STEEL

The Magazine of Metalworking and Metalproducing

VOL. 118, NO. 15 APRIL 15, 1946

NEWS

TECHNICAL

FEATURES

MARKETS

NEXT WEEK...

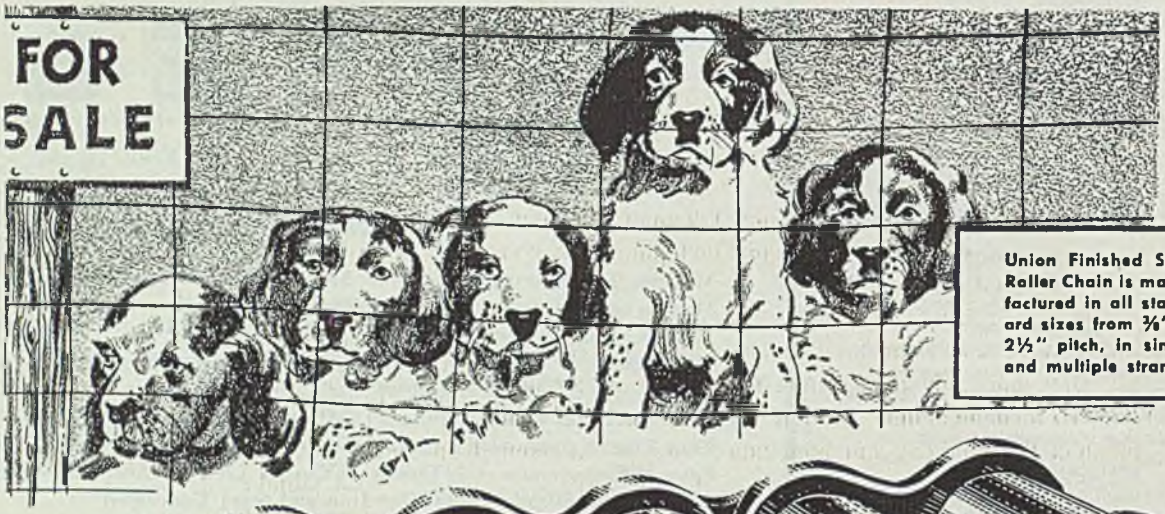
Silicones—Truly New Industrial Materials

Powdered Metal Process for Nickel Filters

New Crush Grinder Produces Flat Form Contours

Continuous Gaging of Rolled Strip

Problems of High-Speed Fine Wire Drawing



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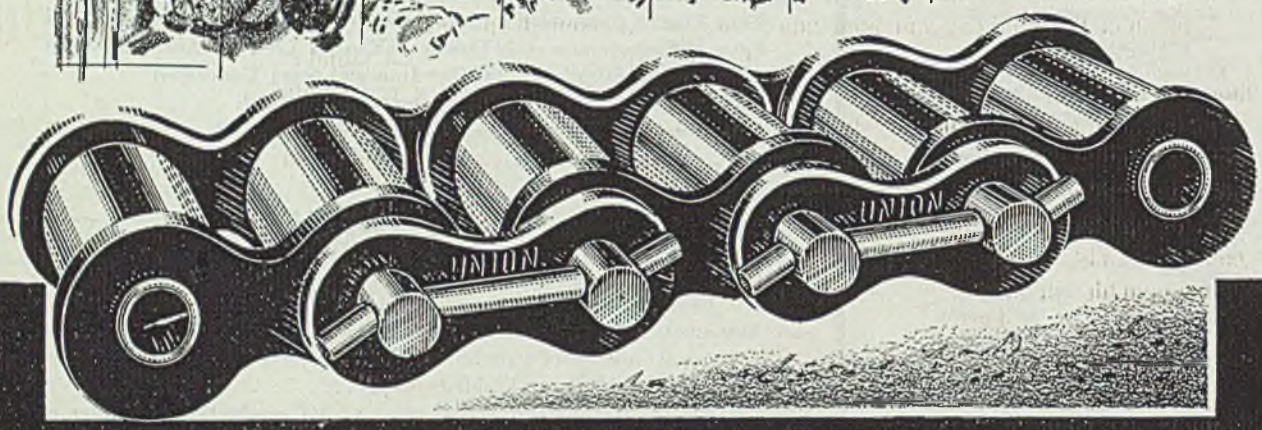

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Flexible Couplings

Roller chain type
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UNION CHAINS

As the EDITOR VIEWS the NEWS

Priority for Production

Last Friday marked the end of Mr. Truman's first year as President. From industry's standpoint, the record of his administration in that year has been disappointing, to say the least.

Almost everything the government has done since V-J Day has hindered rather than aided reconversion and production. This not only has added tremendously and in many cases needlessly to industry's already serious problems but it has also placed the nation's economic system under a terrific strain unnecessarily.

Much of the grief that has been experienced in the internal economy could have been avoided if the President had not persisted in compounding an inherited mistake. Somewhere along the line before Mr. Truman became President, his predecessor's administration had made up its mind that the end of the war would be followed by serious unemployment and deflation. Therefore, most postwar planning envisioned measures that would ease the shock of expected unemployment.

When Mr. Truman took over, his first impulse seemed to be to help industry reconvert quickly. But before he could develop a policy, the hold-over disciples of deflation won his attention and henceforth he supported everything that could be justified as an antidote for deflation.

Wages were upped liberally. Mr. Truman asked Congress for numerous measures intended to extend social security, to lift minimum wages and to otherwise add more income now to the income of the people. All of this was intended to give the people a greater cushion against the unemployment that was to develop before the year-end.

That unemployment has not developed, and yet the President still is demanding his original anti-deflation legislation. Meanwhile the administration says it is combatting inflation. In persisting in asking for measures which would increase purchasing power now, the President unconsciously is seeking oil that can only feed the flames of deflation.

It is a pity that such serious blunders have been made, but there still is time to correct them partially. One way is to ease up on all of the proposals that were intended to combat deflation, concentrate on anti-inflationary moves and particularly upon stimulating production—which is the one most promising weapon against inflation.

Would it not be better to forget socialized medicine, extended social security, minimum wages, etc. temporarily and to conserve any sound measures that may be incorporated in these proposals for use in the deflation that will come later—say five or more years from now? Today production should have priority.

STEEL
April 15, 1946

DANGEROUS TINKERING: Everybody who has occasion to use statistics as an aid in business knows that one of the chief assets of a series of statistics is its consistency over an extended period. Without this consistency, comparisons of one period with another are meaningless.

For this reason, many persons in industry who have learned to rely upon the cost of living index of the Bureau of Labor Statistics of the Department of Labor are grieved to learn that under pressure of protests from union labor representatives, government officials have tinkered with the BLS index until it is practically worthless. In fact, the efforts of the administration to meet at least part way the demands of labor union critics have resulted in compromises and expedients which have led to a partial abandonment of the BLS index.

This in itself is unfortunate, but coupled with the now notorious effort of Secretary Wallace's Department of Commerce to "plant" a report that

(OVER)

wages can be increased 25 per cent without increasing prices, it goes a long way toward discrediting all government statistics.

Many years will pass before statistics issued under government auspices can regain the respect that has been lost through recent "doctoring" of the figures to please political pressure blocks. —p. 74

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ASTE SHOW CLICKS: Visitors to the fourteenth annual convention and the New Era Exposition of the American Society of Tool Engineers were impressed by the many evidences of the rise of tool engineering to an eminent position in the American system of manufacturing. It is not too much to say that the tooling of a plant has become one of the most important phases of successful mass production.

Progress in this direction has been so marked in adapting the feeds and speeds of machines to specific jobs that one cannot help but notice the slower progress in adapting work handling and holding devices to the new requirements. This was pointed out by Tell Berna of NMTBA at the Westinghouse-sponsored Machine Tool Electrification Forum when he designated "better and faster material holding within machine tools as the matter most in need of engineering attention." Why achieve high cutting speeds if the time thus saved is lost in loading and unloading the work?

Everything one saw or heard at the Cleveland and Pittsburgh events was dedicated to the objective of producing more and better things at lower costs. In the efforts of industry along this line lies the greatest hope of the nation for protection against inflationary tendencies. —pp. 66, 68

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ADHESIVES POSTWAR: Judging from the extensive and highly successful use of adhesives during the war, it is reasonable to expect that they will play an important role in peacetime manufacturing.

Probably the most important future possibilities for organic bonding materials lie in the field of composites, in which two or more different materials are joined together, as for instance rubber to metal, or wood to aluminum or steel. Materials that can be joined by adhesives include aluminum, steel, zinc, magnesium and most structural metal, glass, rubber, wood, textiles and most plastics.

In view of wartime applications, one may expect increased applications of adhesives in the postwar manufacture of furniture, refrigerators, radios, automobiles and railway equipment and in the building trades. —p. 100

SIGNS OF THE TIMES: Nationalization of the British iron and steel industry continues to be a controversial subject in Britain. Government spokesmen say no moves will be made until the industry's own elaborate plan of reorganization and rehabilitation has been considered, but the First Lord of the Admiralty states (p. 78) the Labor government will carry out its plan to take over iron and steel properties. Steelmakers contend nationalization is impractical because of the complicated structure of the industry. . . . Hearings on S. 1606, the bill incorporating the national health program of the original Wagner-Murray-Dingell social security bill, will be continued before the Senate Education & Labor Committee through April. Favorable testimony thus far (p. 77) has come largely from New Dealish government agency administrators and CIO-dominated union and government spokesmen. . . . One of the most critical parts shortages confronting automobile builders is hand-polished bright work, such as bumpers, moldings, etc. Suppliers apparently are not able to find the necessary workers for manual polishing (p. 82) and as a result it is not uncommon to see new cars being shipped with 2 x 4 inch wood bumpers as emergency fittings. . . . E. W. Bliss Co. has announced a $2 million expansion program (p. 84) and the movement of its executive offices from Brooklyn to Detroit. . . . On June 11 shareholders will vote on a proposal (p. 85), to merge Edward G. Budd Mfg. Co., Philadelphia, and Budd Wheel Co., Detroit, into a corporation to be known as the Budd Co. . . . A report on the German steel foundry industry (p. 94) shows that during the war many items previously produced as drop forgings, press forgings, or weldments were cast in steel in gray iron foundries converted to the production of steel castings. German steel foundries lacked the mechanization found in many American shops and quality of product was not up to United States standards. . . . A western welding contractor has discovered a procedure by which tanks and pipes filled with gasoline (p. 117) can be cut and welded safely. . . . In discontinuing its monthly reports on shipments of finished steel (p. 71) United States Steel Corp. is terminating a statistical service which, first as "unfilled bookings" and later as "shipments," it has rendered for 40 years. . . . Suspension of price control on April 8 on a selected list of heavy machinery and equipment items (p. 72) represents OPA's most extensive decontrol action to date.

E. L. Shaner

EDITOR-IN-CHIEF

Ryerson Stocks Equally Handy

Steel of all kinds at your finger tips, almost as convenient as the seasonings on a well stocked shelf! The right kind, the exact amount, in easy reach.

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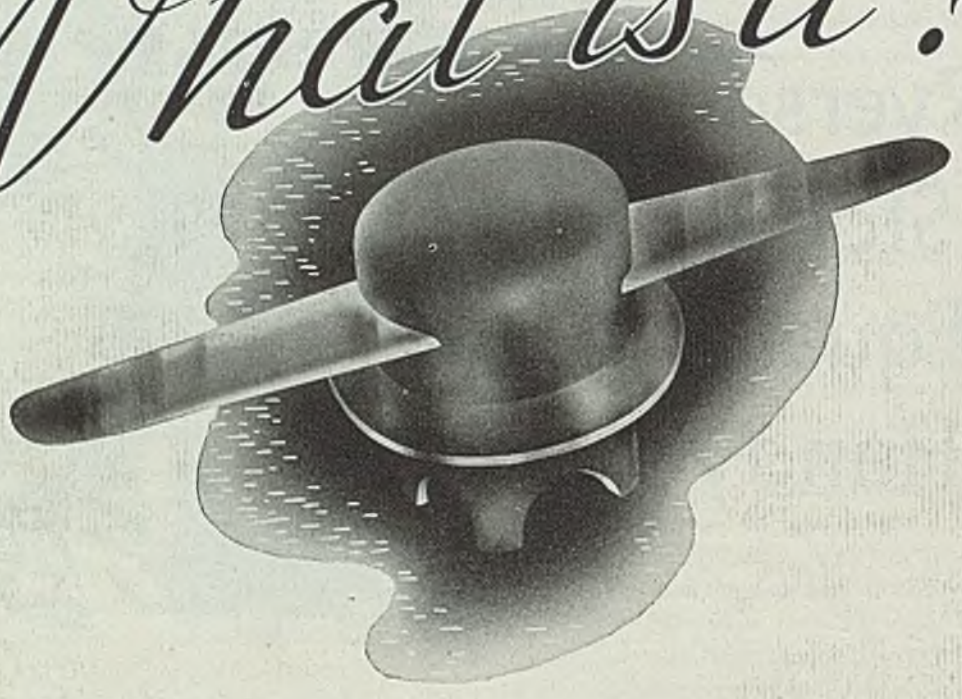

YOUR guess is as good as ours. It might be anything from an ultra-modern secret weapon to a new peacetime household appliance. Industrial and manufacturing changes have become so accelerated during the past decade that we have come to accept the most modern industrial and household equipment as matter of fact. Whatever problems inventive genius present must be met efficiently and economically. The PARISH PRESSED STEEL CO. has facilities to aid in the development of these problems from collaboration in the initial design stage to the faithful reproduction of the most intricate modeled shapes. The use of "PARISH" regular drawing presses assures unimpaired metal structure, elimination of creases or wrinkles, increased production, economy and superior finishes. Whether it be of aluminum or of other metals, PARISH will be happy to assist you in the production of that present or post-war "must".

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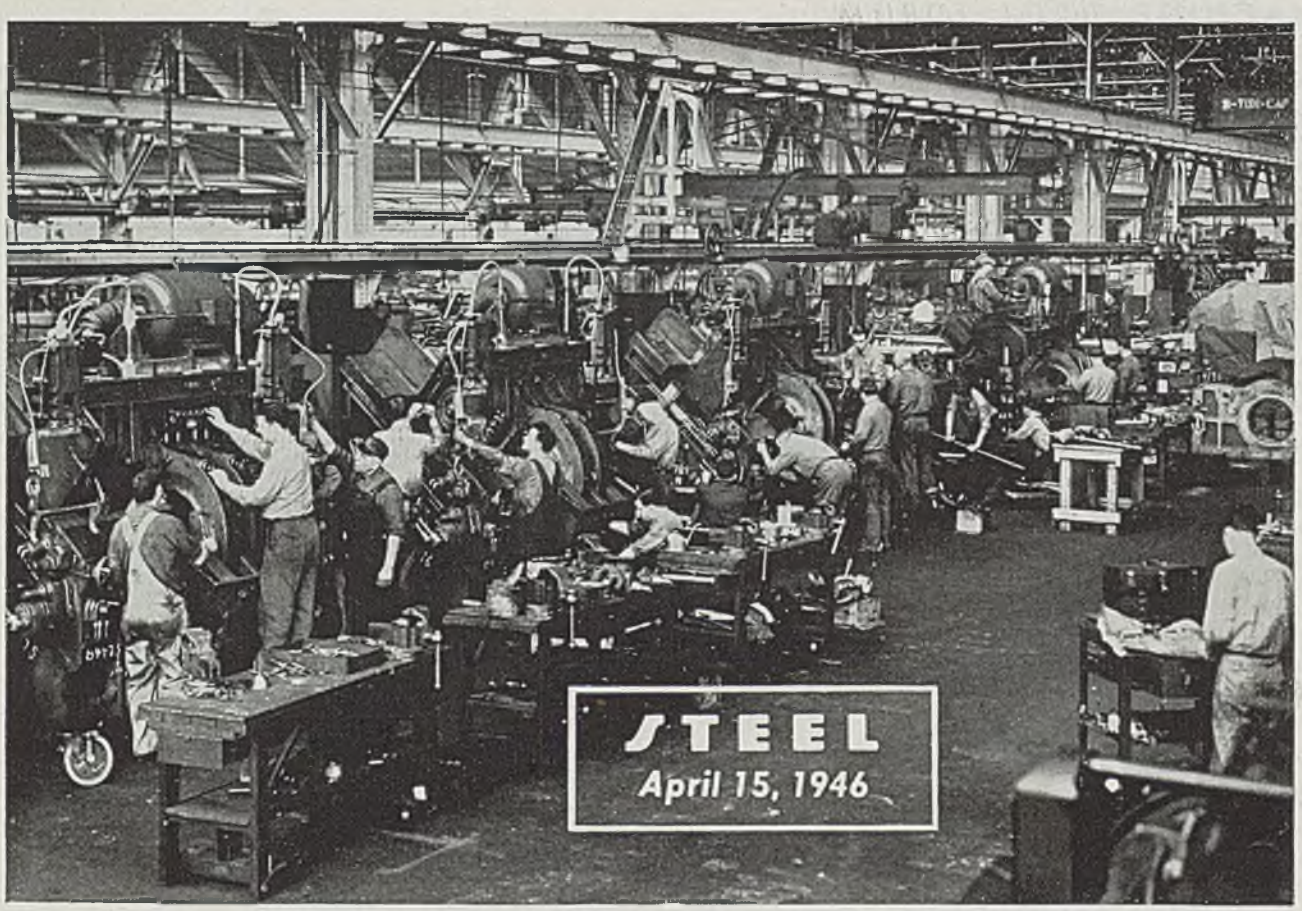


Automatic crankshaft lathes are being produced in volume at the Cincinnati plant of the R. K. LeBlond Machine Tool Co. to assist in the production of America's cars and trucks. Shown in above photo are three 2LB's (line bearing), one DM (drum bearing) and three 1 LB's, all for the production of 8-cylinder cranks

Machine Tool Output Retarded by Materials, Labor Shortages

Sales of government surplus affecting demand for new equipment, but less than expected. Present volume small compared with wartime peak, but larger than prewar averages. Industry's backlog equal to six months' operations at present rate

MACHINE tool production is being retarded by shortages of steel, electrical equipment, castings and by scarcity of skilled labor.

Demand for new equipment, on the other hand, is being affected by sales of government surplus tools, although this factor is having less effect than had been anticipated.

Machine tool shipments during the first quarter averaged only about $28 million a month compared with $35 million in 1945, $41 million in 1944, and $95 million in 1943. Despite this steady downtrend, shipments are still large compared with prewar monthly averages of about $11 million in 1936, $16 million in 1937, $12 million in 1938 and $17 million in 1939.

Builders were able to increase production phenomenally during the war emergency, boosting the total to $126 million in December, 1942, the all-time high. This was accomplished by extensive subcontracting, by utilizing three shifts a day, and by operating many new plants built by the Defense Plant Corp. The current estimated capacity of the industry is placed at about $80 million a month. Members of the industry believe output could be $60 million a month were it not for the shortages mentioned.

Cumulative sales of government-owned surplus machine tools through Feb. 28 showed an increase of $19,416,000 over Jan. 31 figures. Used machines priced under the Clayton formula, which makes allowances for depreciation on a monthly basis, and costing $135,774,000, were sold for $72,707,000.

Lathes were the largest selling item in this group, sales aggregating $21,631,000. The cost of these lathes was $42,371,000. Other prominent machine tool items were milling machines costing $19,502,000, sales price $9,235,000; grinding machines costing $18,182,000, sales price $9,501,000; boring machines costing $11,588,000, sales price $5,518,000; and drilling machines costing $11,362,000, sales price $5,436,000.

Sales of machine tools by dealers approved by the War Assets Administration under the dealer-agency program are now running slightly over $7 million a month (on the basis of government cost) as compared with total industry sales of machine tools of about $28 million a month.

While sales of surplus machine tools

are reducing the present volume of business, the industry generally believes that prompt disposal of the surplus is desirable. Many of the difficulties which have arisen in the disposal of government-owned tools is attributed to general misunderstanding of the approved dealer-agency program, to the inexperience of many of the regional personnel and to imperfect procedural regulations. The industry advisory committee has submitted recommendations to WAA which, if adopted, should correct these conditions.

The industry has an order backlog of over $173 million, or more than six months' production at the first quarter rate of operations. Of this total, foreign unfilled orders account for about $50 million. Heavy domestic demand is attributable to industry's attempt to improve equipment to reduce production costs as an offset to rising labor costs and the expansion programs launched by consumer goods industries.

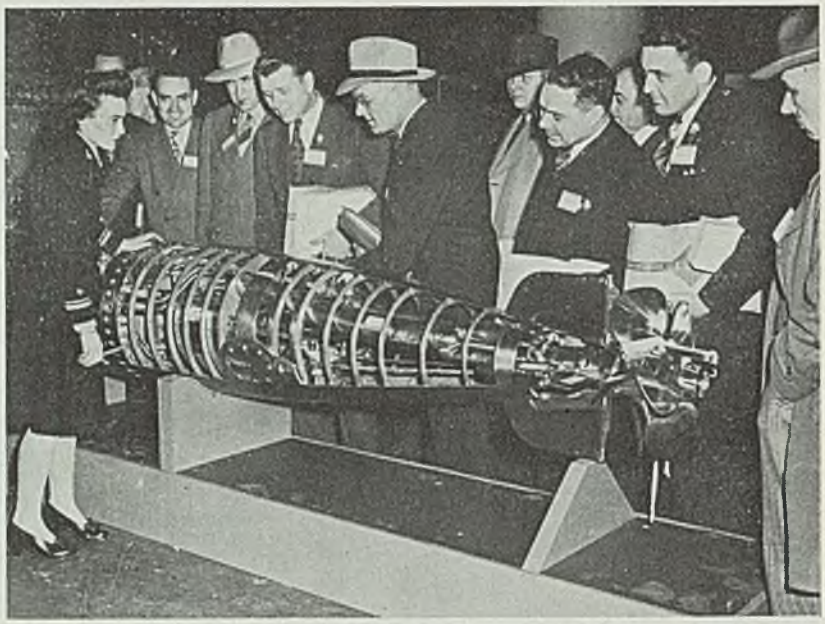
Last week the Office of Price Administration suspended price control on heavy machine tools and permitted an increase of 20 per cent in prices on all power-driven machine tools. While this action is expected to be helpful the extent to which production will be affected is uncertain.

The 20 per cent increase on power-driven tools will permit price adjustments on certain types of equipment, but the tool builders point out that industry competition will be the factor determining how much prices will rise. Prices on some machines may be advanced the full 20 per cent while others may not be increased at all. The higher prices permitted, however, will encourage production of machines which have not been built because of production losses.

Expect Railroads To Apply For Freight Rate Increase

Railroads of the nation this week are expected to apply to the Interstate Commerce Commission for an increase in freight rates to offset wage and other cost increases.

It is estimated that the 16 cents per hour increase in wages awarded last week equals an increase of $176,000 per hour in wages of 1,100,000 railroad workers, amounting to a total of $352 million annually. In addition payroll deductions will account for $24 million more annually, while increased wages for some 200,000 workers remain to be determined. Also should Congress act favorably on a bill now pending to increase retirement and other benefits to railroad workers, railroad operating costs will be upped an additional $240 million.



SUBMARINE "IRON FISH": A WAVE explains to visitors at the American Society of Tool Engineers exposition at Cleveland the workings of a submarine-type torpedo which proved effective against Japanese shipping. The torpedo is driven by a 340-horsepower gas turbine motor, travels at 45 knots, carries a 600-pound warhead, and weighs 3185 pounds

Westinghouse Electric Is Host to 300 at Tenth Machine Tool Forum

PITTSBURGH

FOLLOWING a lapse of one year, due to wartime restrictions on conventions, the Machine Tool Electrification Forum, instituted in 1936 by machine tool men and Westinghouse Electric Corp., came back to life with renewed vigor in the form of a two-day meeting at Hotel William Penn, Apr. 9 and 10.

Between 300 and 400 representatives of 100 or more companies spent a crowded two days "catching up" on wartime electrical developments which will influence design of peacetime metalworking machines. Also, they heard straight-from-the-shoulder talks on economic and social conditions by William P. Kirk, president, National Machine Tool Builders' Association; Gwilym A. Price, president, Westinghouse Electric Corp.; R. M. Gaylord, president, Ingersoll Milling Machine Co., and past president, National Association of Manufacturers; and Tell Berna, general manager, National Machine Tool Builders' Association.

The underlying theme of the talks of all these men was that America's only hope for maintaining industrial supremacy lies in more production of better things at prices which people throughout the world can afford to pay. All favored adequate wages and reasonable hours, but none of them can see any hope of maintaining such conditions in a competitive world unless the working people in this country co-operate to the fullest extent possible in getting maximum output from fine machines and tools which are available in this country as nowhere else in the world.

Tell Berna expressed considerable concern over the slowness of liquidation of government surplus machine tools. The magnitude of this surplus is not generally realized, he said, because of the fact that only a small proportion of the machines have as yet been released. The industry is anxious to co-operate with the government in solving the disposal problem. So far it seems that not much progress is being made. It is not possible even to find out how many surplus machines there are.

Mr. Berna sees greatly increased activity in tooling and production engineering in connection with machine tool selling, this including machines tailored throughout for specific jobs. Also, he sees better and faster "material holding" within machine tools as the matter most in need of engineering attention. It does no good to achieve high cutting speeds

if the time thus saved is lost in loading and unloading the work.

One of the speakers who returned to the forum after several years absence on Navy work, was James R. Weaver, manager, Westinghouse East Springfield, Mass., works.

"Industry," said Mr. Weaver, "will not buy new machine tools as the public buys new automobiles. New machine tools must justify themselves in actual savings in the production of more and better products. This need is now emphasized by the trend toward increased wages."

Backing up Tell Berna's statement, Mr. Weaver said: "Machine tool builders must give more attention to cutting tools, jigs and fixtures. After all, these really determine the productivity of the machine. Too often these problems are left up to users who are not too well versed in that sort of thing."

Among the many new electrical developments revealed at the forum, the most notable was a new line of electric motors designed especially for driving machine tools. Aside from their accuracy, ruggedness and freedom from vibration their most interesting feature is the fact that they are to a large extent constructed of pressed and rolled steel plate of heavy gage. A great saving in weight results and they have fine, streamline finish unusual for motors of large size.

All in all, the speakers showed considerable optimism about the outlook for the machine tool industry over the next five years or so—assuming that the current wave of labor disturbance subsides. Before the war an average year showed $150 million or less of machine tool business. There is good possibility that annual shipments of $200 million to $300 million now are in the offing if we achieve an era of common sense in the near future.

Arrange Program for Steel Institute Meeting May 23

The 54th general meeting of the American Iron & Steel Institute will be held May 23, at the Waldorf-Astoria, New York.

At the morning general session of members of the institute, the speakers will be Walter S. Tower, institute president; Dr. Leo Wolman, professor of economics, Columbia University; E. M. Voorhees, chairman, Finance Committee, United States Steel Corp., New York; Quincy Bent, vice president, Bethlehem Steel Co., Bethlehem Pa., and Walter E. Watson, vice president, Youngstown Sheet & Tube Co., Youngstown, O.

A technical session will be held in the afternoon under the chairmanship of J. L. Mauthe, vice president, Youngstown Sheet & Tube Company. Technical papers on subjects of general interest will be presented at this session by Herman Dobscha, Carnegie-Illinois Steel Corp.; S. D. Gladding, Bethlehem Steel Co.; Charles L. Potter, Jones & Laughlin Steel Corp.; and C. R. FonDersmith, American Rolling Mill Co.

The meeting will be concluded with a dinner at which the principal speaker will be Dr. H. G. Moulton, president, Brookings Institution, Washington.

Railroads Contest Lower Coal Rates to Youngstown

Permanent injunction was sought in federal court last week by eight railroads in a joint petition against an Interstate Commerce Commission order reducing freight rates on bituminous coal shipped from western Pennsylvania into the Youngstown district. The petition covered all-rail shipments and ex-river hauling in which river barge and rail movement is combined.

Complaints by Republic Steel Corp., Youngstown Sheet & Tube Co. and the Western Pennsylvania Coal Operators Association resulted in an ICC order last October reducing the rates. The steel companies claimed the former rates were unreasonable.

Petitioners for the injunction included the Pennsylvania, Baltimore & Ohio, Bessemer & Lake Erie, Monongahela, New York Central, Pittsburgh & Lake Erie, Pittsburgh & West Virginia, Pittsburgh, Chartiers & Youghiogheny railroads.

Present, Past and Pending

■ STEEL INSTITUTE FILLS DIRECTORATE VACANCIES

NEW YORK—Three new directors have been elected to fill existing vacancies on the board of American Iron & Steel Institute. They are: William M. Akin, president, Laclede Steel Co., St. Louis; Carl I. Collins, president, Superior Steel Corp., Pittsburgh; and Henry H. Timken Jr., chairman, Timken Roller Bearing Co., Canton, O.

■ PACKARD RESUMING ASSEMBLY OPERATIONS

CLEVELAND—Packard Motor Car Co. is resuming assembly operations Apr. 15 at the rate of 25 cars per hour, George T. Christopher, president and general manager, announced here last week. By next Monday, the rate will be stepped up to 40 an hour. Packard will not change models this year but may do so early in 1947.

■ FARRIER TAKES POST WITH GUNNISON HOMES

WASHINGTON—Clarence W. Farrier, technical director, National Housing Agency, has resigned to become assistant to the president, Gunnison Homes Inc., New Albany, Ind. He will assume his new duties May 1.

■ LACEY AND ARCHIBALD TO JOIN CPA'S STEEL DIVISION

WASHINGTON—D. F. Lacey, Youngstown Sheet & Tube Co., Youngstown, will join Civilian Production Administration's Pipe Branch soon to handle pipe and sheet. A. A. Archibald, Jones & Laughlin Steel Corp., will join General Steel Products Warehouse Branch, CPA.

■ CONSTRUCTION MACHINERY PRICES RAISED 5 PER CENT

WASHINGTON—Another 5 per cent increase in prices of construction machinery and equipment has been granted by the Office of Price Administration, effective until June 15, when a permanent price increase factor will be issued.

■ OPA ISSUES CLARIFICATION OF PIPE PRICE INCREASE

WASHINGTON—Iron and steel producers have been notified by the Metals Price Branch, OPA, not to reduce discounts under amendment 15 to price schedule 6 so as to result in higher maximum prices than are specified in the amendment on sales of oil country tubular goods and pipe.

■ NEW STEEL WAREHOUSING FIRM ORGANIZED IN EAST

PHILADELPHIA— Dreitus Steel Co. has been organized here to do a warehousing business in new steel. W. O. Lang has resigned as secretary and general sales manager of the Phoenix Iron Co., Phoenixville, Pa., to become affiliated with the new company.

■ WSB RULES ON DETROIT TOOL SHOP WAGE INCREASE

WASHINGTON—Wage Stabilization Board has refused to approve for OPA pricing purposes an increase of 20 cents which 111 Detroit tool and die shops began paying Mar. 4 and which, these shops pointed out, was only a 12 per cent increase whereas the increase in the automobile industry itself was from 15 to 17 per cent. The board ruled that only 18½ cents of the increase could be used as basis for price relief.

Metal Cutting Problems Discussed

Speakers on technical program of ASTE meeting at Cleveland stress factors contributing to efficiency of operations and quality of output

Panoramic view of the exposition of the American Society of Tool Engineers held last week in Cleveland's Public Auditorium

LARGE audiences at afternoon and evening sessions and a well-rounded agenda of technical papers featured the fourteenth convention of the American Society of Tool Engineers at Cleveland, April 8-12.

In addition an exposition of cutting tools and related production equipment and processes at Public Hall throughout the week, was the largest ever held by the society and attracted more than 50,000 people. Many of the displays were in actual operation.

At the opening technical session, H. B. Shaw, Midwestern Division Office, Methods Engineering Council, Kansas City, Mo., laid particular emphasis on tool engineering as a means of reducing handling operations. He recommended that layout be designated as one of the responsibilities for the engineer to carry out. Use of 3-dimensional layouts is worthwhile and furnishes good technique, he stated, and should be used where time is available to set it up. One way to make it effective is to use plastic figures. Another way to obtain effective layouts, he explained, is to isolate the engineering staff and give it a free hand in making investigations.

O. F. Ewert, vice president and general manager, W. F. & John Barnes Co., Ordnance Division, Rockford, Ill., in discussing mass production technique as applied to ammunition production, mentioned that when analysis in uniformity goes into detail, it means that uniformity has to be maintained machine to machine, fixture to fixture, chuck to chuck, tool head to tool head, tool to tool, and the angles on one tool have to be exactly like the angles on the next. To accomplish that type of uniformity, our entire technical process in the shop was run—as now—by our engineering department. Every item possible to be so analyzed and reduced is made a matter of record on a drawing that must be followed; there is no flexibility on that rule. If the item having been made within the engineering drawings fails to produce, the responsibility is that of the engineering department, not of the shop, and the corrections will be made by the engineering department working in conjunction with the shop, but not by the shop. This was a hard lesson to teach, and it took time and persistence, but once having become a state of mind, the results proved its wisdom.

At the first evening session, E. S. Marks, quality engineer, Pratt & Whitney, Division of United Aircraft, Hartford, Conn., insisted that the maintenance of good quality cannot be left to chance. Quality control, he stated, begins before any inspection operation, and goes hand in hand after all operations are completed. He pointed out that specifications cited on drawings should be prepared with such clarity that there could be no question concerning their meaning.

To maintain quality, the speaker laid emphasis on the necessity of instructing inspectors so they can do the job efficiently. He recommended instruction sheets that could be used with the drawings and an inspector's manual of quality procedure. He advocated the training of inspectors along the line of specialists inasmuch as their duties were just as important as any of the manufacturing operations.

A. L. Davis, member of staff, Rochester Institute of Technology, Rochester, N. Y., in discussing fundamentals of inspection procedure pointed out that it is best to inspect all materials before acceptance. The specifications should be checked to see that the plant received protection on the dollar expenditure. Most firms, he reported, usually employ separate gages for inspection as well as in shop work. He emphasized the importance of the quality control chart in

NEW ASTE OFFICERS

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that it shows the operator his way ahead. Moreover, he stated, it is valuable in upgrading workmen.

J. G. Manuele, director of quality control, Westinghouse Electric Corp., East Pittsburgh, Pa., in outlining a complete quality control program for a plant, stated that if defects in the product in the process of manufacture are apparent, sampling should be inaugurated immediately, and the results of the sampling operation reported. When lots are rejected, the speaker recommended written reasons for the rejection. He asserted that without co-operation of the line organization no quality control can be expected.

To obtain the tool life of single-point, high-speed steel tools with a given cutting fluid, or cutting dry, it is desirable to run several tools to destruction at different speeds to obtain a curve of cutting speed versus tool life. This was the contention of D. J. Wangelin, research and development laboratories, Pure Oil Co., Chicago, who spoke at the opening session Tuesday afternoon.

W. H. Oldacre, president and general manager, D. A. Stuart Oil Co., Chicago, favored closer co-operation between machine tool designers and cutting fluid manufacturers. He stated that soluble oil is a misnomer. A good soluble test

(*Please turn to Page* 166)

Wide Range of Equipment Shown At Tool Engineers' Exposition

Show features equipment for making high cost labor economically feasible. Emphasis strong on electrical, pneumatic, hydraulic and mechanical devices which relieve operators of routine and repetitive duties

By GUY HUBBARD
Machine Tool Editor, STEEL

IF ONE were seeking a theme most fully indicative of the spirit behind the 300 or more exhibits in the big Tool Exposition sponsored by the American Society of Tool Engineers in Cleveland Public Hall last week in conjunction with the society's fourteenth annual convention, it well could be: "Don't make an operator of a machine do anything that the machine can be made to do for itself."

That spirit was manifest in a wide variety of things ranging all the way from complete automatic machine tools to simple vises which open and close themselves. That is the sort of thing that tool engineers are contributing to the welfare of the country at a time when so many individuals expect to get more and more for doing less and less.

It is a grave question how much further that sort of thing can go, but it does seem that tool engineers can save the situation if things can be pegged at somewhere near present rather high levels. That is, the situation can be saved if industry institutes widespread adoption of the latest machines, tools and instruments, and working people in turn use these things to full advantage.

While this was not a machine tool show to any great degree, there were enough fine machine tools of foreign origin present to make it clear that American builders no longer are going to find it easy to sell standard machines in foreign markets. The numbers of machine tool builders in Sweden and Switzerland now are on the increase and judging from some of the machines they showed at Cleveland, they "have a lot on the ball."

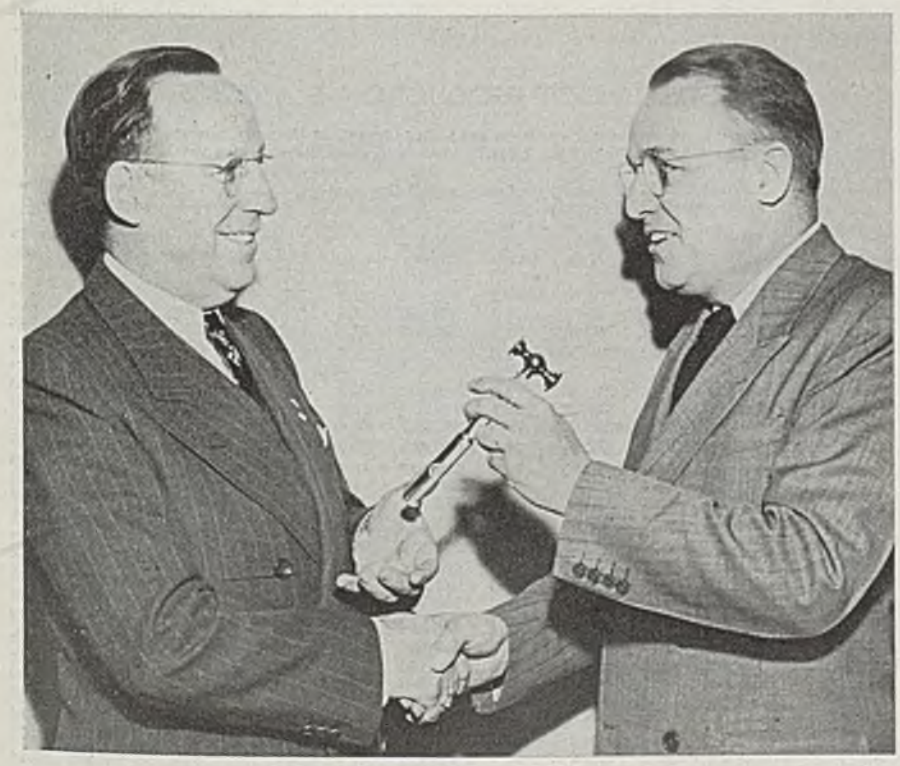
The outstanding thing about all the operating equipment shown by American companies was its essential "handiness." In every case the operator has been considered in the placing of controls, in the location of work holding and feeding mechanisms, in the setting of tools, etc. This extends to heat treating apparatus as well as things involved in metal cutting. By the same token, no stone has remained unturned to make for safe operation.

It is safe to say that in the show as much emphasis was placed on instruments for checking and measuring work as on tools for doing work. Modern limits of fit and finish exceed the ability of the human eye to "see" and the human touch to "feel." Therefore optical, electrical, pneumatic and other systems have been applied to "see" and feel fits and finishes whose limits are expressed in millionths of inches rather than in thousandths.

Not only that, these principles have been applied in such ways that the measuring machines themselves are automatic or semiautomatic, thus enabling inspection to keep pace with automatic production machinery. Also, their actual use has been simplified so that relatively inexperienced people can handle them.

In the development of the American or interchangeable system of manufac-

(*Please turn to Page* 166)



Symbolic of a new age of low-cost mass production, a gavel of cemented carbide, hardest metal yet made by man, replaces the traditional wood gavel at sessions of the American Society of Tool Engineers. Above, C. V. Briner, Cleveland, retiring president, presents the gavel to A. M. Sargent, Detroit, newly elected president, at the society's annual meeting and banquet

Seven large ore freighters of the Pittsburgh Steamship Co. fleet await opening of the shipping season in their winter berths at Monroe, Mich. Many fleet operators will delay sending out vessels due to coal and iron ore mine strikes

Fuel Shortage Cuts Steel Output

Coal stocks dwindle after two weeks of idleness in mines. Sharper reductions in ingot operations to be made this week

SHARPER reduction in steel mill operations will be made within the next week or 10 days, if the soft coal strike continues, producers declared last weekend. Ingot operations dropped 6 points to 75½ per cent of capacity last week following a drop of 8 points in the preceding week.

Most steel mill operators have maintained operations at near capacity during the initial stages of the coal strike in hope that an early settlement would be reached and coal shipments resumed before stocks became exhausted. Stockpiles are being rapidly depleted.

Secretary of Labor Lewis B. Schwellenbach arranged last week to meet with miners and operators after negotiations in the coal dispute collapsed over the welfare fund issue and after UMW President John L. Lewis had dramatically stalked out of the conference room. Mr. Schwellenbach said he was not alarmed over the situation as the coal shortage was not yet acute.

This attitude caused astonishment among steel operators who realize that depleted coal stocks may hamper full operations even after the miners return, and among fleet operators on the Great Lakes who are delaying starting the shipping season due to the scarcity of coal at lower lake ports.

At the end of the second week of the coal strike, Carnegie-Illinois Steel Corp. was the only steelmaker to have curtailed operations in the Chicago district. Carnegie-Illinois operated last week at 52 per cent of capacity, compared with more than 90 per cent the week before. Ten blast furnaces have been banked, leaving 10 active. Only eight of 17 coke oven batteries, 54 of 77 open hearths, no bessemers, two of three electric furnaces and nine of 33 rolling mills were operating. Ten thousand workers were laid off or put on reduced hours.

At Pittsburgh, a similar situation prevailed. Carnegie-Illinois has cut operations sharply and has laid off about 10,000 workers. Other producers will start reducing this week and, if the strike continues, the district's rate may be down to 50 per cent by the end of this week.

In other districts the effect of the coal strike was less pronounced. Birmingham dipped 10 points to 85 per cent as a precautionary measure. Two leading producers at Cleveland are maintaining operations and the third is curtailing gradually. Most districts expect to be forced to cut more sharply this week.

First Quarter Steel Ingot Output Lowest Since 1939

Production of steel ingots and steel for castings during first quarter of 1946 was lower than in any three months period

STEEL INGOT PRODUCTION STATISTICS

Based on reports by companies which in 1944 made 97.0% of the open hearth, 100% of the bessemer and 86.7% of the electric ingot and steel for castings production

	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	
1946										
Jan.	3,528,090	51.1	207,512	47.4	136,452	29.2	3,872,054	49 6	874,053	4.43
Feb.	1,300,944	20.9	25,905	6.6	65,668	15.6	1,392,517	19.8	348,129	4.00
Mar.	5,982,559	86.7	363,949	83.1	188,140	40.3	6,534,648	83.7	1,475,090	4.43
1st qtr...	10,811,593	54.0	597,366	47.0	390,260	28.8	11,799,219	52.1	917,513	12.86
1945										
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	1,663,647	4.00
Mar.	6,927,377	96.9	398,351	79.8	382,237	82.4	7,707,965	95.0	1,739,917	4.43
1st qtr...	19,364,034	93.3	1,124,640	77.6	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	6,663,577	93.2	402,100	80.6	386,075	83.3	7,451,752	91.8	1,682,111	4.43
June ...	6,129,266	88.5	379,807	78.6	333,217	74.2	6,842,290	87.1	1,594,939	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.	5,640,850	81.5	358,664	74.2	201,866	44.9	6,201,380	78.9	1,445,543	4.29
Dec.	5,522,829	77.4	343,266	68.9	192,704	41.7	6,058,799	74.8	1,370,769	4.42
4th qtr...	16,310,049	76.9	944,052	63.8	603,860	43.9	17,857,961	74.2	1,359,053	13.14
Last hlf.	33,235,795	78.4	2,025,819	68.5	1,303,092	47.4	36,564,706	76.0	1,391,881	26.27
Total ...	71,933,769	85.5	4,305,318	73.3	3,480,364	63.7	79,719,451	83.5	1,528,950	52.14

For 1945 percentages are calculated on weekly capacities of 1,614,338 net tons of open hearth, 112,658 tons of bessemer and 104,640 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.

For 1946 percentages are calculated on weekly capacities of 1,558,041 net tons open hearth, 98,849 net tons bessemer and 105,491 net tons electric ingots and steel for castings, total 1,762,381 net tons; based on annual capacities as of Jan. 1, 1946, as follows: Open hearth 81,236,250 net tons, bessemer 5,154,000 net tons, electric 5,500,290 net tons, total 91,890,540 net tons.

since the second quarter of 1939 and was 10 million tons below the first quarter of 1945, according to the American Iron & Steel Institute. The drop was due to the strike of steelworkers in January and February.

March production was 6,534,648 net tons, compared with 7,707,965 tons in March, 1945. February output was 1,392,517 tons and in January 3,872,054 tons were produced, according to revised figures for those months.

First quarter production this year was 11,799,219 tons, compared with 21,568,777 tons in the comparable period in 1945. Average weekly production during first quarter was 917,513 tons, compared with an average of 1,677,199 tons for the same period last year.

March operations were at an average of 83.7 per cent of capacity, compared with 95 per cent in March, 1945; first quarter average operation this year was 52.1 per cent, compared with 91.6 per cent a year ago.

U. S. Steel Discontinues Monthly Shipment Report

Publication of the monthly finished steel shipment figures of the United States Steel Corp. has been discontinued, ending a statistical service which has been issued in one form or another for the past 40 years.

The last statement on Corporation shipments was issued Jan. 10, and covered deliveries for December and the year 1945. The strike of steelworkers in January and February made it impossible to issue the figures for those months. The March shipment report was due April 10.

No explanation was given by Corporation officials as to why the monthly shipment statement has been discontinued. However, trade observers point out that the American Iron & Steel Institute for the past several years has been issuing a monthly statement on billings covering the entire industry. This statement is more detailed than that which had been issued by the Steel corporation though it usually is two months late in coming out.

Monthly tonnage figures have been published by the Steel corporation since shortly after it was organized. Originally the data covered unfilled orders on subsidiary company books at the end of each month. However, during the 1920s issuance of unfilled tonnage data was discontinued and replaced by the shipments report.

Discontinuance of the Steel corporation's monthly shipment figures will cause many statisticians to revise their regular indexes.

U. S. Steel Asks Clarification of FTC Order Banning "Pittsburgh Plus"

Offers to withdraw opposition to court affirmation of cease and desist order issued in 1924 if ambiguous provisions are modified. Practice at which original order was directed long since discontinued. Corporation asks right to sell competitively

UNITED States Steel Corp. will not oppose a court affirmation of the Federal Trade Commission's 1924 cease and desist order on "Pittsburgh Plus" pricing provided it can obtain an authorization for clarification of the order under which the Corporation's subsidiaries would be permitted to meet delivered prices of competitors.

Since the issue of legality of the old "Pittsburgh Plus" method of selling has been determined by the Supreme Court in decisions in the Corn Products Refining Co. and the A. E. Staley Mfg. Co. cases handed down last year, and since this method of selling has been discontinued by U. S. Steel's subsidiaries, the Corporation said it will not be necessary to continue prosecution of the case, provided ambiguities in the order can be clarified.

