
Ulster Iron Works		16,000	16,000
United States Steel Corporation:			
American Steel & Wire Company	543,200		543,200
Carnegie-Illinois Steel Corporation	5,543,700		5,543,700
Columbia Steel Company	479,960		479,960
Tennessee Coal, Iron & Railroad Company	684,100		684,100
TOTAL	7,250,960		7,250,960
Universal-Cyclops Steel Corporation	800		800
West Virginia Steel & Mfg. Company	49,000		49,000
Wickwire Brothers, Inc.	4,000		4,000
Youngstown Sheet and Tube Company	660,000		660,000
GRAND TOTAL	22,685,360	326,080	23,011,440

(a) Includes steel bars.

ge producers total 54 with capacity of 5,863,610 tons mpared with 55 producers and capacity of 5,034,254 ns in 1938. Only 15 makers of bolts, nuts, rivets and shers with capacity of 450,200 tons are noted in the 45 Directory. These figures, however, are not repre-tative since only companies with steelmaking or fin-ing capacity are listed. Thirteen producers of heavy ctural shapes with capacity of 9,118,150 tons com-re with ten in 1938 with capacity of 4,107,488 tons.

Finished steel production has been setting new all-time ords, totaling 65,803,979 net tons in 1944, compared h 63,292,673 tons in 1943 and only 23,568,951 tons in 38. In 1929, production was 45,997,746 tons.

Rails

	Annual capacity (N. T.)	
	Standard (over 60 lb. per yard)	All other
Companies:		
Bethlehem Steel Company	900,000	60,000
Colorado Fuel and Iron Corporation	420,000	9,600
Inland Steel Company	260,000	.....
Sweet's Steel Company	.....	40,000
United States Steel Corporation:		
Carnegie-Illinois Steel Corporation	1,590,000	105,000
National Tube Company	27,000	.....
Tennessee Coal, Iron & Railroad Company	517,000	65,400
TOTAL	2,104,000	170,400
West Virginia Steel & Mfg. Company	.....	85,000
GRAND TOTAL	3,684,000	365,000

Splice Bars and Tie Plates, Track Spikes

(Capacities as of Jan. 1, 1945
Compiled by American Iron & Steel Institute; net tons)

	Annual capacity (N. T.)	
	Splice bars and tie plates	Track spikes
Companies:		
American Rolling Mill Company:		
Sheffield Steel Corporation	.....	18,000
Bethlehem Steel Company	210,800	45,600
Colorado Fuel and Iron Corporation	131,400	15,600
Inland Steel Company	120,000	20,000
Jones & Laughlin Steel Corporation	120,000	36,000
National Steel Corporation:		
Weirton Steel Company	86,400	6,000
Post & Company	12,000	.....
Republic Steel Corporation	162,000	49,000
Sweet's Steel Company	40,000	.....
Tredegar Company	11,200	(a) 12,000
United States Steel Corporation:		
American Steel & Wire Company	283,300	102,100
Carnegie-Illinois Steel Corporation	205,560	.....
Columbia Steel Company	89,000	.....
National Tube Company	1,000	.....
Tennessee Coal, Iron & Railroad Company	193,300	33,100
TOTAL	772,160	135,200
West Virginia Steel & Mfg. Company	6,000	.....
Wheeling Steel Corporation	72,000	12,000
Youngstown Sheet and Tube Company	84,000	15,600
GRAND TOTAL	1,857,960	365,000

Heavy Structural Shapes and Rolled Steel Piling

	Annual capacity (N. T.)	
	Heavy structural shapes	Rolled steel piling
Companies:		
American Rolling Mill Company:		
Sheffield Steel of Texas	187,500	.....
Bethlehem Steel Company	2,820,000	180,000
Colorado Fuel and Iron Corporation	108,000	.....
Geneva Steel Company	250,000	.....
Inland Steel Company	715,000	208,000
International Harvester Company	16,800	.....
Jones & Laughlin Steel Corporation	270,000	.....
Kaiser Company, Inc.	210,000	.....
Knoxville Iron Company	22,000	.....
National Steel Corporation:		
Weirton Steel Company	561,600	.....
Phoenix Iron Company	221,000	.....
United States Steel Corporation:		
American Steel & Wire Company	113,520	.....
Carnegie-Illinois Steel Corporation	3,135,800	48,400
Columbia Steel Company	89,230	.....
Tennessee Coal, Iron & Railroad Company	310,700	.....
TOTAL	3,649,250	48,400
Youngstown Sheet and Tube Company	84,000	.....
GRAND TOTAL	9,118,150	436,400

FINISHED STEEL CAPACITY

Products	Annual capacity (N. T.)		
	Steel	Iron	Total
Structural shapes—Heavy	9,118,150	.....	9,118,150
Steel piling—Rolled	436,400	.....	436,400
Plates—Sheared	8,297,950	30,000	8,327,950
" —Universal	2,143,070	70,000	2,213,070
" —Strip mill	7,048,000	.....	7,048,000
Rails—Standard (over 60 lb.)	3,684,000	.....	3,684,000
" —All other	365,000	.....	365,000
Splice bars and tie plates	1,857,960	.....	1,857,960
Track spikes	353,000	12,000	365,000
Bars, rolled bars other than tool steel bars	22,685,360	326,080	23,011,440
Concrete reinforcing bars included above	6,885,110	.....	6,885,110
Tool steel bars—Rolled or forged	286,670	.....	286,670
Cold finished bars	3,191,960	.....	3,191,960
Rerolling	5,968,800	310,000	6,278,800
Rounds for seamless tubes	4,869,300	.....	4,869,300
Pipe and tubes—Butt weld	2,226,620	47,000	2,273,620
" " —Lap weld	825,400	90,000	915,400
" " —Electric weld	1,606,050	.....	1,606,050
" " —Spiral weld	88,000	.....	88,000
" " —Gas weld	17,000	.....	17,000
" " —Seamless	3,546,400	.....	3,546,400
" " —Conduit included above	183,000	.....	183,000
" " —Mechanical tubing incl. above	1,240,800	.....	1,240,800
Wire rods	7,338,340	.....	7,338,340
Wire—Plain	5,863,610	.....	5,863,610
" —Galvanized	1,709,760	.....	1,709,760
" —Nails and staples	1,266,870	.....	1,266,870
" —Barbed	557,125	.....	557,125
" —Woven fence	1,101,600	.....	1,101,600
" —Bale ties	139,840	.....	139,840
Black plate—Chemically treated	399,000	.....	399,000
Tin and terne plate—Hot dipped	3,758,850	.....	3,758,850
Tin plate—Electrolytic	2,231,850	.....	2,231,850
Sheets—Hot rolled	17,434,820	.....	17,434,820
" —Cold rolled	6,883,460	.....	6,883,460
" —Galvanized	2,849,130	.....	2,849,130
" —Long terne	319,400	.....	319,400
Strip—Hot rolled	8,145,690	.....	8,145,690
" —Cold rolled	3,736,310	.....	3,736,310
" —Galvanized	127,000	.....	127,000
Car wheels—Rolled steel	315,400	.....	315,400
Tires	398,170	.....	398,170
Bolts, nuts, rivets and washers	450,200	.....	450,200

Plates

	Annual Capacity (N. T.)		
	Sheared	Universal	Strip mill
Companies			
Alan Wood Steel Company	145,600	.....	.....
Allegheny Ludlum Steel Corporation	6,000	.....	.....
American Rolling Mill Company	216,000	.....	240,000
Sheffield Steel Corporation	.....	56,000	.....
Sheffield Steel of Texas	281,000	.....	.....
TOTAL	497,000	56,000	240,000
Bethlehem Steel Company	765,000	490,000	860,000
Borg-Warner Corporation	23,000	.....	.....
Byers Company, A. M.	(a) 30,000	(a) 70,000	.....
Central Iron & Steel Company	182,400	105,600	.....
Colonial Steel Company	13,400	.....	.....
Colorado Fuel and Iron Corporation	.....	12,000	.....
Crucible Steel Company of America	15,600	96,000	.....
Disston & Sons, Inc., Henry	5,600	.....	.....
Geneva Steel Company	700,000	.....	.....
Granite City Steel Company	.....	.....	250,000
Inland Steel Company	240,000	180,000	600,000
International Harvester Company	.....	44,800	.....
Jessop Steel Company	28,800	.....	.....
Jones & Laughlin Steel Corporation	100,000	.....	1,028,000
Kaiser Company, Inc.	300,000	.....	.....
Lukens Steel Company	729,230	92,770	.....
National Steel Corporation:			
Great Lakes Steel Corporation	.....	.....	825,000
Pine Iron Works Company	17,400	.....	.....
Republic Steel Corporation	(b) 450,000	.....	840,000
Simonds Saw & Steel Company	400	.....	.....
United States Steel Corporation:			
Carnegie-Illinois Steel Corporation	3,369,420	939,000	1,673,000
Tennessee Coal, Iron & Railroad Company	390,000	126,900	.....
TOTAL	3,759,420	1,065,900	1,673,000
Universal-Cyclops Steel Corporation	17,100	.....	.....
Wheeling Steel Corporation	.....	.....	252,000
Worth Steel Company	300,000	.....	.....
Youngstown Sheet and Tube Company	.....	.....	480,000
GRAND TOTAL	8,327,950	2,213,070	7,048,000

(a) Iron or steel.
(b) Includes universal plates.

Wire Rods

Companies:	Annual capacity (N. T.)
Allegheny Ludlum Steel Corporation	4,000
American Chain & Cable Company	175,200
American Rolling Mill Company:	
Sheffield Steel Corporation	159,000
Sheffield Steel of Texas	154,500
Total	313,500
Atlantic Steel Company	135,960
Bethlehem Steel Company	725,000
Buffalo Bolt Company	121,800
Colorado Fuel and Iron Corporation	180,000
Connors Steel Company	60,000
Continental Steel Corporation	150,000
Copperweld Steel Company	45,000
Crucible Steel Company of America	35,600
Driver Company, Wilbur B.	6,000
Ford Motor Company	40,000
International Harvester Company	5,600
Jones & Laughlin Steel Corporation	366,000
Keystone Steel & Wire Company	254,000
Laclede Steel Company	157,000
Northwestern Steel & Wire Company	218,000
Pittsburgh Steel Company	360,000
Republic Steel Corporation	500,000
Roebling's Sons Company, John A.	145,000
Rustless Iron & Steel Corporation	16,480
United States Steel Corporation:	
American Steel & Wire Company	2,180,400
Carnegie-Illinois Steel Corporation	107,900
Columbia Steel Company	270,000
Tennessee Coal, Iron & Railroad Company	180,000
Total	2,738,300
Universal-Cyclops Steel Corporation	6,700
Washburn Wire Company	61,200
Wheeling Steel Corporation	192,000
Wickwire Brothers, Inc.	38,000
Wickwire Spencer Steel Company	144,000
Youngstown Sheet and Tube Company	144,000
Grand Total	7,338,340

Tool Steel Bars (Rolled or Forged)

Companies:	Annual capacity (N. T.)
Allegheny Ludlum Steel Corporation	13,000
Bethlehem Steel Company	18,000
Braeburn Alloy Steel Corporation	6,400
Carpenter Steel Company	24,600
Colonial Steel Company	12,720
Columbia Tool Steel Company	4,300
Copperweld Steel Company	20,000
Crucible Steel Company of America	95,400
Disston & Sons, Inc., Henry	3,500
Firth-Sterling Steel Company	11,550
Heller Brothers Company	10,300
Jessop Steel Company	12,000
Knoxville Iron Company	500
Latrobe Electric Steel Company	10,500
McInnes Steel Company	800
Midvale Company	9,000
Simonds Saw & Steel Company	2,600
Universal-Cyclops Steel Corporation	18,500
Vanadium-Alloys Steel Company	7,000
Vulcan Crucible Steel Company	6,000
Total	280,670