Corporation officials object to a provision requiring the subsidiaries to desist "from quoting for sale or selling . . .rolled steel products upon any other basing point than that where the products are manufactured or from which they are shipped."

The petition says the companies wish, where it is necessary to meet the lower delivered price of competitors, to reduce their delivered prices to as low as those charged by competitors, particularly in those cases in which the petitioners may desire to sell their products at some place which is nearer to the manufacturing plant of the competitors than to any such plant of the petitioner.

This statement by Corporation attorneys to the Circuit Court of Appeals in Philadelphia, where the case has been pending for the past eight years, came as a surprise to FTC attorneys. Previously, U. S. Steel had contended the FTC order should be set aside on the ground that conditions have changed since it was issued.

FTC took the new petition under advisement and will ask the court for extra time in which to reply. Consideration of the petition will necessitate a review of basic FTC price policy which permits no allowable departure from straight fob mill pricing.

This latest move may presage a settlement of the 38-year-old basing point case which started with the complaint of Birmingham district consumers in 1908 against the practice of U. S. Steel subsidiaries of selling "bars and plates on a Pittsburgh Plus basis."

The Federal Trade Commission issued a complaint against U. S. Steel in April, 1921, amended it in March, 1922, and then took testimony from consumers and others throughout the country. In July, 1924, the commission issued its famous "cease and desist" order against certain U. S. Steel subsidiaries. This provided the companies should within 60 days abandon "Pittsburgh Plus" as a pricing policy and quote prices on an fob shipping point basis.

U. S. Steel agreed to comply with the order "insofar as practical" and established basing points at important producing and shipping centers.

The case then was considered settled and remained dormant until 1938 when an amendment to the Federal Trade Commission Act was passed providing the order become final by May 21 of that year unless action was taken by U. S. Steel to have the order set aside. This action was asked by U. S. Steel on the ground that conditions had changed since the order first was issued.

In June, 1938, Carnegie-Illinois Steel Corp. eliminated price differentials between Chicago and Pittsburgh and Tennessee Coal, Iron & Railroad Co. eliminated the differential between Birmingham and Pittsburgh. This action was followed by independent steel companies establishing new basing points at producing centers generally on a price parity with Pittsburgh.

Additional basing points for various products have been established since.

Despite the widening of the multiple basing point system and the virtual elimination of price differentials, FTC continued to press for enforcement of its original order. The basing point system received considerable attention during the investigations of the Temporary National Economic Committee.

After United States' entry into the war, little was heard of the case until October, 1944, when FTC again indicated it would press for affirmation.

Price Control Suspended on Many Heavy Machinery, Equipment Lines

OPA's action covers six broad classes of product lines, including many items of machine tools and electrical, processing, construction and transportation equipment. Ceilings on power-driven machine tools and parts to be increased 20 per cent

PRICE control was suspended, effective April 8, on a selected list of heavy machinery and equipment products.

This is the most extensive decontrol action yet taken by the Office of Price Administration, according to Paul A. Porter, administrator.

OPA officials indicated last week that it may announce soon a second "broad decontrol" in the machinery and heavy equipment field. The agency also announced that power-driven machine tools not covered by the suspension action and the parts and attachments, when designed for a specific machine tool produced by the machine tool manufacturer, will be given a price increase of 20 per cent over Oct. 1, 1941, prices but that the effective date has not yet been determined.

The price control action taken last week covered items in six broad classes of machinery and equipment and included many items of electrical equipment, machine tools, processing, construction, transportation and miscellaneous machinery and equipment. However, OPA warned that price movements and any possible diversion of manpower, materials or facilities will be carefully watched, and control will be restored promptly on any item if inflationary prices or serious diversion develops.

Major product lines that have been suspended from price control follow:

Electrical: Steam hydraulic and gas turbines; direct current arc welding equipment; electric motors, 250 horsepower and over; all types of transformers, 500 kva and over; telephone central station and other telephone equipment; antenna systems and towers; domestic watt-hour electric meters.

Machine Tools: Large types of both new and second-hand machine tools, as defined in maximum price regulation 67 (New Machine Tools) and maximum price regulation 1 (Second-Hand Machine Tools), respectively.

Processing Machinery: Many types of textile machinery; specially built web-fed, newspaper and magazine printing presses.

Construction Equipment: Dredges; lock and dam machinery listed in revised maximum price regulation 136, appendix A.

Transportation Equipment: Locomotives and tenders; freight cars; passenger cars for surface, subway or elevated lines; many railroad parts and specialties; industrial hand trucks; passenger and freight elevators and escalators.

Miscellaneous: Industrial casters; mechanical precision springs; gaskets; dies, jigs, fixtures, molds and patterns with some exceptions; open or flat die forgings, except commercial drop forgings; tire chains; diesel engines with some exceptions; steam generating equipment; industrial and marine stokers with feeding capacity of 1200 pounds per hour or more; industrial conveyors and conveying systems of stationary type with some exceptions.

Mr. Porter emphasized the fact that most machinery and equipment parts will continue under price control. Suspension of price control was provided in amendment 13 to supplementary order 129.

Prices on Low Capacity Tanks, Vessels Adjusted

An increase of 17 per cent on manufacturers' July 1, 1941, prices for specified medium and low capacity tanks and vessels, most of which are used in parts of housing materials, was authorized last week by the Office of Price Administration.

Simultaneously the price action brought tanks and vessels, 585 gallons or less in capacity, under the coverage of one price regulation instead of continuing controls over them by four regulations. The simplification of control affects tanks and vessels made from seven gauge steel and lighter, or from other metals of equivalent thickness, and includes non-code pressure, non-pressure coated and uncoated, lined or unlined tanks and vessels. The action covers such tanks as water heater tanks, domestic fuel oil storage tanks, water storage tanks, solar tanks, but does not include tanks designed for use with industrial equipment.

Three categories of resellers' prices are set up effective Apr. 8. A 20 per cent markup is provided for wholesalers. Retailers purchasing direct from manufacturers are permitted a 30 per cent markup. Retailers who purchase from sources other than manufacturer are allowed a 20 per cent markup.

Since the items covered in the action were previously under separate regulations, each with varying freeze-period ceiling prices, the exact effect on consumer prices for the installed equipment is not known.

The manufacturers' increases were computed on the basis of OPA's reconversion pricing formula for the reflection in existing ceilings of the increases which have taken place since 1941 in basic wage rates and material prices. Since OPA's study was completed prior to recent steel price increases and a general wage increase in the industry, it was necessary to project the effect of these additional cost advances. OPA estimated the effect of these recent increases to be 9½ per cent on sales. In addition, OPA determined that a 7½ per cent increase was necessary to cover prior cost advances.

OPA Grants Price Relief On Metal Stampings

Manufacturers of metal stampings, used in a wide variety of products, including household appliances, automotive equipment, and machinery, last week were given an increase factor of 19 per cent over their March, 1942, prices by the Office of Price Administration.

This increase, effective Apr. 8, applies to all sales of stampings and replaces the 8 per cent increase given stamping producers on Sept. 19, 1945. This previous increase was applicable only to list and established prices. Before that time prices of all stampings were frozen at March, 1942, levels.

Data submitted to OPA by a representative sample of the industry revealed that a major portion of the companies has been affected by wage increases and all have been affected by higher material costs. The survey indicated that a final wage pattern for the industry had not been established but the increased cost of material made it necessary to give relief promptly to cover material increases and the labor increases which have been approved. The price adjustment will be reviewed when it is believed that a final wage pattern has been established.

Warehouse Association To Hold Meeting in New York

Annual convention of the American Steel Warehouse Association will be held

at The Plaza, New York, May 21 and 22. Details of the program are now being worked out, Walter S. Doxsey, president of the association, announced last week.

Auto Parts Manufacturers Hold Meeting in Detroit

Over 600 members of the Automotive & Aviation Parts Manufacturers Inc. met in Detroit last week to discuss industry problems at their first annual meeting since 1944. B. F. Hutchinson, chairman, Finance Committee, Chrysler Corp. was speaker at the dinner. Frederick C. Crawford, president, AAPM, and president, Thompson Products Inc., Cleveland, was toastmaster.

The AAPM board of directors for 1946, announced at the meeting, includes: Mr. Crawford; John Airey, president, King-Seeley Corp., Ann Arbor, Mich.; J. L. Myers, executive vice president, Cleveland Graphite Bronze Co., Cleveland; Walter F. Rockwell, president, Timken-Detroit Axle Co., Detroit; F. L. Burke, vice president, General Motors Corp., Detroit; J. D. Eby, secretary-treasurer, Wagner Electric Corp., St. Louis; J. Y. Scott, president, Van Norman Co., Springfield, Mass.; W. A. Baker, president, Firestone Steel Products Co., Akron; D. H. Kelly, executive vice president, Electric Auto-Lite Co., Toledo, O.; G. W. Kennedy, president, Kelsey-Hayes Wheel Co., Detroit; M. P. Ferguson, vice president, Bendix Aviation Corp., South Bend, Ind.; A. W. LeFevre, vice president, Stewart-Warner Corp., Chicago; C. I. Ochs, president, Eaton Mfg. Co., Cleveland; W. D. Robinson, president, Briggs Mfg. Co., Detroit; and G. A. Shallberg, vice president, Borg-Warner Corp., Chicago.

MEETINGS....

Apr. 15-18, National Warm Air Heating & Air Conditioning Association: Warm air heating conference, College of Applied Science of Syracuse University, Syracuse, N. Y. George Boeddener, 145 Public Square, Cleveland, managing director.

Apr. 17-19, American Society of Civil Engineers: Annual spring meeting, Bellevue Stratford Hotel, Philadelphia. Association headquarters are at 33 West 39th St., New York 18.

Apr. 22-24, American Management Association: Conference, Hotel Pennsylvania, New York. Association headquarters are at 330 West 42nd St., New York 18.

Apr. 22-27, Society of the Plastics Industry: National Plastics Exposition, Grand Central Palace, New York. Association headquarters are at 295 Madison Ave., New York 17.

Apr. 25-26, American Institute of Mining & Metallurgical Engineers: Twenty-ninth annual open-hearth steel and blast furnace and raw materials conferences, Chicago. A. B. Parsons, 29 West 39th St., New York 18, secretary.

Apr. 26-30, International Lighting Exposition: Stevens Hotel, Chicago.

GOVERNMENT CONTROL DIGEST

Weekly summaries of orders and regulations issued by reconversion agencies. Symbols refer to designations of the orders and official releases. Official texts may be obtained from the respective agencies

CIVILIAN PRODUCTION ADMINISTRATION

Lead: Second-quarter lead allocations cut about 10 per cent from first-quarter total. Lead inventory controls transferred from order M-38 to priorities regulation No. 32 with permissive inventories reduced from 45 days' to 30 days' needs.

New lead chemical order, L-354, further restricts amount of lead which may be used in insecticides and lead chemicals. New ethyl fluid order, L-355, specifies amount of such fluid which may be used monthly and limits motor gasoline to an 80 octane content. (M-38, PR-32, L-354, L-355; CPA-275).

Surplus Equipment: Urgency certificates will be issued to producers of critically scarce products, giving them first call on War Assets Administration stocks of surplus equipment, provided producers can demonstrate they need the equipment urgently to sustain or increase production. Certificates will be issued only for equipment needed by producers of commodities classified as critical in schedule 1 of PR-28, including: Electrical high-silicon sheet steel, coal mining machinery, certain types of coal in specified areas, malleable and gray iron castings, machinery for making clay and building products, fractional horsepower ac motors.

Granting of individual directives on WAA further restricted in favor of named persons or classes of persons. In general such directives will be limited to extreme emergencies due to fires, floods, explosions, or similar causes, or to emergency replacements for essential services.

Applications for emergency certificates made on form CPA-4425. (PR-13; CPA-278).

OFFICE OF PRICE ADMINISTRATION

Control Suspensions, Exemptions: Following products are exempted from price control, effective April 3: Roller skates; furniture made of glass or mirrors; solidified-gasoline burning, portable camp stoves; Christmas decorations; non-mechanical bottle coolers and point-of-sale racks, stands or cabinets, specially designed to hold particular brand beverages. Suspension from price control, effective April 8, applies to certain items of custom-made hardware built for use in specially ordered furniture and equipment that already have been suspended from price control.

Slicing machine choppers, food grinders and coffee grinders, commonly used in both stores and commercial institutional kitchens; metal wagons with bodies longer than 18 inches are still under price control. Sales of custom-built furniture, fixtures, and equipment to hotels, schools, churches, theaters and public carriers are exempt from price control. (SO-126 and 129; OPA-6369).

Metal Cabinets: Manufacturers of steel utility cabinets, wall cabinets and wardrobes may increase existing ceiling prices if present ceilings are below (1) total cost of production plus a margin of profit amounting to 2.4 per cent of cost, and also below (2) stated cut-off prices on sales to retailers. Ceilings may be raised to equal the lower of (1) or (2) and are effective 15 days after a report is filed with OPA unless disapproved in the meantime. (SO-148; OPA-6367).

Tanks and Vessels: Manufacturers' July 1, 1941, prices for specified medium and low-capacity tanks and vessels increased 17 per cent. Action covers such tanks as water heater tanks, domestic fuel oil storage tanks, water storage tanks, solar tanks, but does not include tanks designed for use with industrial equipment.

Tanks and vessels, 585 gallons or less in capacity, brought under coverage of one price regulation, No. 96, affecting those made from 7 gage steel and lighter, or from other metals of equivalent thickness, and includes noncode pressure, non-pressure coated and uncoated, lined or unlined tanks and vessels. (MPR-96, OPA-6374).

Clay Melting Pots: Manufacturers' maximum prices, fob plant or delivered, for clay glass melting pots and clay tank blocks and companion accessories may be increased 16 per cent, effective as of Apr. 1. (MPR-592).

Heavy Machinery: Price control suspended, effective Apr. 8, on following major product lines of heavy machinery and equipment: Electrical, machine tools, processing machinery, construction equipment, transportation equipment, and certain miscellaneous items. For details see page 72. (SO-129; OPA-6386)

Consumer Durable Goods: Price control suspended, effective Apr. 8, on several hundred miscellaneous items of personal, household, office and professional use. Typical of the items being suspended are: Pocket knives, hair clippers, scissors, manicure files and tweezers, saddlery hardware, hand tire pumps, gang and power lawnmowers, lawn sprinklers, barometers, thermometers, compasses, binoculars, telescopes, hair pins, needles, pins, thimbles, button hooks, minor business machines such as checkwriters, counting devices, ticket punches, soda fountains and equipment, bottle coolers and soap dispensers.

Remaining under control of the consumer durable goods regulation are all of the following not covered by some other regulation: All commonly used hardware and tools, household appliances, important houseware such as cooking utensils, carpet sweepers, pails and ironing boards, silverware, luggage, all commonly used health supplies and equipment, major business and store machines, commercial and funeral supplies and equipment, bedding, floor coverings, furniture. Products such as radios, refrigerators, vacuum cleaners, washing machines, stoves, and bedsprings are not affected by the suspension action since they are priced under their own regulations. (MPR-188, SO-126; OPA-6385)

Metal Stampings: Ceiling prices increased 19 per cent over basic "freeze date" 1941 prices on old, modified and new stampings under jurisdiction of maximum price regulation 136. (MPR-136)

Transformers: Ceiling prices of distribution transformers increased about 5.4 per cent over present maximum prices, effective Apr. 15. Producers permitted to use list prices published after Oct. 1, 1941, as their new maximum prices. (MPR-136; OPA-T-4362)

Slab Zinc: Special packing and loading charges for primary slab zinc have been increased effective Apr. 17 to the following levels in cents per ton: For slab zinc wired or strapped, 30; for slab zinc wired and strapped on wooden pallets, 50; for slab zinc wired or strapped on steel pallets, 70. (RPS-81)

Wire and Cable: Electrical wire and cable manufacturers may compute cost of the silver contained in their products at the market price of the silver not in excess of the statutory price of domestic silver (71.111 cents per fine troy ounce of silver), effective Apr. 8. (MPR-82; OPA-T-4372)

Construction Machinery: Construction machinery and equipment prices raised 5 per cent, effective to June 15 when a permanent price increase factor will be issued. Interim price ceilings formerly were 5 per cent above base prices in effect Oct. 1, 1941.

Story of Compromise with Unions on Cost of Living Increase Revealed

President's committee, appointed in 1943, ready to publish 900-page report. Dispute between organized labor and Bureau of Labor Statistics on accuracy of index resulted in partial abandonment of BLS index

NOW in the hands of its authors for corrections are galley proofs of a 900-page book entitled *Report of the President's Committee on the Cost of Living.* Long past due as a public document, the book will be of much interest to employers who would like to know by what chain of reasoning the government compromised with the allegations of AFL and CIO labor leaders—then engaged in trying to shatter the Little Steel formula—that the cost-of-living index of the Bureau of Labor Statistics was inaccurate and misleading.

To resolve this argument, President Roosevelt late in 1943 appointed a Cost of Living Committee headed by William H. Davis, then chairman of the National War Labor Board. The labor members; George Meany, AFL, and R. J. Thomas, CIO, promptly submitted a report asserting that between January, 1941, and December, 1943, the cost of living in the United States had risen at least 43.5 per cent, whereas the BLS index had risen only 23.4 per cent. Thus put on the spot, the Bureau of Labor Statistics admitted that its index might not be perfect but adduced "conclusive evidence" to prove the 43.5 rise cited by Meany and Thomas was "absolutely wrong."

With Messrs. Meany and Thomas firmly insisting that their figure was correct, and with a labor government in the saddle in Washington, there was no doubt among informed observers but that the Bureau of Labor Statistics would have to give ground in this struggle; the only questions were as to how the government would proceed to handle an embarrassing situation, and how much ground it would give. Mr. Davis' approach in this dilemma was the appointment of a Technical Committee consisting of three college professors lecturing in the field of social science—Wesley C. Mitchell, Simon Kuznets and Margaret G. Reid.

ARMY PARADES IN CHICAGO: Heavy Sherman tanks rumble down Chicago's Michigan Avenue during the Army Day parade witnessed by an estimated 850,000 people, including President Truman, Gen. Dwight Eisenhower, Secretary of War Robert P. Patterson and other high-ranking officials. More than 15,000 troops participated in the parade. NEA photo

This committee in June of 1944 came up with a voluminous report which appraised the BLS cost-of-living index on the basis of results of a fundamental study of wartime changes in the economy —of "what Americans are doing and what they are getting to consume." The committee found the criticism of the BLS index to be justified "if cost of living is taken to mean the amount of money a family spends for the commodities and services it buys." On the other hand, the committee had some kind words for the BLS index, but suggested that "the index should be given a less misleading name."

No immediate action was taken on the basis of this report; the administration was holding its ammunition for use when the next big wage crisis would materialize. Its findings were not used until Judge John C. Collett, then economic stabilizer, called on the President's Cost of Living Committee to explain the basis on which the President's new wage-price stabilization policy—as embodied in Executive Order 9651, issued Oct. 30, 1945—was predicated. Judge Collett announced a few days later that the increase in the cost of living in the period January, 1941, to September, 1945, had been found to be up 30 per cent, in contrast to the BLS increase of 27.9. Later, on Dec. 6, 1945, the figure for the increase was moved from 30 per cent to 33 per cent—or 5.1 points above the BLS computation.

Compromise with Unions Adopted

Thus the government found a way to act with a fair degree of satisfaction to the labor unions by allowing them 5.1 of the 20.1 points which they had requested as the allowable increase in living costs as shown by the BLS cost-of-living index. In accordance with usual practice, the unions had set their figure plenty high and were prepared to accept considerably less. In the second place, administration leaders felt that their backs were up against the wall of inflation and that they could not afford to go all the way with the unions.

The book *Report of the President's Committee on the Cost of Living* is expected to be ready for distribution by the Superintendent of Documents, Government Printing Office, late in May. The price per copy is still to be fixed.

Perhaps the most interesting result of the Cost of Living Committee's report is that the government today has no cost-of-living index. In September, 1945, Secretary of Labor Lewis B. Schwellenbach, in line with the recommendations of the Cost of Living Committee, announced abandonment of the name, "cost-of-living," for the BLS in-

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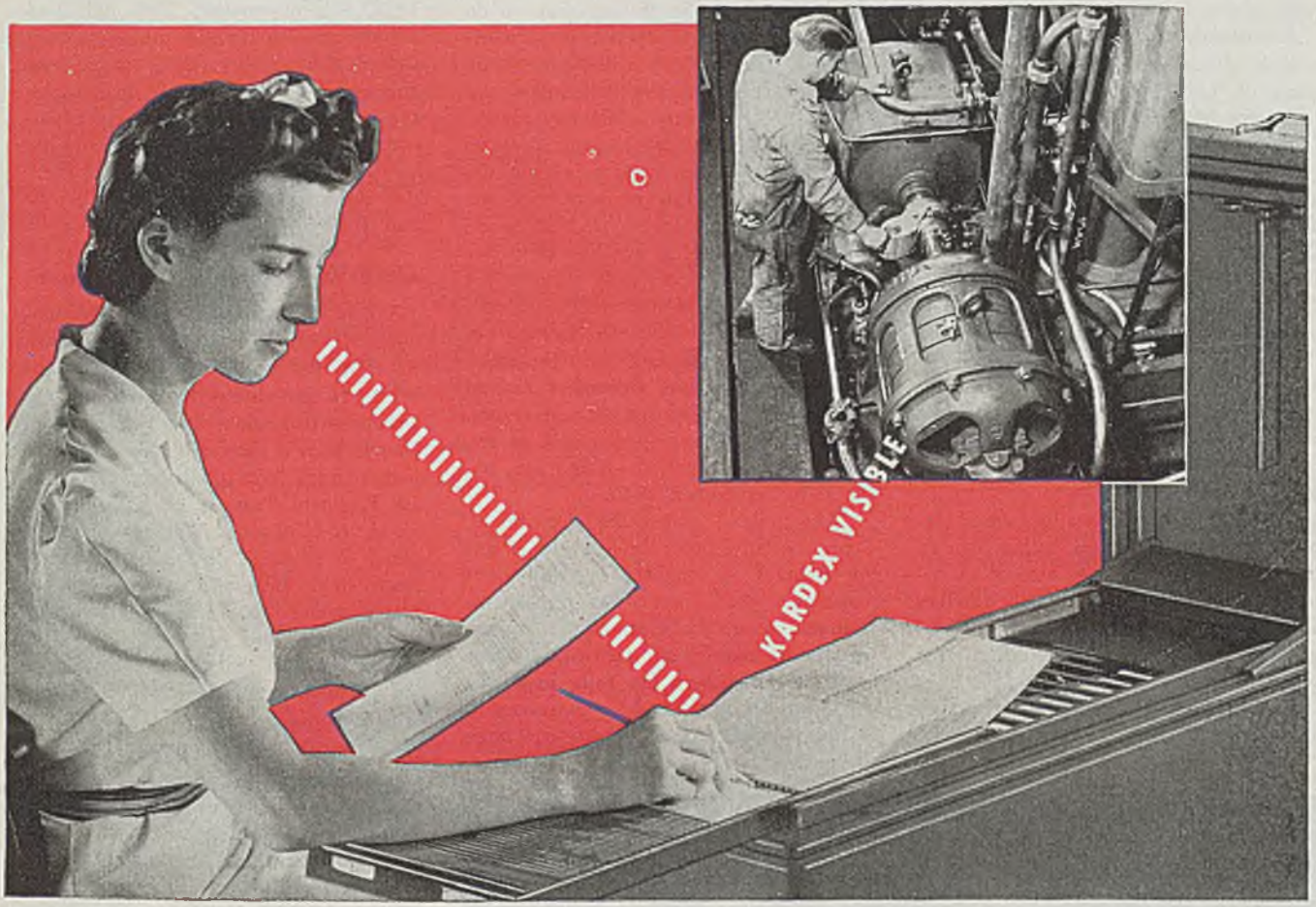

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dex. At the same time he explained the index had been found scientifically accurate in measuring "the influence of average retail prices of selected commodities and services on the cost of a fixed standard of living for the average family of moderate income in the large cities of the United States."

Accordingly the cost-of-living index now is officially known in the Department of Labor as "Consumers' Price Index for Moderate Income Families in Large Cities."

Considerable confusion exists among government departments regarding this change of name and the Department of Commerce in its "Survey of Current Business" still refers to the index as the "Cost of Living."

Judge Schwellenbach explains that there is no way of determining statistically whether changes in total expenditures are necessary or voluntary. He says continuing studies will be needed to measure the increase in the cost of living in the future.

"Periodic field studies of actual expenditures and purchases, rather than an index, is a more accurate method of determining the way in which families are living, and consideration will be given to instituting such studies," the secretary said.

From the standpoint of labor unions, elimination of the term, "cost of living," is an extremely gratifying development.

"We do not wish to be handicapped by any inflexible indexes," a labor union economist explained to STEEL. "We believe in statistics, but we want to use them objectively, as tools to prove our arguments. When we demand a wage increase on some future occasion we do not want to be hampered by a cost-of-living index which will have to be proved in error, as the BLS index was shown to be in error. We can always make field checks which will give us the information we need to reflect the situation as of the moment. Or the government can make its own spot check. We in the unions do not like rigid formulas, and we expect to be able to get along all right without them."

Of interest is the Department of Labor's explanation as to how the stabilization director last December arrived at the figure of 33 per cent as representing the increase in the cost of living over the period from January, 1941, to September, 1945.

"The index," states the department, "only partially shows the wartime effects of changes in quality, availability of consumer goods, etc. The President's Committee on the Cost of Living has estimated that such factors, together with certain others not fully measured by the index, would add a maximum of 3 to 4 points to the index for large cities between January, 1941, and September, 1944. If small cities were included in the national average, another half point would be added. If account also is taken of continued deterioration of quality and disappearance of low-priced merchandise between September, 1944, and September, 1945, the overall adjustments for the period January, 1941, to September, 1945, would total approximately 5 points. As merchandise of prewar quality and specifications comes back into the markets and the bureau is able regularly to price it again, this adjustment will gradually decrease and finally disappear."

President Truman signs the temporary housing bill which calls for an appropriation of $250 million to move temporary housing units to congested areas. Witnessing the signing, left to right, are: Sen. James M. Mead, New York; Wilson Wyatt, housing expediter; and Philip M. Klutznick, president of the Defense Homes Corp. NEA photo

CIO AT WHITE HOUSE

When CIO unions want something done in Washington they do not waste time at the lower echelons. Recent White House visitors included four war veterans—two white and two colored—who flew in a chartered plane to Washington from Winston-Salem, N. C., to ask President Truman, on behalf of the Food & Tobacco Workers—CIO, to plead for passage of the 65-cent minimum wage bill without any crippling amendments. The President reminded them that he had urged passage of the measure several times. Visits of this type are frequent occurrences.

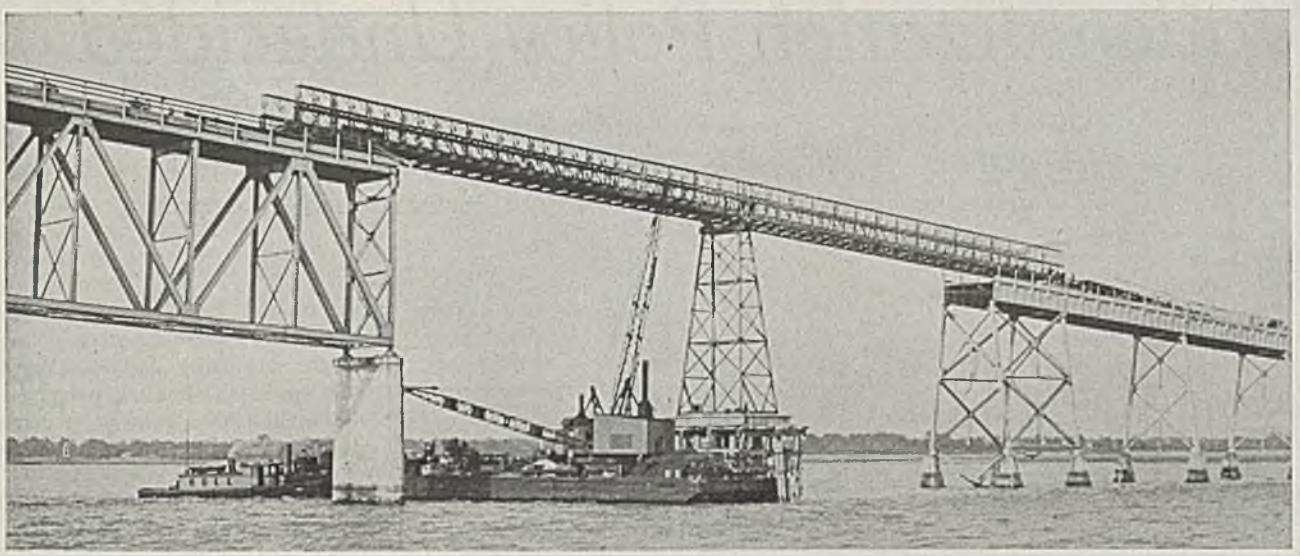
In addition, CIO unions telephone and telegraph the White House when they want action by government agencies. One of these messages was of special interest because it complained of a shortage of iron and steel and made no reference to the extent to which the supply of iron and steel had been reduced as a result of the strike of the union that sent the message. This was the United Steelworkers—CIO. The message, addressed to President Truman, read:

"For lack of 6000 tons of pig iron a month, 2000 steelworkers are idle in Newport, Ky., at the Andrews Steel Co., and this small steel firm may be forced out of business unless it can secure iron.

"Workers in stove and refrigerator plants are being laid off or are suffering from curtailed operations for lack of steel. Small nonintegrated steel firms are finding it increasingly difficult to secure adequate tonnages of semifinished steel."

NATHAN IN BUSINESS

When Bob Nathan recently retired from his post of deputy director of the Office of War Mobilization and Reconversion—in which office he was the government's ranking economist and the chief White House adviser on economic matters—the administration not only lost one of its most brilliant thinkers but



BAILEY BRIDGE IN PEACETIME: The war-born Bailey bridge has been used to repair this span near Charleston, S. C., which was damaged when rammed by a ship. Photo shows the gap closed and ready for traffic

one of its colorful speakers who had the ability to make statistics come to life.

Previous to becoming head economist in the reconversion program, Mr. Nathan occupied numerous other important posts. He was chairman of the War Production Board's Planning Committee in 1942 and 1943, and acting director of the United States - United Kingdom Combined Production and Resources Board over the same period. He had an important voice in substantially all other vital government economic planning and control activities. A young man—Mr. Nathan was born at Dayton, O., on Christmas Day of 1908 and majored in economics at the University of Pennsylvania and Georgetown University. Unmarried, he has the reputation of staying with his work far into the night.

Now he has launched Robert R. Nathan Associates Inc., with offices at 3 Thomas Circle, Washington, to "provide highly-specialized economic consulting services to manufacturing and commercial establishments, investment and banking houses, importers, exporters, and trade associations here and abroad—also well-rounded economic planning assistance to foreign governments."

CANADIAN SHIPS

Repeal by the House of the act which authorized vessels of Canadian registry to transport iron ore during the war to United States ports on the Great Lakes is sure to have approval in the Senate. There it is in the charge of the Merchant Marine Subcommittee, the Commerce Committee. Sen. George L. Radcliffe (Dem., Md.), chairman of the subcommittee, states he will move promptly so that the entire 1946 iron ore movement will be restricted to American-flag ships.

Iron ore hauled to United States great lakes ports by Canadian vessels came to 705,572 tons in 1941, 2,662,582 tons in 1942, 1,245,433 tons in 1943, 271,567 tons in 1944 and 20,650 tons in 1945.

SCIENCE LEGISLATION

S. 1850, the final revision of Senator Kilgore's bill to place scientific research under government supervision, has received the support of Senator Magnuson, and now stands approved by the Senate Military Affairs and Commerce Committees for early Senate action. This is expected to be favorable. After that will come House action, with the House Military Affairs Committee in charge.

Also scheduled for early action in the Senate is the McMahon bill providing for government control of research in the field of atomic energy. This bill, with its Vandenberg amendment providing for a military liaison committee, still is in the Senate Atomic Energy Committee, where Senator McMahon is making a strong effort to persuade the committee to strike out all military jurisdiction over the program; in this effort he is expected to fail. Indications are that, no matter what the Senate votes, the House will insist on adequate representation by the Army and Navy in administration of the program that eventually is adopted.

In the meantime Secretary of War Patterson has called for "continued War Department leadership in scientific research and development," and has restated the department's policy of "pursuing a vigorous and comprehensive technological program to assure security beyond any question of doubt."

He has created a War Department Committe on Scientific Personnel which will report directly to the Secretary of War and which is composed of 15 military and civilian research men in the War Department. Its primary assignment is to make recommendations for "the development of a strong and effective scientific and technical staff" for the postwar army. Chairman of the committee is Dr. Kenneth L. Heaton, chief, Research Section, Civilian Personnel & Training, Office of Secretary of War.

SOCIALIZED MEDICINE

Hearings on S. 1606 were started Apr. 1 before the Senate Education & Labor Committee; this is the bill incorporating the national health program of the original Wagner-Murray-Dingell social security bill. Opposed by the American Medical Society as providing for "socialized medicine," the bill is strongly favored by "liberal" members of Congress, including those particularly sympathetic to CIO-sponsored legislation. The bill's chief sponsors—Senators Murray, Wagner and Pepper, and Representative Dingell—gave it a warm sendoff at the start of the hearings, after which expressions of approval were heard from Watson Miller, administrator, Federal Security Agency; Dr. J. W. Mountain, medical director, United States Public Health Service; Arthur J. Altmeyer, chairman, Social Security Board; Robert Kenny, president, National Lawyers Guild and attorney general, California. The hearings are due to continue through April.

Nationalization Policy Undecided

Steelmakers contend structure of industry would make nationalization extremely difficult. Government to consider industry's own plan for reorganization and re-equipment. Steel demand from reconversion industries and for reconstruction is brisk

By J. A. HORTON
Editorial Correspondent, STEEL

BIRMINGHAM, ENG.

NATIONALIZATION of the British iron and steel industry continues a controversial topic in industrial and government circles, and as yet no decision on the matter has been reached.

Government spokesmen have indicated no action will be taken until the industry's own plan of reorganization and re-equipment has been considered. However, First Lord of the Admiralty recently stated the Labor government undoubtedly will carry out its program of taking over the iron and steel industry.

Steelmakers contend nationalization of the industry is not practical in view of the complicated structure of the industry. They believe it would be almost impossible to divorce the primary industry from the fabricating divisions.

Meanwhile, the iron and steel industry is facing a strong demand for its products from a variety of consuming industries and for almost every phase of the reconstruction program.

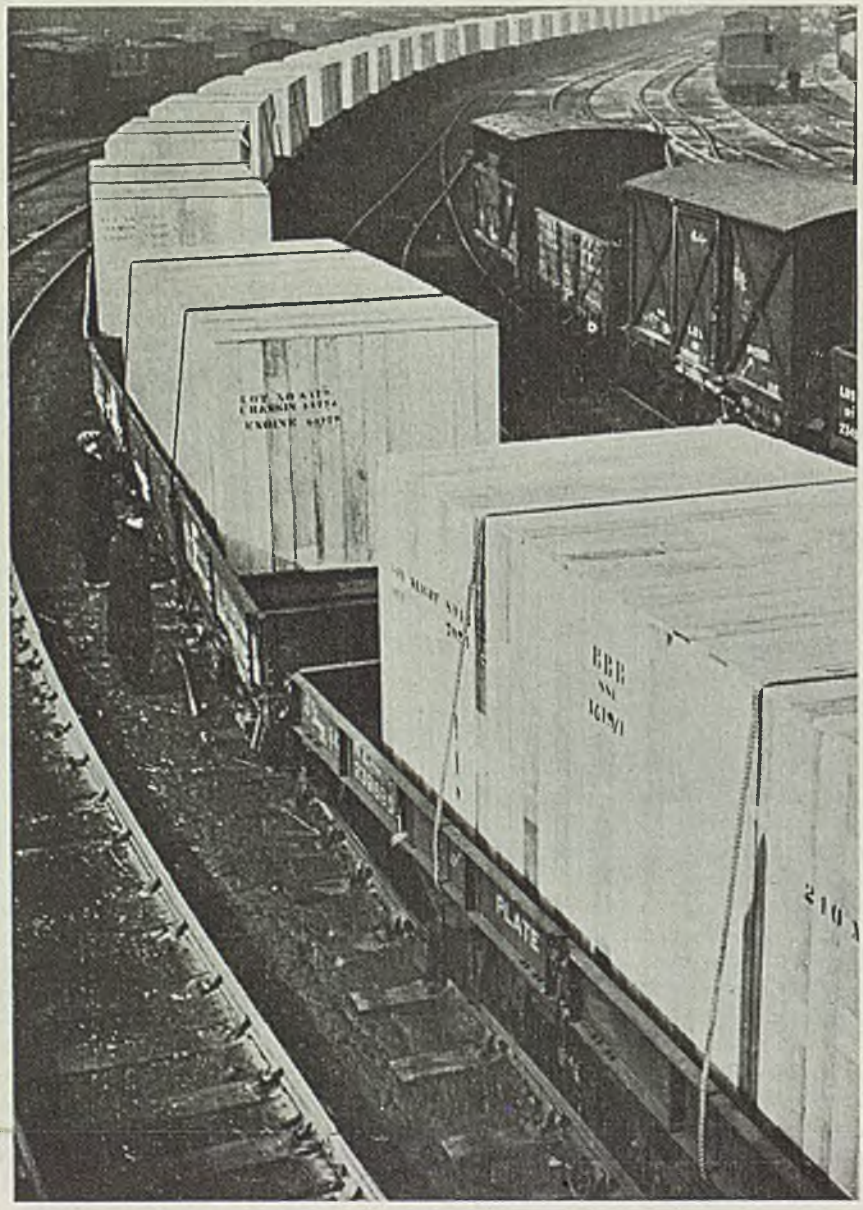
In the big cities and most of the smaller towns the housing program has been started with a consequent demand for steel and cast iron. In industrial centers there is much war damage to be repaired and manufacturers require new buildings and new equipment.

Last year a start was made with exports but the total of 642,366 tons, against 219,939 tons in 1944, was still only about one-third of the 1938 level of 1,915,202 tons. Among the more important items are 93,453 tons of plates and sheets, as compared with 37,631 tons in 1944 and 130,959 tons in 1938; 78,349 tons of iron and steel tubes against 49,383 in 1944 and 219,973 in 1938; and 84,508 tons of railroad material compared with 24,902 tons in 1944 and 158,153 tons in 1938. It has since been realized, however, that the allocations for export in 1945 were too high with regard to the subsequent home demand for products of high priority. In the first quarter of 1946 new export business in heavy steel and steel products used as raw material has not been as heavy as could be desired, and there is little prospect of any additional allocation until autumn. It has been found possible, however, to export finished steel products in increasing quantities.

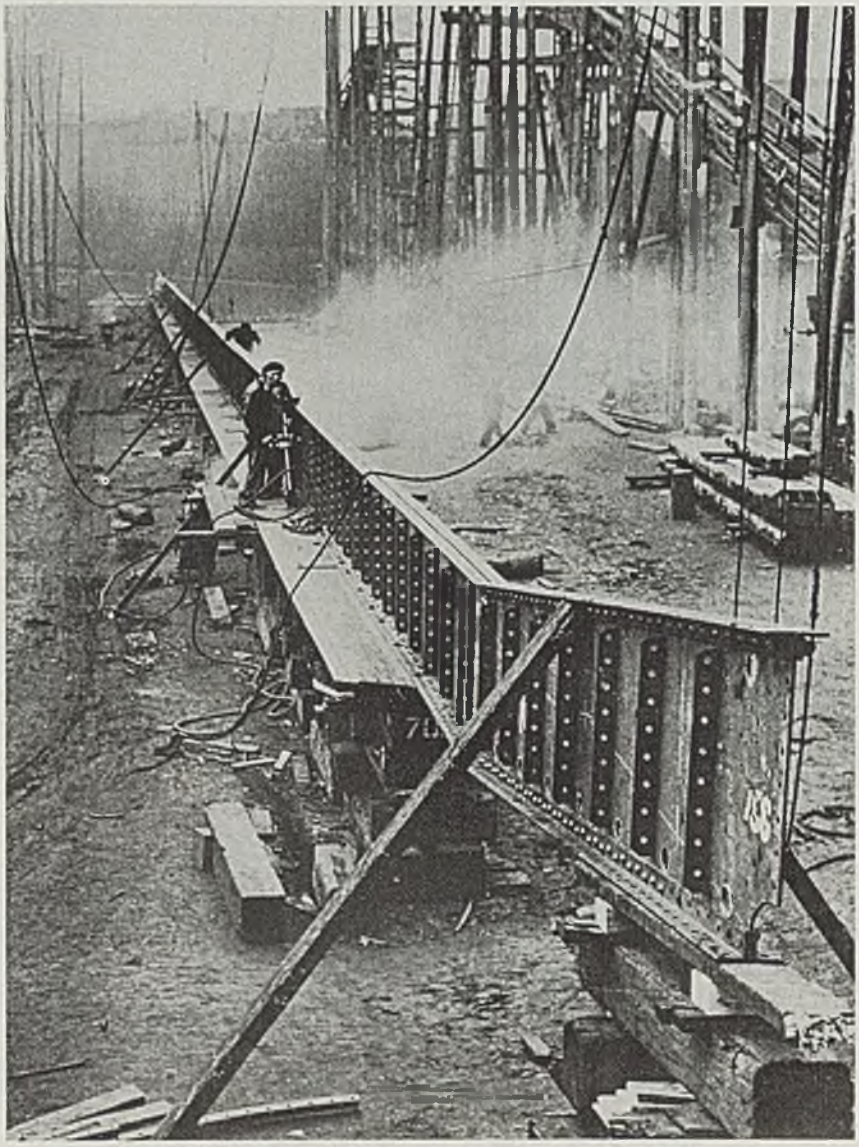
Steel ingot production in January was at an annual rate of 11,898,000 tons whereas 12 months earlier the rate was 11,248,000 tons. It is believed, however, that the full capacity of the industry is some 13 million tons per annum. Output at present is restricted by shortage of coal and insufficient supplies of imported ore. In Lincolnshire and Scotland, furnaces have been idle for long periods due to lack of fuel.

Coal output in February increased to an average of 3,497,900 tons per week as compared with 3,287,700 tons a week in January.

Another factor in restricting output of iron and steel has been insufficient sup-



Long line of freight cars rolls through a British yard. Large orders for new rolling equipment for British roads have been placed recently. NEA photo



Britain is endeavoring to rebuild her merchant marine and demand for shipbuilding plates is heavy. Here a keel is being assembled. NEA photo

plies of imported ore which to the British smelter is of importance because usually it contains about 55 per cent iron, compared with the 30 per cent iron, or less, of most of the home ores. Blast furnaces in coastal areas designed for foreign ores, can achieve high outputs with such material, and there is also economy in coal through a lower coke consumption in the process of smelting.

Difficulties have arisen through a lack of shipping facilities for transport of ores from the Mediterranean area and from the restrictions placed, for currency reasons, upon buying from Sweden.

Lack of shipping facilities has also affected shipments of steel from the mills in the North East of England and large tonnages of plates, shapes, rails, and other products are waiting to be cleared. With a home market pressing for supplies, however, manufacturers are faced with conflicting claims. Makers of automobiles and trucks have embarked on a program of considerable volume both for the home and export markets and are seeking supplies of steel on an ever increasing scale. Railroads represent a heavy accumulated demand as much of their stock is overdue for replacement and much equipment suffered from enemy action during the war years. A contract recently was placed with Dorman Long for 10,000 steel cars of welded construction, each of 16 tons capacity, for the directors of Royal Ordnance Factories and the Ministry of Supply. The same firm is also to supply 7000 cars for French railroads. The Tees-Side Bridge & Engineering Co. is building 1000 all-steel ore cars for the Ministry of War Transport and the London & North Eastern Railway.

Shipbuilding Activity Continues

The activity in shipbuilding is to be seen reflected in the substantial orders for plates now reaching works. World demand for sheets has not been so high for a very long period and most of the mills are said to be filled for six months ahead. Export allocations are comparatively small and the industry is still only able to produce a small proportion of galvanized sheets.

The position in regard to semifinished steel for rerolling has been tight for some months and there is little prospect of much improvement. Particularly does this apply to billets and blooms. The tonnages provided by British producers are inadequate, and although these have been supplemented by imports from British dominions since supplies of American steel were cut short, the difficulty has not been overcome.

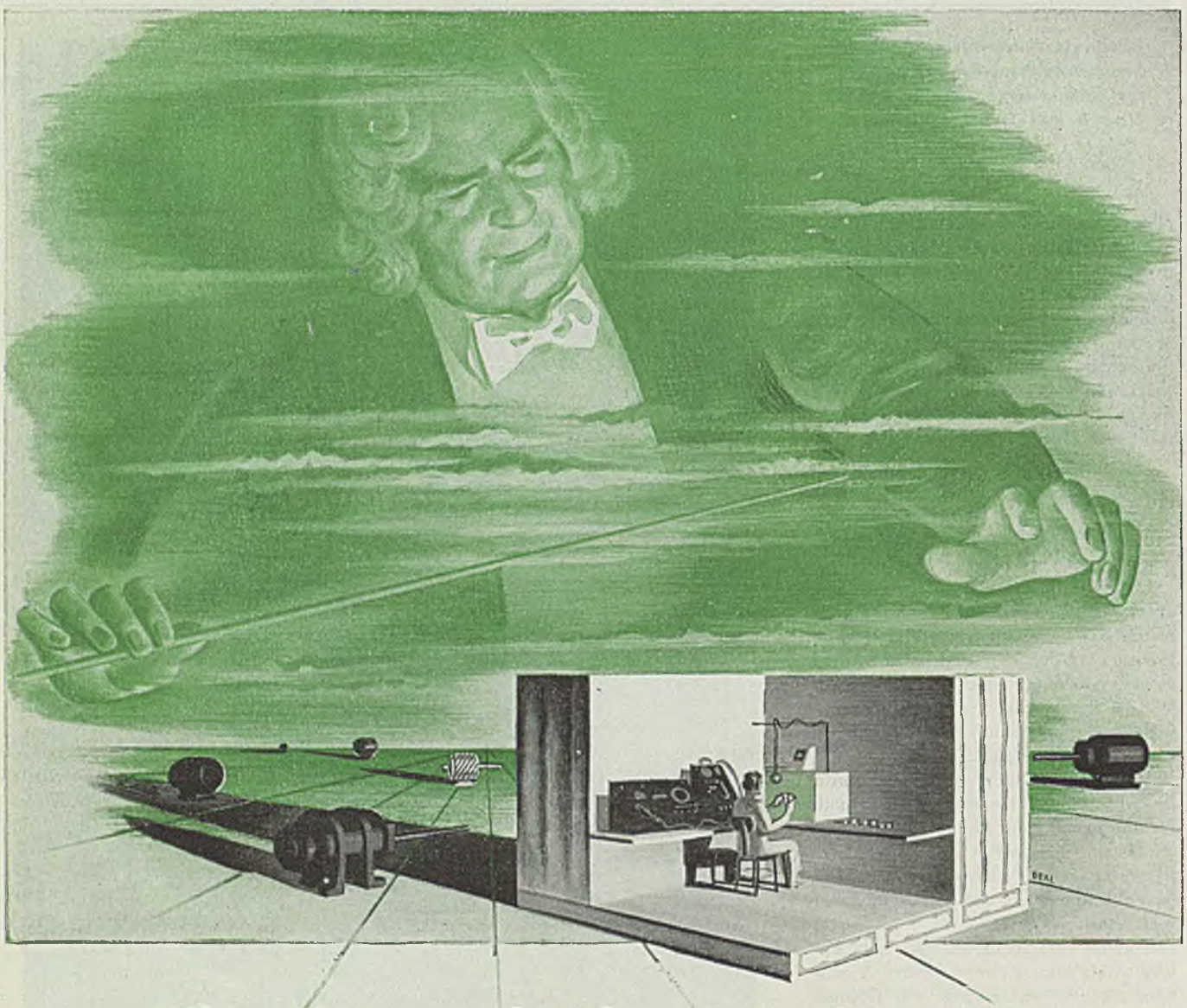
An urgent need is apparent for more high-phosphorus iron for the foundries making light castings. These establishments have entered into substantial commitments for the production of goods for the building and other trades. All the foundries are taking up their full allocations as allowed under the control system but many are pressing for additional licenses. The position in regard to the general engineering and jobbing foundries is less stringent but here also more orders have been booked and the demand for hematite, low and medium phosphorus and refined iron is improving while the whole of the output of basic iron is reserved for steel.

In the Welsh tin plate trade, current production is something over 60 per cent of the total tonnage of plates rolled in the first 16 months of the war. Raw materials appear to be in adequate supply, and the big problem remains the urgent question of the shortage of labor, though probably some of the idle mills will need a fair amount of overhauling and re-equipping before it is possible to start them again. Some mills have restarted recently, bringing the number in operation to 150, compared with 125 running at time of the lowest output during the war.

New Zealand Contemplates Hydroelectric Additions

Expenditures by the New Zealand Government on hydroelectric power development will average at least £N.Z. 5 million annually for the next 15 years, according to a projection by the Minister of Public Works, reported to the United States.

In the next two or three years, he anticipates, according to the report, that 1500 miles of line of a capitalization of £500,000 could be established.



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MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS

mirrors of MOTORDOM

By A. H. ALLEN *Detroit Editor, STEEL*

Labor troubles continue to interrupt automotive assembly operations, causing overhead costs to soar. Detroit sentiment buoyant on production score despite unpredictable supply situation. Ford schedules 100,000 units in May. Chevrolet output to rise sharply

DETROIT

ANNOYING interruptions continue to plague automobile assembly operations, but the industry has become so accustomed to them they hardly make news any more. A handful of interplant truck drivers refuses to work because of some fancied minor grievance, and all shipments of bodies from Briggs to Plymouth are stalled, forcing the closing of both plants for a few days. The trouble was ironed out quickly and operations resumed. Labor trouble at Midland Steel Products in Cleveland shuts off supplies of frames and axle housings for Hudson and assembly lines are quiet. The suspension should be only momentary.

Ford assemblies began running so far ahead of incoming materials and parts, chiefly finished steel, that many departments at the Rouge plant had to be closed for three days and 20 per cent of the employees at work there temporarily dismissed. Affected were final assembly, pressed steel, spring and upset, gear and axle divisions, glass and plastic plants and some rolling mill operations as well as a number of departments at the Highland Park plant. The Ford blast furnaces, open hearths and blooming mill suffered no interruption, and ingot production holds to a high rate of around 14,500 tons per week. However, this is only about half of the overall Ford steel requirements and until depleted stocks bought on the outside could be replenished there was no way to avoid the manufacturing halt.

Overhead Costs Are Serious Factor

These brief shutdowns, while they may not cost so much in terms of actual cars and trucks produced, are extremely serious for their effects on overhead costs, for you do not shut down a large plant like the Rouge just by pulling a few switches. In prewar days if a supplier even came close to causing a shutdown of assembly lines he usually resigned himself to losing the customer's business, and some of the wildest expedients imaginable were often resorted to in the effort to forestall interruption to assemblies.

The story is told of how, a number of years ago, Ford was in dire need of a few carloads of a certain type and size of finished steel. It had to be in the Rouge in a matter of days, and the steel supplier was called in and told to put on the pressure. He rushed down to his mill, uprooted order and schedule clerks and whipped production men into such a frenzy they called in mill crews to work right through a week-end to get the steel into cars by Monday morning. They made it, and more strings were pulled with railroads to expedite the cars to Detroit in record time, the steel company representative even riding the freight cars enroute. As the cars were shunted into the Rouge, he wiped a perspiring brow and went to the Ford offices to say, proudly, "There's your steel." Looking up unconcernedly, a Ford buyer said, "Oh, that's fine, but we have made a change in the specifications and won't need the stuff now. Guess you better route it back to your mill."

Unpredictable though the supply picture may be at the moment, sentiment around Motordom continues buoyant on the score of production. Ford is expecting to roll out 100,000 cars and trucks in May, which would amount to a daily schedule of 4500. Thus far, assemblies from the Rouge have been running about 50-50 between cars and trucks, but the ratio can be expected to increase in favor of passenger cars in the weeks ahead.

Chevrolet has made known its encouraging plans for the next three months, calling for passenger car assemblies of 20,000 this month, 50,000 in May and 75,000 in June, or 145,000 by July 1. To this must be added an undisclosed but considerable number of trucks and commercial cars, perhaps something like 40,000 per month. Projected rate of passenger car output for June would figure to 3750 daily, and Chevrolet is planning facilities to permit eventual output of 6750 daily during what it calls the "catch-up" period.

This daily rate will be an all-time high for the division, and on top of it is planned 2750 trucks per day, or 9500 in all. Odds are against any early achievement of such an ambitious schedule but at least there will be an all-out push in that direction. Eventually the goal may be reached, possibly in a year.

Light Chevrolet Planned

It is not known whether the projected total includes any output of the new Chevrolet light car. At the moment the only facilities for building this new model are still on paper, although application has been made to the GPA for an approval on the plant which will be constructed in Brookpark and Parma, O., southwest of Cleveland. The administrative and engineering staff of the light car division, under direction of Arnold Lenz, is moving into new quarters near the General Motors building here. Beyond the fact that the job will be brand new from the wheels up, little is known of its design. At one time, studies were being made on a flat or pancake type engine as a power unit. Later reported abandoned, it may have more recently been reactivated.

In a recent speech, James D. Mooney, former GM executive and now president of Willys-Overland, professed to see a bright future for the light-weight economy car in this country, in view of currently inflated values of everything. The supposition is that Willys may in-

Automobile Production

Passenger Cars and Trucks—U. S. and Canada

Tabulated by Ward's Automotive Reports

	1946	1941
January	121,861	524,073
February	83,841	509,332
March	140,000°	533,878
Week ended:		
March 30	43,070°	124,165
April 6	47,735°	116,255
April 13	50,000°	99,260

°Preliminary estimate.

PLAN NEW MODELS: Top engineering brains of the Ford Motor Co. are shown here discussing plans for new model production and styling. In this first photograph of the entire personnel of the engineering supervisory staff are, left to right: Val Tallberg, secretary and co-ordinating engineer; William James, director of research; John Wharam, chief passenger car engineer; R. H. McCarroll, director of engineering; E. T. Gregorie, chief stylist; Clyde Paton, consulting engineer, and Dale Roeder, chief truck engineer. Close co-operation between all engineering units is maintained by daily meetings of this group

troduce something along this line if it can get a body source going. Likewise, Chrysler engineers have supported such a design and doubtless have something in the works for Plymouth to introduce.

There is nothing new about the lightweight economy car. All the big three have had designs ready for many years, pending the right time to bring them out. Now, if ever, the day seems to have arrived, the principal difficulty being the delay to be encountered in lining up production facilities, materials and parts. If these designs can be moved to the market inside of a year, booming sales seem assured; if they will take 18 months to two years, the bloom may be off the rose.

Quietly going ahead is a consolidation and extension of General Motors administrative offices in the corporation's building here. Long-time tenants of offices from the sixth floor upward in the building are finding it necessary to locate other space when their leases expire, as GM intends to take over for its own use all space from the sixth to fifteenth floors. It has always had practically exclusive use of the top two floors, but during wartime found it necessary to expand considerably. Now, in the postwar period, still more concentration and expansion are under way.

The corporation's much-publicized technical center northeast of Detroit, on which construction has been started, reportedly has been trimmed back considerably from the original plans, possibly because building costs have soared far beyond original estimates. This is not to infer the project eventually will not mature as originally envisioned, but for the time being budgetary requirements have occasioned retrenchment. The same situation applies to new construction projects launched by other manufacturers.

It may be many months before passenger car builders will have a full range of body types in production. Most are concentrating currently on one or two only. One reason of course is that assemblies can be speeded up if only one or two body styles must be handled. Another is that cost savings can be effected by limiting body types, and right now costs have come to be a most critical item, getting worse by the day as suppliers are compelled to raise their quotations upward in the face of higher wage and material takes. One independent producer of a medium-price car states his production is being confined to four-door sedans only for an indefinite period. A new body style has been announced as just going into production by Hudson—a six-passenger convertible brougham, but it will doubtless carry the top price of the Hudson line.

Reshuffling of the Kaiser-Frazer Corp. purchasing department is seen in the resignation of J. D. Friend, to be succeeded by Fred Lord as director of purchases. Mr. Lord has been associated with Kaiser on the West Coast for several years, during the war, serving as director of procurement for his Portland, Oreg., yards. Another newcomer to the K-F purchasing ranks, but an old-timer in automotive purchasing circles is Eugene L. Reason who has been named consultant to the director of purchases. Gene Reason served for many years as assistant purchasing agent for Chrysler Corp., left there a couple of years ago to be associated with Steel Sales Corp., and about six months ago was identified as director of purchases for the Tucker Corp., in Chicago, which was planning to build the Tucker Torpedo under the manufacturing direction of Ray R. Rausch, former Ford production executive. Not much has been heard of the Torpedo lately, but Mr. Reason will take over at Willow Run May 1.

George Christopher, president of Packard and at heart still a tool engineer, made the feature address before the tool engineers convention in Cleveland last week and said most automobile companies would be unable to produce "really new" models until next year. He suggested the changeover date should be determined by the urgent demand for present cars and the time possible for the manufacturer to do his job thoroughly—both as to testing and processing—for economical production. He predicted the forthcoming model change would be the most expensive engineering, tooling and processing that the industry ever has experienced in a single model change.

Bright Work Is Critically Short

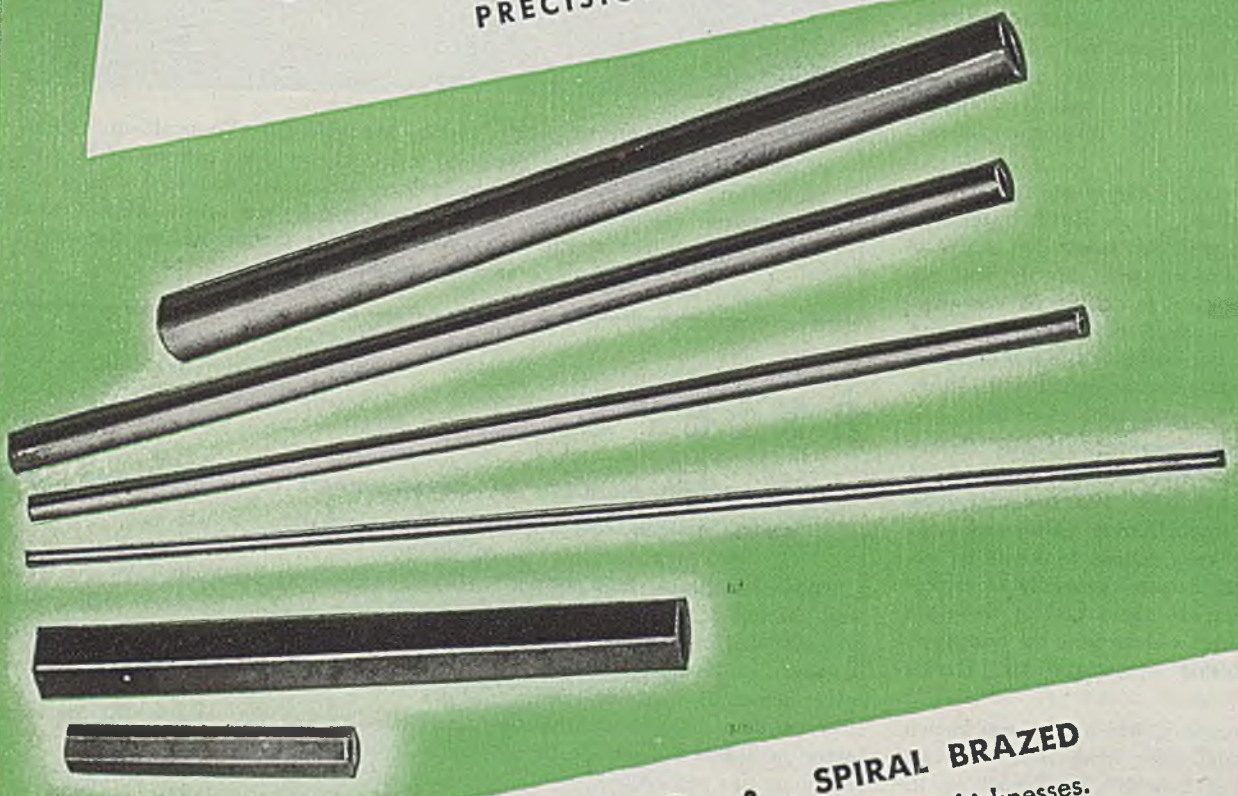
One of the most critical parts shortages confronting car builders is hand-polished bright work, such as bumpers, moldings, etc. Where automatic polishing of plated and stainless parts is possible, delays are not so numerous, but where manual polishing is required, as on bumpers, for example, suppliers apparently are not able to find the necessary labor, so it is a familiar sight to see new cars being shipped with 2 x 4 wood bumpers as emergency fittings.

Complaints of parts manufacturers against retention of ceilings on replacement and service automotive parts are held to be exaggerated in some quarters. Hardship cases in this field, presented to OPA, are reported to be receiving quick relief, although in most cases jobbers are being required to absorb increases allowed manufacturers.

If the number of committees and the caliber of their personnel are any indication, the Golden Jubilee automotive celebration starting here May 31 will be just about the most ostentatious affair ever unwrapped by the industry's promotion experts, who are no slouches at this sort of thing. Both civic and industry committees have drawn on the best talents available, from Prentiss Brown and General Knudsen on down, to lend their names in support of the gala event.

AGALOY

SMALL COLD DRAWN PRECISION TUBING



SEAMLESS • WELDED • SPIRAL BRAZED

SIZES 5/8-inch outside diameter and smaller in all wall thicknesses. Manufactured to meet specifications on temper, tolerance, analysis, finish. Available in Stainless (types 304, 308, 316, 317, 321, 329, 347, 410, 430, 446 and others); Nickel, Monel metal, Inconel, L Nickel, low carbon, high carbon, alloys, etc.

"Plan with Agaloy Tubing" booklet on request

AGALOY TUBING COMPANY

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E. W. Bliss Co. Expansion Will Cost $2 Million

Program includes transfer of machinery producer's executive offices from Brooklyn, N. Y., to Detroit

AN EXPANSION program involving equipment and building expenditures of approximately $2 million has been announced by the E. W. Bliss Co., Detroit, producer of stamping presses, rolling mills, and can making machinery.

Under the program, the company has moved its executive offices from Brooklyn, N. Y., to 450 Amsterdam Street, Detroit.

In announcing the moving of the executive offices, D. S. Harder, company president, said, "A substantial share of our orders today stems directly from the centrally-located industries, such as automotive, household utilities, electric and steel, and our analysis of future domestic sales trends indicates that it will remain that way for some time to come."

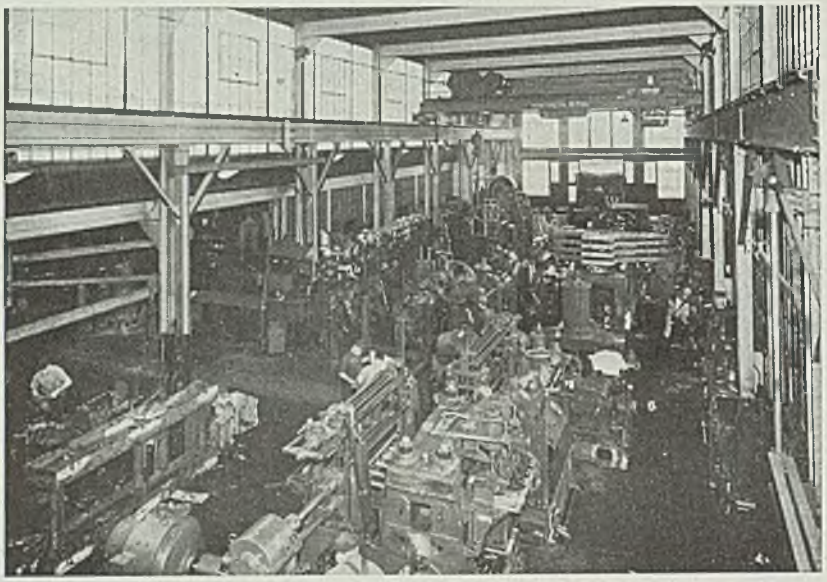
It is therefore logical, Mr. Harder said, for the company to direct and coordinate its sales and manufacturing program from Detroit. Also, the company has long desired to locate its executive offices more centrally in respect to its domestic plants and at the same time, to divorce them from the company's manufacturing operations, Mr. Harder added.

The company, which has been known internationally for more than 80 years as "Bliss of Brooklyn," will maintain its extensive manufacturing division in the Bush Terminal section of Brooklyn, as well as its plants in Toledo, Cleveland, and Salem, O.; Hastings, Mich.; Derby, England; and Paris, France.

Cleveland Buyers' Guide Now Being Distributed

Distribution of 35,000 copies of the *Cleveland Book*, 480-page buyers' guide to Cleveland's products and services, was started recently by the Cleveland Chamber of Commerce, the publishers.

This comprehensive guide has been carefully compiled to assure complete and accurate coverage and is being mailed to purchasing agents throughout the United States and foreign countries. It contains listings of products and services of 5300 Cleveland companies.



MARKS 25th ANNIVERSARY: McKay Machine Co., Youngstown, builder of auxiliary machinery for the steel industry, this year celebrates its 25th anniversary. The company's plants have expanded ten fold during the past quarter century and equipment produced by the firm is used in steel plants all over the world. Shown above is a section of the company's assembly department

BRIEFS . . .

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

Saginaw Malleable Iron Division, General Motors Corp., Detroit, has announced that it is completing final negotiations for the purchase of the Tilton plant which it built and operated for Defense Plant Corp. during the war. Another malleable foundry is to be built adjoining this property.

—o—

Allegheny Ludlum Steel Corp., Brackenridge, Pa., has completed arrangements with Airco Export Corp., New York, subsidiary of Air Reduction Co., for world-wide sales representation on an exclusive basis for its stainless steel products, electrical sheets and alloys.

—o—

Carpenter Steel Co., Reading, Pa., has announced plans for a new three-story research laboratory at the company's mills in that city.

—o—

Walter Kidde & Co., Belleville, N. J., has developed four machines which have commercial applications in the plastic field: A jacket oil heater, developed to supply oil at three or more temperatures simultaneously to the cylinder jackets of plastic extruders; a plastic coater to protect tools and other parts by covering them with a layer of plastic; a fiber bonding machine; and a tension and density control for use in the textile industry.

—o—

Deere & Co., Moline, Ill., has bought the Vermilion Malleable Iron Works, Hoopeston, Ill., from Poore & Co., Chicago.

—o—

Pacific Fabricating Co., Los Angeles, has changed its name to Hammond Mfg. Corp. and will continue to offer consulting and manufacturing facilities.

—o—

Caterpillar Tractor Co., Peoria, Ill., has announced the formation of a manufacturing development division to study and improve manufacturing processes in the company's plants.

—o—

International Nickel Co. Inc., New York, has opened its Empire State Technical Section, Development & Research Division, at Genesee Valley Trust Bldg., Rochester 4, N. Y.

—o—

Reynolds Metals Co., Louisville, Ky., has formed an Ingot Division with headquarters at Louisville. The division's

function will be the production and sale of virgin aluminum and casting alloy ingots as well as aluminum de-oxidizers for the steel industry.

—o—

Taylor-Wilson Mfg. Co., manufacturer of tube mill machinery, has removed its executive, sales and engineering offices from McKees Rocks, Pa., to the Chamber of Commerce Bldg., Pittsburgh.

Pacific States Steel Corp. Begins Expansion Program

Postwar expansion program of Pacific States Steel Corp., Niles, Calif., is now under way with the acquisition of considerable new equipment. According to Joseph Eastwood Jr., president, the company expects to put a 22 inch breakdown mill, now under construction, in operation within the next eight to ten months.

Canadian Iron Ore Company To Start Expansion Plans

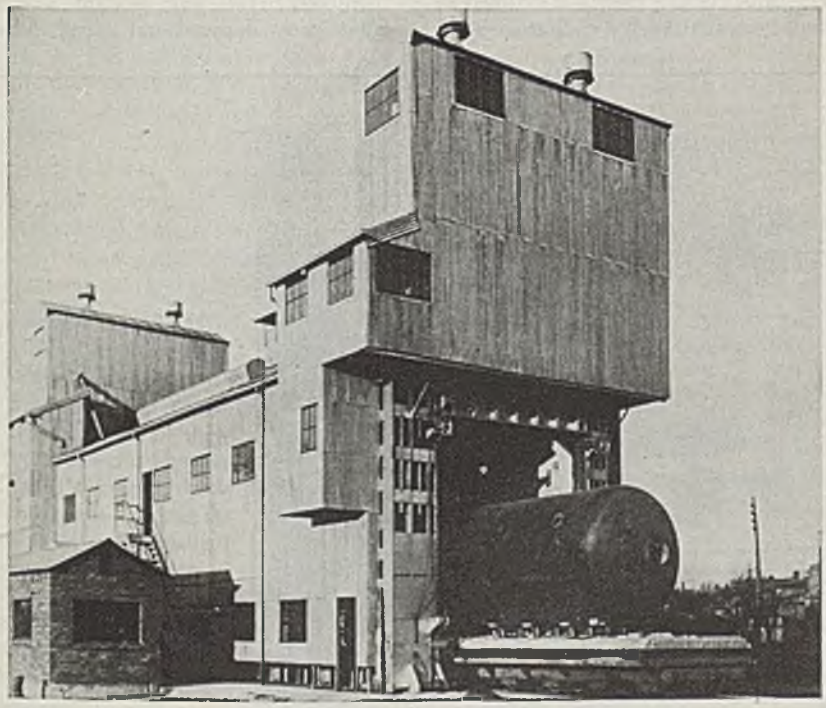
Canada's largest producer of iron ore, Steep Rock Iron Mines Ltd., Toronto, is scheduled for a major program of expansion in the immediate future, according to an announcement made following a meeting of the company's board of directors. The company's ultimate goal, it was stated, is the shipment of 3 million tons of iron ore annually.

Several factors have influenced the decision of the directors to embark on the large-scale program: One has been the demand in both Canada and the United States for the high grade ore of the existing mine; another is the relatively rapid depletion of high-grade ores of the American iron ore ranges. The diminution of higher grade American ores, the directors feel, assures a sustained, long-term demand for the Steep Rock product.

At the meeting, the directors approved plans to bring into large-scale production a second iron ore mine at the company's Steep Rock Lake property in Rainy River district in western Ontario.

Four Sheet Mills May Buy Lowellville, O., Plant

Four nonintegrated sheet mills are planning to buy the Lowellville, O., plant of Sharon Steel Corp., President Henry A. Roemer disclosed. The prospective purchasers are Apollo Steel Co., Apollo, Pa.; Mahoning Valley Steel Co., Niles, O.; Reeves Steel & Mfg. Co., Dover, O.; and Superior Sheet Steel Co., Canton, O.



STRESS-RELIEVING FURNACE: This is the largest of three furnaces constructed by Rust Furnace Co., Pittsburgh, for Chicago Bridge & Iron Co. at Chicago. It is 85 feet long, 15 feet 2 inches wide and 16 feet high. Another furnace for stress relieving welded vessels is being installed at the company's Greenville, Pa., plant and a third, primarily for heating of heavy plates and alloy heat treating, is being erected at Birmingham, Ala.

Plan Announced For Merging of Budd Companies

Edward G. Budd Mfg. Co. and Budd Wheel Co. would be consolidated. Shareholders to vote June 11 on proposal

A PROPOSAL to merge the Edward G. Budd Mfg. Co., Philadelphia, and the Budd Wheel Co., Detroit, is to be passed upon by shareholders June 11 at Philadelphia. The surviving concern would be known as the Budd Co.

In proposing the merger, Edward G Budd, president of the two companies, emphasized that unification would allow the work of one organization to "effectively supplement the other, to the great advantage of the combined company."

The Budd Mfg. Co., with plants in Philadelphia and Detroit, manufactures bodies for automobiles, trucks and highway trailers, and railroad passenger cars. Principal products of the Budd Wheel Co. plants in Detroit are wheels, hubs and drums for passenger cars, buses and trucks; brakes for automobiles and railway cars; agricultural implements; and equipment for heating metals by electrical induction for forging and heat treating.

The ten directors of Budd Mfg. Co. are directors also of Budd Wheel Co. Two additional directors of Budd Wheel, Warren H. Farr, a vice president, and Paul Fuller Jr., would be added to the board of the unified company.

Budd Mfg. Co.'s business volume, Mr. Budd said, is expected to be three times its best prewar volume, at least until the initial postwar demand is satisfied, and prospects of Budd Wheel Co. are that annual sales volume will be three times that of its best prewar year since 1929.

Harris-Seybold Co. Sells Wire Stitcher Business

Harris-Seybold Co., Cleveland, formerly Harris-Seybold-Potter Co., has sold its interest in the Morrison wire stitcher business to Acme Steel Co., Chicago.

R. V. Mitchell, chairman of the Harris-Seybold firm, said his company is experiencing the greatest demand in its history for lithographic presses and paper cutters and that the backlog of orders for them will require full capacity production of all of its facilities.

Fabricators Face Severe Steel Pinch

Prospective shortage of sheets over next two years presents greatest threat to expansion of Pacific Coast metalworking industries

SAN FRANCISCO

IRON and steel fabricating industries on the West Coast will face their most critical period during the next two years, according to S. E. Gates, acting chairman, Iron, Steel & Allied Industries of California.

In a survey of prospects for the iron and steel industry prepared for the California State Chamber of Commerce, Mr. Gates points out that the many uncertainties arising during the transition period from war to peace have been complicated by the wage-price adjustments which are an outgrowth of the steel strike settlement. Up to now the fabricating industries have not completed price changes with the OPA.

In the long run, however, the greatest threat to expansion lies in a prospective shortage of steel, especially thin-rolled sheets in the wider gauges. Mr. Gates points out that at least a year and a half will elapse before rolling mill facilities, now being planned, will be completed. Once Columbia Steel Corp., Bethlehem Steel Co., and Kaiser Co. put into operation new plants to produce sheets, bars and tubular products, West Coast fabricators should have an ample supply for their needs. Now, however, and for for some time to come, they will be restricted by the short supply. Eastern mills, Mr. Gates says, are rationing supplies to old customers and much of the demand from western fabricators is going unsatisfied.

These shortages will especially hamper production of such items as furnaces, stoves, auto assembly components and building products which depend on sheets.

The shortage of steel materials is further intensified by the record-breaking growth of manufacturing plants, and expansion of old-established factories in California during 1945 and thus far in 1946. This expansion and decentralization has resulted in acquisition of sites for 700 new factories, which will require an outlay of $400 million to build. Moreover, this trend is continuing at even a faster pace. A large number of these new plants depend on steel for raw material.

The extent of this growth is outlined in a study prepared by the California State Chamber of Commerce research department, covering expansions during the war period.

For example, this survey points out that machinery manufacturing industries, excluding those making electrical goods, have increased the value of their production from $102 million in 1939 to nearly $627 million in 1944.

This group includes companies making such products as pumps and pumping equipment, oil tools, construction machinery, office and store machinery, agricultural machinery, engines and turbines and household equipment like refrigerators, washing machines, air-conditioning equipment, etc.

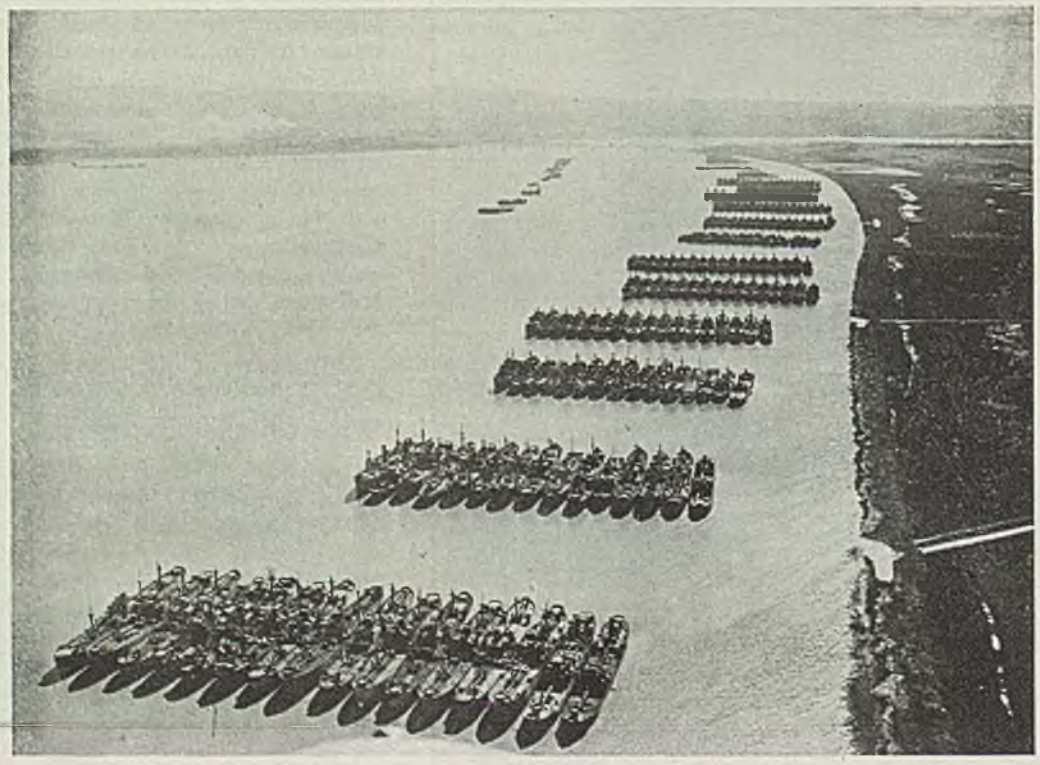
Every indication is, the survey points out, that continued expansion of production and facilities is in prospect for this industrial group.

Electrical Industry Also Expanding

A similar trend is underway in the industries making electrical equipment. Westinghouse Electric Corp., General Electric Co. and Sylvania Electric Products Co. have expanded branch plants on the West Coast, and further expansion is planned.

Automobile assembly is being increased as well. Four new plants are going up in the Los Angeles area, and a new truck manufacturing plant has been opened on San Francisco Bay.

Although the war brought a sharp reduction in shipyard and aircraft plants,



IDLE SHIPS: Scores of vessels ride idly at anchor in Suison Bay, Calif., where they have been stored to await conversion or for other possible future use. Instruments have been removed or covered and the vessels painted against weathering. NEA photo

those industries nevertheless are still operating at considerably higher levels than before the war, an activity which is expected to continue for some time.

The effect of higher prices of steel on construction materials, both of private and public nature, was demonstrated in the necessity for revising plans for a new natural gas pipe line from Texas to Los Angeles. It is estimated that the new line will cost $3.5 million more than was forecast prior to the recent advance in steel prices.

Steel Supply Views Given Concrete Form on Coast

Current credo of western industrialists has been given concrete form in an analysis of Pacific Coast problems first presented by Kenneth T. Norris, president, Norris Stamping & Mfg. Co., Los Angeles, to the Senate Small Business Committee at its recent session in that city.

In briefed form, Mr. Norris' conclusions are as follows:

Before the war, the 11 western states annually consumed in sheet and strip steel some 427,000 tons. Postwar requirements in the foreseeable future will run to about 770,000 tons annually.

This means that (allowing for present meager western production) about 600,000 tons of this class of material will have to be supplied by basic steel mills located in the inland and eastern areas of the nation until such time as greater facilities for steel production are built in the West.

During the war, much tonnage came from Illinois, Indiana, Ohio, Pennsylvania and West Virginia, because a shutdown of water transportation and price readjustment allowed these mills to serve at a profit.

Since the war, water transport has reopened. Several inland steel mills are withdrawing from the Pacific Coast market completely.

To a great degree, the West's reconversion program hinges on production of consumer products either never made there before, or made in small quantities. All these consumer items hinge upon use of sheet and strip steel. Thus employment plans for the greatly augmented population depend upon obtaining of sheet and strip.

It is fair to point out that most eastern mills are allocating their production to customers on the basis of prewar purchases. Although many in the West are included in this "old line" customer list, the fact is that eastern customers "nearer home" are receiving the bulk of production now.

Man-Hour Loss Due To Strikes Cut During March in Los Angeles Area

Only 81,196 man-days lost during month, 62 per cent drop from the 213,815 man-days lost in February. Kaiser steel mill at Fontana has sufficient coal in stock to assure uninterrupted operations until May 1

LOS ANGELES

APPROXIMATELY 81,196 man-days were lost during March in the Los Angeles area because of strikes, it was disclosed last week by the Merchants & Manufacturers Association there.

This was 62 per cent less than the previous month's loss, which totaled 213,815 man-days, the report stated.

Throughout the entire first quarter of 1946, the area suffered from 65 strikes that affected 16,328 workers, who lost wages totaling $4,579,423.

CIO unions directed 98 per cent of the strikes during the period named, while AFL unions called 1.7 per cent.

The association report, based on California Labor Statistics Bulletin findings, contained the following excerpts:

"Employment in all manufacturing industries in the Los Angeles area decreased 9000 between January and February. Retail trade employment increased slightly.

"Average hourly earnings of all manufacturing industries in February were about 2½ cents higher than in January. Average number of hours worked per week by employees in all manufacturing industries in February were 0.2 of an hour higher than in January.

"Number of unemployment insurance claims in Los Angeles, Ventura and Santa Barbara counties for the week ending Mar. 21 was 1.1 per cent lower than the February weekly average."

The Southern California Edison Co. will build a $15 million steam-powered electric generating plant at Redondo Beach near Los Angeles, with a capacity of 120,000 kilowatts, W. C. Mullendore, president of the company, announced last week. The new plant will give the company a total capacity of 1,346,450 kilowatts in the area.

Edison service capacity was increased during the last six months by 135,000 kilowatts through contracts with the Metropolitan Water District and others for use of additional hydroelectric generating facilities at Boulder Dam.

The company's Hayfield-Chino 220,000 volt transmission line, the third Boulder Dam circuit, was placed in service in 1945 to bring additional energy into Southern California.

Consolidated Vultee Aircraft Corp. at San Diego and Downey, Calif., last week ordered a 15 per cent wage boost for employees not represented by a union.

The increases have been federally approved and will be retroactive to last Feb. 1.

Representatives of the company and of the International Association of Machinists, the union currently on strike at the San Diego plant, have slated meetings with United Conciliation Commission panels in San Diego.

Union and company have agreed on a 15 per cent wage raise but have been unable to agree on other bargaining points.

The Ford Motor Co. plant in Long Beach, Calif., employing 1200, shut down for one week from April 4 to 11 because of a shortage of sheet steel. The plant is assembling at the rate of 132 cars per day.

The Kaiser Steel Co. mill at Fontana, Calif., has sufficient coal in stockpiles and enroute from Utah mines to insure pig iron production until about May 1, Thomas Hart, assistant superintendent, said last week.

Bethlehem Steel Co. and Columbia Steel Co. mills in the Los Angeles area, announced no curtailment is foreseen since open hearths are fired with oil.

Sheet and Strip in Short Supply

Fabricating plants in Southern California saw added gloom in the outlook for strips and sheets, already critically short. While no specific shutdowns were reported last week, many plants said that a few days more of shutdowns in the East would undoubtedly force suspension of operations.

So desperate is the need for sheet steel that some plants, notably Timm Aircraft Corp., are advertising widely in western newspapers in pleading for release of sheets and strips, wherever held.

The housing problem continues a major headache among other reconversion obstacles being faced by industry in Southern California. Despite many promises and a plethora of gaudy programs, very few actual homes have been completed since V-J Day, either for veterans or others.

MEN of industry

Capt. Nelson W. Pickering, just released from active duty with the Navy, has been named executive vice president of Republic Industries Inc., New York, control of which recently was acquired by Barium Steel Corp., Canton, O. He will have charge of operations of all of the subsidiaries and divisions of Republic Industries. Until he was called to duty in 1942 with the Navy he was president of Farrel-Birmingham Co. Inc., Ansonia, Conn.

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C. T. Spivey has been promoted to assistant director of industrial relations of Columbia Steel Co., San Francisco, subsidiary of United States Steel Corp.

—o—

John W. Barriger has been named manager of the recently combined Diesel Locomotive Division and Railroad Division of Fairbanks, Morse & Co., Chicago. He had been manager of the diesel division. **John S. King,** who has been acting manager of the Railroad Division, has been named assistant manager of the new division. **V. H. Peterson,** formerly assistant to the president and manager of the New York office of the Baldwin Locomotive Works, has been appointed manager of railroad sales for the Fairbanks, Morse Eastern Division, New York.

—o—

G. N. Beaumariage Jr., with the U. S. Army Ordnance Department for the past three and one-half years, the last two in the Cleveland district, now is works metallurgist, Central Furnaces & Coke Works, American Steel & Wire Co., Cleveland.

—o—

Charles U. S. Grant has been appointed sales engineer for the Cleveland office of Foote Bros. Gear & Machine Corp., Chicago.

—o—

J. A. Zurn Mfg. Co., Erie, Pa., has appointed **Harry Goss** as regional supervisor in charge of the company's San Francisco office, **Neal Derby** as district representative in charge of the Seattle office, and **L. J. Campbell** to the Chicago office.

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H. T. Lintott has been named manager of operations for Pacific States Steel Corp., Niles, Calif. He has been manager of industrial relations for Columbia Steel Co., San Francisco, subsidiary of United States Steel Corp.

—o—

William Beattie has been named manager of the newly formed Wales-Strippit of Canada Ltd., with plant and sales offices at 85 Cannon St. W., Hamilton, Ont.

—o—

Six new members from the metals industry have been elected by the Controllers Institute of America, New York. They are: **Harry J. Longeway,** controller, Michigan Steel Tube Products Co., Hamtramck, Mich.; **Willard E. Roberts,** controller, Carpenter Steel Co., Reading, Pa.; **Robert F. Schutz,** controller, Ingersoll Steel & Disc Division, Borg-Warner Corp., Kalamazoo, Mich.; **Anthony von Wening,** vice president and controller, A. O. Smith Corp., Milwaukee; **Henry I. Barclay Jr.,** controller, Continental Gin Co., Birmingham; and **William F. Staegemann,** controller, Graver Tank & Mfg. Co. Inc., East Chicago, Ind.

—o—

Capt. Myron Tribus, now of the College of Engineering, University of California, Los Angeles, has been awarded the SAE Wright Brothers Medal of 1945 for contributions to the solution of the aircraft de-icing problem in a technical paper, "Report on the Development and Application of Heated Wings," prepared while he was assigned to the Equipment Laboratory, Engineering Division, Air Technical Service Command, Wright Field, O.

—o—

R. S. Stover, formerly district manager of the Washington office of Ampco Metal Inc., Milwaukee, has been appointed supervisor, Philadelphia-Washington district, with headquarters in the Wilford Building, Philadelphia. **Elmer E. Whitson** remains as Philadelphia district manager.

—o—

J. Paul Ahlbrandt has been appointed master mechanic for Bendix Home Appliances Inc., South Bend, Ind. He succeeds **A. R. Grierson** who has become assistant to the president of the Clyde Porcelain Steel Products Corp., Clyde, O. Mr. Ahlbrandt has been acting plant manager for the Midwest Mfg. Co., Galesburg, Ill.

—o—

B. I. Hines has been appointed assistant branch manager of the Ford Motor Co.'s Buffalo plant, succeeding **Llewellyn W. Smead** who has become head of the company's business management department at Dearborn, Mich.

WILLIAM E. MAHIN

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William E. Mahin has been appointed chairman of metals and minerals research at the Armour Research Foundation of Illinois Institute of Technology, Chicago. He formerly had charge of metallurgical engineering at the East Pittsburgh, Pa., plant of Westinghouse Electric Corp., and had done alloy research and development work at Bridgeville, Pa., for the Vanadium Corp. of America, New York.

—o—

William G. Holiday, Indianapolis, formerly a lieutenant colonel in the Army, serving in Australia, New Guinea, and the Philippines, will return to Sydney, Australia, to become assistant managing director for the American Rolling Mill Co., Middletown, O. Mr. Holiday and his wife will sail from San Francisco, Apr. 15.

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Dr. Charles D. Coryell, former chief of a research section on radiochemistry and fission products at the atomic power and plutonium production plant at Oak Ridge, Tenn., has been appointed professor of chemistry at Massachusetts Institute of Technology, Cambridge, Mass.

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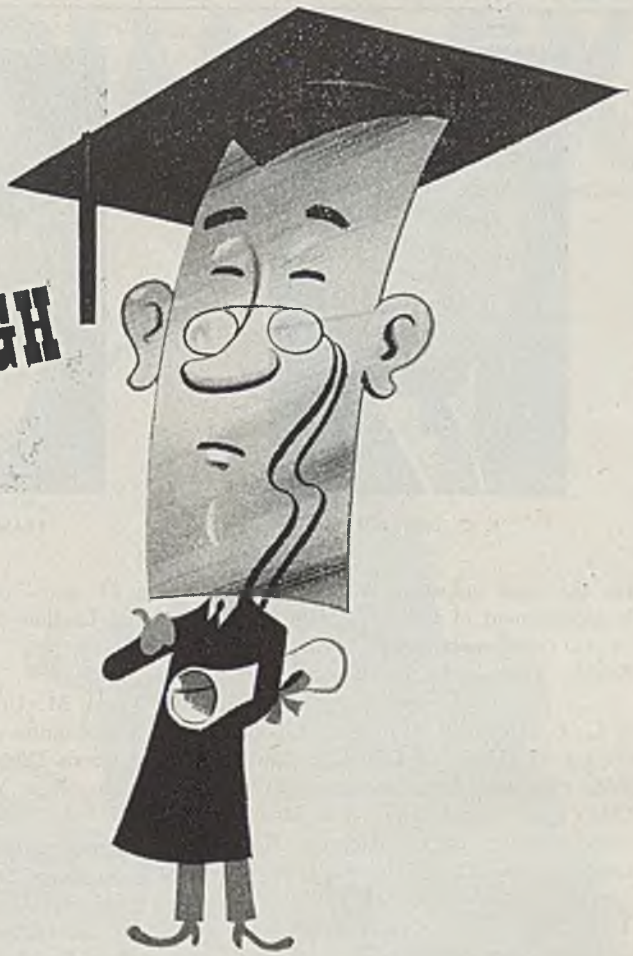
Reynolds Metals Co., Richmond, Va., has formed an Ingot Division with headquarters at Louisville and has announced the following personnel: **R. G. Roshong,** product manager; **J. M. Stuart,** assistant product manager; **T. D. Stay,** technical adviser; **P. C. Beck** and **J. E. Collins,** field service engineers; and **Owen Lee Mitchell,** supervisor of smelting methods and quality control. Function of the new division is the production and sale of virgin aluminum and casting alloy ingot as well as aluminum deoxidizers

SHEET STEEL with a HIGH Q.C.



Every ARMCO mill supervisor knows Q.C.—"Quality Control." He sees it, hears it, and talks it. What's more, he sees to it that "Q.C." guards every sheet of steel that is made for your products.

what it is . . .

Summed up, ARMCO "Quality Control" means just this:

Every mill-order is considered a special-purpose job—because *only one kind of steel* can be the right steel for the customer's product.

All direct orders from customers are "tagged" with special instructions to operators. At every step in production—from open-hearth to the shipping platform—operating men know what's needed and how to produce it.

For example, if the customer's product calls for a difficult drawing operation, a special carbon analysis may be required. Or special annealing and temper rolling—sometimes even changes in the sequence of operations may be necessary.

How do Armco's metallurgists know the answers to strict "Quality Control?"

here's the story

It's not guesswork—or theory. The answers come from experience with similar products; blueprint data obtained from the customer; records and results on all previous orders; chemists' analyses of all previous orders, and mill representatives' data. These and other facts determine the steps in processing.

The ARMCO metallurgist may know you make furnaces, or washing machines—or even auto bodies. But that isn't enough for him. He wants to know exactly what you do with the steel—and *how* you do it.

This is why ARMCO produces special-purpose steels. "Quality Control" means you get the *right kind of steel* for your individual requirements. The American Rolling Mill Company, 1571 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

THE AMERICAN ROLLING MILL COMPANY

SPECIAL PURPOSE ★ ARMCO ★ SHEET STEELS

L. C. DOOLITTLE

FRANK M. URBAN

PAUL J. BEST

for the steel industry. Also announced is appointment of **Leland E. Householder** as chief metallurgist of its Grand Rapids, Mich., extrusion plant.

—o—

L. C. Doolittle has been appointed by the Weatherhead Co., Cleveland, as sales manager of the Aviation Division. Other appointments are: **J. A. Strachan**, sales manager of the Original Equipment Division; **D. W. Holmes**, sales manager of the Standard Parts Division; and **T. V. Scott**, sales manager of the Liquefied Petroleum Products Division.

—o—

Robert Leggat-Weir has been designated assistant sales manager and **Preston W. Wolf**, assistant sales promotion manager, General Detroit Corp., Detroit. Mr. Leggat-Weir joined the company 2 years ago as assistant to the general manager, Extinguisher Division; and Mr. Wolf became associated with the company following discharge from the Army in March, 1945.

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Ray Lance has been elected charter president of the Ten Year Club of the Herman Machine & Tool Co., Tallmadge, O. The club is composed of 31 employees having 10 years or more service with the company. Other officers of the group are: **Harold Dickard**, vice president; **Carl Dunlap**, secretary; and **Lewis Kline**, treasurer.

—o—

Robert G. Glover, formerly with the U. S. Department of State and Department of Commerce, has become vice president of Alberto Ubbelohde Inc., New York, purchasing and export agency.

—o—

A. V. Fingulin, Cleveland, has been named manager of the Decorative Moulding Council, national association of manufacturers of metal and plastic moldings. Mr. Fingulin has operated his own trade association office following 21 years' connection with the National Leather & Shoe Finders Association.

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Frank M. Urban has been advanced to merchandise manager of the Mechanical Goods Division, United States Rubber Co., New York.

—o—

Heman Greenwood, vice president, Carrier Corp., Syracuse, N. Y., has been elected president of the American Brazilian Association Inc., New York, succeeding **Joseph T. Wilson**, world trade manager of International Business Machines Corp., New York. Purpose of the association is to promote good relations and trade between the United States and Brazil.