Skelp and Rounds for Seamless Tubes

Companies:	Annual capacity (N. T.) Skelp	Rounds for seamless tubes
Allegheny Ludlum Steel Corporation		4,000
Babcock & Wilcox Tube Company		70,000
Bethlehem Steel Company	600,000	
Borg-Warner Corporation	10,000	
Byers Company, A. M.	*310,000	
Crucible Steel Company of America		252,000
Inland Steel Company		60,000
Jones & Laughlin Steel Corporation	522,000	420,000
Kaiser Company, Inc.	180,000	
Laclede Steel Company	180,000	
National Steel Corporation:		
Great Lakes Steel Corporation		192,000
Pittsburgh Steel Company		308,000
Republic Steel Corporation	658,000	
Timken Roller Bearing Company		480,000
United States Steel Corporation:		
Carnegie-Illinois Steel Corporation	1,991,800	732,000
National Tube Company	816,000	1,775,300
Total	2,807,800	2,507,300
Wheeling Steel Corporation	327,000	
Youngstown Sheet and Tube Company	684,000	576,000
Grand Total	6,278,800	4,869,300

* Iron or steel.

Electric Weld Pipe and Tubes

Companies:	Annual capacity (N. T.)
Babcock & Wilcox Tube Company	45,000
Brainard Steel Corporation	3,000
Globe Steel Tubes Company	900
Jackson Tube Company, Inc.	10,000
Jones & Laughlin Steel Corporation	36,000
Mark & Company, Clayton	24,000
Ohio Seamless Tube Company	6,000
Pacific Tube Company	4,900
Pittsburgh Steel Company	3,000
Republic Steel Corporation	654,250
Rome Manufacturing Company	30,000
Smith Corporation, A. O.	520,000
Southern Pipe & Casing Company	10,000
Standard Tube Company	20,000
Toledo Steel Tube Company	11,000
Youngstown Sheet and Tube Company	228,000
Total	1,606,050

Butt Weld Pipe

Companies:	Annual capacity (N. T.)
Bethlehem Steel Company	180,000
Byers Company, A. M.	*47,000
Fretz-Moon Tube Company, Inc.	60,000
Jones & Laughlin Steel Corporation	180,000
Laclede Steel Company	54,000
Mercer Tube & Mfg. Company	80,000
National Supply Company	180,000
Pittsburgh Tube Company	31,000
Plymouth Tube Company	250
Republic Steel Corporation	290,000
Sharon Tube Company	9,000
Simmons Company	3,100
United States Steel Corporation:	
National Tube Company	514,000
Wheatland Tube Company	121,470
Wheeling Steel Corporation	187,800
Youngstown Sheet and Tube Company	336,000
Total	2,273,620

* Iron or steel.

Gas Weld Pipe

Companies:	Annu capac (N. T
Laclede Steel Company	5,0
Mercer Tube & Mfg. Company	12,0
Total	17,0

Lap Weld Pipe

Companies:	Annu capac (N. T
Allegheny Ludlum Steel Corporation	40,0
Bethlehem Steel Company	120,0
Byers Company, A. M.	*90,0
Jones & Laughlin Steel Corporation	102,0
National Supply Company	126,0
South Chester Tube Company	108,0
Wheeling Steel Corporation	136,2
Youngstown Sheet and Tube Company	199,2
Total	915,4

* Iron or steel.

Conduit

Companies:	Annu capac (N. T
Fretz-Moon Tube Company, Inc.	12,0
Laclede Steel Company	5,0
Mark & Company, Clayton	6,0
National Supply Company	24,0
Republic Steel Corporation	18,0
United States Steel Corporation:	
National Tube Company	67,0
Youngstown Sheet and Tube Company	51,0
Total	183,0

Spiral Weld Pipe

Companies:	Annual capacity (N. T.)
American Rolling Mill Company	60,000
Naylor Pipe Company	18,000
Taylor Forge & Pipe Works	10,000
Total	88,000

Concrete Reinforcing Bars

Companies:	Annual capacity (N. T.)
American Rolling Mill Company:	
Sheffield Steel Corporation	390,500
Sheffield Steel of Texas	150,000
Total	540,500
Atlantic Steel Company	132,000
Bethlehem Steel Company	1,220,000
Borg-Warner Corporation	25,000
Buffalo Steel Company	12,000
Colorado Fuel and Iron Corporation	110,000
Connors Steel Company	97,350
Franklin Steel Works	22,400
Inland Steel Company	750,000
Jones & Laughlin Steel Corporation	240,000
Judson Steel Corporation	40,000
Knoxville Iron Company	66,000
Laclede Steel Company	230,000
Missouri Rolling Mill Corporation	53,500
National Steel Corporation:	
Great Lakes Steel Corporation	360,000
Northern Steel Company	9,000
Northwest Steel Rolling Mills, Inc.	8,000
Pollak Steel Company	30,000
Simmons Company	3,000
Sweet's Steel Company	40,000
Texas Steel Company	36,000
United States Steel Corporation:	
Carnegie-Illinois Steel Corporation	2,109,400
Columbia Steel Company	479,960
Tennessee Coal, Iron & Railroad Company	181,000
Total	2,770,360
West Virginia Steel & Mfg. Company	30,000
Youngstown Sheet and Tube Company	60,000
Grand Total	6,885,110