—o—

Walter Pestrak has been appointed to represent the Progressive Welder Co., Detroit, in its new southeastern Ohio and western Pennsylvania sales district. His headquarters will be at Canton, O.

—o—

P. E. Francis, formerly vice president of North Western-Hanna Fuel Co., St. Paul, and **W. B. Poindexter**, formerly general sales manager, Pittsburgh Coal Co., Pittsburgh, have been appointed vice presidents of the Lake Coal Division, Hanna Coal & Ore Corp., Cleveland.

—o—

Jones Y. Pharr Jr. has been designated southern representative for New Departure ball bearings, New Departure Division, General Motors Corp. His headquarters will be in Charlotte, S. C.

—o—

Walter F. Myers has been appointed assistant district manager of the Washington office, Cooper-Bessemer Corp., Mt. Vernon, O., succeeding **T. E. Kraner** who has been named manager of the company's Venezuela branch. **Laurence B. Hume** has been appointed sales engineer and service supervisor for the territory covered by the Washington district office. Mr. Myers has been with the company since January, 1945, and Mr. Hume recently returned from 2 years' service as a Navy technician in the Pacific area.

—o—

Paul J. Best has been promoted to quality manager of the Crosley Corp., Cincinnati, and **T. J. Michel** has been advanced to production superintendent for Crosley Cincinnati plants.

—o—

Dr. Austin W. Fisher and **Dr. Bruce S. Old** have joined Arthur D. Little Inc., Cambridge, Mass., industrial research organization. Dr. Fisher will supervise chemical engineering research and Dr. Old will engage in metallurgical research.

—o—

James R. Duffy, Sylvania Electric Products Inc., Ipswich, Mass., has been appointed to the company's public relations staff in New York.

—o—

F. R. MacFadyen has been transferred from the Milwaukee office to the Canton engineering department of the Timken Roller Bearing Co., Canton, O., as industrial engineer, and **Walter F. Green** has been promoted to assistant manager of the company's division of reasearch and development, of which **Joseph M. Roshong** has been named superintendent. **Harley J. Urbach** has been appointed works engineer, taking over the former duties of Mr. Green. Mr. Roshong has been with the company since 1923 and Mr. Urbach since 1933.

—o—

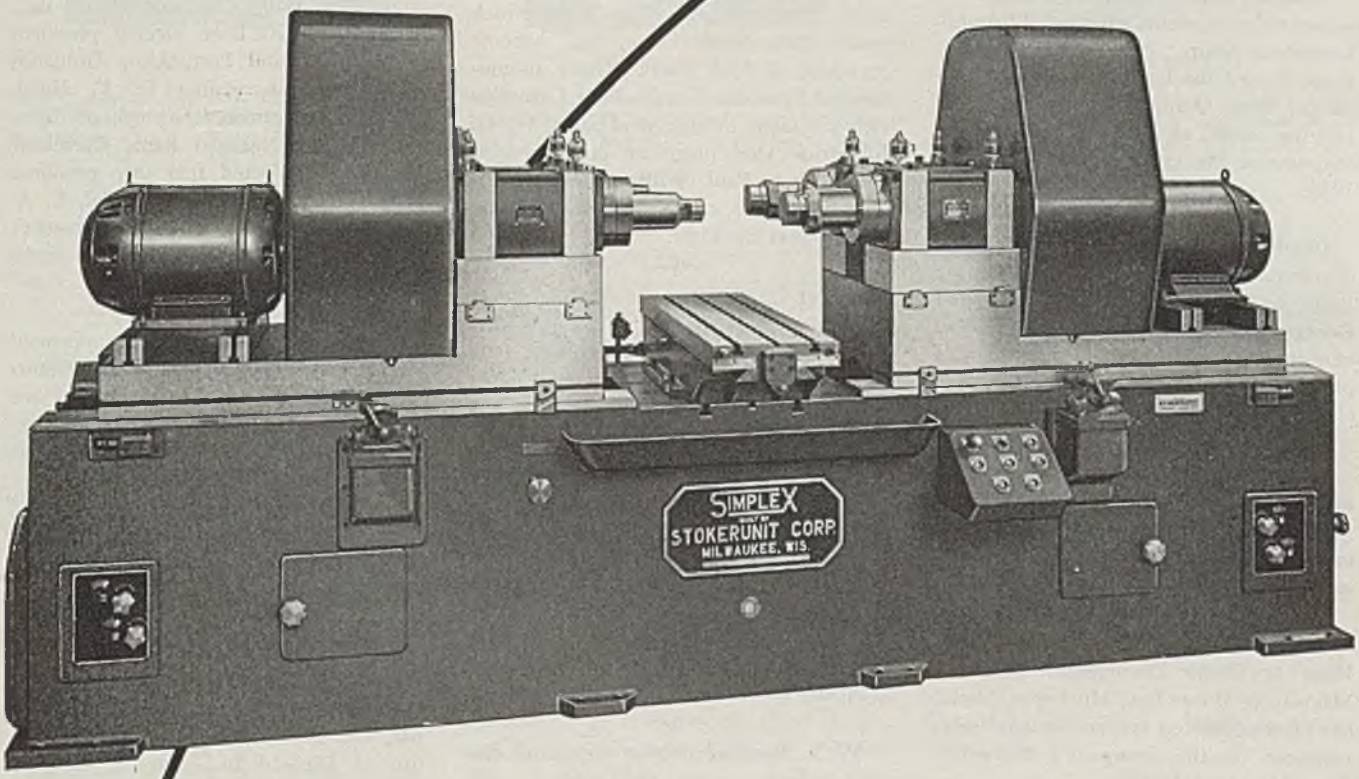
Dr. F. R. Hensel has been elected vice president in charge of engineering of P. R. Mallory & Co. Inc., Indianapolis. Since 1934 he has been chief metallurgical engineer for the company.

—o—

Richard W. Meacham, Birmingham, has been appointed sales representative for the Alabama-Louisiana-Mississippi

SIMPLEX

Increasing wage rates of today make necessary new methods of reducing costs. At medium production rates, this becomes difficult with general purpose machine tools. Simple multiple tooling and fixtures, indexing from roughing to finishing position, offer a new cost reduction method. Tooling costs are low — job possibilities endless.



This photograph shows a SIMPLEX 4U 2-way Precision Boring Machine equipped with four #4 spindles and a hydraulically indexed sliding table operating between adjustable positive stops. On the sliding base a single work holding fixture is mounted providing for operating on the work from both ends. After the roughing operation is completed on both ends, the table is indexed to the finishing position, the finishing operations are performed on both ends simultaneously and the completed job is ready to remove from the fixture to change to the next job. The fixture and tools are removed and retained intact, ready for a quick set-up when the job is again run. The automatic cycle relieves the operator and helps maintain predetermined production schedules.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4532 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

territory of the Stamford Division of the Yale & Towne Mfg. Co., New York. He succeeds "Van" **Waldron**, who has been transferred to the company's New England territory.

—o—

Don Campbell, a Navy lieutenant recently placed on inactive status, has been appointed to the public relations staff of the American Locomotive Co., New York. Prior to serving with the Navy, Mr. Campbell was copy desk chief of the *Herald*, Miami, Fla.

—o—

John G. Patterson II has been appointed secretary and general attorney, Pittsburgh Limestone Corp., Pittsburgh. Mr. Patterson joined the legal staff of Carnegie-Illinois Steel Corp. in November, 1935, and has served as assistant secretary and attorney of the company since January, 1938.

—o—

Charles E. Bunting has been elected chairman of directors of the Bunting Brass & Bronze Co., Toledo, O., and **George H. Adams**, formerly executive vice president, has been elevated to the presidency. **Walter F. Volk** has been elected secretary-treasurer.

—o—

John C. Cairns has been named executive vice president and **Rodman W. Chamberlain**, vice president and general manager, the Stanley Works, New Britain, Conn.

—o—

C. E. Miller, manager of Load-Lifter Hoist & Crane Division of Manning, Maxwell & Moore Inc., Muskegon, Mich., has been appointed assistant general sales manager of the company's Shaw-Box Crane & Hoist Division.

—o—

P. P. Wojtul, formerly assistant to the vice president and comptroller, Continental Can Co. Inc., New York, has been appointed assistant to **Hans A. Eggerss**, executive vice president. **H. A. Swertfeger**, who was chief industrial accountant, succeeds Mr. Wojtul as assistant to the vice president and controller.

—o—

Henry W. Dodge, former vice president and general sales manager of the Texas Co., New York, has been elected chairman of directors of Air Products Inc., Detroit.

—o—

W. R. Harrison, president, Spun Steel Corp., Canton, O., has resigned to enter a new manufacturing enterprise, and **Curtis Franklin**, treasurer of Automatic Products Co., New York, which owns Spun Steel Corp., has become president of Spun Steel. Other promotions in Spun Steel make **John Carnahan** vice president in charge of sales, **W. G. Kilpatrick** vice president in charge of engineering, **Paul Williams** vice president in charge of production, and **Arthur Sowers** treasurer.

—o—

Robert C. Maentz, who had charge of refractory sales in the Pittsburgh district for Permanente Products Co., Permanente, Calif., has been named sales manager for that company's Eastern Refractories Division, with headquarters in Akron.

—o—

B. F. McMahon, manager of sales, Tin Plate Division, Bethlehem Steel Co., Bethlehem, Pa., has retired, and **William J. Stephens** has been promoted to manager of sales, tin mill products. Mr. Stephens has been associated with the company since 1922.

—o—

W. K. Breeze has been appointed district sales manager in Cincinnati for Jones & Laughlin Steel Corp., Pittsburgh. Since early 1940 he has been Pacific Coast manager for Jones & Laughlin Steel Corp., Pittsburgh. He succeeds **M. M. Harper** who has been appointed special sales representative in Cincinnati.

—o—

Directors of Pressed Steel Car Co. Inc., Pittsburgh, have elected the following officers: **Lester N. Selig**, chairman; **J. F. MacEnulty**, vice chairman; **Ernest Murphy**, president; **H. J. Gearhart**, executive vice president; **C. P. Mapp, H. Odle, F. L. Johnson, H. E. Chilcoat**, and **G. J. Lindroth**, vice presidents; **B. W. Harvey**, secretary; and **F. D. Evans**, treasurer.

—o—

Ward M. Canaday, chairman, finance committee, Willys-Overland Motors Inc., Toledo, O., has been elected president of the Cleveland Post, Army Ordnance Association, succeeding **C. F. Hood. John C. McHannan**, chairman of directors, Central National Bank, Cleveland, has been re-elected first vice president of the ordnance group, and **Col. E. A. Lynn**, chief of the War Department's Cleveland Ordnance District, is secretary-treasurer.

—o—

William I. Burt has been appointed vice president in charge of manufacturing and **Dr. Frank K. Schoenfeld**, vice president in charge of technical operations, B. F. Goodrich Chemical Co., Cleveland.

—o—

Richard W. Darrow, former newspaperman and aviation writer, has been appointed public relations director for the Glenn L. Martin Co., Baltimore.

—o—

John R. Barry and **Daniel Maggin**, both of New York, and **James C. Gruener**, Cleveland, are newly-elected directors of Diebold Inc., Canton, O. Mr. Maggin was elected also to a vice presidency in which he will serve as industrial and financial consultant.

—o—

Andrew Jollie is retiring from the chairmanship of the National Association for Rolled & Re-rolled Steel Products, London, England. Succeeding him is **G. H. Latham.** Recently Mr. Latham became president-elect of the British Iron & Steel Federation, London, and is to take office in 1947 to succeed **Ellis Hunter.**

—o—

H. S. Dershimer, who for the past ten years has been district sales manager at Tulsa, Okla., for Babcock & Wilcox Tube Co., Beaver Falls, Pa., has been made assistant sales manager, Mid-Continent District, Tulsa, Okla., for Pittsburgh Steel Co., Pittsburgh.

—o—

H. L. Crowder, traffic manager, Pennsylvania Salt Mfg. Co., Philadelphia, has retired after 30 years' service with the

P. P. WOJTUL

W. K. BREEZE

HUGO A. PULS

Recently appointed director of purchases and traffic, Ingalls Iron Works Co. and Ingalls Shipbuilding Corp., noted in STEEL, Apr. 1, p. 134

JOHN SMYLY

Who has become general sales manager, J. M. Dalglish & Co., St. Paul, noted in STEEL, Mar. 25, p. 84.

C. RIDER BRANDAU

Newly appointed Baltimore district sales manager, Lukens Steel Co. and subsidiaries, Coatesville, Pa., noted in STEEL, Apr. 1, p. 130.

company. He is succeeded as traffic manager by his assistant, **J. G. Robison. William J. Robb** has been named assistant traffic manager.

—o—

Harry M. Clarke has been named assistant to the president of Bliss & Laughlin Inc., and will be located in the general offices in Harvey, Ill. He has been associated with Bliss & Laughlin in a sales and metallurgical engineering capacity.

—o—

At the recent annual meeting of the Mahoning Valley Steel Co., Niles, O., the following were elected officers: **W. Aubrey Thomas**, president; **John P. Hosack**, vice president and treasurer; **Robert W. Wilson**, secretary; **George L. Wick**, assistant treasurer; and **Paul O. Cline**, assistant secretary. Mr. Wilson succeeds the late **John M. Thomas**, who served as secretary of the company many years.

—o—

Kasimir Oganowski, for the past six years supervising metallurgist for the American Rolling Mill Co., Middletown, O., has been promoted to associate director of the company's research laboratories. Other appointments are **Raymond W. Kelly** as assistant general traffic manager in Middletown and **Paul E. McGraw** to succeed Mr. Kelly as traffic manager of the company's Ashland, Ky., Division.

—o—

William Rosenthal, formerly vice president and a director of Hyman-Michaels Co., Chicago, with which he was associated for 41 years, has become vice president of the Purdy Co., with offices at Chicago and St. Louis. Mr. Rosenthal will be joined in the Purdy office at St. Louis by his son, **Richard S. Rosenthal.**

OBITUARIES...

William A. Rogers, 94, co-founder in 1880 of the former Rogers, Brown & Co., noted pig iron firm at Buffalo, and one of the organizers of American Iron & Steel Institute, died Apr. 7. At the age of 75 Mr. Brown retired from business in 1926 to pursue his hobbies of travel and horticulture. Rogers, Brown & Co. specialized in foundry and forge iron. At one time the company was actively interested in 24 blast furnaces in various parts of the country and sold the products of nearly as many more. Mr. Rogers held executive posts in a number of firms, and also was well known for his community service and philanthropy. His share in the development of the Niagara region for the production of iron is said to have helped elect President William McKinley in his "full dinner pail" campaign of 1896. Born in Berkshire, N. Y., Sept. 8, 1851, Mr. Rogers lived his early life at Cincinnati, where his father was a noted physician.

—o—

George E. Van Hagen, 72, president and one of the founders, Standard Forgings Corp., Chicago, died Apr. 5 in Miami Beach, Fla.

—o—

George H. Griffiths, president and general manager of *Hardware Age* and vice president, the Chilton Co., died recently at Orange, N. J.

—o—

Fred D. Lothrop, 57, East Cleveland, O., sales engineer for Joseph T. Ryerson & Son Inc. for more than 25 years, died Apr. 7 in Cleveland.

—o—

Charles A. Cabble, 66, superintendent of William Cabble Excelsior Wire Mfg. Co., Brooklyn, N. Y., died Apr. 7 at his home in Forest Hills, Queens, N. Y.

—o—

Cuthbert J. Brown, 58, secretary and a director of the Wilson Mechanical Instrument Co. Inc., New York, and an authority on pyrometry, died Apr. 7 at his home in Foxboro, Mass.

—o—

Col. Arthur Smith Dwight, 82, president of the Dwight & Lloyd Sintering Co. and Dwight & Lloyd Metallurgical Co., New York, died recently at Hobe Sound, Fla.

—o—

Edwin C. Wilhite, 57, general manager, Wilhite Machine Works, Los Angeles, died in that city Apr. 3.

—o—

Edward F. Ozab, 51, assistant Latin American regional director, United States Steel Export Co., New York, died Apr. 9 at his home in that city. Mr. Ozab had been associated with the company 35 years, serving 21 years in its Havana office, for a time as manager.

—o—

William C. Sproul, 71, vice president, Ingersoll Milling Machine Co., Rockford, Ill., died Apr. 7 at Rockford.

—o—

George G. Cassidy, 55, traffic manager for the last 25 years for Central Foundry Co., New York, died Apr. 5 at his home in Bronxville, N. Y.

—o—

Peter Thompson, 70, president, Thompson Bros. Boat Mfg. Co., and Unit Structures Inc., Peshtigo, Wis., died recently at Marinette, Wis.

By CHARLES W. BRIGGS
Technical Research Director
Steel Founders' Society
Cleveland

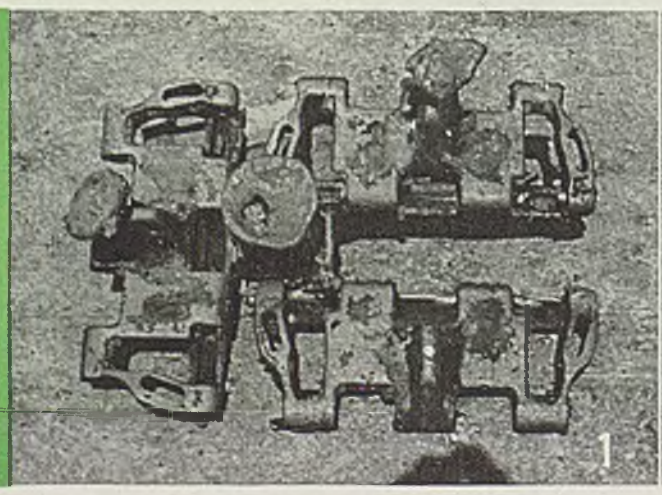
THE GERMAN Steel Casting INDUSTRY

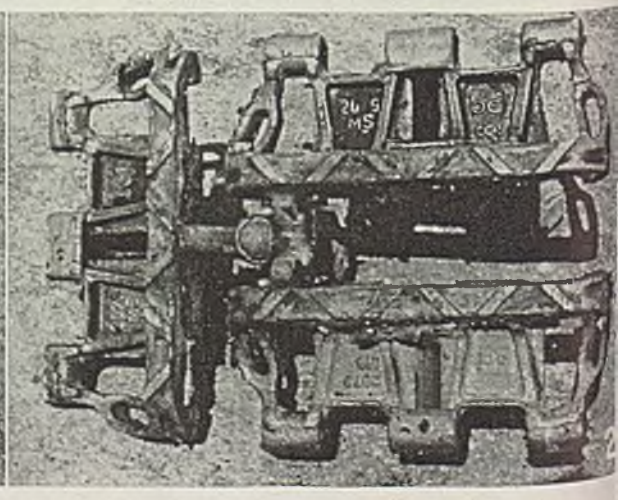
Many items normally produced as drop forgings, press forgings or weldments during emergency were cast in gray iron foundries converted to production of steel castings. Study of industry indicates very few improvements or innovations and quality below United States standards

STEEL CASTINGS weighing a few ounces, to those weighing 230 tons, were produced by the German steel casting industry. Castings were, for the most part, armament castings, or parts of equipment to be used by the armed forces. Major classifications were: Armor castings, tanks, tractors and automotive castings, aircraft, submarine and ship castings, projectiles, guns and gun carriages and parts. Castings produced to assist the prosecution of the war were: Synthetic gasoline cracking plant castings, locomotive and railroad castings, mining equipment, castings for heavy machinery such as presses and power plant equipment castings.

A portion of the castings produced would not be made as steel castings in peactime, as they were more economically suited as drop forgings, forgings or weldments. Such items were produced because of the limitation of process capacity. Thousands of such castings weighing from a few ounces to a few pounds were produced in the gray iron foundries converted to the production of steel castings. These castings averaged 85 to 90 per cent yield, as no risers were used.

Basic Open Hearth: The average size of open-hearth furnaces was from 30 to 35 tons capacity. A few, such as those at the Wertmar Plant, Bochum Verein, were 60





tons capacity. An opinion held by a number of the German engineers was that the best quality of basic open-hearth steel could be produced for castings in furnaces of about 30 to 35 tons capacity.

For the most part, the furnaces contained rammed bottoms of a mixture of dolomite and 6 to 12 per cent tar. Bottoms of this type were favored, as it was claimed that steel of lower sulphur content could be obtained than if magnesite bottoms were used.

There was very little instrument control equipment at the furnaces, considerable reliance was placed on the knowledge and experience of the melters and melting superintendents. These men, for the most part, had been with their organization many years and a great percentage of them had doctor's degrees. Slag control consisted of slag pancake tests with close observation of the fracture color.

It was a general rule that the last slag sample should not contain more than 10 per cent FeO. In a number of plants, chemical determination of FeO required approximately 10 min.

The furnaces for the most part were fired by coke oven gas and generator gas. At meltdown the carbon usually averaged from 0.85 to 1.00 per cent and carbon drop averaged between 0.15 and 0.30 per cent per hr. When phosphorus content at meltdown was high, which was the normal state of events, the slag was run off in the tilting open hearths and tapped through a slag hole in the stationary furnaces. In the latter case slag was removed from the ladle, and the molten metal coming over with the slag was recharged to the furnace. In many cases three slags were used to produce steel of the proper phosphorus content. Phosphorus and sulphur content of finished steels averaged 0.02 per cent each.

Acid Open Hearth: Only three steel foundries—Krupp, Deutsche Eisenwerke, Ruhrstahl Gelsenkirchener—produced acid open-hearth steel for castings; capacity of these furnaces was from 20 to 30 tons. The process was not liked for steel castings by German foundrymen inasmuch as they were unable to obtain the low sulphur contents which they believed should be kept to an average of 0.02 per cent or lower to keep hot tears at a minimum and to maintain high ductility on the addition of aluminum.

Charge normally consisted of 25 to 30 per cent low phosphorus and low sulphur pig iron, with the remainder as basic open-hearth scrap. The carbon content at meltdown would fall from 0.60 to 0.80 per cent. Ore additions amounted to 0.7 to 1.2 per cent of the charge. A long oxidizing period was maintained as it was believed by the German steelmaker that only in this manner could high-grade acid steel be made. Phosphorus and sulphur contents of finished steels averaged about 0.04 per cent each. This steel was used primarily as a non-specification steel for such as mine car wheels, pulleys, automotive castings and such castings of a round or symmetrical shape where hot-tear formation would be at a minimum.

Basic Electric: Capacity of the basic electric furnaces in the steel foundries averaged from 2 to 40 tons. The major types used were: (1) The stationary; (2) the stationary furnace with the roof rolled out over the pit (Stein-Roubair); (3) the stationary roof with the furnace rolled back over the charging floor (Brown-Bovori); and (4) the 30-degree rotation rolled-back furnace with stationary roof (DeMag).

All furnaces were lined with dolomite and 6 to 10 per cent tar. Bottoms were rammed 16 to 20 in. thick for 8 to 40 ton furnaces. Slide walls were rammed to a thickness of from 10 to 12 in. Roofs consisted of silica brick normally laid in rows instead of in the concentric fashion normal in the United States. Average rerfactory life was: Hearth 600 to 1000 heats, side walls 80 to 100 heats, roof 60 to 100 heats. The Soderberg type of electrodes were largely used. A 6 to 8 ton furnace required 18-in. diameter electrodes.

Carbon content at meltdown averaged from 0.50 to 1.00 per cent and all furnace operators required at least a 0.30 per cent carbon drop during the boil. During the oxidation period from 2 to 5 slags were taken off to assist in phosphorus removal. During the refining period an operation of from 1-1½ hr under a white disintegrating slag was required. All ferroalloys were heated prior to their addition to the furnace to free them from moisture and possible hydrogen pickup. Ferrosilicon was heated to 1000-1300° F to remove hydrogen. Slag-making materials were kept in dry places to keep moisture absorption to a minimum.

In a number of foundries a rule was maintained of not permitting the finishing slag to contain more than 1 per cent total of iron, manganese and chromium; otherwise, no slag analyses or viscosity tests were made. Metal fluidity tests were conducted only in connection with thin-walled aircraft castings. Phosphorus and sulphur contents were for the most part under 0.02 per cent each. Occasionally, for less critical castings, the permissible phosphorus and sulphur was upward of 0.035 per cent.

A number of German steel foundries were engaged in producing light-walled aircraft steel castings which were finished to sections of ¼-½-in. The steel was made in

Fig. 1—Cope view of tank track castings

Fig. 2—Drag view of tank castings

Fig. 3—Large casting illustrating top-gating technique used

the basic electric furnace and because of the light sections, it was necessary that the steel be tapped very hot (from 3100 to 3300° F).

A Ruff fluidity test was employed at the furnace for aircraft castings, using a 5 mm diameter channel. A minimum fluidity of 320 mm (12½ in.) for the aircraft castings was run. Since extremely hot steel was required for the casting of the thin-walled aircraft castings, the acid roof life on the basic furnace was rather low until the Krupp ring was used. The Krupp ring is a cast water jacket that is installed around each electrode, and extends entirely through the roof.

The exposed metal face was from one to 2 in. wide. Cold water was projected along the exposed section. Fig. 4 shows a cross-section through the ring, in place in the roof, and Fig. 5 shows the method of holding the rings so that they are not a part of the weight applied to the brick roof.

With use of the Krupp ring, the life of the roof was increased from 25 heats to 150 heats per lining at Rochling Stahlwerke Volkingen, near Saarbrucken. The management was very enthusiastic concerning the value of the Krupp ring.

Acid Electric: Only two steel foundries in Germany used the acid electric practice—Deutsche Edelstahlwerke, Remscheid, and Eisengiesserei Streicher. Only carbon steels were produced by this method. The castings were small and poured by hand shanks, hence a good degree of metal fluidity was required. The castings were not made to specifications and, for the most part, were automotive castings.

Ore was added with the charge and again at meltdown. Carbon content at meltdown was from 0.30 to 0.40 per cent, whereas after the boil it was 0.15 to 0.20 per cent. The FeO content of the oxidizing slag was 25 to 40 per cent. Spiegel was used to slow the boil, and a partial slag-off was made at the end of the boil to lower the FeO content. Sand and limestone were used for the refining slag. The melter aimed to produce a high green finishing slag. All heats were tapped at 3100°F or above. Aluminum in quantities of 1.5 to 2 lb per ton was added to ladles and hand shanks.

Acid Converter: Most of the converter furnaces in the steel foundries were approximately 2 tons capacity, and they were lined as shown in Fig. 6. Lining life was from 80 to 100 heats.

Cupola iron of 2.3 to 2.8 per cent carbon, and 1.3 to 1.6 per cent silicon, 0.10 to 0.12 per cent sulphur and 0.07 to 0.08 per cent phosphorus were used. The alkali treatment of the cupola metal for removal of sulphur was not carried on too efficiently, as a record of sulphur reduction below 0.08 per cent was seldom encountered.

Operation of the acid converter in Germany was similar to that in this country. The ferromanganese was usually preheated to temperatures above 1200° F before adding it to the converter. A 20 to 25 per cent greater recovery of manganese was possible because of the preheating requirements. Ferrosilicon was also heated above 1200° F.

(*Please turn to Page 118*)

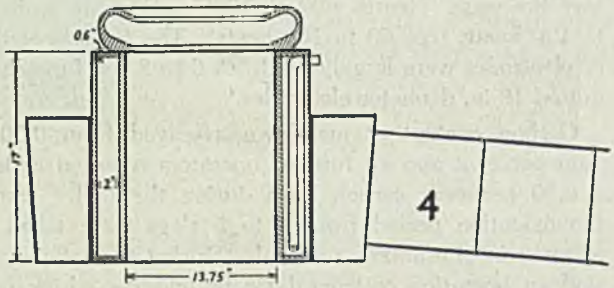


Fig. 4—Cross section of Krupp ring

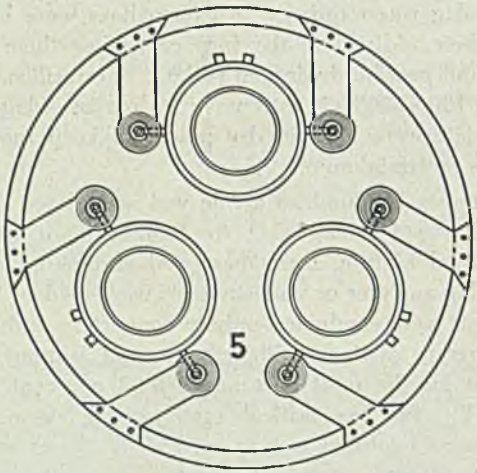


Fig. 5—Attachment of Krupp ring to furnace is made so that it is not a part of weight applied to the roof

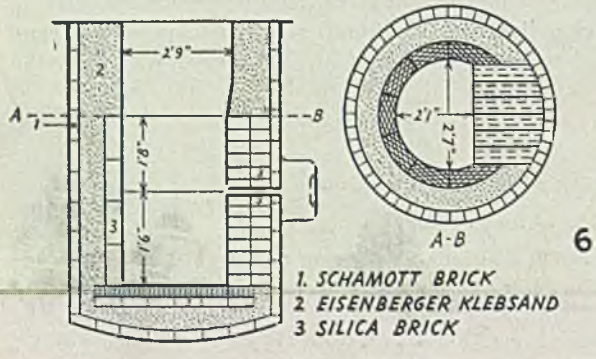


Fig. 6—Typical lining that is used in German acid converter

CAST STEEL DIN 1681

MINIMUM VALUES

NO.	TENSILE STR. p.s.i.	YIELD POINT p.s.i.	ELONG %	R.A. %	IMPACT mkg/cm²
NORMAL GRADE					
38.81	54,000	—	20	—	—
45.81	64,000	—	16	—	—
52.81	74,000	—	12	—	—
60.81	85,000	—	8	—	—
SPECIAL GRADE					
38.81 S	54,000	25,600	25	—	—
38.81 K	"	"	"	—	7
38.81 B	"	"	"	25	—
38.81 BK	"	"	"	"	7
45.81 S	64,000	31,000	22	—	—
45.81 K	"	"	"	—	6
45.81 B	"	"	"	20	—
45.81 BK	"	"	"	"	6
52.81 S	74,000	35,500	18	—	—
52.81 K	"	"	"	—	4
52.81 B	"	"	"	17	—
52.81 BK	"	"	"	"	4
60.81 S	85,000	51,000	15	—	—

Automatic Crankshaft Lathes

More automatic, and faster than prewar predecessors, four improved lathes perform essential turning operations on crankshafts with utmost efficiency

FOUR improved machines which complement each other and together comprise a well rounded assortment of automatic crankshaft lathes signalize resumption of normal production for industry at R. K. LeBlond Machine Tool Co., Cincinnati. Designed to perform such turning operations as rough and finish turning, filleting, cheeking and shaving, with special emphasis on the machining of bearings, these machine tools are said to incorporate features which make them more automatic and much faster than the models produced before the war.

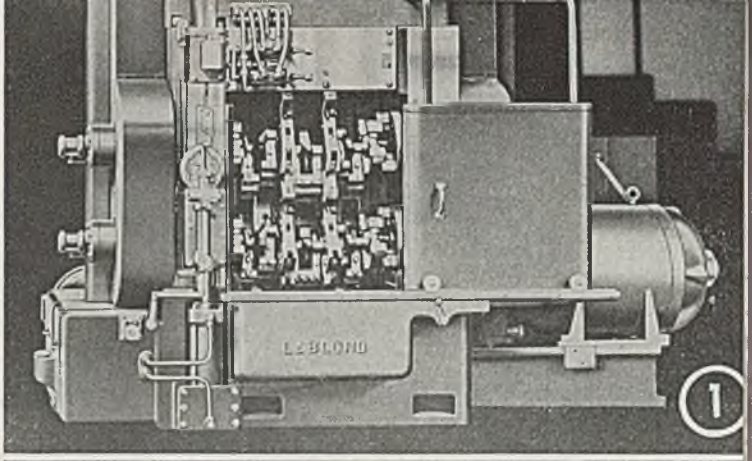
This group consists of one model (6AC) for rough or finish turning of all pin bearings; another (7ACL) for rough turning all line bearings; a third (1LB) which combines rough and finish turning of line bearings; and the fourth (DM) for finish turning of line bearings.

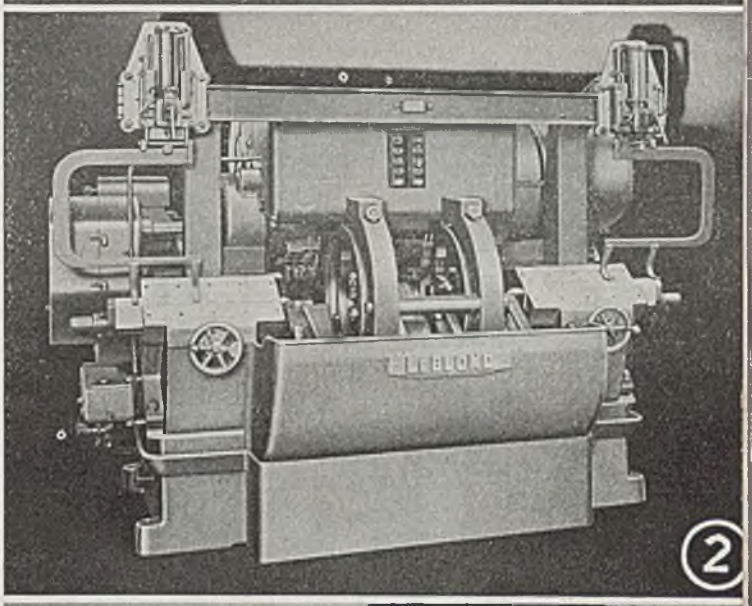
In Fig. 1 is shown model 6AC, built for simultaneous rough turning of pin bearings on both spindles or simultaneous finish turning of pin bearings on both spindles. It is a 2-spindle machine, provided with drive from both ends in hydraulically operated pot type chucks.

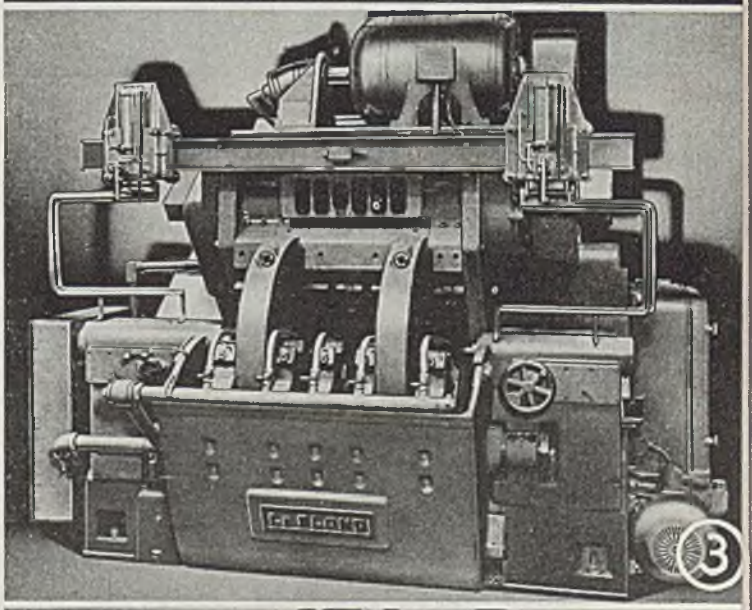
Two master crankshafts, enlarged duplicates of the crank to be machined, pattern the movement of the tools through the cycle of rapid traverse to start of cut, feed movements to the sizing stop, and rapid return to starting position. Predetermined design of cam allows variation of feed on any part of cut. Dynamic reversing switch automatically stops the spindle at any predetermined position. Control circuit is interlocked with chucking valve. Average production is 30-50 cranks per hour.

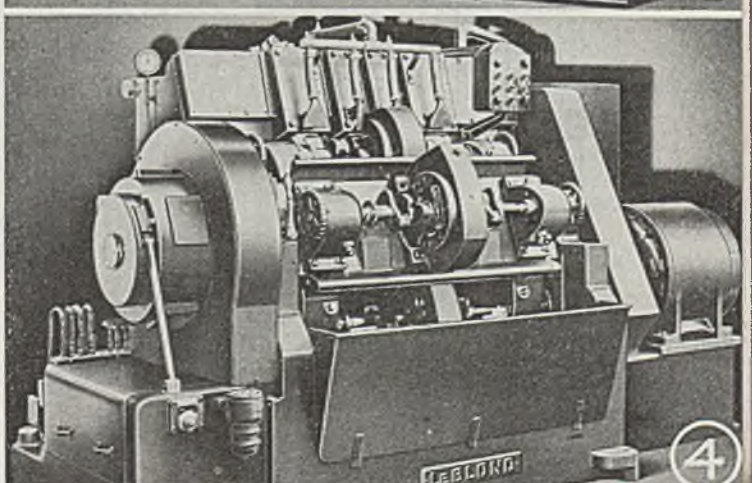
The 7ACL type, Fig. 2, provides single or double-center drive for rough turning all line bearings in one operation. Driving head and tools and mechanical feed are electrically powered. Dwell is provided at the end of the cut to remove rough tool marks. Tool is equipped with air-operated carrier crane for handling of crankshafts in and out of ma-

(*Please turn to Page* 145)

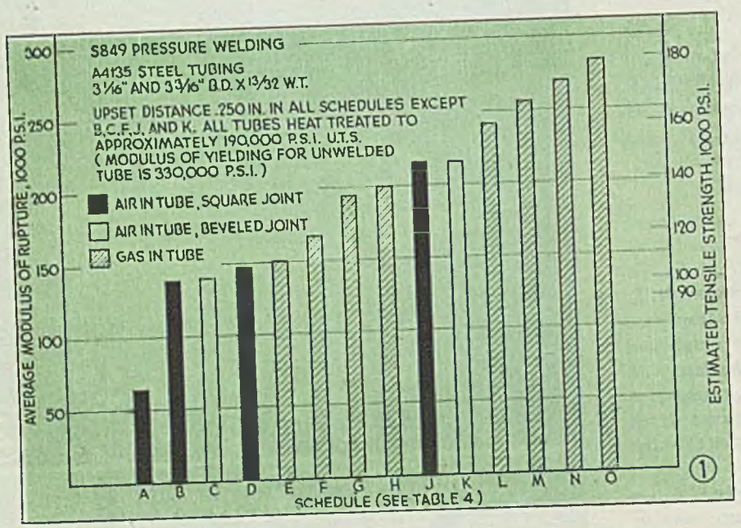




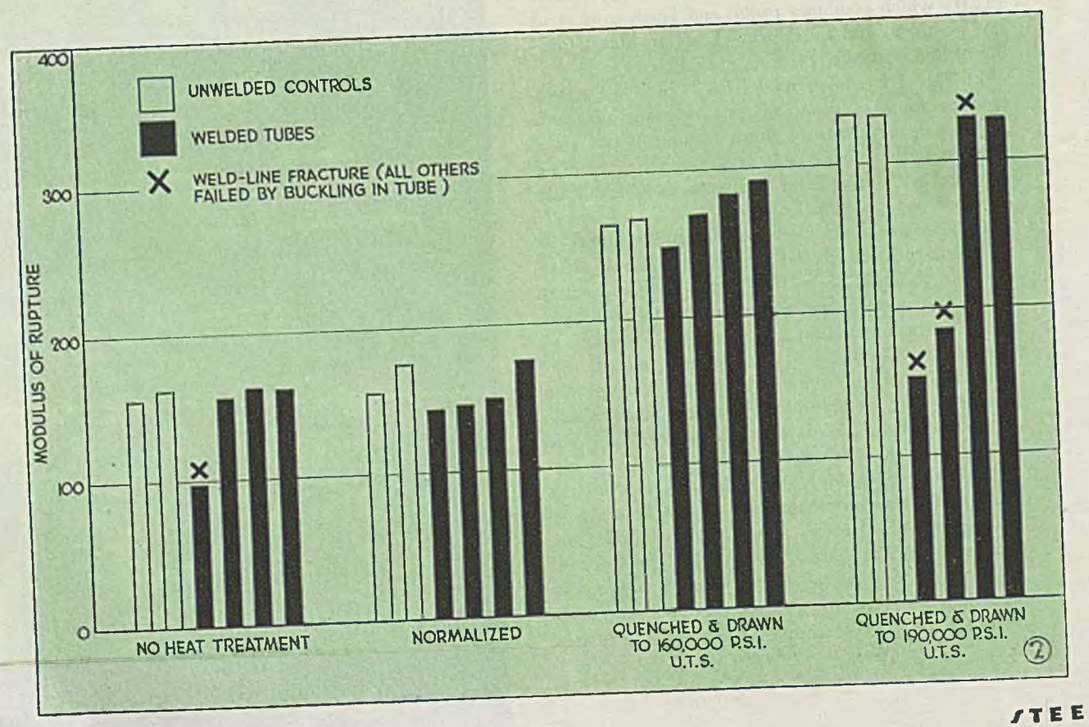




High-Strength PRESSURE WELDED JOINTS



Investigation by the authors for WPB's Office of Production Research and Development provides basis for prediction that more efficient utilization of the protective gases helium and hydrogen, during the heating cycle in welding, will aid development of lighter automotive, airplane and other alloy steel parts



By C. B. VOLDRICH and J. L. ZAMBROW
Battelle Memorial Institute
Columbus, O.

Improvement in designs of machines may result from tests recently completed on new pressure welding processes of alloy steels, according to the final progress report on WPB Research Project NRC-558 which describes results of various oxyacetylene pressure-welding tests on 3 1/16 and 3 3/16 in. OD by 13/32-in. wall A-4135 seamless steel tubing. Objectives of the tests, conducted at Battelle Memorial Institute, Columbus, O., under the sponsorship of CPA's Office of Production Research and Development, were as follows:

(1) To determine the structural properties of pressure-welded joints in alloy steels.

(2) To determine the most favorable welding technique for several sizes, shapes, and steel compositions.

(3) To determine the range of variation in welding technique which can be tolerated without affecting the properties of the welded joints.

(4) To investigate the effects of individual variables in the process (pressure, temperature, duration of heating sequence of operations, etc.) on the quality of the pressure-welded joints.

Results of the experiments, outlined in the 217-page report, are summarized by the authors in this article.

THE greater part of the experimental work was done using the closed-joint pressure-welding method, in which the faces to be joined are butted firmly together, heated from the outside, and upset when the weld zone has become plastic. Various forms of this technique are being used today for the joining of carbon steel parts such as pipe lines and railroad rails, and as is the case with flash-welded joints, a substantial reinforcement is left on the weld. Comparatively little is known about pressure welds in alloy steels, particularly regarding their strength and performance when all of the weld upset or reinforcement is removed, and the part is heat treated after welding. For some applications, as in the aircraft industry, it is often desirable to have no weld reinforcement, and it was to study joints in this condition that the tests described in this report were made.

After sufficient preliminary work had been done to roughly indicate the optimum welding conditions and settings for the size of tubing and type of oxyacetylene burners available, the experimental work was directed toward improving the weld quality by variations in the welding schedule and joint preparation, and by protecting the welding faces from oxidation during the heating cycle. The various schedules used are summarized in accompanying table and the results of bend tests on welded joints made according to those schedules are shown in Fig. 1.

BENDING TESTS OF CLOSED-JOINT PRESSURE WELDS[1]

Schedule	Atmosphere In Tubes	Type of Joint	Pressure	Upset Distance In.	Average Modulus of Rupture, psi[2]
A	Air	Square	Dual	0.25	64,000
B	Air	Square	Dual	0.50	138,000
C	Air	Beveled	Constant	0.375	139,000
D	Air	Square	Constant	0.25	144,000
E	Helium[4]	Square	Constant	0.25	151,000
F	Helium[3]	Beveled	Constant	0.50	169,000
G	Nitrogen[5]	Square	Constant	0.25	194,000
H	Hydrogen[4]	Square	Constant	0.25	200,000
J	Air	Square	Constant	0.50	216,000
K	Air	Beveled	Constant	0.50	217,000
L	Helium[5]	Square	Constant	0.25	240,000
M	Helium[3]	Internal Bevel	Dual	0.25	256,000
N	Helium[5]	Internal Bevel	Constant	0.25	269,000
O	Hydrogen[3]	Square	Dual	0.25	284,000

[1] See also Fig. 1.
[2] All tubes heat treated to approximately 190,000 psi ultimate tensile strength. Modulus of yielding for unwelded tube heat treated to 190,000 psi is about 330,000 psi.
[3] Gas passed directly from cylinder to tube.
[4] Gas dried in $CaCl_2$ drying tower before introduction into tube.
[5] Gas dried by chilling with dry ice and passing through magnesium perchlorate before introduction into tube.

Perhaps the principal conclusion that can be drawn from this work is that it is considerably more difficult to attain 100 per cent weld-joint efficiency in an alloy steel part, from which all the weld reinforcement has been removed and which is heat treated after welding, than in a plain carbon steel or alloy steel part which is left with the weld upset intact. In the tests described in the first progress report, the weld reinforcement was not removed from the specimens, nor were they heat treated after welding, and it was not very long before welding sequences had been established which produced welds that were as strong in bending as the adjacent tube material. However, when similar welded tubes were machined smooth on the outside and inside to remove the upset, and the tubes were heat treated to a high tensile strength, most of the specimens failed on the weld line when tested in bending. Some of the weld failures took place at very high loads, but in general the load required to produce failure on the weld line was less than that required to cause buckling of an unwelded tube.

It is possible to make pressure welds which, if the strength and service requirements are not too severe, and some weld reinforcement is retained, will consistently be as strong as the stock. As the strength requirements are increased, and as the weld reinforcement is reduced or eliminated, it becomes increasingly more difficult to secure 100 per cent joint efficiency. This situation is encountered in other forms of welding, such as flash-welding and arc welding. If the results reported here suggest difficulties in obtaining 100 per cent efficiencies under relatively severe conditions, it may be recalled that pressure welding is no different than other types of welding.

Numerous welding schedules were tried in an attempt to improve the quality of the welded joint so that it would have a unit strength equal to that of the parent tubes. Various combinations of pressure, rate of heating, duration of heating, oscillation of the ring burner, and amount of upset were tried. With some schedules strong welds were obtained, but it was still impossible consistently to produce

(*Please turn to Page* 136)

ADHESIVES ...and theory of adhesion

Fig. 1 — Demonstration panel of 10 different materials bonded together with Pliobond

Fig. 2—Examples of dissimilar materials and those of a kind bonded together with an adhesive bonding agent. Photos for Figs. 1 and 2 courtesy Goodyear Tire & Rubber Co.

Industrial applications of adhesives for bonding metal, wood, rubber and plastic parts is expanding rapidly. This survey of nature of adhesion is based on physical and chemical forces involved

ADHESIVES have a great many industrial applications and their requirements may vary within wide limits. There is not, and is not likely to be an adhesive of universal applicability. The general conception of an adhesive is that it is a substance applied as an intermediate layer between two surfaces to stick these to each other. This definition, however, is not entirely precise since it does not include all substances which can be called adhesives—such materials as paper sizes, the adhesives that bind together fine cellulose fibers to a continuous paper sheet; yet, it seems to cover metals used to solder together two metal surfaces, which are not ordinarily considered as adhesives.