Cold Finished Bars

Companies:	Annual capacity (N. T.)
Allegheny Ludlum Steel Corporation	26,000
Anchor Drawn Steel Company	2,850
Bethlehem Steel Company	96,000
Bliss & Laughlin, Inc.	290,000
Buffalo Bolt Company	10,600
Carpenter Steel Company	22,200
Columbia Steel & Shafting Company	136,000
Compressed Steel Shafting Company	20,000
Copperweld Steel Company	31,200
Crucible Steel Company of America	90,900
Cumberland Steel Company	40,000
Cuyahoga Steel & Wire Company	12,000
Fitzsimons Company	45,700
Fort Howard Steel & Wire	7,800
International Harvester Company	30,000
Jones & Laughlin Steel Corporation	480,000
Joslyn Mfg. & Supply Company	18,000
Keystone Drawn Steel Company	24,000
Kidd Drawn Steel Company	2,000
LaSalle Steel Company	228,000
Latrobe Electric Steel Company	1,100
Medart Company	2,400
Monarch Steel Company	38,400
Moltrup Steel Products Company	72,000
Nelsen Steel & Wire Company	36,000
Pilgrim Drawn Steel Corporation	30,000
Pittsburgh Tool Steel Wire Company	5,200
Republic Steel Corporation	544,000
Rotary Electric Steel Company	51,800
Rustless Iron & Steel Corporation	42,450
Superior Drawn Steel Company	36,000
Timken Roller Bearing Company	102,000
United States Steel Corporation:	
American Steel & Wire Company	200,300
Carnegie-Illinois Steel Corporation	15,360
Total	215,660
Universal-Cyclops Steel Corporation	10,100
Western Automatic Machine Screw Company	52,500
Westland Drawn Steel Company	20,000
Wyckoff Steel Company	319,100
Grand Total	3,191,960

Mechanical Tubing

Companies:	Annual capacity (N. T.)
Babcock & Wilcox Tube Company	100,000
Globe Steel Tubes Company	40,900
Jackson Tube Company, Inc.	10,000
Jones & Laughlin Steel Corporation	108,000
Laclede Steel Company	54,000
Mark & Company, Clayton	18,000
Mercer Tube & Mfg. Company	12,000
Michigan Seamless Tube Company	2,800
National Supply Company	10,000
Ohio Seamless Tube Company	33,600
Pacific Tube Company	1,500
Pittsburgh Steel Company	60,000
Pittsburgh Tube Company	21,000
Republic Steel Corporation	114,000
Summerill Tubing Company	7,200
Timken Roller Bearing Company	259,200
Toledo Steel Tube Company	11,000
United States Steel Corporation:	
National Tube Company	365,600
Youngstown Sheet and Tube Company	12,000
Total	1,240,800

Seamless Pipe and Tubes

Companies:	Annual capacity (N. T.)
Allegheny Ludlum Steel Corporation	3,000
Babcock & Wilcox Tube Company	198,000
Brown Fence & Wire Company	4,500
Detroit Seamless Steel Tubes Company	25,800
Globe Steel Tubes Company	60,000
Ivins Steel Tube Works, Ellwood	1,800
Jones & Laughlin Steel Corporation	426,000
Michigan Seamless Tube Company	8,600
National Supply Company	312,000
Ohio Seamless Tube Company	33,600
Pacific Tube Company	7,800
Pipe & Tube Products, Inc.	2,400
Pittsburgh Steel Company	208,800
Plymouth Tube Company	1,000
Summerill Tubing Company	7,200
Timken Roller Bearing Company	259,200
Tube Reducing Corporation	50,000
United States Steel Corporation:	
National Tube Company	1,473,200
Youngstown Sheet and Tube Company	470,000
Total	3,546,400

Wire Products

Companies:	Annual capacity (N. T.) Nails and staples	Barbed	Woven fence	Bale ties
American Chain & Cable Company		600	7,200	
American Rolling Mill Company:				
Sheffield Steel Corporation	21,000	13,500	19,000	4,000
Sheffield Steel of Texas	18,500			
Total	39,500	13,500	19,000	4,000
Angell Nail & Chaplet Company	9,800			
Atlantic Steel Company	31,500	10,400	40,800	4,500
Bethlehem Steel Company	102,000	32,400	24,000	13,600
Brown Fence & Wire Company			24,000	
California Wire Cloth Corporation		1,500		1,500
Cleburne Wire, Wire Nail & Screw Company	1,000			
Colorado Fuel and Iron Corporation	54,000	32,400	18,000	14,400
Continental Steel Corporation	51,000	31,000	54,000	
Copperweld Steel Company		175		
Davis Wire & Cable Corporation, K. H.				450
Ivins Brothers, Inc.	2,500			
Jones & Laughlin Steel Corporation	78,000	36,000	14,400	
Keystone Steel & Wire Company	54,000	48,000	220,000	
Kokomo Nail & Brad Company	3,900			
Mid-States Steel & Wire Company	9,400	10,000	13,500	5,500
Nichols Wire & Steel Company	15,450	16,500	7,500	11,100
Northwestern Steel & Wire Company	40,800	26,400	126,000	32,400
Pittsburgh Steel Company	44,000	20,000	89,000	
Republic Steel Corporation	100,000	31,000	33,000	13,000
United States Steel Corporation:				
American Steel & Wire Company	365,220	184,650	279,900	17,090
Columbia Steel Company	65,000	3,800	8,700	
Tennessee Coal, Iron & Railroad Company	89,800	36,200	91,800	14,700
Total	520,020	224,650	380,400	31,790
Wheeling Steel Corporation	57,600	21,600	29,800	4,200
Wickwire Brothers, Inc.	7,200	1,000		
Wickwire Spencer Steel Company	1,200		2,000	
Wilson Steel & Wire Company	20,000			3,400
Youngstown Sheet and Tube Company	18,000			
Grand Total	1,266,870	557,125	1,101,600	139,840