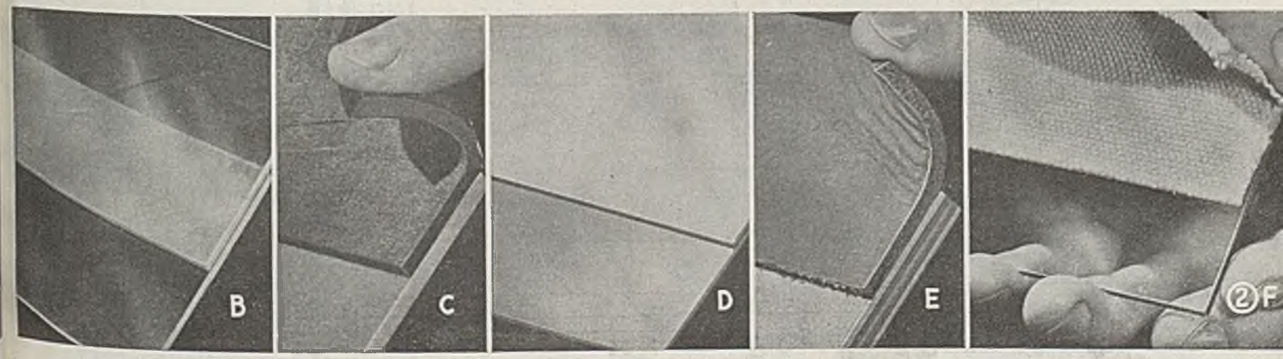
In each production problem there is usually a particular type of adhesive which most nearly meets the requirements. Pure substances are seldom used as adhesives. In most cases modifying agents are added to the basic adhesive. These modifying agents can be plasticizers, dryers, etc. depending to a large extent on the basic adhesive and the application of the finished product. The various synthetic resins such as urea-formaldehyde, phenol-formaldehyde, vinyl and acrylic resins and their modifications have found recent application as both metal and wood adhesives.

One of the current important uses has been in the plastic plywoods, in which case the advantageous qualities of synthetic resins are united with those of the wood. Often a rubber, either natural or synthetic, and a synthetic resin are combined, either beforehand or at the time of using the material and heat or pressure applied during bonding to "set" the adhesive.

Adhesive joining of metals, accomplished several years ago by the Cycle Welding and Reanite bonding materials, found important wartime use in the aircraft industry. New adhesives are being added to those which were tested and accepted for use in the manufacture of military aircraft. Consolidated Vultee Aircraft Corp. successfully used its Metbond in the building of the Liberator bomber; B. F. Goodrich has announced its Plastilock 500 for bonding of metals; and Goodyear Tire & Rubber Co. is actively promoting its synthetic adhesive, Pliobond.

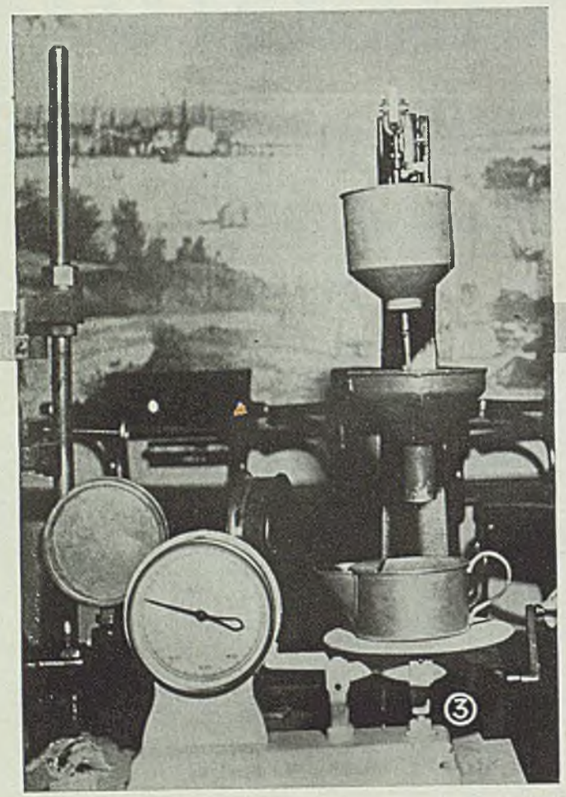
Possibilities

Important uses, and probably the most important future possibilities for the new organic bonding materials lie in the field of composites, in which two or more different materials are joined together. During the wartime construction program on glider ski pedestals, rubber was joined to metal so securely that the rubber itself would tear before the bond would fail. "Sandwich" materials in which an inner and outer sheet of one material, such as aluminum or wood veneer are separated by a layer of another material, have been very successful. Metal sheathed plywood has been used in the construction of railroad cars, door panels, and the bulkheads of ships[1]. Because of the ability to bond metal to metal, certain of the adhesives may be used to assemble jigs and fixtures quickly and accurate-



ly. Heat requirements for bonding of this type is usually insufficient to cause warping of the metal. If necessary, the bond may be disassembled by suitable means that will not harm the assembly.

In delicate instruments and equipment where riveting, soldering or welding is difficult or impossible, an adhesive may prove extremely useful. Many of the synthetic adhesives are also sealants, and may therefore be used for such jobs as putting together a motor case or small working part that must work in or near gasoline or lubricating oil. In some instances the strength and stiffness of the



continuous bonds such as obtained with adhesives were found to exceed those having intermittent types of fastening, such as riveting or spot welding. During the war the aircraft industry found that the continuous bonding methods—by means of suitable adhesives—permitted the use of unskilled labor instead of the skilled labor needed for riveting, and the cost of assembling certain parts was reduced to a fraction of their former riveting costs[2].

Materials that can be joined by adhesives include aluminum, steel, zinc, magnesium, and most structural metals, glass, natural and synthetic rubbers, wood, textiles, and most plastics. However, no one adhesive is best suited for the entire range of materials. In the manufacture of civilian goods the group of adhesives are certain to find increased application in the building trades and the manufacture of furniture, refrigerators, and radios, as well as in automotive and railway construction.

Nature of Adhesion

The theory of adhesion is still in an elementary state. The development of adhesives for bonding metal, wood, rubber, and plastics has been largely empirical. It is generally recognized that there are two types of forces which hold materials together, cohesive and adhesive forces. Cohesion is usually thought of as the attraction between like materials, and adhesion the attraction between unlike materials. In thinking of these general terms, it should be kept in mind that the strength of metals such as aluminum and steel is largely due to adhesive forces. For example, the precipitation of carbon between ferrite crystals in carbon steels results in high intercrystalline adhesion and accounts for the high strength of these alloys. Thus the importance of adhesive forces cannot be overemphasized.

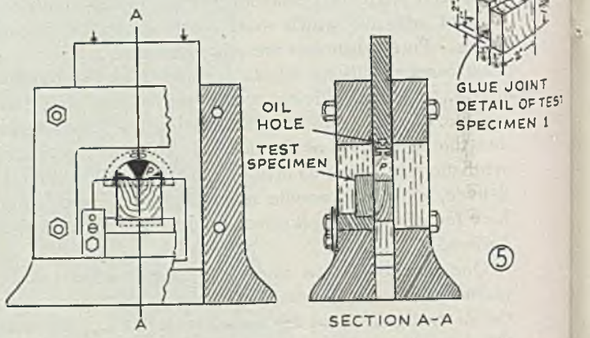
Theoretical Aspects of Adhesion[3]

Intermolecular and Interatomic Forces:

All matter is composed of discrete particles or atoms which are held together by electrical forces of attraction. These forces operate between the positively charged atomic nuclei and the negatively charged orbital electrons. By studying the physical and chemical properties of compounds of atoms it has been possible to recognize certain types of these attractions as differing from others. These differences, however, are not distinct and only in extreme cases is a bond a manifestation of a pure type. It is much closer to the truth to think of these bonds as having well defined properties, but to bear in mind that the transition from one type to another is not sharp but may be very gradual. When a bond is formed it does not mean that all the forces between the electrons and nuclei of the two participating atoms have been neutralized, but rather that a force concentration has been set up in a certain direction. Residual energy is always present.

In explaining chemical and physical phenomena of adhesion it is convenient to recognize four general types of bonds: (A) Electrostatic; (B) Covalent; (C) Metallic; (D) Residual bonding attraction forces, commonly known as Van der Waals forces.

Electrostatic forces are set up when, for example, an atom of potassium combines with one of chlorine by means of an electron transfer to form a molecule of potassium chloride. This association can be interfered with, however, by solution in water, in which case the potassium chloride will dissociate into chlorine as a negative ion and potassium as a positive ion. In many molecules it is difficult or impossible to determine which atom is positive



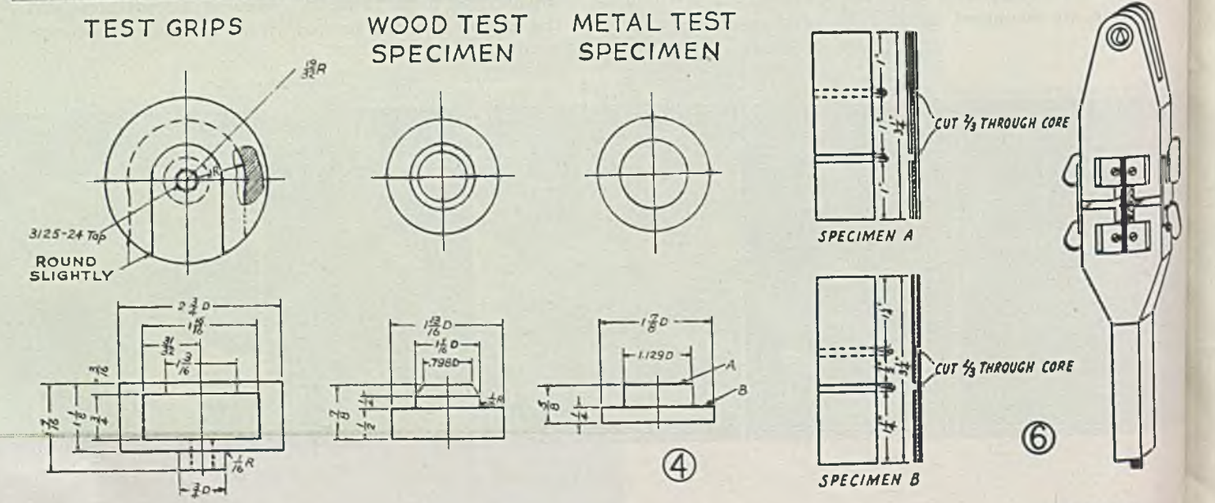


Fig. 3—Shear test of plastic adhesive. Flat sheets of stainless steel bonded to stainless steel, etc., are tested on this Riehle tensile tester wherein psi of force necessary to separate bond in shear is measured. Some adhesives withstand between 500 and 1000 psi

Fig. 4—ASTM tensile test specimen (NACA-TN 989)

Fig. 5—Block shear specimen and tool (NACA-TN 989)

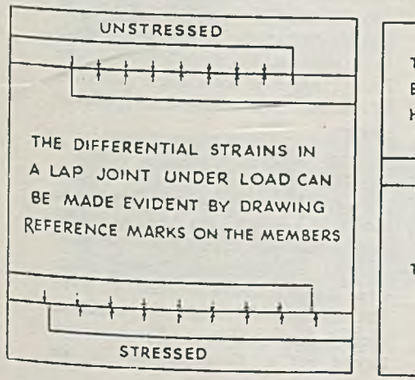
Fig. 6—Plywood shear specimens and grips (NACA-TN 989)

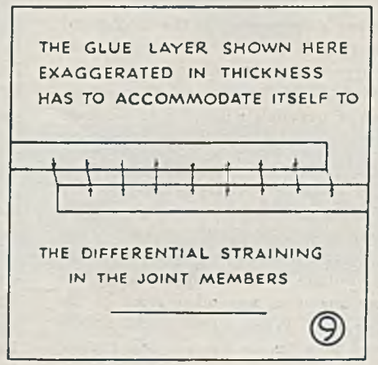
Fig. 7—Cylindrical single shear specimen and grips

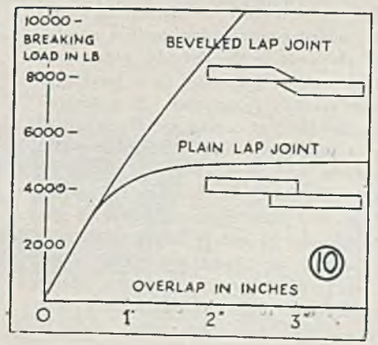
Fig. 8—Cylindrical double shear specimen and grips

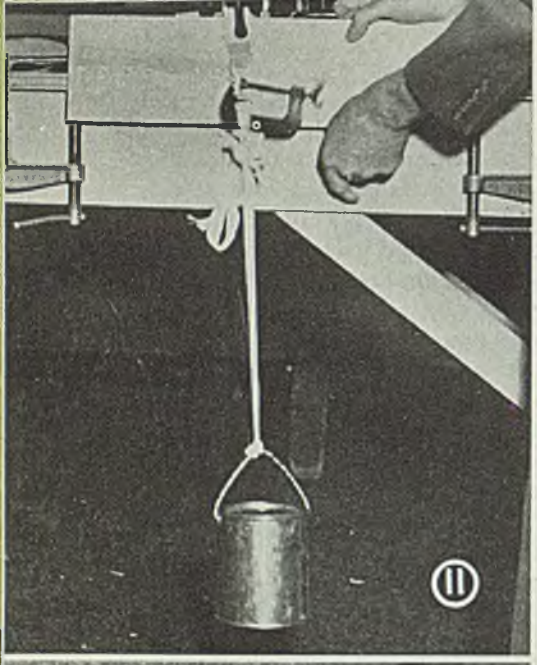
Fig. 9—Concentration of stress due to a differential strain in a lap joint specimen

Fig. 10—Shear strengths of tapered and untapered lap joint specimens









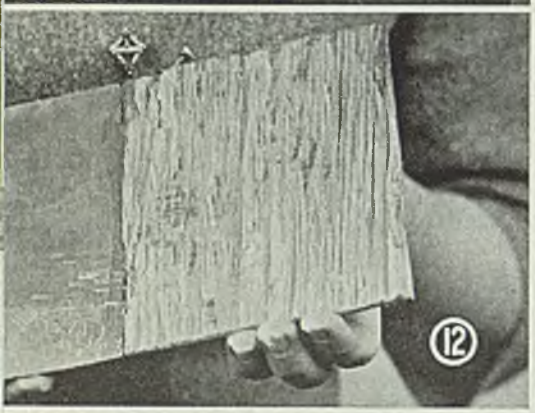


Fig. 11—Shock resistance test on plastic adhesive. Shown is a series of 1-in. strips of canvas to which it attached bucket with 10 lb of lead shot. A 2-ft drop provides 20-lb of impact

Fig. 12—Wood joined to aluminum with Plastilock 500 held tight at bond when tested under pressure, but wood itself pulled loose. B. F. Goodrich photo

and which is negative, for example sulphur dioxide and carbon dioxide. These substances do not ionize in solution, and to account for their stability it has been suggested that this type of linkage be termed "covalent." The metals which comprise the greatest number of elements in the periodic system owe their unique properties to a bond type only recently recognized[4]. It is generally thought that a pure metal consists of a crystalline arrangement of metallic cations with free electrons moving in the interstices. Furthermore it is postulated that these electrons exist in a continuous set of energy levels.

Up to this point the more potent forces of attraction between atomic nuclei and orbital electrons have been given. All these interactions may be thought of in terms of units of energy. These units, however, participate in maximum and not total exchanges. When a bond is formed, the positive and negative charges of the participating molecules are not completely neutralized. There remain in many molecules residual energies which are very nearly of stable bond-forming magnitudes. These forces affect the melting and boiling points of many substances.

Matter composed of both electrons and protons always exerts attraction. A liquid will wet a solid surface to a degree dependent upon the magnitudes of the attractive or adhesive forces between the two substances and the cohesive forces within each. In the case of a drop of mercury on a glass surface, the cohesive forces within these two materials is much greater than the adhesion between them; consequently the mercury droplet almost forms a sphere, but there is sufficient attraction to distort this shape.

Many substances which will react at higher temperatures are attracted by Van der Waals forces at lower ones. These attractive forces initiate reactions by virtue of the fact that their magnitudes are potent over greater distances than those of an electrostatic nature which are responsible for bond formation.

It was in recognition of these facts that Van der Waals presented his corrected version of the equation of state for gases and means for calculating the magnitudes of these residual attractive forces for all substances. It has been found that they are greater for the molecules of compounds than for molecules of elements or inert atoms, thus showing that unequal distribution accounts for a greater residual force field and consequently the more asymmetric the molecule the greater these values will be. This is a matter of great importance in explaining adhesive and cohesive properties.

Nature of Cohesion

The mechanism whereby molecules or atoms in homogeneous matter are held together is known as cohesion. The physical state as well as the mechanical properties of the material depend upon the type and magnitude of its cohesive bonds. A brief consideration of several types of materials will serve to illustrate the behavior of the different cohesive forces.

The criterion of crystallinity is the regularity of the arrangement of the atoms in a solid structure. Any atom in a crystal is separated from its neighbors by the same distances and at the same angles as any other atom of the same kind. When a true crystal is subjected to a tensile stress it will rupture along the line of least resistance. The structure of crystals has been well established by x-ray and chemical studies. Thus, it is possible to identify the forces which were overcome along the cleavage plane.

Most materials used for construction, however, are not pure crystalline substances, but do have varying degrees of crystallinity. The cohesive behavior of amorphous substances may be explained on the basis of the more definite knowledge of crystal structure, inasmuch as the same forces hold them together.

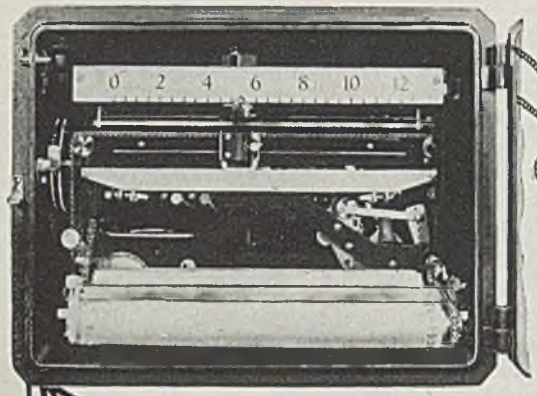
Metals: Most metals consist of isolated regions of crystallinity surrounded by an amorphous medium. Alloys exhibit the properties of the component parts except where true intermetallic compounds are formed. In the disordered amorphous regions of metals, the cohesion is due to Van der Waals forces of high magnitude. This is merely another way of stating that the attractive force does not reach the magnitude of a valence bond. When metals are cold drawn, however, there is a much greater tendency toward crystalline lattice formation with an accompanying increase in cohensive strength.

Glass: Silicate glasses are the most common and have been shown[5] to consist of a random network of silicon and oxygen atoms with each silicon atom tetrahedrally bonded to four oxygen atoms. All the oxygen atoms, however, are not bonded to silicon atoms; thus interstices of varying sizes exist throughout the structure. When the composition of the glass is modified by alkali or alkaline earth metals, these interstices become more numerous and each metal ion is surrounded by oxygen atoms with unsatisfied charges and is consequently linked to these through co-ordinate covalent attractive forces.

Wood: The structure of wood is, as is true of most complex natural materials, very imperfectly known. Predominantly, it consists of long fibers of cellulose joined together by means of lignin. The structure of cellulose is that of a chain composed of glucoside units linked to one another through C-O-C bonds. Neighboring chains are intramolecularly held together by means of hydrogen bonds. Lignin is not a single substance; its chemical nature varies from species to species.

Nature of Adhesion

Most of the investigations into the nature of adhesion has had as its objective the establishment of the most desirable physical and chemical properties for an adhesive between two given surfaces so that maximum structural strength can be obtained. Based on work carried out in Great Britain[6] on the



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mechanism whereby two surfaces of an adhesively formed joint are held by the adhesive, it has been concluded that two types of bonded joints can be formed:

Mechanical—between porous surfaces; *specific*—between smooth, dense surfaces. Some[7] however, have maintained on the basis of other work that although a part of the strength of the bond between two porous surfaces must be attributed to tendrils of adhesion which enter the pores, this mechanical interpenetration cannot account for more than a small fraction of the joint strength.

Chemical Properties of Surfaces[8]

It has been shown that adhesion to any porous surface is not primarily a mechanical phenomenon. Evidence is accumulating in every pertinent field that molecular attractive forces are responsible for the bond between any two surfaces. A knowledge of the chemical nature of surfaces is necessary in order to establish the type of bond formation which may occur.

The surfaces of solids are entirely different from their internal structures. The simple treatments of grinding and polishing differ very greatly in their effects on surfaces nature. In metals, especially, x-ray diffraction patterns show that grinding removes sections of the surface without appreciable distortion of the remaining crystal structure; whereas polishing removes the promontories and deposits materials from them in the crevices, leaving a smooth transparent amorphous film known as the Beilby layer. This layer has more of the characteristics of a liquid than a solid and is much more reactive. If, for example, a metal vapor is condensed upon a polished metal surface, a crystal pattern is first obtained but, on standing, this changes to that of a completely amorphous structure. If a nail is hammered into a crystalline surface, the amorphous ring around the hole will be more readily attacked by acids than the remainder of the surface.

Solid surfaces are very irregular in their constitution. Thus, the surface of even a monocrystalline metal will contain different faces, edges, corners, and projections. For this reason, all parts of a given surface will not have the same catalyzing ability and consequently the same degree of affinity for adhesive substances.

The greater the activity a surface possesses, the more likely it is to be contaminated with impurities, which are present in the air. Freshly split mica surfaces will sieze each other tenaciously, but if they are freely exposed to circulating air currents they lose this activity after a few minutes. It has been demonstrated that if these surfaces are covered, they will retain their attraction for each other for several days. Accidental traces of grease will greatly reduce the wetting properties of such surfaces and even slight contamination will increase the contact angle with a liquid.

The purification of a surface is, consequently, of the greatest importance if strong tenacious adhesive lines are to be obtained. This is by no means a simple operation. It is possible to clean the surface of glass by heating with a flame for a short time, provided the contamination is not excessive, but this treatment cannot be applied to most other surfaces as they would become sintered.

Metals may be cleaned with solvents or by slight etching with acids followed by careful washing and drying. It has been demonstrated experimentally at the Curtiss-Wright Laboratories that sanding of wood surfaces with the finest grade of sandpaper immediately before gluing gives a much better bond than that obtained with glazed surfaces produced by planing or with roughly sanded ones; thus the sanding operation appears to be one of cleaning.

Mechanism of Adsorption

One of the primary considerations in selecting a suitable adhesive for a given surface is an evaluation of the relationship between active groups on the molecules of the adhesive and the surface.

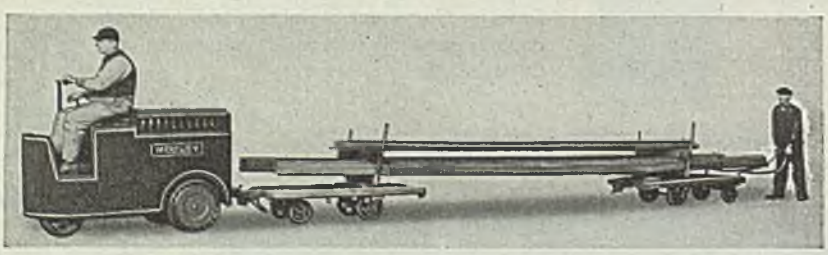
Metals to Metals (direct). The art of metal bonding depends very greatly on the uses of solders and welds. The chemistry of alloy formation furnishes considerable information on the nature of the attractive forces involved. If two metals are very closely related—for example, copper and gold atoms of the one will replace atoms of the other in a crystal. When there are certain definite proportions—for example, CuAu and Cu_3Au, the distribution in the crystal will resemble that of an ionic compound such as NaCl. If the metals are dissimilar, they may actually form chemical compounds which have their own crystals structure and have chemical and physical properties which are quite different from those of the constituent elements. Thus, the melting points of sodium and mercury are 97.5° and −38.7° C, respectively; whereas the substance Hg_2Na melts at 360° C.

Although the exact relationships which hold in the crystalline state are not exactly those obtained in a soldering or welded joint, the same general laws apply.

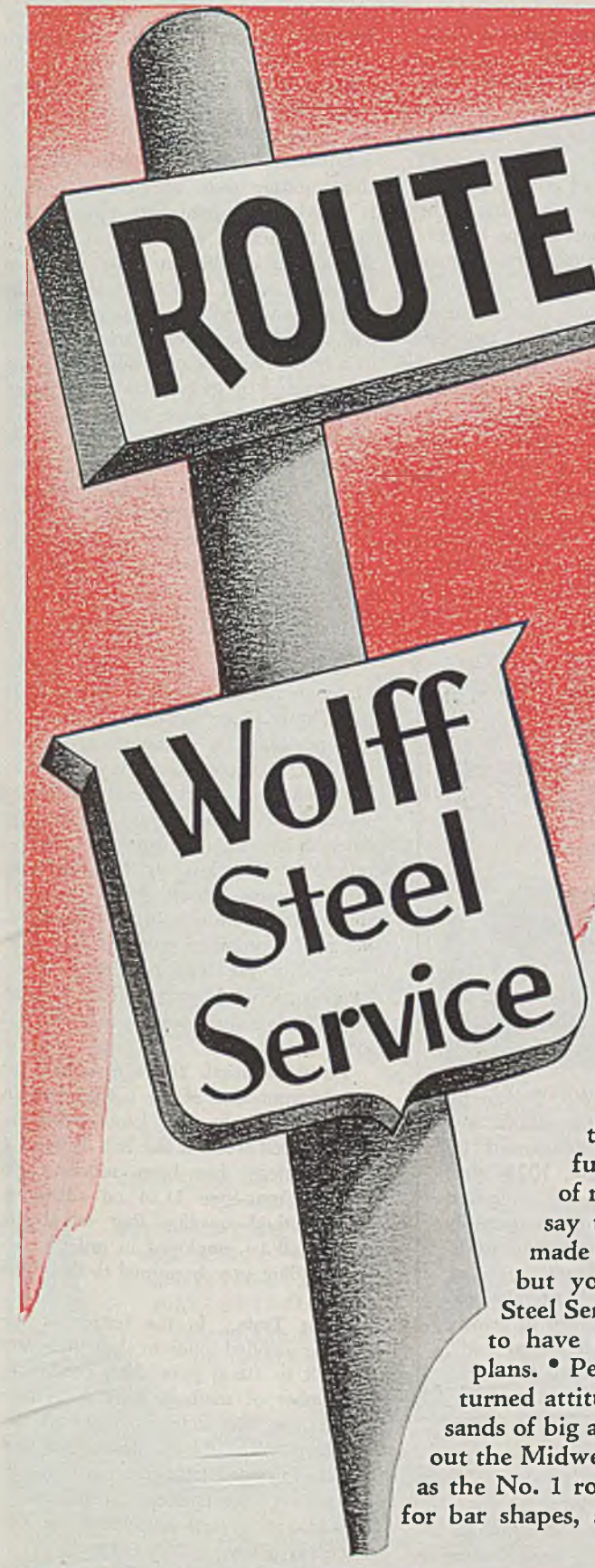
Therefore the experience with solders has been that the strongest and most permanent bonds are formed between metals having optimum chemical affinity[9]. In all cases where the metal surface remains solid, a good bond with the liquid solder is best obtained when a wetting agent or flux is employed to cleanse the interface.

Metals to Enamels. When metals are glazed with vitreous enamels, it has been observed that the ground coat between the metal and the glaze must contain cobalt or a similar oxide. The role of the cobalt compound has been the subject of much controversy, but a plausible theory is that it serves as a catalyst in forming the bonds between atoms of the metal and oxygen atoms which are attached to silicon in the enamel. The interfacial bond between a vitreous and a metallic surface, is thought to be of the chemical type[10]. It has been reported[11] that in the case of good bonding between iron and enamels, atoms of iron partially penetrate into the enamel in the form of dendrites which remain attached to the iron surface.

Metals to Rubber. It has long been known that extremely good bonds are obtainable by vulcanizing rubber onto



HANDLING LONG LOADS: Steel rods, beams or other materials are easily carried by plant tractors with the aid of the Swivel Bolster developed by Mercury Mfg. Co., 4140 South Halstead street, Chicago. Unit consists of two identical assemblies, each of which may be quickly attached to a single-caster steer trailer by inserting posts into side rack sockets. Setup makes it simple to adjust regular handling equipment to carry loads of extraordinary length. Rear trailer is guided manually



On The Road Back to Steel

Like all industry, like the mills themselves, steel warehouses too, are starting from scratch on-the-road-back-to-steel. It will be weeks, even months, before the hungry market for metal will be balanced to the point where anything like normal stocks can be carried by any warehouse, anywhere. • But even in a contingency like this, Wolff Steel Service is set to function for anyone caught on dead-center by a lack of material badly needed for production. This is not to say that miracles can be produced and required stock made available on call—for this is a general impossibility—but you can be sure that Wolff Steel Service will cover every source to have the steel so vital for your plans. • Perhaps this leave-no-stone-unturned attitude is one reason why thousands of big and little companies throughout the Midwest have come to regard Wolff as the No. 1 route to steel . . . particularly for bar shapes, sheets, plates and tin plate.

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certain metallic surfaces. Evidence shows that the rubber is actually attached to the surface through a sulphur bridge. The bond is obtained more easily with brass than with iron[12] a fact which correlates with the greater ease of the sulphide formation of copper and zinc than of iron.

Metals to Resinous Adhesives. An example of primary bond formation between a resin and a metal surface has been described in the case[13] of a vinyl chloride-acetate copolymer resin VMCH developed for use as a metal lacquer by polymerizing a small amount of maleic acid with resin, thus giving free carboxyl groups on the chain ends of the polymer. The amount of acid must be controlled to a small proportion, because 5 per cent or over causes excessive corrosion of the metal. As low as 0.1 per cent, however, gives improved adhesion and the optimum amounts are between 0.3 to 1.0 per cent. That the carboxyl group is responsible for adhesion was proved by forming the sodium salt of the resin, thereby destroying its adhesive properties. Diesters of the acid showed poor adhesion, but monoesters were almost as effective as the acid itself. This development is an excellent example of what may be expected from a careful study of the chemical nature of adhesion.

The adhesion of a large number of substances to metals has been investigated[14]. A close relationship has been found between the atomic volume of metal and the bond strength of a given adhesive. With shellac, for example, there is almost a linear relationship between atomic volume and tensile strength of the joint, as shown by the following table:

Metal	Atomic Volume	Tensile Strength of Shellac-Glued Joint (PSI)
Nickel	6.7	3500
Copper	7.1	3300
Aluminum	10.1	2800
Tin	16.2	1100
Lead	18.2	600

Investigators at the Resinous Products & Chemical Co. have found that "Redux" joints are stronger with high valency metals than with low, and that with different grades of steel the adhesion is poorest with those which oxidize readily, such as silicon steel.

Properties of Adhesively Bonded Structures

High polymers such as may be used in adhesives, consist of a weblike distribution of molecules which in addition to being mechanically intertwined, are attracted to one another by forces ranging from weak Van der Waals forces to strong chemical bonds. Any high polymer at a given temperature will consequently, be either rigid or soft, depending on the magnitude of these bonds. There is a definite temperature for each substance below which it is appreciably more rigid than it is above that temperature. This point is known as the transition point. Thus, when a high polymer is placed under a given stress it will suffer a deformation, the extent of which depends on the temperature and the amount and rate of loading.

This deformation may be resolved into several components[15]: (1) Ordinary elastic deformation, where the individual links in the chain molecule are stretched by altering the bond angle under an applied load; (2) highly elastic deformation, where in order to increase the distance between the ends of the molecules, it is necessary that distorting loads be sufficient to uncoil the chain; (3) viscous deformation, which takes place in a thermoplastic material above the transition temperature.

PNEUMATIC SAW: Driven by compressed air, this 3½-lb saw and filing tool developed by Air-Speed Tool Co., 1028 West Slauson avenue, Los Angeles, can be worked advantageously in awkward or cramped quarters or from difficult positions. Adjustable barrel permits circular sawing in metals or woods, as well as difficult "dead end", keyhole or scroll work

Surface Smoothness. In order to obtain a strong joint, a smooth surface is more desirable than a roughened one, inasmuch as the depressions in the roughened one must be filled in addition to the gap between the two surfaces. Furthermore, if the surface is deeply scored, there is always a possibility that air bubbles will be trapped in the glue line. The existence of such points of interfacial discontinuity will cause high concentrations of stresses in their vicinity which will result in premature failure of the entire bond when external loads are applied.

Effect of Curing Conditions. When a thermosetting resin adhesive is used, it is cured in the joint with pressure and very frequently with heat. Thus, it reaches an equilibrium state under an abnormal set of conditions. When the pressure and heat are released, the resin has a tendency to reach an equilibrium at a lower pressure and temperature, but is restrained by its bond to two surfaces. This results in a stress at the glue line. If the glue line is very thin, these stresses will be very small with respect to the bond strength and the glued joint will be able to support much higher loads. Similar stresses are set up in adhesive films which are formed by evaporation of solvent.

Test Methods For Bond Strengths

The American Society for Testing Materials has organized Committee D-14 on adhesives to formulate methods of tests pertaining to adhesives. In view of the fact that comparatively little work has been done on the development and standardization of testing methods for determining the fundamental physical properties of adhesively bonded joints, the co-operative efforts of this committee should contribute to a better understanding of the problems involved in testing.

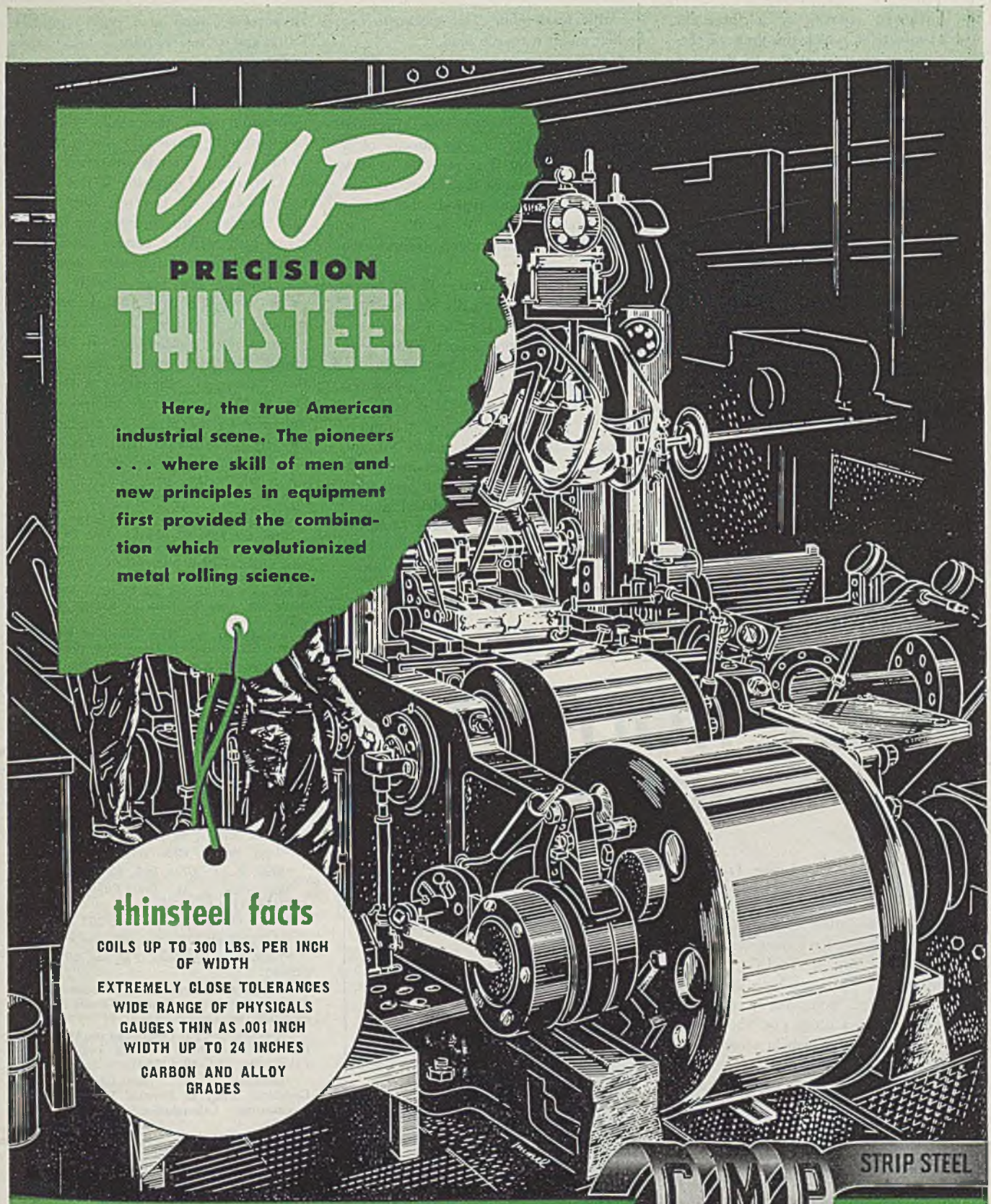
Some of the testing methods which have been used or proposed for the determination of bond strengths are given below:

Tensile Strength Test. A method for the determination of the tensile strength of adhesively bonded joints based on experimental work at the Bell Telephone Laboratories[16] has been submitted to ASTM Committee D-14 on adhesives. This method specifies that self-alining grips shall be employed in order to assure loading exactly normal to the glued surface.

Shear Tests. In the testing of adhesively bonded joints in shear it is very difficult to attain pure shear conditions. A number of methods have been proposed for the determination of this property. The block shear joint test and the plywood joint test were used in Army-Navy aeronautical specifications. In addition, several other tests are also described below.

Block Shear[17]. The block shear test is the method most widely used for evaluating the bonding strength of adhesives to wood. The specimen and shearing tool are shown in Fig. 5. The specimen is broken by the application of a compressive load.

Plywood Shear[17]. The plywood shear



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test specimen consists of a three-ply wood laminate in which the grain of the center ply is at right angles to the two face plies. The specimen is prepared by milling a grove two-thirds through the core on each of the face plies. The specimen is broken under a tensile load in special grips as shown in Fig. 6.

Single Lap Joint Shear[18]. The single lap joint specimen has been widely used for the measurement of adhesion to metals. The specimen is broken under a tensile load. Standard grips for tensile specimens are used.

Double Lap Joint Shear[18]. The double lap joint specimen was developed for the purpose of overcoming the unequal distribution of stresses encountered in the single lap joint specimen, and is broken in the same manner.

Scarf Joint Shear[18]. The scarf joint specimen is difficult to prepare, but the shearing stresses developed in the glue line are more uniform than for any other type of shear test. If the two adherends are of equal modulus, the single scarf joint is adequate. For materials of unequal modulus, however, it is necessary that the angle taper of each be proportional to its modulus, thus necessitating a double scarf joint. The specimens are broken under a tensile load.

Cylindrical Single Shear[6]. The cylindrical single shear test has been used to reduce the amount of wood failure in the glue line. The grips and specimen are shown in Fig. 7 By means of a special adjustment it is possible to vary the angle Θ shown in the figure. It was found that the most reproducible values were obtained when $\Theta = 60°$. The specimen is broken under a compressive load.

Johnson Double Shear. The Johnson shear test consists in rigidly clamping the outer sections of the specimen in a shearing tool and applying a compressive load upon the shear member which applies an evenly distributed load to the central portion of the specimen. It is necessary that the two glue lines be accurately placed in the shearing planes of the instrument; thus very careful machining of the specimen is required for reproducible values. The cylindrical double shear test is similar to the Johnson shear test described above. The essential difference is that the cylindrical specimen is broken by a tensile load.

Each of the shear tests have disadvantages; some give poor reproducibility and others require a high degree of accuracy in machining. One source of error arises from the fact that stresses applied to the specimens are not equally distributed over the entire glue line, but tend to be concentrated near the ends of the overlap. This is illustrated in Fig. 9. This unequal stressing is due largely to the shape of the test piece rather that the means for applying the load. A given load will be concentrated excessively at the ends of each member of the overlap and very slightly on the exact center of the glued area, resulting in a partial shear failure and a partial peeling action. It has been found that by tapering the ends of the overlapped sections, as is shown in Fig. 10, the shear value will become proportional to the area. A similar modification of the double lap joint eliminates even more of the distortional error.

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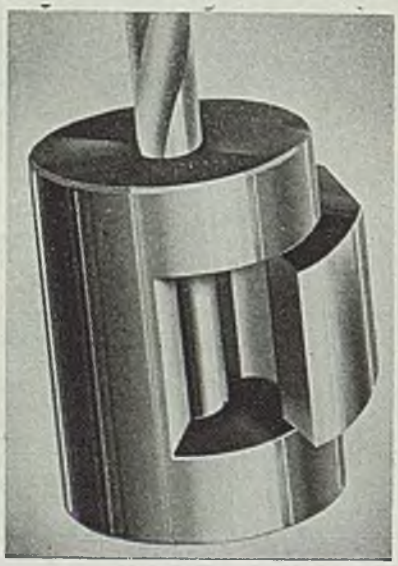
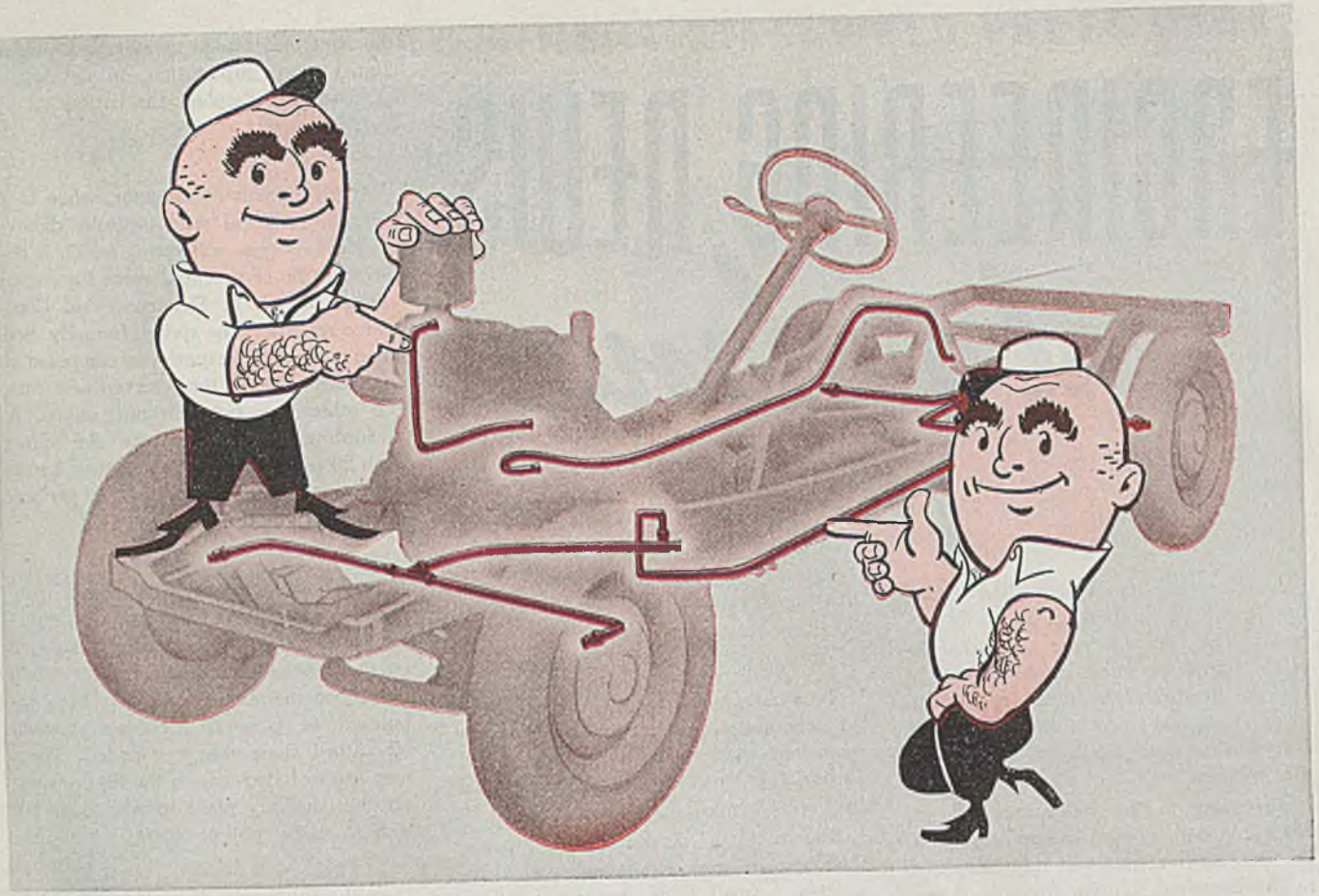


An informative, pictorial booklet published by Eaton Mfg. Co., Cleveland, covers all products made by the company in its various divisions. Intended to publicize the knowledge and techniques developed in the past five years, the booklet describes and illustrates products which, states the company, represent every type of metal fabrication practiced in its twelve plants. Also included are the latest results of the company's laboratory developments.



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ENGINEERING NEWS *at a glance*

A chemical treatment, called Iridite Bright, which produces a mirror-bright, transparent film on zinc or cadmium-plated parts is latest development of Rheem Research Products Inc., Baltimore. It is said to form an entirely new corrosion-resistant finish on surfaces of the metals.

According to the Baltimore firm, no electric current is used to apply the film. Parts to be treated are simply immersed in the chemical solution for only 5 sec, rinsed, dried.

Zinc plate test panels, after 100 hr exposure to salt spray showed no signs of white corrosion, it is reported. In other tests, it was found the film offered no resistance to soldering when applied over cadmium plate . . . . . .

A standardized cylinder which can be operated by air, oil or water and which lends itself to almost universal mounting applications is the latest development of Engineering Products Co., Los Angeles. Designed for heavy-duty applications, it is at present manufactured in quantities, and is being offered in an assortment of diameters and stroke lengths, the company states . . . . . .

Socony-Vacuum Oil Co. Inc., New York, reports it is offering a new series of light-colored, transparent cutting oils which enable cutting tools to operate at maximum speeds without smoking or giving off an odor.

One of these oils, called Sultran B3, was demonstrated at the recent Metal Congress in Cleveland. Readers who attended the show may remember the exhibit. Then the new oil was used in a turret lathe for forming, recessing and cutting off souvenir paper weights which were being turned out in the form of miniature oil drums.

According to Socony-Vacuum, use of these oils extends tool life from 10 to 20 hr. . . . . .

True carbon case depths are produced on steel, and all salt is removed from oil-quenched work when using the liquid carburizing process recently developed by Park Chemical Co., Detroit.

Known as the Karbo Kasing process, development uses equipment which regulates a small flow of oxygen into a molten bath containing a powdered, water soluble cyanide-base salt, in which a carbon cover is incorporated.

Flow of oxygen is regulated so the carbon cover is not dispersed, the company states. While oxygen acts as the emergizing agent, the mild agitation which it provides also contributes to uniform results.

Weight of salt in the bath is only 86 lb per cubic foot, and daily replenishment required is between 5 and 10 per cent of the bath weight, it is reported . . . . . .

A wind-driven electric generator, no larger than a pocket watch, supplies the power to the tiny, rugged radio transmitter and receiver incorporated in one of the latest bomb and rocket projectiles used by the armed forces. It forms one of the components of the VT proximity fuse, and is mounted in the nose of the projectile. The radio "set," itself no bigger than a man's fist, sends out high-frequency radio waves that detonate the explosive charge of the bomb or rocket when they rebound from the target.

According to the *Army Ordnance* magazine, a dry cell battery the size of a fountain pen cap was used to provide the necessary current originally, during the few seconds the projectile was in flight. The battery, however, proved undependable at low temperatures encountered at high altitudes. This led the National Bureau of Standards, under Signal Corp supervision, to develop a generators to replace the battery . . . . . .

A government investigator, while in a German technical steel institute, discovered a new type coil spring which is believed to be of potential value for engine valves, the U. S. Department of Commerce reports. The spring, formerly used in an automatic weapon, was composed of five wires. One of these served as a core, the other four being wound around it. According to the Germans, the spring with 20 per cent less material than a solid wire spring of some rate, has a 20 per cent greater fatigue life . . . . . .

In Schenectady, Dr. C. G. Suits, company vice president and laboratory director, stated 20 scientists, formerly engaged on the Manhattan District Project which developed the atom bomb, have been appointed to General Electric's research laboratory since the war ended. These men are included among the 60 researchers the company plans to add to its lab staff to study atomic energy . . . . . .

At the Pittsburgh Foundrymen's Association meeting recently, Peter Soffel, president, Pittsburgh Metals Purifying Co., demonstrated a new exothemically reactive material for use as inserts in risers, hot tops and in other portions of metal castings where it is desired to maintain a high degree of fluidity of the metal, or retard its solidification during shrinkage. The material, referred to as a Thermotomic compound, consists of a composition that generates heat through oxidation of a metal or metals by means of one or more oxides, modified to control rate of heat release. Once burned, Thermotomic changes from a heat-generating agent to a refractory of any given shape, having a heat resistant factor of 3475° F, he said . . . . . .

Geo. D. Roper Corp., Rockford, Ill., reports it is now producing a three-in-one battery size, hydraulic power unit which adds zip to an industrial yard truck or tractor for loading and lifting materials. The Rockford concern says use of the unit permits an operator to raise jog, stop or lower the loads to suit work conditions. . . . . .

Welding lenses remain unpitted with the use of a baked plastic lens coating developed by Eastern Equipment Co., Willow Grove, Pa. In addition, smoke and smudge can be wiped off treated lenses without affecting the coating, it is said . . . . . .

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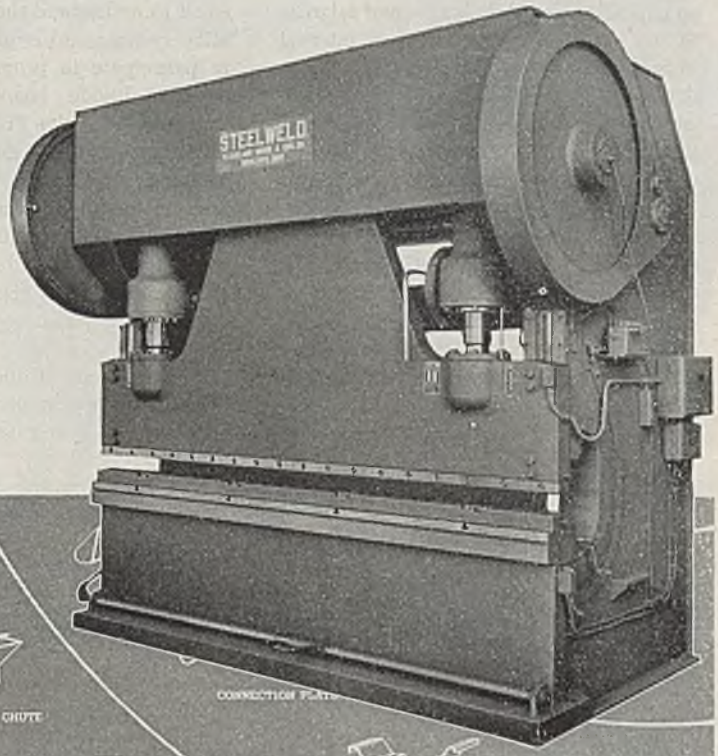

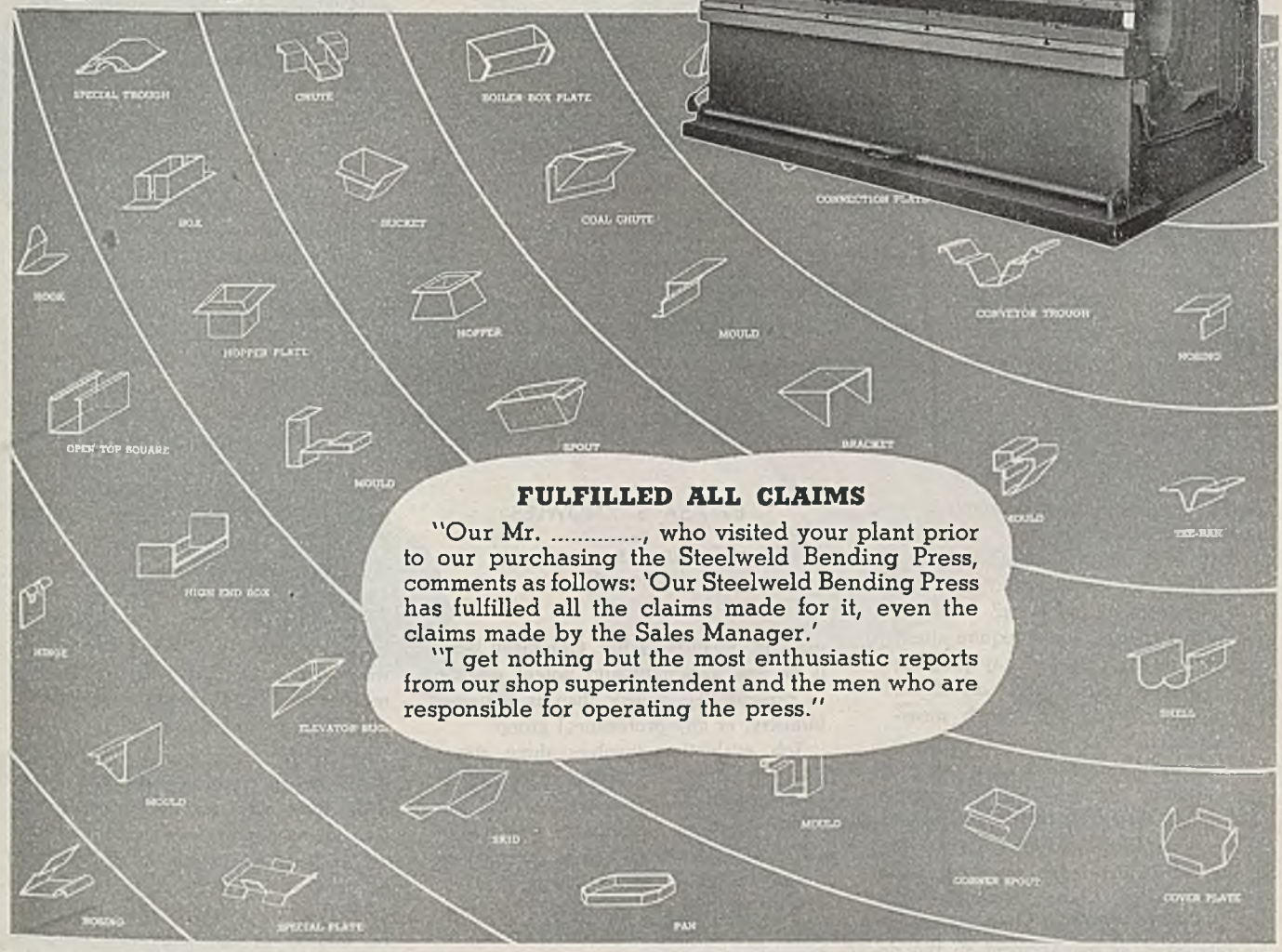

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Job Evaluation

*These basic concepts of job evaluation and merit rating and their installation are here re-emphasized in view of their worth as tools of wage administration**

By ASA S. KNOWLES
Dean
Rhode Island State College
Kingston, R. I.

IN the handling of wage and salary problems today, the spotlight is focused on general increases in wages and salaries. In the next few years, however, internal wage structures will receive more attention. The emphasis will shift from wage increases to problems of internal adjustment in order to minimize pay inequalities.

More than ever before, job evaluation and merit rating are recognized as the best means for correcting internal maladjustments in pay rates. Consequently, there is currently a rush on the part of many firms to adopt job evaluation and merit rating as tools of wage and salary administration. Because of this there is a need to re-emphasize some basic concepts concerning job evaluation and merit rating and problems encountered in their installation. These are:

—What is job evaluation?

—What can be expected of it by management and labor?

—What considerations require attention at the outset of any program (policies, special problems of job analysis, weighing of job measures, etc.).

Both management and labor can profit greatly from the use of job evaluation and merit rating as tools of wage and salary administration. For many years these techniques were regarded as of primary value to management. During recent years, organized labor has become as interested as management in the development and application of job evaluation and merit rating. Both employers and union representatives recognize that the facts concerning job requirements as set forth in job definitions reveal clearly the difference in job difficulties and, therefore, provide valuable information for use as a guide in setting base rates of pay. Similarly, both management and labor recognize that merit rating can be a valuable guide for deciding what amount of pay should be added to job base rates to compensate for performance of the man who is in the job at the time.

Today, organized labor is making every effort to understand thoroughly job evaluation systems and is preparing its leaders to participate in programs. In this connection, Rhode Island State College's Workers' Education Program, a state-wide evening school for labor, is conducting classes in stewardship, collective bargaining, arbitration, and similar subjects. One of the first courses requested by organized labor in Rhode Island was job evaluation and merit rating. A class of 20 representatives of unions now is attending this course.

The Workers' Education Program at the college is one of the several in the United States being established at the request of organized labor. Organized labor is no less important and potent a force in present day society than is business, industry, or any professional group.

Job evaluation involves three steps: (1) Job analysis to uncover facts necessary to define requirements of each job; (2) job rating to establish a schedule of the relative worth of jobs as revealed by differences in job requirements; (3) the pricing of jobs or setting of base rates using job ratings and certain other information as guides.

A thorough-going plan of job evaluation gives no consideration to present pay rates as part of the process for establishing the relative differences in the requirements of jobs. The honest evaluation of a job demands that its relative position in the pay scale be based solely on an impartial, unbiased, factual analysis of its requirements. To consider present pay rates in advance or as part of a job rating procedure serves only to perpetuate errors in pay rates, which job evaluation is designed to correct.

Any plan of job rating which uses present pay rates as one of the measures for setting a rating scale or for deciding the relative importance of jobs is more properly designated as a plan of job classification. This is a technical distinction and is not intended to deride the value in use of any job classification system. It serves to emphasize that the weighted point method of rating jobs is the only one which achieves the original objective of job evaluation. The weighted point method defines jobs and then rates them by assigning numerical scores which reflect differences in job requirements. Only when this job rating is completed is any consideration given to existing pay rates as one of the considerations of pricing jobs on setting base rates.

Advantages of Program

The installation of a job evaluation program in many organizations will result in the following: (1) Fair rates of pay within a given organization based on job requirements thereby minimizing prejudice and emotional factors; (2) improved organization as job analysis uncovers the realistic lines of responsibility and authority; (3) improved administrative efficiency, as supervisors learn to know what they are supervising, and work assignments are made more effectively by assigning the right man to the right job; (4) better collective bargaining due to the factual data about job requirements; (5) increased morale, with workers understanding that both management and labor are trying to develop rates of pay which recognize that jobs vary in their requirements and should, therefore, be compensated accordingly.

While the advantages of job evaluation in use clearly outweigh any of its limitations, those who are planning to undertake job evaluation can profit most from its use if its limitations are understood in advance. Although its great usefulness is in settling intraplant inequalities, it may be limited to the individual company. Among the other limitations of job evaluation are that it is a long-range proposition; considerable time and cost is involved; it is not a mathematical formula, but only a guide in setting pay rates; job evaluation without merit rating is limited in usefulness; union co-operation definitely is needed; job evaluation temporarily results in increased total payroll.

Some of the broader policy considerations in installing a job evaluation program are as follows:

—Selection of the staff

* Also the subject of a recent address by the author before the New England District of the Pressed Metal Institute, Worcester, Mass. Dean Knowles is associate consultant, Thompson & Lichtner Co., Boston, Mass.

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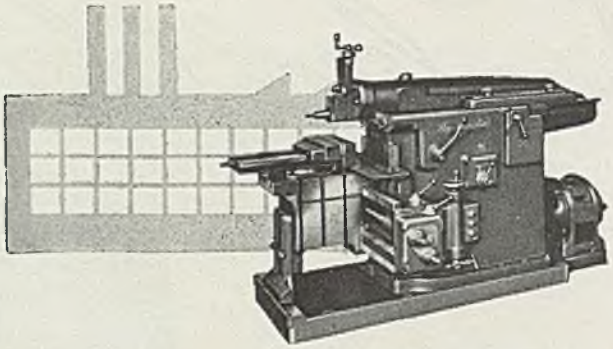

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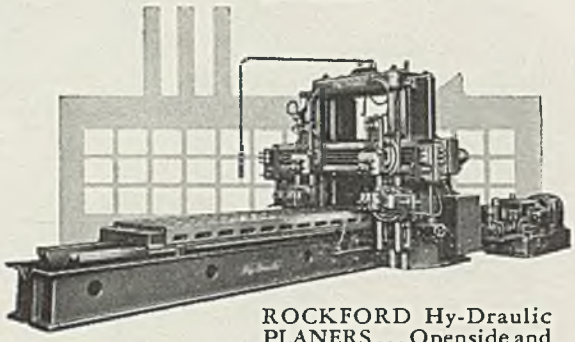
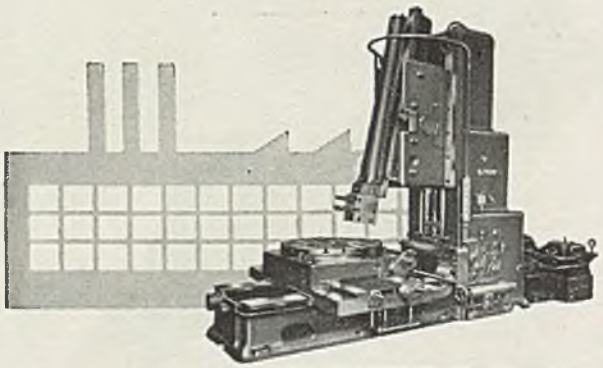
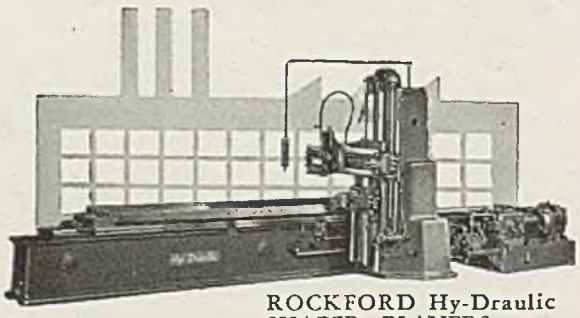


ROCKFORD Hy-Draulic PLANERS . . . Openside and Double-Housing. Four sizes, each available in maximum stroke lengths of 10, 12, 14, 16, 18 or 20 feet.



ROCKFORD Hy-Draulic SLOTTERS . . . 12", 20" and 36" stroke.



ROCKFORD Hy-Draulic SHAPER - PLANERS . . . Stroke length sizes of 42", 66", 90", 120" and 144".

4601

Hy-Draulic

ROCKFORD MACHINE TOOL CO.

ROCKFORD, ILLINOIS

—Range of jobs to be included
—Selling the program to employees
—Securing employee participation
—Determining extent to which the union should participate.

The correct attitude on these policies is tremendously important to the success of any job evaluation program.

Job ratings are no more reliable than the data on which they are based. The type of job questionnaire which is to be used to collect job facts deserves careful attention at the outset of any program. Questionnaires vary in length and detail, as well as does the latitude permitted job analysts in interpreting job facts. Job fact questionnaires should force job analysts to be consistent in their use of terminology and in the questions asked about all jobs. It is not fair to ask questions about one job that are not asked about others. Moreover, facts about jobs should be collected in terms of the language to be used in job rating. Consistency in terminology can be forced by requiring all job analysts to use a glossary of definitions of the terms which appear in the job analysis questionnaire and in the job rating form.

The measure by which jobs are compared are termed "common" job measures. They are "common" in the sense that they are common to all jobs within their range. They are not necessarily common in the sense that all job requirements are part of each measure. It is possible to use the measures and numerical weights assigned to them on a uniform basis in several different plants of the industry. It is not desirable, however, to transfer a set of measures and the weights assigned to them from one industry to another. For example, the measures and corresponding weights which might apply in the glass industry, as reflecting the importance attached to various job measures, do not necessarily apply in the hotel industry. It is important, therefore, in using measures and weights already established to adjust them so that they reflect the true situation of a particular industry.

In some instances it has been found desirable to change weights of measures as used in one plant of an industry to truly reflect differences in working conditions, hazards, and so on, which exist in a particular plant. Common job measures which are regularly used in a variety of industries are grouped under skill, responsibility, effort and working conditions. Skill is subdivided under three headings: (A) Mental—including education and experience, judgment, resourcefulness and exactness; (B) manual—including dexterity and versatility and, (C) social.

Responsibility covers plant and property equipment, financial expenditures, methods, policies and rules, safety, supervision and training. *Effort* includes both mental and physical. *Working conditions* covers such items as accidents and health hazards and environment.

Higher wage and material rates make it increasingly important to minimize any pay inequalities and to correct promptly internal maladjustments in pay rates if labor is to be contented and maximum production secured.

Experience has proved that when the management of any company sincerely undertakes a job evaluation program under proper guidance, successful results can be achieved

Cutting and Welding of GAS-FILLED TANKS

DELICATE job of cutting with oxyacetylene torches into tanks half-filled with 24,500 gal of gasoline—with a potential explosive power of 50 lb of dynamite in every gallon—has been made absolutely safe by a new process said to make gasoline "as harmless as water."

In constructing a new warehouse for a gasoline distributor in Bakersfield, Calif., it was found that one cement wall would lie directly over filled pipes leading to underground storage tanks, as indicated by the excavation shown in Fig. 1. Ordinarily, to relocate the fill pipes in recesses shown at the left, it would have been necessary to close the plant, pump out petroleum products, dig up tanks and steam them out, do necessary cutting and welding, and replace tanks. A minimum of 3 weeks would have been required for this operation, at a cost of $3000, as well as 3 weeks loss of business.

Instead of this complicated procedure, a simple air-displacement process was employed. As patented in 1938, by the Koch Welding Works, Los Angeles, a blanket of mixed carbon monoxide and carbon dioxide gases is pumped into the gasoline tanks. Because they are heavy gases, they settle on top of the gasoline and gradually force all of the oxygen and gasoline vapors out of tank vent pipes.

"Test buckets" are attached to length of hose fastened to the vents. When processing is started, gases in the test buckets are ignited, and continue to burn until all oxygen has been eliminated from the tank. Welding then can proceed safely, as the gasoline cannot burn without oxygen. A lighted oxyacetylene torch also may be submerged in the bucket, and if the flame is instantly snuffed out, the tank may be considered properly processed.

In Fig. 2, torch is cutting into tank containing 10,000 gal of gasoline. The job was completed in only 9 hr. at a cost of $210, by the Kern Valve Service Co., Bakersfield, Calif., licensee of the process. All tanks were approximately half full of petroleum products, and the plant remained in operation while alterations were being made, according to L. V. Weddle of the Kern organization.

German Steel Castings

(*Continued from Page 96*)

before adding to the ladle. As much as 4 lb of aluminum per ton was added to the ladle. Finished steel contained 0.085 to 0.12 per cent phosphorus and from 0.08 to 0.12 per cent sulphur.

Induction Furnaces: The German steel casting industry employed a large number of induction furnaces. For the most part these were lined with quartzite (ganister) and 10 per cent borax. Approximately 100 to 140 heats per lining could be obtained for low-alloy steels. Broken glass, approximately 2 per cent of weight of the charge, was often used as a slag covering.

Some 50-odd steel casting classifications were produced for German aircraft; a few of these were cylinder barrels, casings, bearing blocks, brackets and covers, fork pieces, struts, wheel segments, axle shanks, fittings, lever parts, propeller hubs, etc.

Castings were produced to two types of test requirements: Class A, a full-load test and hardness tests; and Class B, brinell hardness tests only. Mechanical property requirements for aircraft castings were: Tensile strength 130,000 psi minimum, and elongation 20 per cent minimum. Impact testing was not specified, but tests were nearly always made for purpose of obtaining information.

The size of the test coupons was from ¾ to 2½ in. thick, depending upon the thickness of the critical section of the casting. The coupons were cast attached to the casting or separately. These requirements were being used for specification castings of all types, and not aircraft castings alone. No allowance for lower mechanical properties was made for the heavier sections.

The manganese-vanadium or chromium-vanadium steels were used in most cases during the latter part of the war. The castings were 100 per cent machined or ground and all castings were quenched and tempered. After heat treatment, castings were tested for hardness, followed by an oil cooking test (immersion in boiling oil for 1½ hr), then sand blasted and given visual examination for oil leaks. All castings were magnetic particle tested and one in each lot was tested by radiography, size of the specified lot depended upon the importance of the casting although a lot smaller than 30 was not observed from records.

Approximately 7 tons of molten steel were required to produce one ton of finished machine aircraft castings. All German steel foundries had fairly extensive machine shops and, for the most part, castings were sold in the rough or finished machine condition. One steel foundry employed 300 men in the cleaning room and in the machining of 100 tons of aircraft castings per month.

Popular composition for armor castings was 2.50 to 3.25 per cent chromium, 0.25 to 0.50 per cent molybdenum and 0.10 to 0.25 vanadium. This was altered towards the end of the war by dropping out the molybdenum content owing to a scarcity of molybdenum. These castings, for the most part, were normalized at temperatures from 1700 to 1825° F, oil quenched from 1600 to 1650° F, followed by tempering from 1050° to 1250° F. Tensile strengths of 100,000 to 150,000 psi were obtained.

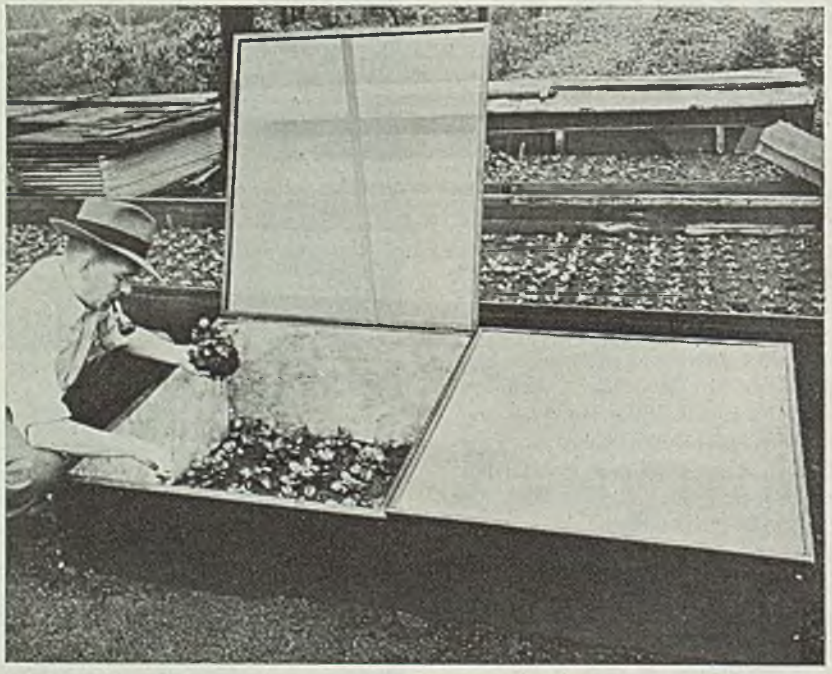
Tank Shoes Stripped of Alloys

While track shoes for tanks were not usually considered as armor casting (from the standpoint of production figures), they were made in large quantities by a number of steel foundries. The castings (Figs. 1 and 2)—were produced in air dried sand molds with extensive coring. The sands used were either a fine, washed quartz sand with 3 to 4 per cent clay and 1 per cent dextrine (from potatoes) or a fine, natural-bonded sand of about 12 per cent clay to which dextrine was added.

Prior to the war the track shoes were produced out of 12 to 14 per cent manganese steel, but as the war progressed the composition was changed from one low-alloy steel to another in order to conserve alloys until, at the end of 1944, many track shoes were being produced from a 0.40 to 0.50 per cent carbon steel. The castings were given a water quench and temper heat treatment. Average scrap losses for all items including outside tolerances, machining and casting defectives, amounted to about 15 per cent.

Steel for 90 to 150 mm projectiles of the Howitzer and mortar type was produced in acid lined converters to a carbon content of 0.35 to 0.45 per cent. Phosphorus and sulphur contents were specified not to exceed 0.25 per cent total (phosphorus content normally was about 0.10 per cent and the sulphur 0.12 per cent). The projectiles were used in the as-cast condition, or were given an annealing treatment to obtain maximum machinability.

During the early days of the war the process of casting projectiles was worked out and production in large quantities was started. Projectiles were made in cast iron molds so constructed that 4 to 6 projectiles were cast in the same mold. The nose of the projectile was not cast as an integral part of the shell. An oil sand core, thickly washed, was inserted to fit tightly at the nose of the projectile and to stand upright. Base of the pro-



PREFABRICATED STEEL COLD FRAME: This 3 x 6 ft seed bed with 22-gage steel frame, Fiberglass insulation and Vimlite plastic glazing can be assembled in 10 min. Cover of seed bed is two 36-in. square panels designed to shed water. Glazing is standard 12 x 12 mesh galvanized wire, coated with cellulose plastic said to be hailproof, shatterproof. Unit, developed by Celanese Plastics Corp. Wilmington, Del., in co-operation with Green Thumb Inc., weighs about 45 lb

This 12,500% increase *sounds fantastic!*

But True!

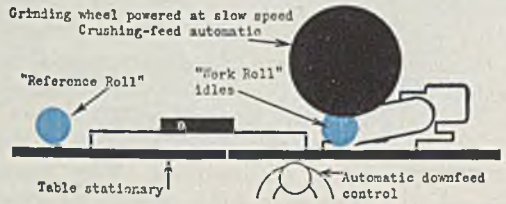
One of the major drawbacks to crush form grinding precision flat form contours has been the inability to produce on a practical production basis. This obstacle has been eliminated in two ways by the new Thompson Truforming Process.

First: Truform Grinders are engineered and built as a single unit, eliminating the failures of make-shift crushing arrangements and attachments.

Second: TWO CRUSHING ROLLS ARE USED. This is a major advancement, because it greatly extends crushing roll life and makes possible, for the first time, quantity production without constantly disturbing the set-up to re-process the crushing roll.

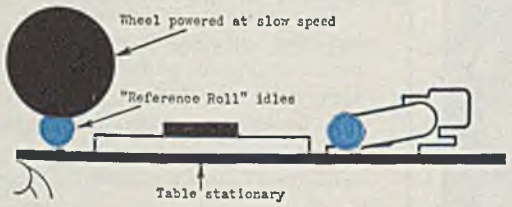
How two rolls operate in the Truforming Process is briefly illustrated and described below. The normal crushing or truing position is shown first.

Normal Crushing Position
Also Truing or Dressing



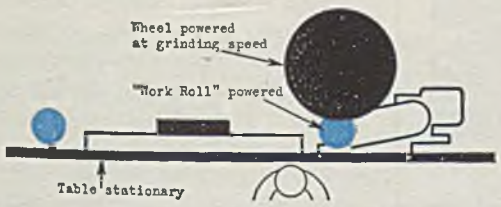
This is the position for the initial crushing of the wheel—and for subsequent truing or dressings when production grinding. On an eight pitch modified buttress thread form, 125 dressings were provided by the "work roll" before losing form.

Touching-up Position



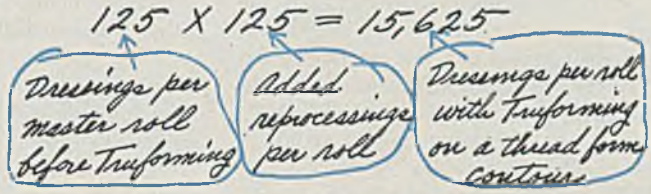
When the "work roll" loses form the table is moved to bring the grinding wheel over the "reference roll" for touching up, as shown above.

Re-processing Position



Because both rolls are table mounted, are in perfect alignment, and can be brought in the same relation to the grinding wheel, the original degree of accuracy can be quickly transferred from the "reference roll" back into the grinding wheel . . . and then ground back into the "work roll" as shown above.

The machine is then ready for production grinding again without disturbing the set-up or removing anything from the machine. In this way the "work roll" can be re-processed whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out. Duplicate crushing rolls can be ground in the same way on all Thompson Truform Grinders.

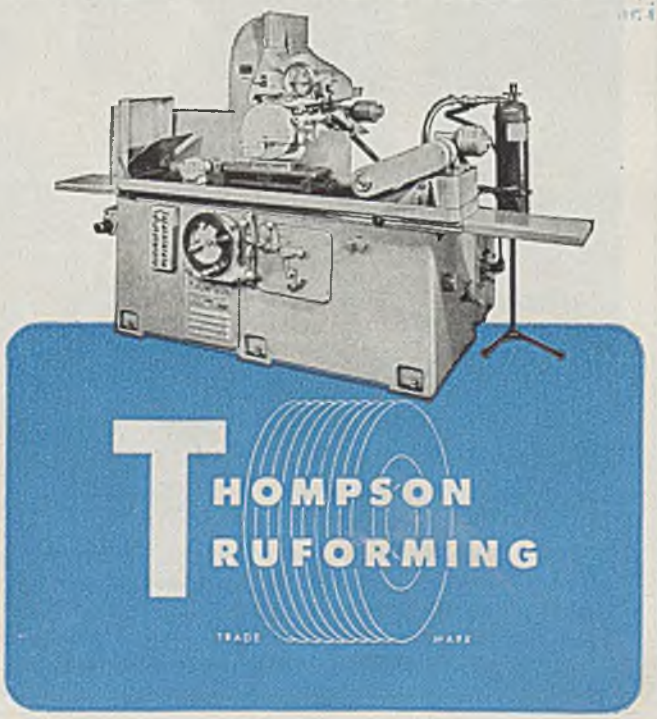


What this means in savings is illustrated by the following example, involving a modified buttress thread form with an eight pitch form. Where two rolls are used in the Thompson Truform Process, it was possible to get *over 15,625 dressings* from the "work roll" before it was worn out. This meant an increase in continuous production (without changing or disturbing set-up) of 12,500%.

Write for the new 8-page Truform Leaflet—"Why didn't you tell me about this process before?"

Address Dept. 11

The Thompson Grinder Company • Springfield, Ohio



jectile was uppermost in the mold and was stopped off at the proper height by a cover core; cover core contained 8 pencil gates of ½-in. diameter, equally spaced around the circumference of the projectile. Steel was poured into a centrally placed runner cup which distributed the steel to the 4 or 6 openings, from there the metal fed through the pencil gates to each projectile. Risers were not used to feed the castings. The metal mold and the sand core permitted excellent controlled solidification. The projectile section was approximately 1⅜ in.

Surface appearance of the shells was not too good, but this made little difference as they were required to be machined on the outside surface. An allowance of about ⅛-in. was made for machining. There was no machining of the inside surface. The cast iron molds produced from 3500 to 4000 shells and were then machined out to produce a larger projectile.

Minimum properties required for the steel were: Tensile strength 85,000 psi and elongation 3 per cent. A fragmentation test required a minimum of 420 fragments over 5 grams per shell. Shells were given a hydrostatic test at 10,000 lb pressure. The weight of the as-cast shells was from 30 to 40 lb, depending upon size.

Every foundry had from 1 to 20 circular saws, varying from 3 to 6 ft in diameter, for cutting off gates and risers. Foundrymen realized that it was more costly and time-consuming to saw risers than to cut them by oxyacetylene, but sawing was preferred since in many cases the smooth saw-cut area acted as reference points or positions for setting castings during the machining operation.

Shot Blasting Preferred

Shot blasting was much preferred to sand blasting, and cleaning room equipment was extensive and modern; this was necessary, considering the large proportion of castings containing "burnt-on" sand. In most cases the cleaning room was separated from the foundry. Grinding booths were fairly well ventilated. Bakelite-bonded swing-frame grinding wheels were used and were well liked.

Electric arc and atomic hydrogen arc welding were used in all foundries. The atomic hydrogen arc method was preferred because it was claimed that results superior to electric arc welding could be obtained with unskilled foreign labor. Approximately 70 per cent of all welding in the industry consisted of atomic hydrogen welding. In some foundries all welding was done by the atomic hydrogen practice. It was universally used on all light weight castings.

Carbon steel castings were not preheated prior to welding unless the casting was large, important, or unless the carbon was above 0.50 per cent. All alloy steel castings were preheated from 200 to 900° F, depending upon the alloy content and the shape of the casting.

Welding requirements were mostly set by the foundry. Heat treating after welding usually consisted of heating the casting above the critical temperature. Only occasionally were welds given a stress relief heat treatment.

Four types of electrodes were used which would produce the following strengths after an annealing heat treatment:

54,000 to 64,000 psi.
71,000 to 78,000 psi.
128,000 to 142,000 psi.
Austenitic

Oxyacetylene welding was used only in minor cases or for special purposes.

Heat Treating

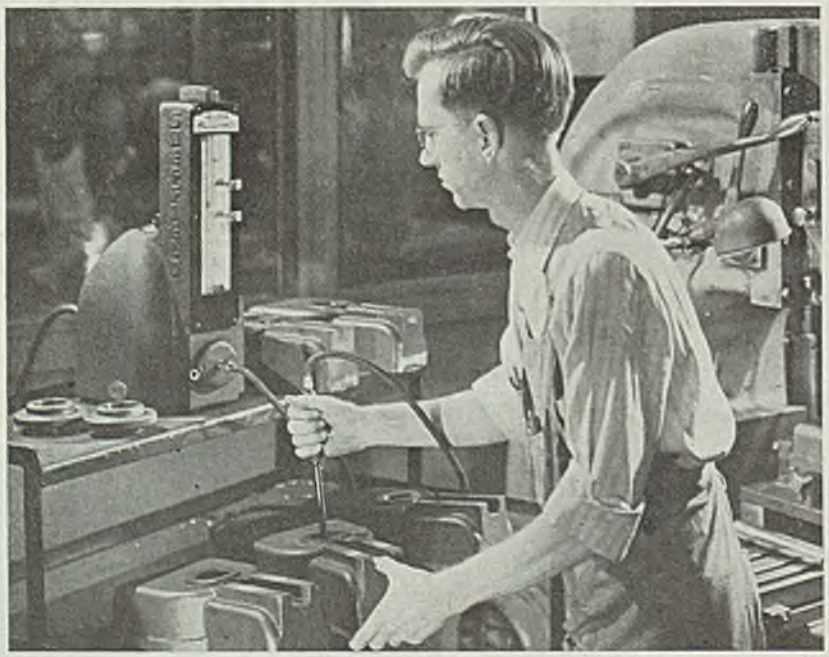
Castings were heat treated mostly by annealing or by liquid quenching and tempering. Whenever possible, the alloy steel castings were quenched and tempered. Water or oil quenching was used, depending upon the alloy compositions, or the carbon content and the thickness of sections. The government specified oil quenching for all casting compositions containing nickel, and water quenching for alloy compositions without nickel.

Castings of carbon contents above 0.50 required quenching in oil, castings weighing as much as 150 tons were water quenched and as much as 230 tons were oil quenched. The mechanical equipment for quenching did not usually lend itself to fast quenches or to time quenching. Hardenability studies were not made to assist in quenching and tempering practices, and time quenching was not employed.

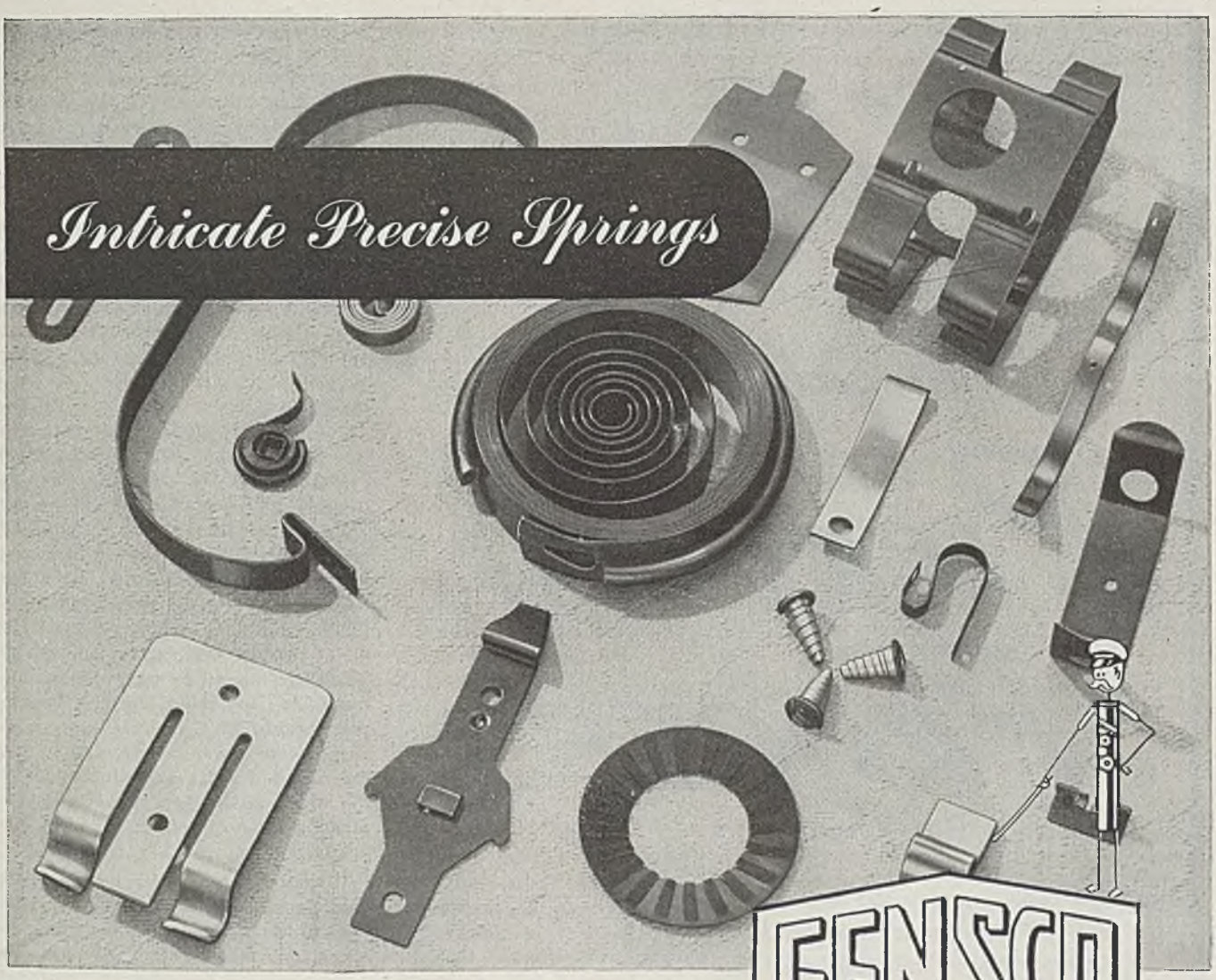
Most castings, either small or large, had poor surfaces. In many cases metal penetration and pinhole porosity were very prominent. Sand, slag inclusions and buckles were also fairly extensive and shrinkage cavities and hot tears were occasionally encountered in castings.

Very little use was made of radiography. The x-ray machines were small and radium was not used, but messotherium was supplied by the government inspection service for inspection of certain classes of castings. Magnetic particle testing was used on all aircraft castings and on a few armor castings.

Tensile properties of castings were excellent. A considerable amount of impact testing was carried on and, in some cases, notched-bar impact values were specified. It is the opinion of the author that as a whole the quality of the steel castings produced in Germany was not equivalent to that produced in the United States.



PRODUCTION-LINE CHECK: Use of the Precisionaire gaging unit, made by Sheffield Corp., Dayton, O., at a vertical boring mill is said to increase production, reducing scrap to less than 2 per cent. In above operation, checking column hole of a visual gage base casting, gaging unit holds tolerances to 0.0005 in.



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Combination of Acids Employed in PICKLING PROCESS

Hydrochloric acid used in combination with sulphuric acid and inhibitor. Mix is maintained at low constant temperature. Process affords increase in pickling speed, minimizes acid and steam consumption and loss of iron and has a distinct advantage over straight sulphuric acid baths. System of recovery is simplified

By E. W. MULCAHY
London, England

TWO normal methods of pickling steel include hydrochloric acid at normal temperature and sulphuric acid at temperatures from 158 to 194°F. Hydrochloric acid provides a brighter and cleaner finish to the metal, while sulphuric acid, although requiring steam heating, is a quicker and cheaper method, mainly because of the difference in the cost of the acids at commercial strength.

Dr. DeLattre of Belgium has evolved a pickling process which retains the technical advantages of hydrochloric solutions, yet gives the ease of recovery of spent sulphuric acid pickling baths. The process is based upon the reaction: $FeCl_2 + H_2SO_4 = FeSO_4 + 2HCl$. It is claimed in the chemical analysis and mathematical calculations of Dr. DeLattre that the most favorable conditions for this result are obtained when the pickling liquor contains per liter 1 g mol. wt of ferrous sulphate, from 1 to 2 g mol. wt of hydrochloric acid, and 1 g mol. wt of sulphuric acid. This solution is employed at a constant temperature of 122 to 131°F maintained by steam heaters immersed in the pickling liquid. The proportions of H_2SO_4 and HCl are maintained at the level corresponding to the lower limit of $FeSO_4$ concentration during the whole pickling operation by appropriate addition of both acids and the inhibitor.

It must be made clear that it is sulphuric acid which is consumed by pickling and that the addition of hydrochloric acid is only necessary in small quantities, to make up the losses due to mechanical splashes, etc. As mentioned in the patent specification, a special inhibitor is used in the pickling solution, and consists of gelatin, peptonised by HCl.

Two Acids Are Employed

Four tanks, 25 ft long, are used for pickling bars of hexagon, round and rectangular sections, varying from ½-in. hexagon to 3-in. round. The acid is a mixture of sulphuric and hydrochloric heated to 140°F by thermostatically controlled heaters. The tanks are of mild steel, rubber lined and covered, and additionally lined and covered with a protective layer of blue bricks set in silicious cement. The sulphuric acid is fed into each pickling tank by valve controlled pipelines running from a calibrated measuring vessel, which is in turn fed by gravity from a 40-ton storage tank situated some distance from the building. This system of handling the acid insures that quantities are kept constant, and that the acid is handled with safety. The hydrochloric acid, which is introduced into the tanks by carboys, requires little makeup during the course of a day, providing the temperature is kept at a maximum of 140°F; above this temperature serious evaporation takes place.

The atmosphere of the pickling shop is much improved at this controlled moderate temperature and is an impressive feature of the process. It is not suggested, however, that defuming systems can be dispensed with, but visibility is not hampered as in the case of H_2SO_4 baths working at higher temperatures. The low working temperature represents a big economy in steam consumption; this is readily understood when considering that each bath is heated with four 1-in. open-ended circulating heaters.

Claims of the inventor are adequately borne out at least for static pickling baths; the speed of pickling is almost constant right up to the maximum iron concentration of the bath, and there is little decrease in pickling speed. Each bath of 1200 gal pickles approximately 150 tons of mixed bars and reaches a total iron content of 13.6 per cent before being discarded. A straight sulphuric bath at 180°F working under similar conditions without agitation is discarded when the iron content is 5 to 6 per cent and acidity 2½ to 3 per cent. Pickling speed at this stage is intolerable.

Each pickling bath can be separately emptied through 3-in. valve-controlled outlets connected to a main rubber-lined steel conduit, which conveys the acid by gravity to a 2500 gal receiving tank below ground level in the acid recovery building. The valves on the tank outlets, and all other valves in the piping system, are of the rubber diaphragm type, simple to operate and chokeless.

It may be added at this point that all sludge from the pickling tank bottom can be washed out with the acid liquor through a weir filtering system and intercepting tank, which form part of the acid recovery storage tank arrangement. The storage tanks are a monolithic arrangement of two 2500 gal tanks, constructed of reinforced concrete lined with rubber and acid-resisting blue brick, one tank receiving the liquor to be treated, while the other contains the regenerated acid after treatment.

The filter for separating the suspended solids consists of layers of graduated flints and fine silver sand. The heavier oxide sludge is intercepted in a deep cone-shaped tank immediately before the filter, into which the liquor flows over a weir from the cone tank.

Tank Equipped With Heaters

The storage tanks are fitted with circulating injector heaters, which are used only if the liquor remains in one tank a long time before being regenerated, resulting in an appreciable drop in temperature, in which case the crystals would precipitate in the tank. The heaters in the regenerated liquor storage tank are for preheating the acid before returning to the pickling plant.