STEEL INDUSTRY STATISTICS

Sheets

	Annual capacity (N. T.)			
	Hot rolled sheets	Cold rolled sheets	Galvanized sheets	Long terne sheets
Companies:				
Alan Wood Steel Corppany	77,500			
Allegheny Ludlum Steel Corporation	135,000			
American Rolling Mill Company	2,090,000	1,130,000	324,000	70,000
Sheffield Steel Corporation	37,500			
Sheffield Steel of Texas	37,500			
TOTAL	2,165,000	1,130,000	324,000	70,000
Andrews Steel Company	180,000		96,000	16,000
Apollo Steel Company	132,000		24,000	
Bethlehem Steel Company	1,625,000	500,000	288,000	
Borg-Warner Corporation,	65,000			
Colonial Steel Company	1,120			
Continental Steel Corporation	240,000		201,000	35,000
Crucible Steel Company of America	21,000	9,600		
Disston & Sons, Inc., Henry	7,500			
Eastern Stainless Steel Corporation	15,000	8,000		
Empire Steel Corporation	120,000			14,400
Follansbee Steel Corporation	35,000			12,000
Ford Motor Company	465,000	182,000		
Granite City Steel Company	326,000	100,000	60,000	
Inland Steel Company	900,000	420,000	96,000	
Jessop Steel Company	6,900	2,000		
Jones & Laughlin Steel Corporation	1,368,000	540,000	24,000	
Mahoning Valley Steel Company	97,500			
National Steel Corporation:				
Great Lakes Steel Corporation	1,308,000	840,000		
Weirton Steel Company	1,080,000	1,050,000	150,000	
TOTAL	2,388,000	1,890,000	150,000	
Niles Rolling Mill Company	84,000		51,600	
Parkersburg Iron & Steel Company	36,000		25,000	
Reeves Steel & Mfg. Company	87,240		42,120	
Republic Steel Corporation	1,873,000	885,000	330,000	
Simonds Saw & Steel Company	4,000			
United States Steel Corporation:				
American Steel & Wire Company		18,000		
Carnegie-Illinois Steel Corporation	3,758,430	732,860	459,500	
Columbia Steel Company	174,530		100,910	
Tennessee Coal, Iron & Railroad Company	398,000		187,000	
TOTAL	4,330,960	750,860	747,410	
Universal-Cyclops Steel Corporation	13,100			
Wheeling Steel Corporation	108,000		390,000	
Youngstown Sheet and Tube Company	528,000	466,000		
GRAND TOTAL	17,434,820	6,883,460	2,849,130	

Plain and Galvanized Wire

	Annual capacity (N. T.)	
	Plain	Galvanized
Companies:		
Allegheny Ludlum Steel Corporation	6,500	
Alloy Metal Wire Company	1,500	
American Chain & Cable Company	92,000	25,000
American Rolling Mill Company:		
Sheffield Steel Corporation	90,500	40,000
Sheffield Steel of Texas	36,000	
TOTAL	126,500	40,000
Angell Nail & Chaplet Company	15,000	
Atlantic Steel Company	80,600	14,000
Atlantic Wire Company	24,000	3,500
Bethlehem Steel Company	424,000	125,000
Buffalo Bolt Company	38,000	
California Wire Cloth Corporation	21,870	
Cedarburg Wire, Wire Nail & Screw Company	1,500	
Chicago Steel & Wire Company	8,500	1,000
Colorado Fuel and Iron Corporation	140,400	40,000
Connors Steel Company	22,500	
Continental Steel Corporation	150,000	60,000
Copperweld Steel Company	25,800	
Crucible Steel Company of America	16 900	
Cuyahoga Steel & Wire Company	18,000	
Davis Wire & Cable Corporation, K. H.	4,000	700
Driscoll Wire Company	12,000	
Driver Company, Wilbur B.	1,500	
Ford Motor Company	40,000	
Igoe Brothers, Inc.	20,000	
Johnson Steel & Wire Company, Inc.	24,000	
Jones & Laughlin Steel Corporation	192,000	68,400
Keystone Steel & Wire Company	230,000	108,000
Laclede Steel Company	60,000	6,000
Macwhyte Company	12,000	1,000
Madison Wire Company, Inc.	8,700	
Mid-States Steel & Wire Company	67,720	37,960
National Standard Company	24,840	6,300
New England High Carbon Wire Company	10,000	
Nichols Wire & Steel Company	37,500	9,000
Northwestern Steel & Wire Company	252,000	170,000
Pittsburgh Steel Company	324,000	104,000
Prentiss & Company, Geo. W.	4,800	
Republic Steel Corporation	348,000	85,000
Roebling's Sons Company, John A.	136,700	65,000
Rustless Iron & Steel Corporation	18,130	
Seneca Wire & Mfg. Company	15,000	700
Spencer Wire Company	2,400	
Thompson Wire Company	8,000	2,000
Union Wire Rope Corporation	28,650	6,000
United States Steel Corporation:		
American Steel & Wire Company	1,962,600	508,400
Columbia Steel Company	142,500	26,000
Tennessee Coal, Iron & Railroad Company	165,600	63,600
TOTAL	2,270,700	598,000
Universal-Cyclops Steel Corporation	6,000	
Washburn Wire Company	17,400	
Webb Wire Works	600	
Western Automatic Machine Screw Company	12,000	
Wheeling Steel Corporation	192,000	70,000
Wickwire Brothers, Inc.	30,400	8,000
Wickwire Spencer Steel Company	120,000	23,200
Wilson Steel & Wire Company	35,000	5,000
Wright Steel & Wire Company, C. F.	12,000	3,000
Youngstown Sheet and Tube Company	72,000	24,000
GRAND TOTAL	5,863,610	1,709,760