Filtered acid is pumped from the storage tank to the crystallizing vessel which treats 500 gal in one charge. The pump is a specially designed reciprocating glandless type, capacity 2000 g.p.h., suction head 7-ft, delivery head 20-ft. The crystallizer, which is mounted on a structure 18 ft above floor level, is a tellurium-lead lined vessel, fitted with a helical chemical lead cooling coil through which water at atmospheric temperature is pumped at a fixed velocity. To avoid

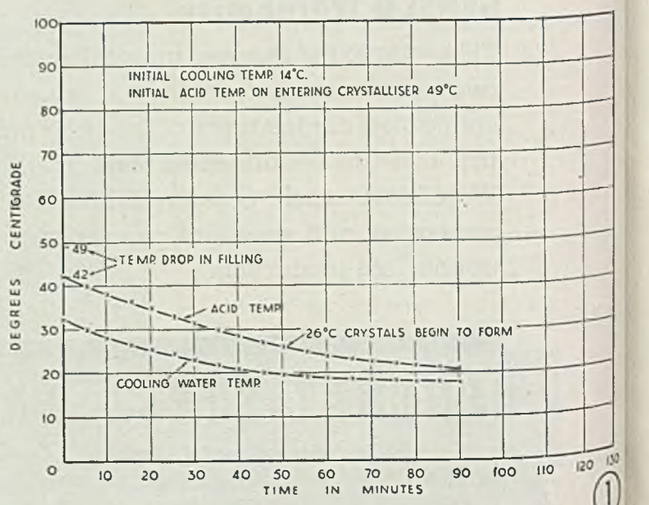

Fig. 1—Curve showing rate of cooling in 500-gal crystallizer

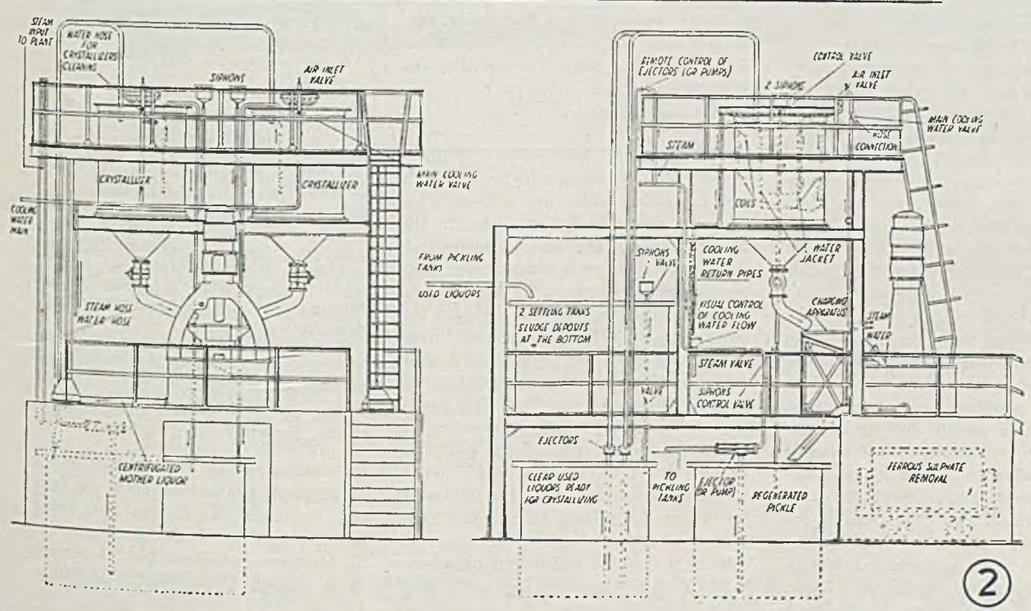

Fig. 2—Two views of standard type of acid recovery plant involving two crystallizers

waste, the cooling water passes straight from the coil to the rinse tanks in the pickling shop.

The acid in the crystallizer is agitated by a vertically suspended marine screw impeller rotating at a high velocity, which causes a turbulent circulation over the surface of the coils. The internal velocity of the cooling water through the coils, and the external velocity of the acid liquor over the coil surface, are of fundamental importance to the rate of heat transfer and crystal size. The total cooling time for 500 gal is approximately 60 min, the temperature dropping from 130 to 63°F with a cooling water temperature of 60°F in the summer time. As the quantity of crystals in a normal cooling process varies with the cooling water temperature, well water should be used where possible.

Crystals Are Reclaimed

Stirring is normally stopped when the liquor temperature is within 3 to 5°F of the cooling water temperature. The crystals then precipitate and collect in the conical bottom of the vessel. A period of 4 to 5 min is allowed for complete settling, and the bulk of the treated liquor is then decanted off into the regenerated liquor storage tank. Decanting is done with an ejector operated syphon, the suction leg of which extends to the bottom of the parallel section of the crystallizer. The remaining liquor carries the crystals as a slurry through the outlet in the bottom of the cone into the rotating centrifugal hydro basket. The crystallizer outlet pipe is controlled by a large chokeless diaphragm valve.

The hydro basket, which is of the flexible drive overhung type, is situated conveniently below the crystillizer, and is mounted on concrete piers arranged so as to provide an angular chute into a tile lined crystal collecting sump, from which the ferrous sulphate crystals are bagged or loaded into barrels for dispatch.

As soon as the crystallized sludge enters the hydro basket, which is then rotating at 450 rpm the liquor is expelled through the perforations in the periphery of the basket, and the crystals form into a vertical wall about 4 in. thick on the side of the basket. The hydro is then run at full speed (900 rpm) for 3 min, and this practically dries the crystals. The hydro is stopped by means of a lever operated brake which also operates a trip switch shutting off the current. The crystals are then discharged from the basket, through a specially designed removable bottom down the chute to the tile-lined tray. The acid liquor expelled from the basket to the outer casing of the hydro is conducted through an outlet pipe to the regenerating liquor tank. All the centrifugal hydro parts that come into contact with crystals and acid liquor, casing, basket, suspension-shaft, and outlet pipe, etc., are covered with hard rubber.

The crystals on being discharged from the centrifugal hydro resemble snow in appearance, apart from their greenish tint. The low moisture content enables them to be bagged for rail or road dispatch.

The regenerating liquor, which has been stripped of half of its total iron content, is now ready to be pumped back to the pickling tanks; this is done with a similar pump to the one used to fill the crystallizer. The acid is pumped at the rate of 2000 g.p.h. through the same pipe, which gravity feeds the spent liquor from the pickling tanks to the acid recovery plant. The arrangement saves piping, and clears the pipes and valve of saturated liquor, thus preventing crystals from forming in the pipe line. This pump is fitted with a simple pressure relief valve, to provide for accidental pumping against closed valves. Mechanical relief valves are somewhat unreliable with acid liquors, so this release arrangement consists of a vertical loop on the pressure side of the pump, the height of which is slightly in excess of the total head when pumping against a full pickling tank. By a simple valve arrangement in the pump line, both large storage tanks can be emptied from one to the other, and each can be discharged to the drains after washing down with water. Periodical washing down is necessary in view of the accumulation of sludge after several charges have passed through.

The floor and walls in the immediate vicinity of the acid storage tanks are covered with acid-proof tiles to provide against splashing.

The structure carrying the crystallizer has two checker-plated platforms connected by a staircase, with two access ladders from lower platforms to floor level. The crystallizer valve is controlled from the lower platform, which extends on to the working platform of the hydro. The top platform is 18 ft above floor level, from which temperature and other tests are taken.

All electrical equipment, switches, starters, transformers, fuses, automatic cut-out gear, etc., are housed in a fume-tight well-lightetd cabin inside the building.

This process from the point of view of pickling has a distinct advantage over straight sulphuric baths— i.e., the lower temperature of the process with little reduction in time of pickling, which is almost constant up to the saturation point of solution. This is an important point when considering continuous pickling process which normally discards at a high content of acid.

It is not important to remove as much iron from this solution in regenerating, as in the case of sulphuric acid, but if this is desirable, it can be achieved by including a refrigeration plant in the layout, in which case temperatures below 0°C can be reached, and practically the whole of the iron is crystallized out.

Other advantages may be summarized as follows:

1. Increased pickling speed due to control of liquid, acid density, and temperature.
2. Thorough cleaning of the metal surface. Reduction of hydrogen absorption and consequent brittleness due to incorrect pickling operations.
3. The special pickling technique combined with the recovery method, leads to an absolute minimum of acid consumption, and to a correspondingly reduced loss of iron.
4. Reduced steam consumption for heating baths owing to the lower working temperatures required.

From an article in *Sheet Metal Industries*, London, January 1946.

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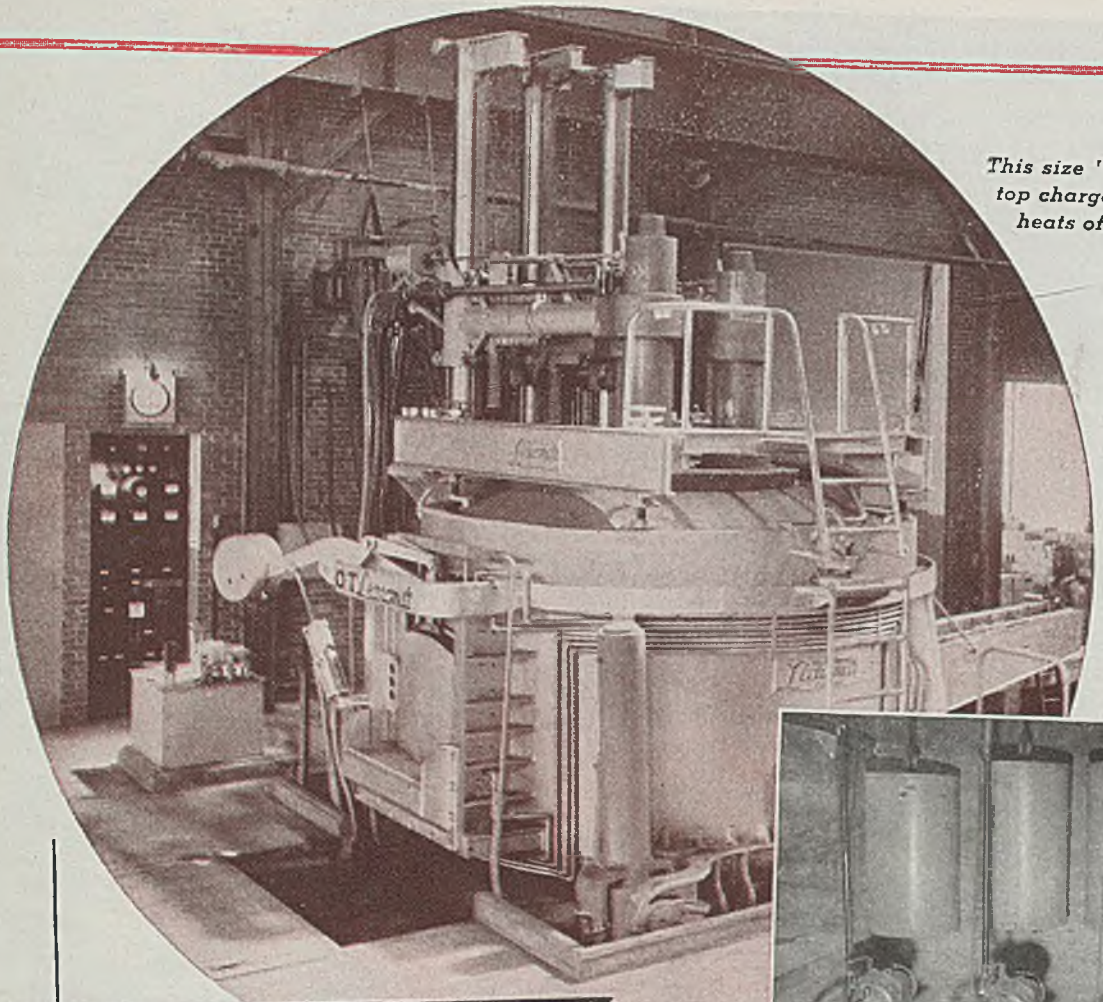
As many as one hundred twenty 9 x 12 in. photostats or blue prints per hour can be dried by a dryer now being manufactured by Fedco Products Co., 37 Murray street, New York. According to the maker, the machine also is capable of drying ninety 11 x 14 in. copies in the same time.

Miniature Ball Bearings Available in New Sizes

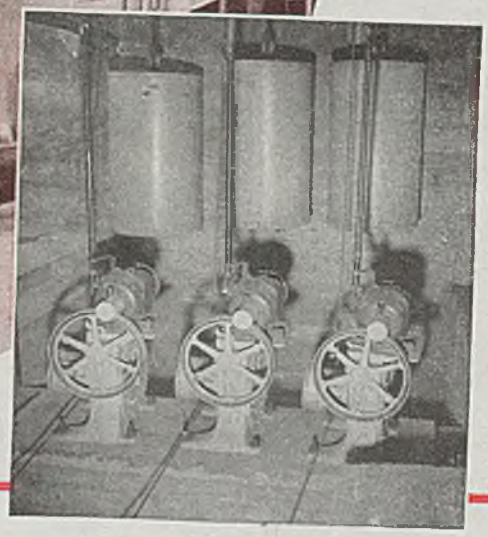
New series of very light miniature ball bearings now is available with outside diameter of $\frac{5}{16}$-in. and bores of $\frac{3}{32}$, $\frac{1}{16}$, $\frac{5}{32}$ and $\frac{1}{8}$-in. Bearings are manufactured of chrome bearing steel and finished to precision tolerances of plus 0 and minus 0.0002-in. They are shown in actual size in illustration. They occupy little space, and furnish all advantages of antifriction operation in restricted locations where they replace plain bearings or bushings.

Bearings are designed for use in small motors, computers, electronic equipment, drive movements of recording devices, testing and laboratory equipment and for supporting the moving parts of various precision mechanisms. They take unusually heavy loads and high speeds for their size and weight, according to Miniature Precision Bearings, Keene, N. H., the manufacturer.



This size "OT" Lectromelt top charge furnace pours heats of 8 to 12 tons.

MELTING EFFICIENCY THAT EXCEEDS ALL OTHER METHODS



Furnace electrode operating winches.

The Lectromelt patented counterbalanced electrode system makes possible furnace efficiency that excels all other metal melting methods.

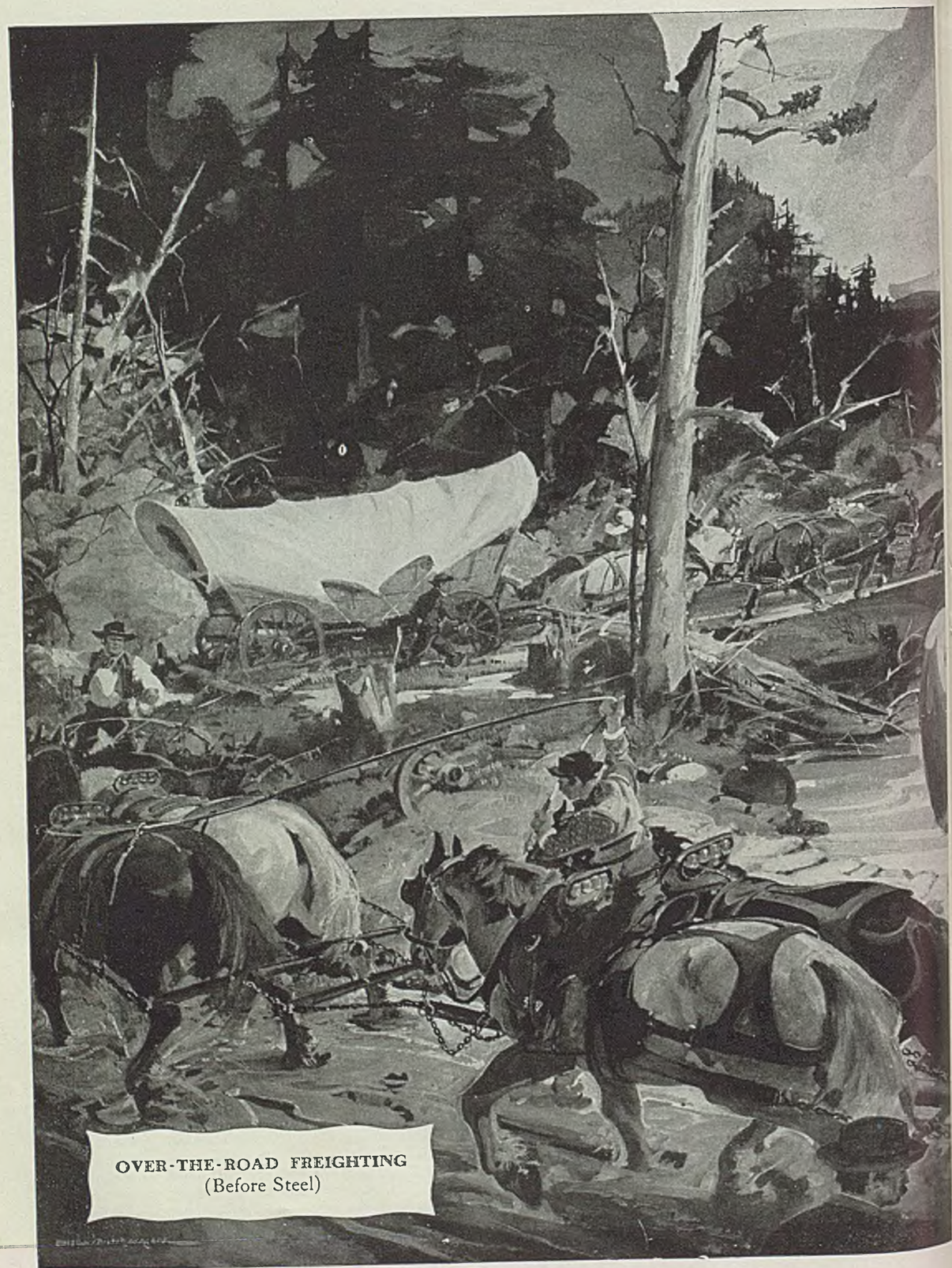
The entire electrode arm, including electrode, crosshead and holder, is counterbalanced by an over and under friction bite winch system so as to give the most sensitive and rapid electrode movement, thus permitting accurate regulation of the arc and minimizing power consumption and electrode breakage. Full information sent on request.

Lectromelt Top Charge Furnaces available in capacities ranging from 100 tons down to 250 pounds.

MOORE RAPID Lectromelt FURNACES

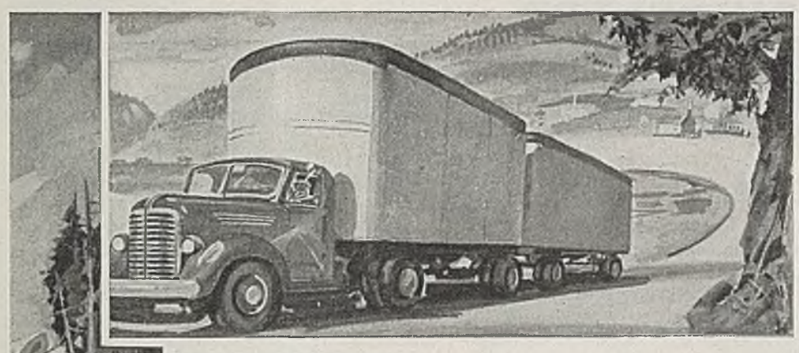
PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH..30..PENNA.



OVER-THE-ROAD FREIGHTING
(Before Steel)

DRAWN FOR JONES & LAUGHLIN STEEL CORPORATION BY ORISON MACPHERSON



YOUR SHIPMENTS BY HIGHWAYS WOULD BE SMALL, SLOW, COSTLY —WITHOUT STEEL

Without steel, you could only afford to ship goods to nearby markets in small lots on the backs of pack mules, or in lumbering, six-horse Conestoga wagons, often through the hub-deep mud of storm-swept mountain roads. On long hauls the wagon freight rate sometimes was double the value of the shipment.

Steel has changed all that, and made possible the swift, flexible, low-cost freight service that motor transport brings to your door today. The bodies for new, heavy-duty, medium and light trucks are being built of new, stronger steels for lighter weight construction. One of these is Otiscoloy steel, a Jones & Laughlin development. The great strength of Otiscoloy enables saving of weight in truck bodies with corresponding increases in pay loads. Moreover, Otiscoloy is resistant to the destructive forces of corrosion and abrasion. Its use reduces maintenance cost because repairs are less frequent.

With new trucks and trailers and wide, all-weather highways of easy grades and long, sweeping curves, over-the-road shipments of freight and express by motor transport are fast becoming heavier, speedier, safer and more frequent—because of steel.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

J&L STEEL

LIGHTER, STRONGER, CONTROLLED QUALITY STEELS

HIGHWAY FREIGHT

"Ships of inland commerce" were the graceful, boat-shaped Conestoga wagons with their spreading white tops. In bad weather it took them 3 weeks to make the freight haul between Philadelphia and Pittsburgh. Today's fleets of "highway motor ships," the great steel trucks and trailers, make the run overnight.

5 million trucks operate today in U. S. and ¼ million trailers and semi-trailers, more than half run by one-truck owners.

"Dutch Waggons" built in the 1700's took the name of the Conestoga Valley (near Lancaster, Pa.) where they originated, once occupied by Conestoga Indians.

Trucking industry employs 4 million (exclusive of those working on farm vehicles). This is more than any other transportation industry, says the American Trucking Associations, Inc.

"There with bells on" originated among Conestoga freighters proud of the bronze harness-bells that advertised safe arrival in a town. But, if wagon bogged down, it brought driver the humiliation of having to hand over his bells to the team that towed his wagon out.

Old-time Conestoga wagon complete with original harness, trappings, and bells rigged on life size models of six-horse team is on display in Pennsylvania Historical Museum, Harrisburg.

Long wagon trains a century-and-half ago, like motor truck lines of this century, brought the need for better roads. In 1794, the Lancaster Pike was completed to Philadelphia, first toll road in America. Twenty-four feet wide, surfaced with broken stone, it takes its place in history as a great road-building job, as does the 162-mile, 4-lane, all-weather, non-stop Pennsylvania Turnpike between Pittsburgh and Harrisburg opened in 1940, designed primarily to expedite motor freight transport.

1st motor truck made its appearance in Detroit in 1904, attracted skeptical attention amidst the plodding horse-drays.

Dump truck's big job is hauling excavated material away from building and other construction. Trucks with Otiscoloy steel bodies are enough lighter and stronger to take on additional pay load.

Coal trucked from mines exceeds 25 million tons a year. New trucks with strong Otiscoloy steel bodies can take on ¼ bigger load with no increase in overall weight. Otiscoloy's abrasion and corrosion resistance properties extend life of body.

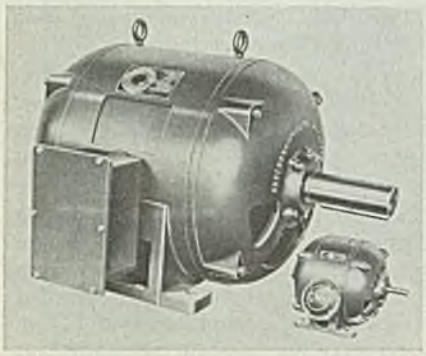
10,000 freight wagons were in the Philadelphia-Lancaster-Pittsburgh run in 1800, according to one historian.

For Otiscoloy booklet (illustrated), giving technical information and suggested applications of this weight-saving J&L steel, write Publicity Manager, Jones & Laughlin Steel Corporation, Pittsburgh.

INDUSTRIAL EQUIPMENT

Squirrel-Cage Motors

Providing full protection against dripping liquids, falling metal chips and other foreign matter, three new frame sizes now complete a line of ac squirrel-cage, protected-type motors from 1 to 200 hp manufactured by Crocker-Wheeler division, Joshua Hendy Iron Works, Ampere, N. J.

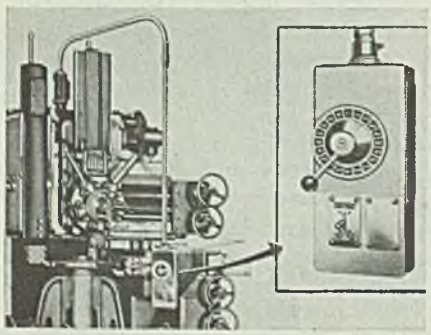


Rated at 40° C rise, these full-load continuous duty motors have a 15 per cent service factor. Frames have two shielded air-exhaust openings in the upper half of the frame. Use of centrifugal bearing seal allows use of softer greases for better lubrication.

Steel 4/15/46; *Item No.* 9231

Pendant Control

Gears are quietly and almost instantaneously shifted through an electrically-controlled, hydraulically-operated mechanism, operated by the pendant control, a feature of vertical turret lathes, manufactured by Bullard Co., Bridgeport 2, Conn.



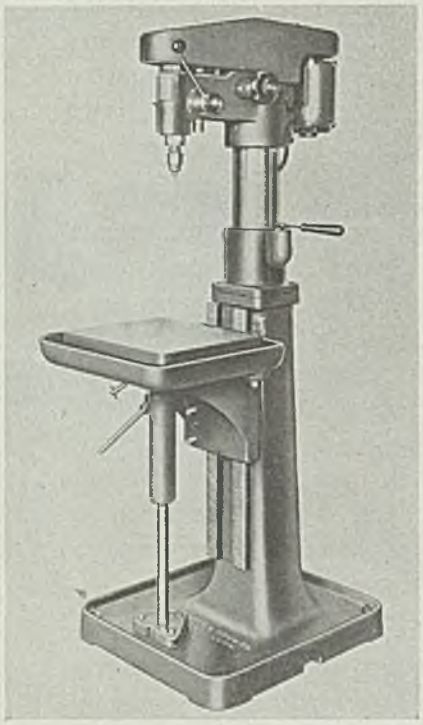
The design is a departure from conventional controls of this type, inasmuch as speeds are selected rapidly by means of dialing. When the machine is in operation and a speed change is desired, switch lever is thrown into brake position, change of speed quickly dialed and lever thrown back into clutch position. A self-interlocking design provides protection for the proper selection of gears.

Jogging of table for positioning and indicating purposes accomplished through use of switch lever which will jog and position table for any fraction of a revolution.

Steel 4/15/46; *Item No.* 9212

Drilling Machines

Allowing selection of correct cutting speed for each diameter drill, reamer, or counterbore in any material, two new drilling machines offered by Taylor & Fenn Co., Hartford, Conn., incorporate a self-contained, motor-driven unit providing infinite speeds.



Quiet, vibration-free operation at all speeds is assured by use of sealed ball bearings. Uniform belt tension at all speeds, full ball bearing spindle with multisplined drive and fully enclosed driving mechanism are features of these machines, both of which are furnished in one to six spindle units.

Model M-96 has spindle overhang of 8⅝ in. and a traverse of 3¾ in., and a maximum spindle to table distance of 21 in. Model M-125 has spindle overhang of 8 in. a traverse of 2½ in. and maximum spindle to table distance of 26 in.

Steel 4/15/46; *Item No.* 9087

Gage Block Set

Wear resistant tungsten-carbide gage blocks which, under normal conditions of service, need never be replaced or recalibrated are now available in an 82-piece set announced by the Fonda Gage Co., 59 Daly street, Stamford, Conn.

Having a finish of 0.2 to 0.4 microinch rms, blocks show practically no shrinkage or growth due to inherent stability of tungsten-carbide.

Block sizes range from 0.050 to 4 in. in the new set, about 480,000 combinations being possible. Use of this large set employs fewer blocks in wringing groups to the same measurement than possible with the company's 35-piece set.

Three grades are being offered with tolerances ranging from plus or minus 0.000002 to 0.000008 in.

Steel 4/15/46; *Item No.* 9222

Repeat Cycle Timer

A type 2T15U repeat cycle timer, recommended for applications requiring two adjustable timing periods to run in a continuous cycle, is offered by Combustion Control Corp., 77 Broadway, Cambridge, Mass. Cycle of timer is initiated by either momentary or sustained contacts, and provision for automotive recycling is provided.

Each timing period is adjustable from 1/20th sec to 2 min. Specially designed snap-action relays result in accuracy of control and interchangeability, variations

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 133.)

NEW FAST, CLEAN, SIMPLE METHOD OF LOADING HAND GUNS

NEW ALEMITE 35-LB. CAPACITY LOADER PUMP

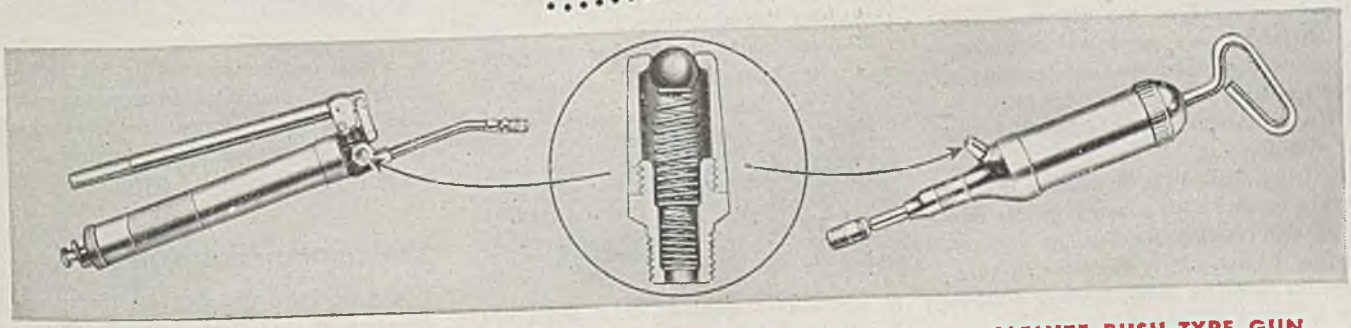
Model 6851-E

This pump is similar to the 100-lb. capacity model in operation and features. However, it is designed to fill hand guns from the portable container. The loader is completely closed to atmosphere, dirt, and moisture.

NEW ALEMITE 100-LB. CAPACITY LOADER PUMP

Model 6721-E

For steel industry where extensive lubrication is necessary. Fits original 100-lb. container. This pump provides a quick, positive method of refilling hand guns. A loader fitting on the gun fits a loader valve on the pump. An automatic cut-off stops pump handle when gun is full, preventing damage to the gun barrel. A loader pump prevents troublesome air pockets which result when hand paddle methods are used. Loaders also eliminate contamination of lubricants.



ALEMITE LEVER-TYPE GUN WITH LOADER FITTING

A heavy-duty gun with loader fitting mounted in the head. It is the same as fitting shown at the right. Gun is available in two models—No. 6679-J and No. 6243-J.

CUTAWAY VIEW OF ALEMITE LOADER VALVE

Model G-306740

Available to convert present guns to loader operation.

ALEMITE PUSH-TYPE GUN WITH LOADER FITTING

Note the loader fitting on the head of the gun. A cutaway view of the fitting is shown at the left. Gun is available in two models—No. 7553 and No. 7584.

THIS NEW Alemite gun loading equipment gives oilers a full gun every time . . . *in seconds*. And from barrel-to-bearing, every drop of lubricant is protected against contamination.

For complete details, contact the nearest Alemite distributor, or write Alemite, 1879 Diversey Parkway, Chicago 14, Illinois.

STEWART WARNER

ALEMITE

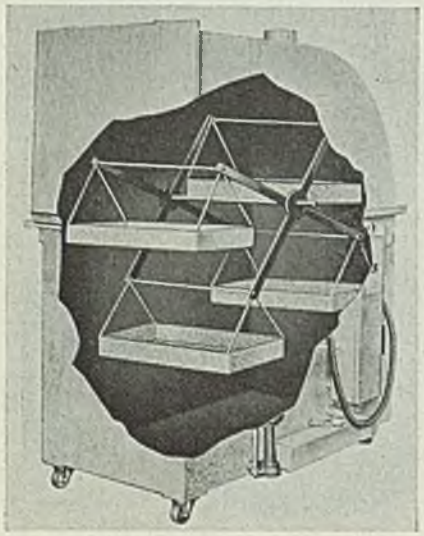
First in Modern Lubrication

in repeat cylcle timing being less than 2 per cent. Timer is universal for six maximum time ranges from 1.5 sec to 2 min for each period of the cycle. Each range is represented by a timing element which is snapped into a clip on the front of the control. Timer is set for any interval up to these maximums by dials set on the timer itself or in a small housing. It is designed for 115 v ac-dc current.

Steel 4/15/46; *Item No.* 9223

Vapor Degreaser

A vapor degreaser which features both semiautomatic operation and a controlled cleaning cycle is now offered by Phillips Mfg. Co., 3419 Touhy avenue, Chicago. Consisting of a motor-driven rotating frame, governed by an automatic limit switch and interval timer, a loading de-



vice is mounted on the degreaser from which baskets are suspended in a ferris wheel manner. Each basket is brought to the degreaser for loading and unloading and is automatically swung into the bath for cleaning.

The unit, called the Rotomatic, is completely hooded with a hanging door covering the opening for loading and unloading baskets. It is available in three sizes for handling 1200, 3000 or 4000 lb per hr.

Steel 4/15/46; *Item No.* 9184

Megohm Meter

Protection against atmospheric conditions where precise testing is required, and accuracy within 5 per cent at any position on all ranges are features of new model 1500 megohm meter, developed by Communication Measurements Laboratory, 120 Greenwich street, New York. A range from 400,000 ohms to 100,000 megohms in five ranges on a single scale 4-in. meter is claimed. This may be extended below 400 K by the increment method.

Weighing only 8 lb, this meter may be employed to measure and test in widely scattered locations. It may be used on a wide range of applications: Measuring leakage resistance of insulation materials,

condensers, coaxial cables, wiring harness, motor and transformer windings. Other uses are for determination of moisture content of materials in which electrical resistance is a function of moisture content. The meter is designed for use with 115 v, 60-cycle current.

Steel 4/15/46; *Item No.* 9230

Conduit Fairlead

Comprised of two simple parts, a new fairlead for electrical and other types of conduit in airplanes, boats, automobiles, and appliances has been developed by the Double T Fairlead Co., 301 Acacia avenue, Hawthorne, Calif. It eliminates necessity for springs and other parts.

The devices are designed to support tubing of any combination of sizes. When used on gang fairleads, any individual line or conduit may be removed without disturbing the other lines.

The two parts, the bracket and grommet, are light in weight, resulting in

greater aircraft payload. It is assembled by placing split grommet over tubing and inserting other half of the grommet.

Steel 4/15/46; *Item No.* 9224

Air Conditioning Unit

Curtis Mfg. Co., 1905 Kienlan avenue, St. Louis 20, announces a new, improved model of their packaged air conditioning unit. This unit provides a complete air conditioning system in one compact unit, which cools, dehumidifies, circulates, and filters the air. It can be adapted for heating and humidifying also, if desired. Installation requires only electrical and water connections. It is available in 3 and 5-ton capacities.

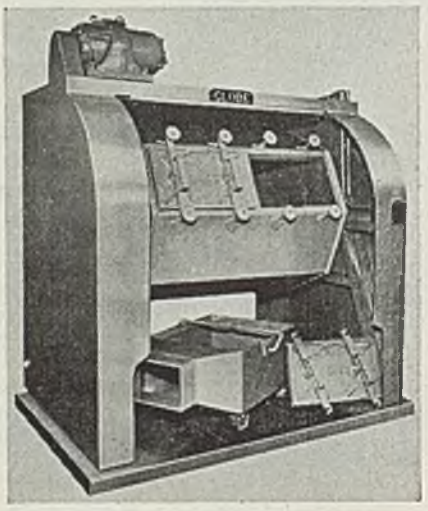
Steel 4/15/46; *Item No.* 9102

Deburring Machine

"Burr-Rite" machine offered by Globe Stamping Division, Hupp Motor Car Corp., Cleveland, features double and triple compartments which can perform two operations, polishing and de-burring, simultaneously.

Handling of aluminum, brass and die cast parts has been simplified by installation of a hoist pan and large lightweight doors to make loading and unloading easier. The compartments can be relined with tough, hard maple liners without removing shell.

The machine is available in three models: Single compartment model with



a cubical content of 18.4 ft; the double model with two 9 cu ft compartments; and triple compartment model having three 5.1 cu ft capacity compartments.

Steel 4/15/46; *Item No.* 9219

Pneumatic Pilot Valve

A pilot valve designed for use in application of controlled air power to machine tool applications has been announced by Modern Products Ltd., 952 South Grand avenue, Los Angeles.

Known as Modernaire CRV pilot valve, unit is designed to be used as a 2 or 3-way valve, normally either open or closed, the former being accomplished by plugging one port. This compact valve measures 3¼-in. overall with the piston fully extended.

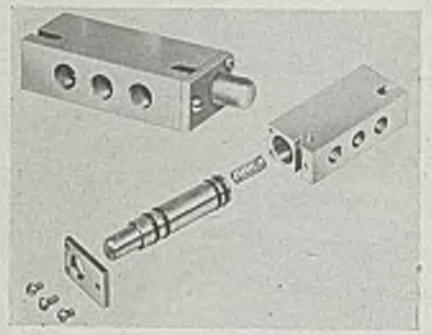
Valves are operated, dependent upon the nature of the installation, by hand, foot treadle or cam which may be part of a timed sequence of operations in air

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 133.)

or low pressure hydraulic control and actuating systems.

Elimination of metal-to-metal contact within the valve results in smooth and positive operation over long periods without servicing. Complete renewal is attained by replacing four "O" ring packings.

The piston rod is retained by an end-plate, completely eliminating the possi-



bility of the plunger coming out during operation. It will operate freely under conditions of extreme pressure variation.

The valve is normally supplied with ⅛-in. ports; other size ports are available.

Steel 4/15/46; *Item No.* 9217

Gas Analysis Instrument

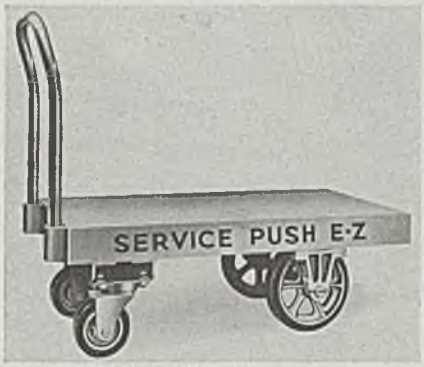
Safety equipment for detection and analysis of combustible gas or vapor in air is announced by Davis Emergency Equipment Co. Inc., 45 Halleck street, Newark, N. J. The extended line is the result of grant of license to manufacture and sell special thermal conductivity cells under a W. O. Hebler Co. patent.

The new equipment will detect and analyze any one gas, whether combined or not with other gases, or measure gas or vapor air mixture from the characteristics of explosion. Instruments are available with direct reading meters, circular chart, or strip chart recorders, or with recording and control equipment.

Steel 4/15/46; *Item No.* 9227

Magnesium Truck

Greater payloads, easier operation and less physical fatigue are advantages of an all magnesium alloy materials handling truck built by Service Caster & Truck division, Domestic Industries Inc., Albion,



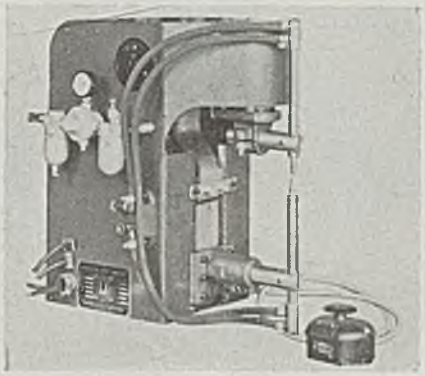
Mich., in co-operation with the foundry division of Hills-McCanna Co., Chicago. The truck, a service push-E-Z model, has a capacity of 6000 lb.

Steel 4/15/46; *Item No.* 9228

Bench Spot Welder

Two thicknesses of 16-gage sheet steel can be welded by the new 7½ kva automatic bench spot welder, developed by Universal Welder Corp., Cleveland. Its four steps of adjustable weld-heat control delivers a secondary maximum of 12,000 amp. Also, an accessory unit of the air-operated welder insures clean lubricated air delivery to the air cylinder.

Unit consists of an air filter, regulator, lubricator and pressure gage. Improved pressure switch, fast 4-way solenoid air valve, heavy-duty butt contact, inbuilt welding contactor and an air-flow regulating valve for adjusting point impact speeds are among other operating equipment. Welder has a throat depth of 9 in.,



and its lower arm is adjustable up and down for a wide range of work.

Steel 4/15/46; *Item No.* 9220

Bronze Electrode

A new type phosphor bronze electrode, designed for operation with direct current and reverse polarity in all-position welding of brass, bronze, copper, cast iron and steel has been developed by Alloy Rods Co., York, Pa. Designated as Cupro-Arc C, it conforms to AWS-ASTM and Navy specifications.

The smooth flowing arc of electrode eliminates erratic arc action and spatter loss is minimized. Typical applications are repair and maintenance of bushings, bearing surfaces, castings, gears, fabrication of copper-clad metals and welding of dissimilar metals.

Steel 4/15/46; *Item No.* 9221

FOR MORE INFORMATION on the new products and equipment mentioned in this section, fill in this form and return to us. It will receive prompt attention.

Circle numbers below corresponding to those of items in which you are interested:

9231	9184	9227
9212	9230	9228
9087	9224	9220
9222	9219	9221
9223	9217	

4-15-46

NAME ..... TITLE .....

COMPANY .....

PRODUCTS MADE .....

STREET .....

CITY and ZONE ..... STATE .....

Mail to: STEEL, Engineering Dept.—1213 West Third St., Cleveland 13, Ohio

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on this page.)

"Let's take the one *I* can carry upstairs"

Of course smart housewives will pick a vacuum cleaner made strikingly *lighter*—with magnesium! Who'd miss the chance for easy, breezy cleaning . . . light lifting . . . effortless carrying? And you won't either. ¶ No, you'll choose a *magnesium* cleaner—and be happy to pay the slightly higher price it may cost. For with all its lightness, this remarkable metal gives value-plus in strength, durability, service. ¶ Naturally, Dow is not a producer of vacuum cleaners, but as America's foremost source of magnesium metal it cooperates with manufacturers throughout the nation. ¶ Now on the way are many new products . . . better . . . more useful . . . and made vastly lighter . . . with *magnesium!*

Ready . . . to make products move!

MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS

Foremost in magnesium production, Dow is turning out this lightweight metal in quantities ample to supply the needs of the nation's manufacturers.

Dow cooperates closely with a long list of magnesium fabricators highly skilled in producing parts and assemblies to lighten products of all types.

Steadily growing in number and variety, the end products containing magnesium include many kinds of consumer items and diversified industrial applications.

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN • New York, Boston, Philadelphia, Washington, Cleveland, Detroit, Chicago, St. Louis, Houston, San Francisco, Los Angeles, Seattle

This is a reprint of a Dow magnesium advertisement which appears in full color in national magazines reaching millions of readers in all parts of the country.

MAGNESIUM

appeals to the public . . .

You don't have to be a technical man to appreciate the advantages of magnesium. Plain folks can sense the significance of *lightness* the instant they pick up a modern product made of this fine weight-cutting metal. It's a feature that makes for consumer sales—despite a possible slight price premium. For technical men, manufacturers, and production men, on the other hand, magnesium has industrial advantages of equal importance. They profit by advantages like speedy machining, easy handling, ready adaptability to many production methods. In many a modern plant they're adding up all these advantages to increased profits, lower costs.

MAGNESIUM

. . . appeals to industry

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SAWING is a speedy and efficient method of cutting magnesium. Speeds up to 15,000 feet per minute can be attained with band saws, and magnesium can also be readily cut with circular saws and hand or power hack saws. Low cutting pressures permit larger cuts per tooth than are possible with other structural metals.

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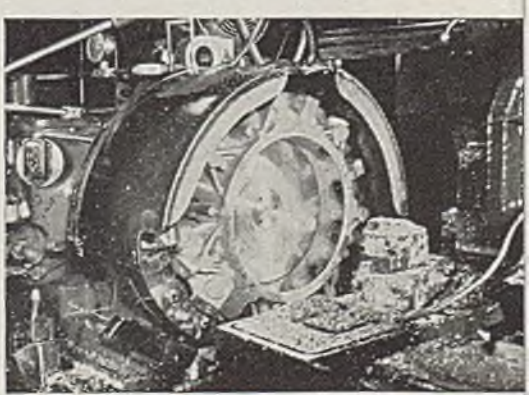
MACHINING takes minimum time and power with magnesium. Magnesium is a free machining metal in all forms. The life of cutting tools used for magnesium work is exceptionally good, especially if they are carbide tipped. Fine surface finish is readily obtained.



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Pressure Welded Joints

(*Continued from Page* 99)

100 per cent efficient joints. Explanations for this, such as poor gas pressure regulation, faulty burner design, erratic behavior of the hydraulic pressure system, and inadequate preparation or protection of the welding faces, were investigated but they appear unwarranted. Welding schedules were used which almost certainly entailed adequate upsets, a high enough internal temperature, a long enough heating time, and careful preparation of the welding faces. Some difficulties were encountered in the regulation of gas flow to the ring burners, and with the characteristics of the burners, but even these were believed to be under satisfactory control.

Results point to one principal cause of inconsistent weld strength, namely, the presence of oxygen as oxides or in solution at the plane of the weld. The necessity of maintaining clean, unoxidized welding surfaces has been emphasized by many investigators, but the degree of "cleanliness" which is necessary to produce a 100 per cent efficient joint in an alloy steel part with no reinforcement has not been clearly established.

It is believed that the very thin oxide film present on the welding surfaces of two freshly machined or polished parts may not be an important factor. Probably, harm comes from the oxides which form on welding faces during the heating cycle, and from the oxygen and oxides which dissolve into adjacent metal. Even if the welding faces are machined very accurately so that they fit together with virtually no clearance, it is quite probable that during the heating cycle sufficient differential expansion and warping take place to open a crevice into which oxygen from the atmosphere, and oxygen and water vapor from the welding flame, enter.

Removing Oxide Film or Particles

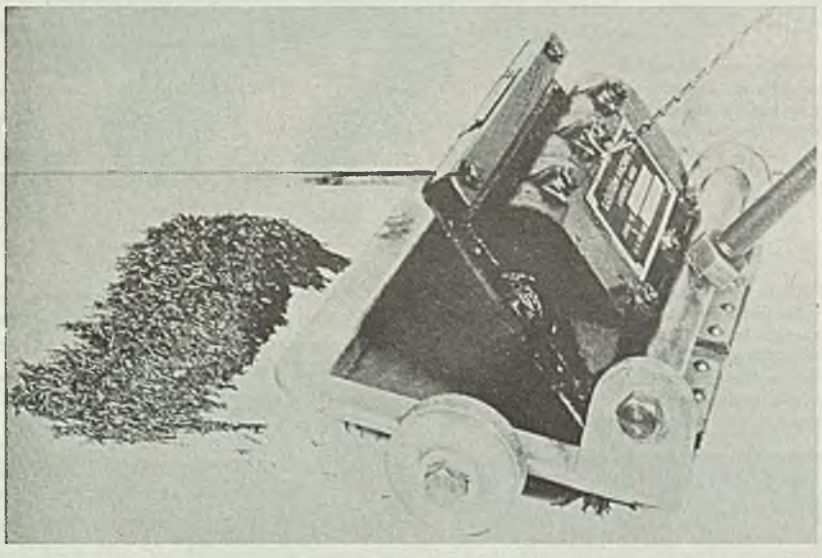
It has been suggested that the oxide film or particles on the weld plane will disappear if, during the welding cycle, sufficient heat and time are provided to permit solution of oxides into the adjacent metal. This may be true, but the possibility exists that oxygen absorbed by the metal also exerts a deleterious effect on the strength of the joint. Many of the photomicrographs in this report show weld section etched with a reagent which, it is believed, brings out the presence of relatively large amounts of dissolved oxygen. These weld sections, when etched with nital or a similar reagent, show no sign of a weld line or band, and many show complete coalescence of the structure across the original plane of the weld faces. However, the same sections etched with the special reagent show a white line or band. It has been suggested by other investigators that, when welding technique is such as to eliminate the presence of this white band, a series of goods welds will result; but if the white weld line is not eliminated, consistently satisfactory welds will not be obtained.

The experimental work in this investigation has not fully established the character or influence of this narrow band at the plane of the weld, but considerable work with protective atmospheres suggests strongly that weld quality can be improved by preventing oxygen from entering the joint during the heating cycle. Since it was found difficult to produce consistently satisfactory welds by variations in the welding schedule alone (temperature, pressure, upset, etc.), attempts were made to protect the welding face from the atmosphere and the flame by metal plating, films of flux, lacquer and other compounds, and by forcing an inert gas such as helium, or a reducing gas such as hydrogen, through the joint during the heating cycle. The experiments with films and fluxes were not successful, but when protective gases were used, strength of the welds was appreciably increased, although 100 per cent efficiency was not always attained (see Fig. 1 and 2). This technique has been applied with some success in the related flash-welding method, and it is quite possible that for pressure welding of alloy steel joints, where top weld efficiencies are required, such protection of welding faces during the heating cycle is desirable.