Strip

	Annual capacity (N.
	Hot rolled strip
Companies:	
Acme Steel Company	545,000
Allegheny Ludlum Steel Corporation	200,000
Alloy Metal Wire Company	
American Chain & Cable Company	
American Shim Steel Company	
Atlantic Steel Company	97,000
Blair Strip Steel Company	
Bopp Steel Corporation	
Borg-Warner Corporation	3,000
Brainard Steel Corporation	
Buffalo Bolt Company	50,000
Buffalo Steel Company	4,000
California Cold Rolled Steel Corporation	
Carpenter Steel Company	
Cleveland Cold Rolling Mills Company	
Cold Metal Products Company	
Colorado Fuel and Iron Corporation	12,000
Connors Steel Company	45,000
Crucible Steel Company of America	
Detroit Steel Corporation	
Disston & Sons, Inc., Henry	
Elliott Brothers Steel Company	
Follansbee Steel Corporation	
Ford Motor Company	186,000
Greer Steel Company	
Griffin Manufacturing Company	
Hind Steel Company, Inc.	
Inland Steel Company	180,000
International Harvester Company	45,360
Jessop Steel Company	
Jones & Laughlin Steel Corporation	180,000
Joslyn Mfg. & Supply Company	10,000
Knoxville Iron Company	6,000
Laclede Steel Company	184,000
McLouth Steel Corporation	108,000
National Standard Company	
National Steel Corporation:	
Great Lakes Steel Corporation	960,000
Weirton Steel Company	468,000
TOTAL	1,428,000
Newman-Crosby Steel Corporation	
Republic Steel Corporation	415,000
Rhode Island Steel Corporation	
Roebling's Sons Company, John A.	17,000
Rome Strip Steel Company	
Sharon Steel Corporation	420,000
Simonds Saw & Steel Company	780
Simmons Company	2,700
Stanley Works	150,000
Superior Steel Corporation	115,000
Thomas Steel Company	
Thompson Wire Company	
United States Steel Corporation:	
American Steel & Wire Company	91,000
Carnegie-Illinois Steel Corporation	2,618,460
Columbia Steel Company	78,990
Tennessee Coal, Iron & Railroad Company	158,600
TOTAL	2,947,050
Universal-Cyclops Steel Corporation	9,600
Wallace Barnes Company	
Wallingford Steel Company	
Washburn Wire Company	61,200
Wheeling Steel Corporation	693,000
Worcester Pressed Steel Company	
Youngstown Sheet and Tube Company	31,000
GRAND TOTAL	8,145,690

	Annual capacity (N.	
	Cold rolled strip	G
Companies:		
Acme Steel Company	200,000	
Allegheny Ludlum Steel Corporation	61,500	
Alloy Metal Wire Company	500	
American Chain & Cable Company	5,000	
American Shim Steel Company	12,000	
Atlantic Steel Company		
Blair Strip Steel Company	18,000	
Bopp Steel Corporation	48,000	
Borg-Warner Corporation		
Brainard Steel Corporation	30,000	
Buffalo Bolt Company	5,800	
Buffalo Steel Company		
California Cold Rolled Steel Corporation	35,400	
Carpenter Steel Company	6,500	
Cleveland Cold Rolling Mills Company	240	
Cold Metal Products Company	60,000	
Colorado Fuel and Iron Corporation		
Connors Steel Company		
Crucible Steel Company of America	12,600	
Detroit Steel Corporation	134,000	
Disston & Sons, Inc., Henry	20,000	
Elliott Brothers Steel Company	18,000	
Follansbee Steel Corporation	254,800	
Ford Motor Company		
Greer Steel Company	72,000	
Griffin Manufacturing Company	36,000	
Hind Steel Company, Inc.	3,000	
Inland Steel Company	24,000	
International Harvester Company		
Jessop Steel Company	1,000	
Jones & Laughlin Steel Corporation	168,000	
Joslyn Mfg. & Supply Company		
Knoxville Iron Company		
Laclede Steel Company		
McLouth Steel Corporation	57,000	
National Standard Company	6,000	
National Steel Corporation:		
Great Lakes Steel Corporation	849,000	
Weirton Steel Company	105,000	
TOTAL	945,000	
Newman-Crosby Steel Corporation	20,000	
Republic Steel Corporation	195,000	
Rhode Island Steel Corporation	3,000	
Roebling's Sons Company, John A.	24,000	
Rome Strip Steel Company	14,400	
Sharon Steel Corporation	86,000	
Simonds Saw & Steel Company	220	
Simmons Company		
Stanley Works	164,000	
Superior Steel Corporation	92,000	
Thomas Steel Company	67,000	
Thompson Wire Company	32,000	
United States Steel Corporation:		
American Steel & Wire Company	261,500	
Carnegie-Illinois Steel Corporation		
Columbia Steel Company		
Tennessee Coal, Iron & Railroad Company		
TOTAL	264,500	
Universal-Cyclops Steel Corporation	69,250	
Wallace Barnes Company	10,000	
Wallingford Steel Company	40,000	
Washburn Wire Company	23,100	
Wheeling Steel Corporation	360,000	
Worcester Pressed Steel Company	7,500	
Youngstown Sheet and Tube Company	30,000	
GRAND TOTAL	3,736,310	

Tin Plate, Terne Plate, Chemically-Treated Black Plate

	Annual capacity (N. T.)		
	Chemically treated black plate	Hot dipped tin and terne plate	Electrolytic tin plate
Companies:			
Bethlehem Steel Company	74,000	600,000	216,000
Granite City Steel Company		70,000	50,000
Inland Steel Company	25,000	232,000	124,000
Jones & Laughlin Steel Corporation	45,000	336,000	150,000
National Steel Corporation:			
Weirton Steel Company	12,000	636,250	636,250
Republic Steel Corporation	20,000	190,000	83,000
United States Steel Corporation:			
Carnegie-Illinois Steel Corporation	84,000	574,600	507,600
Columbia Steel Company		45,000	
Tennessee Coal, Iron & Railroad Company	59,000	520,000	225,000
TOTAL	143,000	1,139,600	732,600
Wheeling Steel Corporation	50,000	315,000	90,000
Youngstown Sheet and Tube Company	30,000	240,000	150,000
GRAND TOTAL	399,000	3,758,850	2,231,850

Axles

	Annual capacity (N. T.)
Companies:	
Bethlehem Steel Company	50,000
Johnson & Company, Inc., J. R.	8,070
Pittsburgh Steel Company	40,000
Standard Forgings Corporation	78,400
United States Steel Corporation:	
Carnegie-Illinois Steel Corporation	204,700
Tennessee Coal, Iron & Railroad Company	17,000
TOTAL	221,700
GRAND TOTAL	398,170

Rolled Steel Car Wheels

	Annual capacity (N. T.)
Companies:	
American Rolling Mill Company	52,000
Baldwin Locomotive Works	28,500
Bethlehem Steel Company	80,000
Edgewater Steel Company	27,000
United States Steel Corporation:	
Carnegie-Illinois Steel Corporation	127,900
TOTAL	315,400

Bolts, Nuts, Rivets, Washers

	Annual capacity (N. T.)
Companies:	
American Car & Foundry Company	1,500
American Rolling Mill Company:	
Sheffield Steel Corporation	42,000
Atlantic Steel Company	1,100
Bethlehem Steel Company	116,000
Buffalo Bolt Company	55,200
Colorado Fuel and Iron Corporation	40,650
Falls Hollow Staybolt Company	600
Igoe Brothers, Inc.	700
Inland Steel Company	7,500
Milton Manufacturing Company	15,000
Republic Steel Corporation	112,600
St. Louis Screw & Bolt Company	9,000
Ulster Iron Works	700
United States Steel Corporation:	
American Steel & Wire Company	32,200
Carnegie-Illinois Steel Corporation	2,600
Tennessee Coal, Iron & Railroad Company	12,700
TOTAL	47,500
Wheeling Steel Corporation	750
GRAND TOTAL	450,200

Canadian STEEL CAPACITY

ALTHOUGH the Canadian steel industry is small in size compared with that in the United States, it is exceedingly well rounded out. Capacity also was expanded substantially during the war years.

In the seven years intervening since the American Iron and Steel Institute issued its last directory, Canadian plants have added four blast furnaces, eight open-hearth furnaces and 13 electric furnaces, making the respective 1945 totals 14, 51 and 23. In addition, added finishing mill capacity makes Canada more nearly self-sustaining as far as quantity and variety of steel products is concerned.

Blast furnace capacity now is 2,697,800 net tons compared with 1,771,504 tons in 1938, an increase of 47 per

Coke Capacity

	No. of ovens	Annual capacity (N. T.)
Algoma Steel Corporation, Ltd.	244	1,230,000
Dominion Steel & Coal Corporation, Ltd.	180	450,240
Steel Company of Canada, Ltd.	80	500,000
TOTAL	504	2,180,240

Blast Furnace Capacity

	Pig iron		Ferro-alloys		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Algoma Steel Corporation, Ltd.	5	1,035,000			1,035,000
Atikokan Iron Company, Ltd.	2	182,000	(a)	15,000	197,000
Dominion Steel & Coal Corporation, Ltd.	4	730,000			730,000
Steel Company of Canada, Ltd.	3	735,800			735,800
TOTAL	14	2,682,800	(a)	15,000	2,697,800

(a) Included under "Pig Iron."

Steel Ingot Capacity

(Includes ingots and steel for castings)

	Open Hearth		Bessemer		Electric and Crucible		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Kinds:							
Open hearth—Basic	51	3,008,000					3,008,000
Bessemer			(a) 1				
Electric					22	524,550	524,550
Crucible					1	200	200
TOTAL	51	3,008,000	1		23	524,750	3,532,750
Steel for castings included above		51,600				(b)47,900	99,500
Companies:							
Algoma Steel Corporation, Ltd.	12	974,000	(a) 1				974,000
Atlas Steels, Ltd.					6	169,550	169,550
Burlington Steel Company Ltd.					1	24,000	24,000
Canadian Car & Foundry Company, Ltd.	3	51,600			3	(b)48,200	99,800
Canadian Tube & Steel Products Ltd.					3	40,000	40,000
Dominion Bridge Company Ltd.	2	20,000					20,000
Dominion Foundries and Steel Ltd.	4	200,000			5	100,000	300,000
Dominion Steel & Coal Corporation, Ltd.	15	722,400			1	28,000	750,400
Federal Foundries & Steel Company Ltd.					2	15,000	15,000
Manitoba Rolling Mill Co., Ltd.	2	20,000			1	15,000	35,000
Steel Company of Canada, Ltd.	13	1,020,000			1	85,000	1,105,000
TOTAL	51	3,008,000	(a) 1		23	524,750	3,532,750

(a) Used in melting charge for open hearth furnaces.
(b) Includes 200 tons crucible steel for castings.

cent. Total steel capacity at 3,532,750 tons is 50 per cent higher than the 1938 figure of 2,346,064 tons. Three companies had 418 coke ovens with capacity of 1,701,616 net tons in 1938. The same companies now have 504 ovens with capacity of 2,180,240 tons.

As might be expected, much of the new capacity was designed to supply Canada's thriving shipbuilding and armaments industries during the war. Six companies now have facilities for the production of 622,000 net tons of sheared and universal plates compared with three companies with capacity of 213,920 tons in 1938.

A sharp increase in hot rolled bar capacity also is shown with 12 mills now capable of turning out 869,600 tons annually, against eight with facilities for 461,440 tons in 1938. The 1938 figure also included tool steel bars. Concrete reinforcing bar capacity of nine producers now is 176,000 tons, compared with 123,088 tons for seven producers in 1938.

Finished Steel Products (Canada)

	Annual capacity (N. T.)
Heavy Structural Shapes:	
Algoma Steel Corp., Ltd.	100,000
Canadian Car & Foundry Co., Ltd.	12,000
Dominion Bridge Co., Ltd.	1,000
Manitoba Rolling Mill Co., Ltd.	5,000
Peck Rolling Mills Ltd.	10,000
Trenton Steel Works, Ltd.	20,000
Total	148,000
Steel Piling:	
Algoma Steel Corp., Ltd.	50,000
Plates (Sheared and Universal)	
Dominion Bridge Co., Ltd.	1,000
Dominion Foundries & Steel Ltd.	225,000
Dominion Steel & Coal Corp., Ltd.	150,000
Manitoba Rolling Mill Co., Ltd.	5,000
Steel Company of Canada, Ltd.	216,000
Trenton Steel Works, Ltd.	25,000
Total	622,000
Rails (Standard and Light):	
Algoma Steel Corp., Ltd.	346,000
Dominion Steel & Coal Corp., Ltd.	280,000
Trenton Steel Works, Ltd.	5,000
Total	631,000
Splice Bars and Tie Plates:	
Algoma Steel Corp., Ltd.	22,000
Dominion Bridge Co., Ltd.	500
Dominion Steel & Coal Corp., Ltd.	25,200
Steel Company of Canada, Ltd.	50,000
Trenton Steel Works, Ltd.	5,000
Total	102,700
Track Spikes:	
Steel Company of Canada, Ltd.	9,600
Trenton Steel Works, Ltd.	3,000
Total	12,600
Hot Rolled Bars Other than Tool Steel Bars:	
Algoma Steel Corp., Ltd.	76,000
Atlas Steels Ltd.	152,000
Burlington Steel Co., Ltd.	70,000
Canadian Car & Foundry Co., Ltd.	10,000
Canadian Tube & Steel Products Ltd.	50,000
Dominion Bridge Co., Ltd.	13,000
Dominion Steel & Coal Corp., Ltd.	61,600
Federal Foundries & Steel Co., Ltd.	30,000
Manitoba Rolling Mill Co., Ltd.	23,000
Peck Rolling Mills Ltd.	30,000
Steel Company of Canada, Ltd.	337,000
Trenton Steel Works, Ltd.	17,000
Total	869,600
Concrete Reinforcing Bars:	
Algoma Steel Corp., Ltd.	11,000
Burlington Steel Co., Ltd.	70,000
Canadian Car & Foundry Co., Ltd.	10,000
Canadian Tube & Steel Products Ltd.	25,000
Dominion Bridge Co., Ltd.	3,000
Manitoba Rolling Mill Co., Ltd.	7,000
Peck Rolling Mills Ltd.	10,000
Steel Company of Canada Ltd.	23,000
Trenton Steel Works, Ltd.	17,000
Total	176,000
Tool Steel Bars:	
Atlas Steels Limited	18,000
Federal Foundries & Steel Co., Ltd.	15,000
Total	33,000
Cold Finished Bars:	
Atlas Steels Ltd.	9,000
Union Drawn Steel Co., Ltd.	44,000
Total	53,000
Butt Weld Pipe:	
Canadian Tube & Steel Products Ltd.	30,000
Page-Hersey Tubes, Ltd.	130,000
Steel Company of Canada, Ltd.	28,000
Total	188,000
Lap Weld Pipe:	
Page-Hersey Tubes, Ltd.	40,000
Gas Weld Pipe:	
Burlington Steel Co., Ltd.	1,000
Seamless Tubes:	
Page-Hersey Tubes, Ltd.	60,000
Conduit:	
Canadian Tube & Steel Products Ltd.	5,000
Mechanical Tubing:	
Page-Hersey Tubes, Ltd.	8,000
Wire Rods:	
Atlas Steels Ltd.	30,000
Canadian Tube & Steel Products Ltd.	20,000
Dominion Steel & Coal Corp., Ltd.	112,000
Steel Company of Canada, Ltd.	145,000
Total	307,000
Plain Wire:	
Canadian Steel Corp., Ltd.	30,000
Canadian Tube & Steel Products Ltd.	12,000
Dominion Steel & Coal Corp., Ltd.	60,000
Frost Steel & Wire Co., Ltd.	24,000
Laidlaw Bale Tie & Wire Co., Ltd.	6,400
Morrison Steel & Wire Co., Ltd.	4,900
Pender & Co., Ltd., James	10,000
Steel Company of Canada, Ltd.	124,000
Total	271,300
Galvanized Wire:	
Canadian Steel Corp., Ltd.	12,000
Dominion Steel & Coal Corp., Ltd.	29,900
Frost Steel & Wire Co., Ltd.	14,000
Steel Company of Canada, Ltd.	27,500
Total	83,400
Wire Nails and Staples:	
Canadian Steel Corp., Ltd.	700
Canadian Tube & Steel Products Ltd.	500
Dominion Steel & Coal Corp., Ltd.	24,6
Frost Steel & Wire Co., Ltd.	5
Morrison Steel & Wire Co., Ltd.	4,3
Pender & Co., Ltd., James	7,8
Steel Company of Canada, Ltd.	35,0
Western Wire & Nail Co., Ltd.	1,8
Total	75,2
Barbed Wire:	
Canadian Steel Corp., Ltd.	1,6
Dominion Steel & Coal Corp., Ltd.	29,9
Frost Steel & Wire Co., Ltd.	5
Steel Company of Canada, Ltd.	10,7
Total	43,0
Woven Wire Fence:	
Canadian Steel Corp., Ltd.	8,0
Frost Steel & Wire Co., Ltd.	12,0
Steel Company of Canada, Ltd.	14,8
Total	34,8
Wire Bale Ties:	
Canadian Steel Corp., Ltd.	1,0
Canadian Tube & Steel Products Ltd.	
Frost Steel & Wire Co., Ltd.	2,0
Laidlaw Bale Tie & Wire Co., Ltd.	
Pender & Co., Ltd., James	
Steel Company of Canada, Ltd.	1,3
Total	6,4
Hot Dipped Tin and Terne Plate:	
Algoma Steel Corp., Ltd.	60,0
Canadian Steel Corp., Ltd.	67,2
Dominion Foundries & Steel Ltd.	150,0
Steel Company of Canada, Ltd.	72,0
Total	349,2
Hot Rolled Sheets:	
Steel Company of Canada, Ltd.	131,4
Cold Rolled Sheets:	
Steel Company of Canada, Ltd.	83,3
Galvanized Sheets:	
Canadian Steel Corp., Ltd.	33,4
Steel Company of Canada, Ltd.	51,0
Total	84,4
Hot Rolled Strip:	
Dominion Foundries & Steel Ltd.	225,0
Cold Rolled Strip:	
Stanley Steel Co., Ltd.	20,0
Axles:	
Atlas Steels Ltd.	17,0
Trenton Steel Works, Ltd.	15,0
Total	32,0
Bolts, Nuts, Rivets, and Washers:	
Canadian Car & Foundry Co., Ltd.	1,0
Canadian Tube & Steel Products Ltd.	9,0
Steel Company of Canada, Ltd.	40,0
Total	51,0