However, there are other factors which need to be considered in the establishment of a satisfactory pressure-welding schedule. One of the more important ones seems to be the amount of upset. Other things being equal, specimens which were welded with large upset distances were stronger than those with relatively short upset distances. The reason for this probably is that a large upset more completely disrupts the oxide films or oxygen-bearing layers which are formed prior to upset.

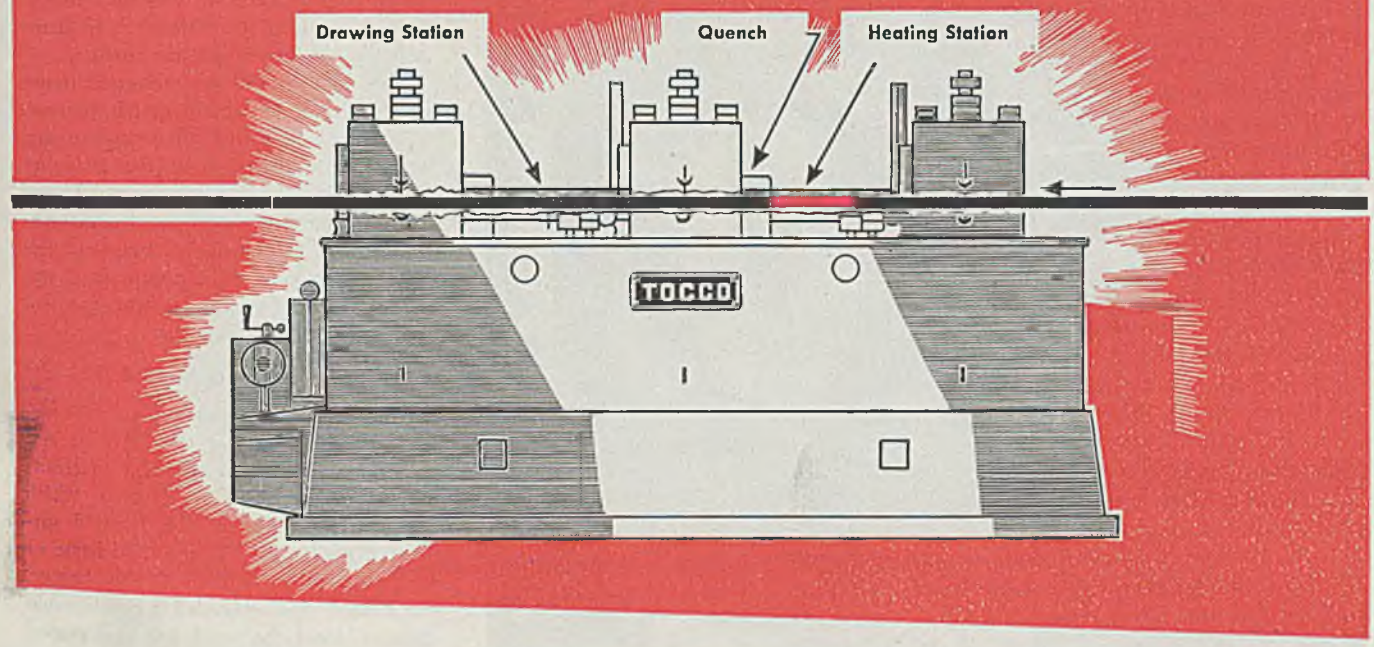
Other factors which seem to have a beneficial influence on weld quality are the magnitude and duration of temperature. Weld strength improved, though not consistently, when joints were maintained at maximum temperature for a short period after upset, or when conditions were such that interior of the tube walls attained a relatively high temperature.

It was found during the course of these experiments that, to obtain consistent rates of heating and upset during a series of welds, it was necessary to exercise very careful control of the acetylene and oxygen flow to the ring burner. Early in the work, sensitive pressure regulators were installed to replace standard pressure regulators originally purchased. This permitted the operator to maintain more uniform pressure settings from weld to weld; but even with the new regulators fluctuations in gas



MAGNETIC FLOOR SWEEPER: As this sweeper is pushed along the floor near drills, punch presses, under lathes, etc., all ferrous materials, filings and chips, cling to a plastic sheet on its bottom. A non-metallic framework mounted on wheels, holds a permanent magnet, hinged at one end, above fixed sheet. Scrap drops off sweeper when magnet is raised by a lever and chain attached to handle, according to Sjostrom Machine Co., Lawrence, Mass.

WHY $30? Heat-treat bar stock for $15 per ton with TOCCO



STANDARD steel bar stock enters the TOCCO machine shown above, is heated, quenched and drawn continuously as it passes through. It emerges as a *straight, scale-free* heat-treated bar with an absolutely *uniform* metallurgical structure throughout its entire length and cross-section (for maximum machining speed). All this at half the cost of the conventional method.

As many as eight TOCCO Bar Stock Units can be operated by one man, producing any desired tonnage of heat-treated stock in sizes of 3/8" to 3" diameter—any length.

Typical performance is for one man to treat 1 ton of 1-inch, S.A.E. 1045 stock per hour—hardened to 63-64 R.C. and drawn to 30-31 R.C. as shown above. Comparison of results:

CONVENTIONAL METHOD	TOCCO PROCESS
Costs $30 per ton	Costs $15 per ton, total
Heavy scale	Scale-free
Bar is distorted	Bar is straight
Hot, dirty conditions	Cool, clean
Non-uniform structure	Uniform throughout

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flow were experienced, and it was difficult to maintain constant welding conditions.

Improvements in design and operating characteristics of the ring burners used in pressure welding are also necessary. All of the oxyacetylene burners used in this work gave trouble at one time or another because of unequal gas flow through the jets in a given segment of the burner, and it was also impossible to adjust the intensity of flame through a sufficiently wide range.

The data in the first progress report showed that to obtain good pressure welds in thick-walled alloy steel tubing, high end temperature at the inside of the weld section was necessary. It was relatively easy to obtain the desired temperature on the outside of the weld section, but an important requirement was to maintain a minimum heat gradient through the wall thickness.

Closed-Joint Method

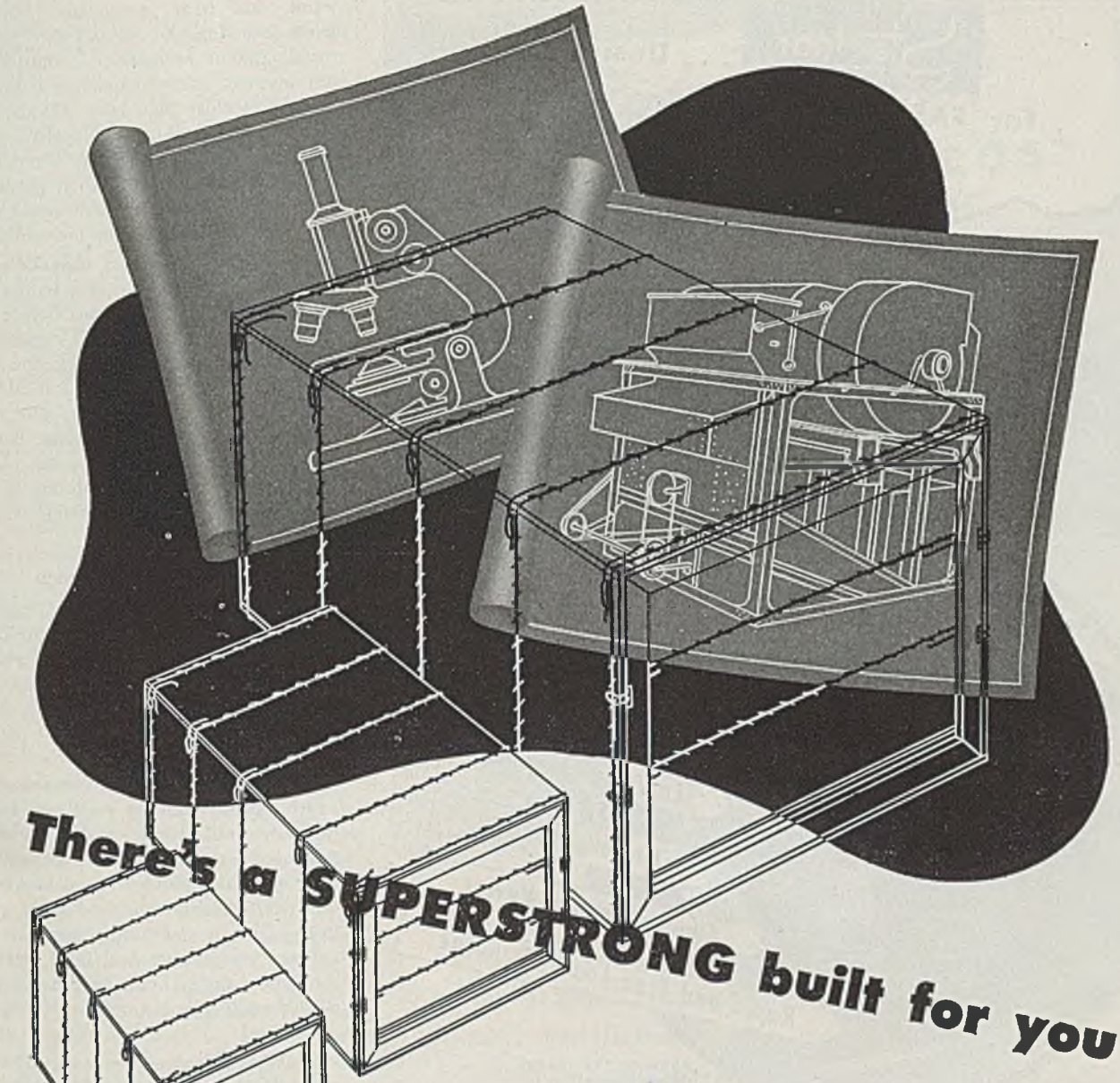
With the closed-joint method two factors, excessive flaring of the joint and excessive melting of the external surface, limited the temperature which could be obtained at the internal surface of the tube. With a mild flame or longitudinal oscillation of the burner, the heated zone extended a considerable distance from the weld line and caused excessive flaring at the joint. On the other hand, with an intense flame the rate of heating was increased and the plastic zone was narrower, but the external surface of the tube began to melt before the internal surface had reached the optimum welding temperature.

Several methods for increasing internal temperature without producing excessive external melting or joint flaring were investigated, and are discussed in this report.

To obtain higher end temperature at the weld joint, with neither flaring nor external melting, a dual-pressure cycle was tried. Relatively low pressure (400 to 2000 psi) was maintained on the tubes until the weld zone had become plastic, and the pressure was then increased (to about 6000 psi) for only a few seconds, during which practically all the upset occurred.

In Schedule A (Fig. 1) such a dual-pressure cycle was used, with the single-row ring burner and a square joint. The upset was limited to ¼-in. by means of a positive stop. Owing to low initial pressure, the interface was comparatively accessible to flame gases and air in the tube, and as a result was considerably oxidized. No improvement in weld strength was obtained over similar welds made with the constant or single-pressure cycle.

Additional dual-pressure welds were made with intermediate and high heat



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input, and with square and beveled joints (Schedules B, M, and O). Again, metallographic examination indicated no improvement over comparable constant-pressure welds (Schedules M and N). However, the dual-pressure cycle, in conjunction with a protective atmosphere and the two-row ring burner, produced some of the strongest welds made during the entire investigation (Schedule O).

To offset the effect of inequalities in the circle of jets in the ring burner, all welds were made with the burner oscillating circumferentially 14 degrees, at 14 cycles per minute. Longitudinal oscillation, varying in length but always at 29 cycles per minute, was also used to equalize heating at the joint, but its principal purpose was to obtain higher end temperatures at the interior of the joint without excessive melting on the outside.

Longitudinal Oscillation

In the first tests, longitudinal oscillation was maintained throughout the heating period. However, this caused a wide heated zone and undesirable flaring, and welds were thus less satisfactory than those made with circumferential oscillation only.

Subsequently, a schedule was used in which burner was not oscillated longitudinally until the external surfaces of tubes had approached the melting temperature. Longitudinal oscillation was then started, and continued for a relatively short period until a more nearly uniform temperature had been attained throughout the section. In this way, excessive melting at the outer surfaces was avoided.

A similar procedure was used in schedules where large upsets were required. In this case, however, longitudinal oscillation was begun at start of the upset.

Pressure welds can be made without longitudinal oscillation of burner; this depends on size and thickness of the parts. However, in the present tests longitudinal oscillation was used to advantage to help control the heat gradient through tube wall, and to prevent excessive external melting.

Another method used to induce more uniform heating through tube wall was beveling of tube ends. Both external and internal bevels were tried.

The external bevel produced desired results insofar as faster and more uniform heating of the tubes was concerned. Also, volume of external upset was reduced because the external bevel tended to direct initial upset inward. However, the reduction in wall thickness at the joint led to extreme outbent fiber at final upset. It was felt that this was detrimental to the strength of the joint

in bending, because the direction of tensile stress was essentially normal to the flow lines. It was noticed that some of the bend failures in this series started along the outbent fiber rather than on the weld line.

The internal bevel, used in conjunction with protective gases, produced some of the best welds made (Schedules M and N). A possible additional benefit was that with the small bevel involved (2°), the outbent fiber was not as extreme as that wide external bevel.

It is believed that oxidation of weld surfaces can take place during the heating cycle even if joint is machined square to insure good contact between parts. Such oxidation, even if very slight, undoubtedly has a deleterious effect on quality of the weld joint. Considerable work was done in an effort to eliminate or decrease oxidation by various methods (fluxes, metal plating, and inert and reducing gases), as described in a later section.

However, it was felt that effects of oxide films could also be reduced by mechanically disrupting their continuity. This was done by increasing upset distance. A comparison of Schedules D and J shows the improved strength obtained by increasing upset distance. Both schedules were identical except that in Schedule D (average modulus of rupture, 144,000 psi), upset distance was ¼-in., and in Schedule J (average modulus of rupture, 216,000 psi) it was ½-in.

The beneficial effect of greater upset is also shown in Schedules C and K, bevel joint welds. These were also identical, except that in Schedule C (average modulus of rupture, 137,000 psi) the upset distance was ⅜-in., and in Schedule K (average modulus of rupture, 217,000 psi) it was ½-in.

Bend tests of pressure welds made in air indicated that increasing upset distance improved weld strength. As suggested above, this may possibly have been caused by disruption of oxidized layer on weld line. However, in every case metallographic examination showed that some weldline oxidation persisted. Various methods were tried to actually protect the faces to be welded during the heating operation, by means of metallic and nonmetallic coatings and oxygen-free atmospheres.

Nonvolatile Coatings. First protective medium tried was a thin film of nickel plate on both faces to be welded. The idea was that the nickel might afford adequate protection to the steel during the initial heating period (without itself oxidizing), and would subsequently diffuse into the steel during upset and the final heating period. However, all of these weld joints were relatively weak. Failure occurred between the two nickel

layers, and metallographic inspection of weld sections showed that no appreciable diffusion of nickel into steel had taken place.

One chromium-plated joint was tried, without success. Several kinds of flux coatings were also used, but welds were poor because a thin layer of flux was always trapped at plane of the weld.

Volatile Coatings. Coatings of waxes and lacquers were also investigated with the thought that faces to be welded would be protected from oxygen during the greater portion of the heating period, and that as welding temperature was approached the coatings would volatilize, thus leaving no material to be trapped at weld interface. Indications were that coatings did volatilize, but either they volatilized too soon, or gave up oxygen of their own; metallographic inspection revealed considerable weld-line oxidation.

Gases. Since protective atmospheres have been used successfully in flash-welding to improve weld quality, the technique was also tried for pressure welding. Helium, hydrogen, and oxygen were used in these experiments.

After the tubes had been clamped in position in welding machine, the gas was blown through the tubes to remove air, and then during heating, the gas was maintained in the tube at low pressure, sufficient to force the gas past the welding faces as long as an opening existed.

First welds were made with gases taken directly from the cylinders. Metallographic examination of joints revealed oxides on the weld line, and it was suspected that the gases may have contained slight amounts of moisture. Therefore, all subsequent tests were made with dried gas, either by passing it through a calcium chloride drying tower or through a freezing tube and magnesium perchlorate. This seemed to improve the protective action of the gas.

Results of later tests (Schedules E, F, G, H, L, M, N, and O) indicated that helium and hydrogen were quite effective in improving weld quality. Hydrogen was only slightly more effective than helium; this suggests that its function, like that of helium, was in excluding air from the joint, and that little if any reduction of oxides took place.

Use of protective atmospheres of dried helium or hydrogen was the most effective method of improving weld quality developed during the investigation. However, the gases did not completely eliminate weld-line oxidation, and strength of the joints was not uniform. For example, highest average modulus of rupture, 284,000 psi, was obtained with Schedule O, but individual values ranged from 212,000 to 322,000 psi.

These tests indicated that while heat

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treatment after welding might improve quality of the joint (by eliminating original heat effects, promoting microstructural coalescence across weld line, and diffusing carbon toward the weld line if decarburization had occurred during welding), it did not increase strength of the weld so that the joint was always as strong as the parent tubes. Failures on the weld line, at less than 100 per cent efficiency (machined tubes), were encountered in almost all series of heat-treated welds.

Metallographic inspection showed that the white band along the weld line, brought out by special etching techniques and believed to be indicative of oxygen in solution in the metal, was present even after heat treatment.

In the open-joint method, pieces to be welded are held apart during the heating cycle, and the burner flame flows past or impinges on welding faces. When desired temperature is reached, parts are brought together by a rapid upset, approaching that used in flash-welding.

No exceptionally good welds were produced by this method. The chief reason was that the weld line always contained an excessive amount of oxides, or a mixture of once-molten metal and oxides which had not been forced out during upset. It was found that the timing in the open-joint operation had to be very closely controlled. The parts had to be upset together just before or immediately when the welding faces began to melt. If the upset came too soon, the plastic zone was not deep enough to produce a good weld; if too late, an excessive amount of molten metal was usually trapped in the joint. In any case, there was always undesirable oxidation and, in contrast with closed-joint welds, more or less decarburization of the metal at the welding faces.

It is believed that success of the open joint welding technique depends chiefly on design of burners which will produce a quick and uniform heating of welding faces, and which possibly might entail some means of protecting the metal from oxidation and excessive decarburization during the heating cycle and the critical instant when the gap between welding faces is closing. The two-row straight-jet burner and the crossed-jet burner designed for open-joint experiments in this investigation did not have the desired characteristics.

—o—

Savings in weight, space and maintenance are provided by the new high-pressured steel valve recently added to its Hancock line by Manning, Maxwell & Moore Inc., Bridgeport, Conn.

The development, called the Weld-valve, also is said to eliminate or neutralize volve, seat ring, and bonnet joints.

Build Prefabricated Hanger for Private Planes

A low-cost, easy-to-erect, prefabricated hanger for private aircraft has been developed by the William Bayley Co., Springfield, O. This mass-produced hanger is constructed of structural members covered with corrugated sheets with jack-knife doors that open to a 38 ft width.

This permanent hanger is T-shaped and arranged for the second unit to interlock with the first, using a common wall and trusses. By using the same parts, it is possible to erect rectangular hangers all opening on the same side with only additional structural members and roofing required.

Advantages claimed by the manufacturer are that any available labor can erect the hanger, that it can be easily moved to another location, and it can be used either with or without a concrete floor. It is reputedly fire, weather, and wind-proof and the individual locked compartment provide safety for the contents.

New Silver Brazing Flux Developed

A silver brazing flux has been developed by Sherman & Co., New York, 13, which melts and forms a protective coating over the metal surfaces at 480°, well below the oxidation temperature of most metals and which, the company claims, eliminates oxidation, making it especially effective on stainless steels.

As the flux, Nu-Braze Wonderflux No. 4, has a pH factor of 5-6 it can be considered completely neutral, thereby eliminating the possibility of corrosion or skin irritation; other asserted advantages are that it also is said to be nonhygroscopic; and at 800°F., this flux is thin enough to flow through clearances as close as 0.0015 in.

Carbide Inserts Extend Life of Pliers

A new application for Carboloy cemented carbides has been announced by the Carboloy Corp., Detroit. One large manufacturer of electrical refrigerators found that the pliers used in holding half-pistons in a deburring operation lasted only 4 hr due to the destructive action of the grinding wheel with which it came in contact. With the brazing of a Carboloy insert to the pliers where it came in contact with the wheel, no appreciable amount of wear could be detected after 2 months of service.

Automatic Crankshaft Lathes

(*Concluded from Page* 97)

chine. Average production is 15-25 cranks per hour.

The 1 LB, shown in Fig. 3, is a single or double center drive lathe with separate sets of tool units for simultaneously rough and finish turning all line bearings, flange and stub ends of crankshafts. Two sets of oppositely moving cutting tools rough out all line bearings, followed by another set of finishing tools on separate tool unit moving in from a third direction for finishing previously roughed-out surfaces thus saving time between roughing and finishing operations.

Powered By Electric-Hydraulic Unit

Finishing tool unit provides positive, smooth dwell of predetermined duration for sizing the work, contains coolant system, and acts as chip guard and apron for protection of operator. Lathe is powered by combination electric-hydraulic motor units, controlled by readily accessible electric push buttons. Average production of this model is 12-20 cranks per hour.

The four station DM, Fig. 4, indexing machine is built on the revolving drum principle for finish turning of line bearings; it eliminates completely all rough grinding operations. The addition of the fourth or loading station makes possible continuous operation of the machine without time formerly lost for loading and unloading. Lathe is powered by combination electric hydraulic motor units, controlled by electric push buttons. A large number of cutting operations are combined in a complete cycle, thereby increasing the productive capacity of the lathe. Its average production is 30-40 cranks per hour.

New Liquid Flux Leaves No Corrosion

A new organic soft solder liquid flux, Superior No. 30, which reportedly is more effective than common rosin fluxes and which does not normally leave a corrosive residue on the work, is being made by the Superior Flux Co., Cleveland. A complete absence of injurious deposit at the joint, leaving a residue that is noncorrosive, nonconductive, nonhygroscopic and soluble in water, is claimed.

It is recommended for applications where rosin-alcohol is unsatisfactory or where strong acid fluxes cannot be used because of the corrosion factor. It may be used in soldering copper, steel, silver, brass alloys and electroplated parts. The composition was developed by the Battelle Memorial Institute.

the BUSINESS TREND

FIRST WEEK of the bituminous coal miners' strike pushed STEEL's industrial production index down nine points to 123 per cent (preliminary) for the week ended Apr. 6, and the downtrend continues as effects of the strike fan out.

This decline, which set in just as the industrial activity index reached a new postwar high of 132 per cent in the week ended March 30, reversed the upward trend that had prevailed since the week ended Feb. 16. Factors lowering the index were decreased steel ingot production and decreased loading of railroad freight cars, for steelmaking tapered off from curtailment in fuel supplies, and car loadings of coal declined markedly when bituminous mines ceased operations.

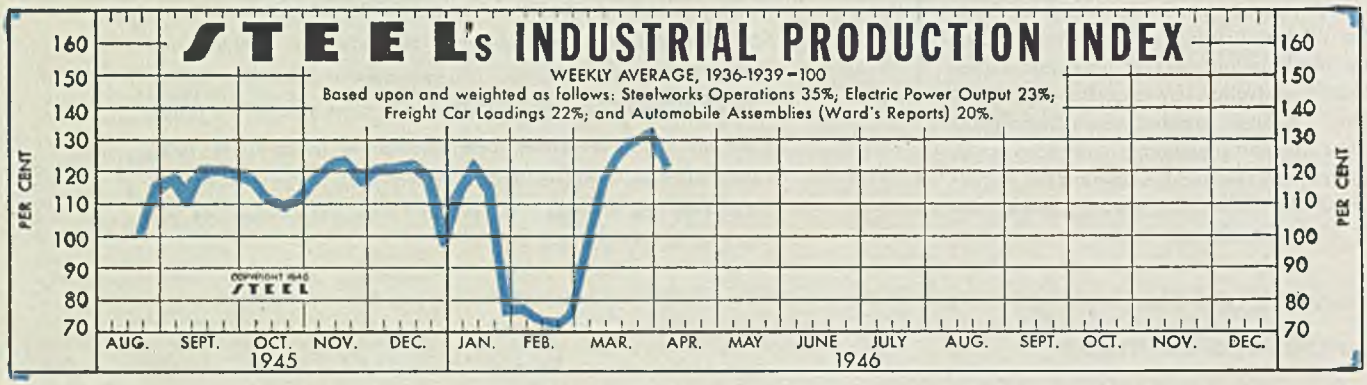
COAL PRODUCTION—The coal miners' strike came just after bituminous coal output for March broke all monthly production records for 19 years. Bituminous output that month is estimated at 56,800,000 tons. Last time this figure was exceeded during a calendar month was in March, 1927, according to Solid Fuels Administrator J. A. Krug. Total production of bituminous coal for the first 11 months of the fuel year beginning Apr. 1, 1945, was estimated at 585 million tons, a 4.3 per cent decrease from the 611,293,000 tons mined in the 1944-45 fuel year.

AUTO OUTPUT—While the coal miners' strike slowed some industries, the automobile industry made a slight gain in production in the week ended Apr. 6 when output totaled 47,735 units, highest since January, 1942. However, April production goals are threatened by many supply shortages, including sheet steel, and cast and forged components.

RAILROADS—Peacetime operations produced 30 per cent less net income (after interest and rentals) for Class I railroads in the United States in February, 1946, than in the corresponding month last year when war demands were stimulating railroad transportation. Estimated net income in February, 1946, was $26 million, compared with $37,378,247 in February, 1945.

PRICES—One evidence of the inflationary trend in prices is the Dun & Bradstreet daily wholesale commodity price index which since the first of this year has risen 3.9 per cent. The index on Apr. 2 reached a new postwar high of 188.99 per cent of the 1930-1932 average of 100 per cent.

BUILDING COSTS—Another indication of inflationary tendencies is a 4-point rise in the first quarter of 1946 in the industrial building costs index compiled by the Austin Co., Cleveland. The index stands now at 136 per cent of the 1926 average of 100 per cent. The company reports that a sharp upturn in efficiency in the construction field offset to some extent the marked increases in material and labor costs.



The Index (see chart above): Latest Week (preliminary) 123 Previous Week 132 Month Ago 119

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	81.5	89.5	77.5	96.5
Electric Power Distributed (million kilowatt hours)	3,988	3,992	3,953	4,322
Bituminous Coal Production (daily av.—1000 tons)	2,210	2,196	2,083	2,049
Petroleum Production (daily av.—1000 bbls.)	4,446	4,424	4,403	4,784
Construction Volume (ENR—Unit $1,000,000)	$131.0	$134.9	$68.4	$33.7
Automobile and Truck Output (Ward's—number units)	47,735	43,070	23,050	20,645

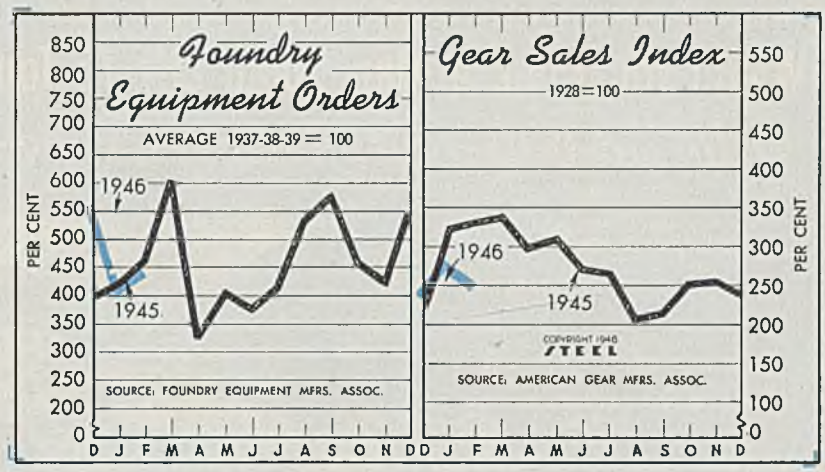
*Dates on request.

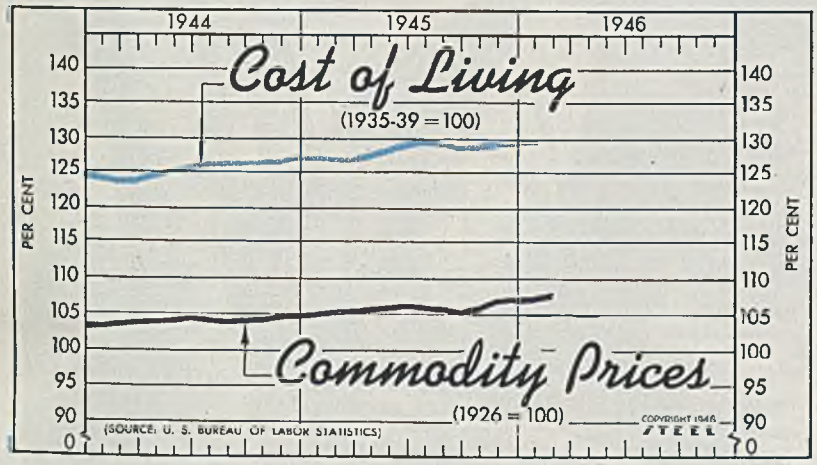
TRADE				
Freight Carloadings (unit—1000 cars)	640†	809	786	765
Business Failures (Dun & Bradstreet, number)	19	18	22	23
Money in Circulation (in millions of dollars)‡	$27,912	$27,842	$27,957	$25,865
Department Store Sales (change from like wk. a yr. ago)‡	+12%	+12%	+19%	+8%

†Preliminary. ‡Federal Reserve Board.

Foundry Equipment Orders — Gear Sales

	Foundry Equipment Orders Index (1937-38-39=100)			Gear Sales Index (1928=100)		
	1946	1945	1944	1946	1945	1944
Jan.	392.8	422.4	378.3	269	323	246
Feb.	432.8	465.3	456.8	253	331	214
Mar.	.....	604.7	498.4	...	339	485
Apr.	.....	325.0	385.7	...	296	308
May	.....	404.7	503.9	...	309	305
June	.....	375.4	466.1	...	271	328
July	.....	411.7	375.8	...	264	242
Aug.	.....	532.2	450.5	...	205	247
Sept.	.....	577.2	388.0	...	213	248
Oct.	.....	457.8	526.5	...	251	293
Nov.	.....	416.6	369.5	...	255	209
Dec.	.....	547.6	397.4	...	239	219
Ave.	.....	461.7	433.1	...	275	279





Wholesale Commodity Price—Cost of Living Indexes

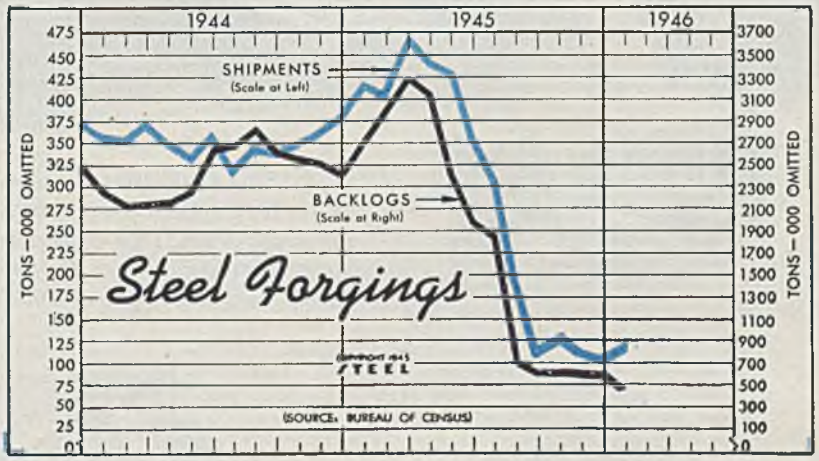
	—Commodities— (1926=100)			—Living Cost— (1935-39=100)		
	1946	1945	1944	1946	1945	1944
Jan.	107.1	104.9	103.3	129.9	127.1	124.2
Feb.	107.7	105.2	103.6	.....	126.9	123.8
Mar.	.....	105.3	103.8	.....	126.8	123.8
Apr.	.....	105.7	103.9	.....	127.1	124.6
May	.....	106.0	104.0	.....	128.1	125.1
June	.....	106.1	104.3	.....	129.0	125.4
July	.....	105.9	104.1	.....	129.4	126.1
Aug.	.....	105.7	103.9	.....	129.3	126.4
Sept.	.....	105.2	104.0	.....	128.9	126.5
Oct.	.....	105.9	104.1	.....	128.9	126.5
Nov.	.....	106.8	104.4	.....	129.3	126.6
Dec.	.....	107.1	104.7	.....	129.9	127.0
Ave.	.....	105.8	104.0	.....	128.4	125.5

Steel Forgings

Tons—000 omitted

	Shipments		Backlog		Consumption of steel	
	1946	1945	1946	1945	1946	1945
Jan.	116	417	478	2,723	162	556
Feb.	...	406	...	3,018	...	544
Mar.	...	469	...	3,304	...	632
Apr.	...	442	...	3,147	...	576
May	...	430	...	2,428	...	567
June	...	357	...	1,947	...	467
July	...	306	...	1,853	...	393
Aug.	...	195	...	696	...	257
Sept.	...	110	...	623	...	152
Oct.	...	128	...	643	...	173
Nov.	...	118	...	620	...	163
Dec.	...	104	...	603	...	136

Note: Backlogs before Jan., 1946, consisted of forgings for sale and for own use. After that they consist only of forgings for sale.



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$13,004	$11,801	$12,023	$10,175
Federal Gross Debt (billions)	$274.5	$276.8	$278.7	$235.0
Bond Volume, NYSE (millions)	$25.0	$25.7	$24.5	$38.5
Stocks Sales, NYSE (thousands)	8,127	6,804	5,226	3,506
Loans and Investments (billions)†	$66.0	$66.3	$68.1	$57.8
United States Gov't. Obligations Held (millions)†	$46,818	$47,458	$49,518	$43,565

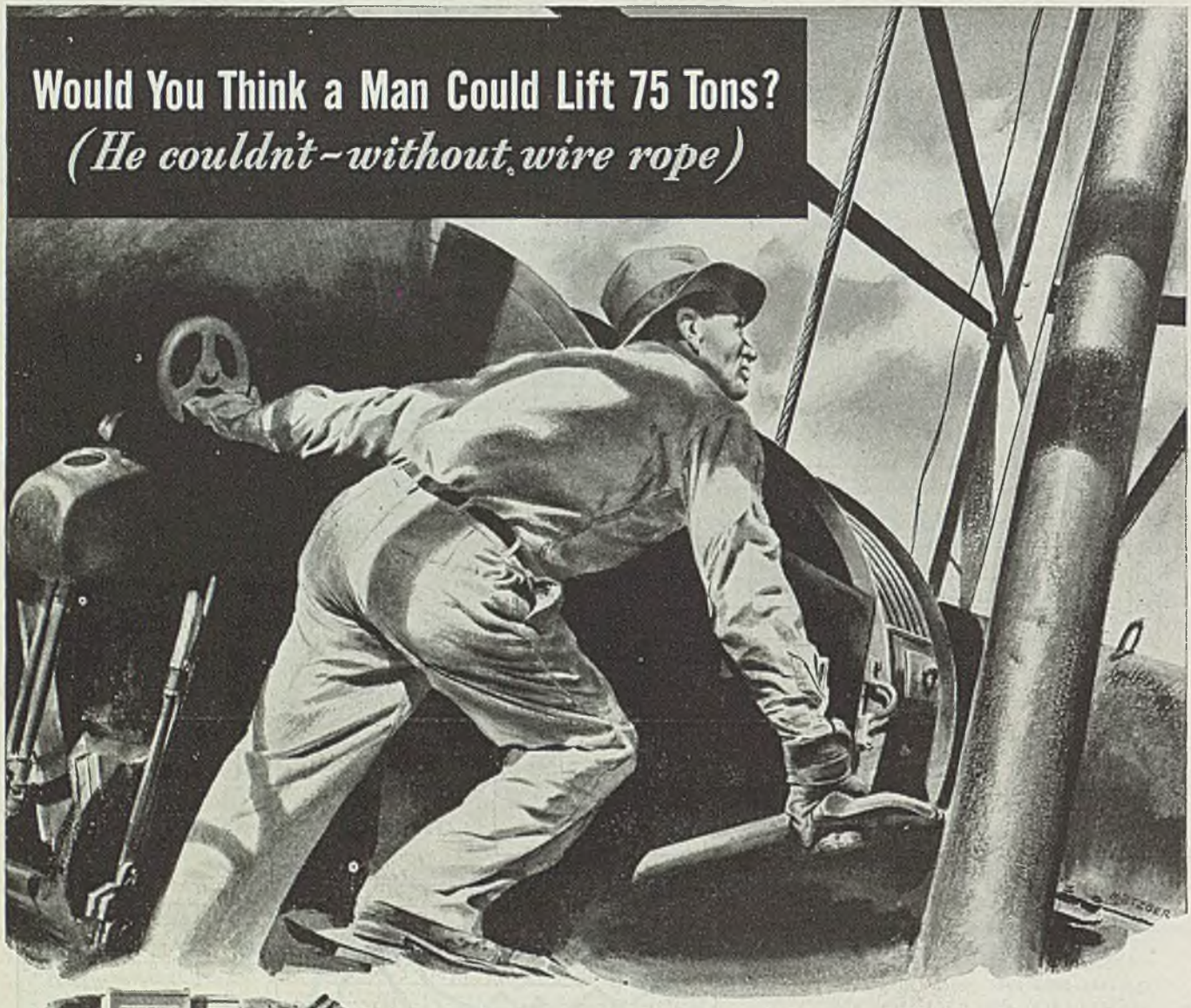
†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$63.54	$63.54	$63.54	$57.55
All Commodities†	108.7	108.4	107.6	105.1
Industrial Raw Materials†	121.1	120.9	119.5	116.2
Manufactured Products†	104.5	104.3	103.7	101.9

†Bureau of Labor Statistics Index, 1926 = 100.

Would You Think a Man Could Lift 75 Tons?
(He couldn't—without wire rope)



They use a lot of wire rope in and around coal mines. One important ground use is for car spotters and retarders. Preformed wire rope is easier and safer to handle.

He's lifting 15,000 feet of heavy steel drill pipe—no wonder he keeps his eye on the wire rope. Running at high speeds, wire rope tends to whip and pile up on the drum. This crushes rope and forces early shutdowns for replacement. Operators prefer Preformed wire rope because it resists whipping, spools evenly and reduces shutdown frequencies.

Power shovels scoop up earth and rock with giant bites. The wire rope makes it look easy. Being more flexible, Preformed wire rope runs over small sheaves with minimum wear.

Modern machines almost invariably are equipped with Preformed wire rope. Preformed is flexible and limber. It is tractable and free from internal tension. It handles easier, so operators like to work with it, and it lasts longer so the front office likes to order it.

ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

WIRE ROPE HANDLES EASIER - LASTS LONGER

Steel Mills Yield Slowly To Effects of Coal Strike

Sheet tonnage not yet cut seriously . . . Pig iron output first to suffer . . . March ingot production back close to normal

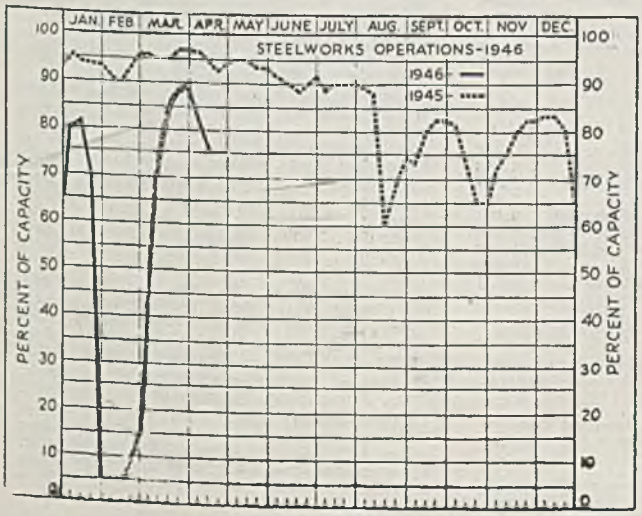
PRODUCTION of sheets, among the most critical of all steel products, has not yet been materially affected by the soft coal strike, but output of plates, bars and rails and some other items has been cut into severely. Another week of the coal strike may see considerable effect on sheets.

Demand for all products remains strong, notably for small diameter bars and light flat-rolled products. The fuel situation adds to uncertainty and some mills operating on a quarterly quota and recently planning to announce third quarter quotas at this time have postponed action for at least two weeks. In one case a sheet producer considering setting up quotas for entire last half has abandoned that idea.

Because of difficulty in getting desired quantities of steel from mills government surplus and contract termination materials are being scrutinized more closely for the salvageable steel that might be uncovered. Tonnagewise the principal items thus obtained are plates and shapes, because of closing of various shipyards. Much of this finds its way into warehouses and to some extent is exported.

Relatively few cancellations have followed construction restrictions by Civilian Production Administration and these have had no effect on nearby shape mill schedules. Delivery promises on shapes are as tight as ever, with leading producers able to offer relatively little for the remainder of the year. New work continues to come out and some important contracts are being let. Much depends on final interpretation of the order as projects come up for approval.

Steelworks operations are yielding slowly to effects of the soft coal strike, fuel stocks being used carefully to produce as much steel as possible before curtailing deeply. The estimated rate last week dropped 6 points to 75½ per cent of capacity. Chicago suffered most, declining 22½ points to 69½ per cent. Birmingham lost 10 points to 85, Youngstown 8 points to 70, Wheeling 4½ points to 86, Cleveland 1 point to 95½ and New England 4 points to 88. St. Louis made a gain of 4½ points to 54, Cincinnati 2 points to 79 and Pittsburgh 1½ points to 70. Rates were unchanged at Buffalo, 90½, eastern Pennsylvania 84 and Detroit 80.



DISTRICT STEEL RATES

(Percentage of Ingot Capacity Engaged in Leading Districts)

	Week Ended Apr. 13	Change	Same Week 1945	Same Week 1944
Pittsburgh	70	+1.5	88.5	93.5
Chicago	69.5	—22.5	98.5	100.5
Eastern Pa.	84	None	94	95
Youngstown	70	—8	91	94
Wheeling	86	—4.5	93.5	94.5
Cleveland	95.5	—1	88.5	92.5
Buffalo	90.5	None	90.5	90.5
Birmingham	85	—10	95	95
New England	88	—4	90	89
Cincinnati	79	+2	89	87
St. Louis	54	+4.5	80	80
Detroit	80	None	90	88
Estimated national rate	75.5	—6	94.5	98.5

[a]Based on steelmaking capacities as of these dates.

Because of fuel shortage blast furnaces are being banked and pig iron supply is much curtailed, though every effort is being made to distribute it as widely as possible. In some cases furnaces are being continued in operation after they had been scheduled to go down for relining. Foundries are operating at low rate in the face of heavy backlogs of orders and a better labor supply than in recent months. In addition to lack of iron foundries also are unable to obtain scrap in sufficient quantities.

The general scrap situation is tight, with steelworks and foundries pressing for all the tonnage that can be obtained, high springboards being paid to attract remote supply. Steelmakers are taking all that is offered, in spite of lower steel production rates.

Warehouses are in receipt of more inquiry than for a long time, a result of inability of mills to furnish delivery to consumers. With broken assortments and small shipments from mills they are unable to meet needs of customers. Sheets, shapes and nails are most in demand and stocks are low in each. Volume of business in general is higher than in recent months in spite of low stocks from which to fill orders.

Steel ingot production in March snapped back from the depths reached in January and February, during the steel strike, and totaled 6,534,648 net tons, almost equaling output of March last year, when it was 7,707,965 tons. However, first quarter production at 11,799,219 tons, was lowest for any three months since second quarter of 1939 and was almost 10 million tons below first quarter of 1945. Average weekly production in first quarter was 917,513 tons, at 83.7 per cent of capacity, compared with an average of 1,677,199 tons, at 95 per cent, in first quarter last year.

COMPOSITE MARKET AVERAGES

	Apr. 13	Apr. 6	Mar. 30	One Month Ago Mar., 1946	Three Months Ago Jan., 1946	One Year Ago Apr., 1945	Five Years Ago Apr., 1941
Finished Steel	$63.54	$63.54	$63.54	$63.54	$58.27	$57.55	$56.73
Semifinished Steel	40.60	40.60	40.60	40.60	37.80	36.00	36.00
Steelmaking Pig Iron	25.50	25.50	25.50	25.125	24.75	24.00	23.00
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	19.17

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. 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; others, gross tons.

COMPARISON OF PRICES

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

Finished Material, cents per lb.; coke, dollars per net ton; others dollars per gross ton.

Finished Material

	Apr. 13, 1946	Mar., 1946	Jan., 1946	Apr., 1945
Steel bars, Pittsburgh	2.50c	2.50c	2.25c	2.15c
Steel bars, Philadelphia	2.82	2.82	2.57	2.47
Steel bars, Chicago	2.50	2.50	2.25	2.15
Shapes, Pittsburgh	2.35	2.35	2.10	2.10
Shapes, Philadelphia	2.465	2.465	2.215	2.215
Shapes, Chicago	2.35	2.35	2.10	2.10
Plates, Pittsburgh	2.50	2.50	2.25	2.20
Plates, Philadelphia	2.55	2.55	2.30	2.25
Plates, Chicago	2.50	2.50	2.25	2.20
Sheets, hot-rolled, Pittsburgh	2.425	2.425	2.20	2.20
Sheets, cold-rolled, Pittsburgh	3.275	3.275	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	4.05	4.05	3.70	3.65
Sheets, hot-rolled, Gary	2.425	2.425	2.20	2.20
Sheets, cold-rolled, Gary	3.275	3.275	3.05	3.05
Sheets, No. 24 galv., Gary	4.05	4.05	3.70	3.65
Hot-rolled strip, over 6 to 12-in., Pitts.	2.35	2.35	2.10	2.10
Cold-rolled strip, Pittsburgh	3.05	3.05	2.80	2.80
Bright bess., basic wire, Pittsburgh	3.05	3.05	2.75	2.60
Wire nails, Pittsburgh	3.25	3.25	2.90	2.80
Tin plate, per base box, Pittsburgh	$5.25	$5.25	$5.00	$5.00

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$38.00	$38.00	$36.00	$34.00
Slabs, Pittsburgh, Chicago	39.00	39.00	36.00	34.00
Rerolling billets, Pittsburgh	39.00	39.00	36.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.30c	2.30c	2.15c	2.00c

Pig Iron

	Apr. 13, 1946	Mar., 1946	Jan., 1946	Apr., 1945
Bessemer, del. Pittsburgh	$27.69	$27.315	$26.94	$26.19
Basic, Valley	26.00	25.625	25.25	24.50
Basic, eastern del. Philadelphia	27.84	27.465	27.09	26.34
No. 2 fdry., del. Pgh. N. & S. sides	27.19	26.815	26.44	25.69
No. 2 foundry, Chicago	26.50	26.125	25.75	25.00
Southern No. 2, Birmingham	22.88	22.505	22.13	21.38
Southern No. 2, del. Cincinnati	26.80	26.425	26.05	25.36
No. 2 fdry., del. Philadelphia	28.34	27.965	27.59	26.84
Malleable, Valley	26.50	26.125	25.75	25.00
Malleable, Chicago	26.50	26.125	25.75	25.00
Lake Sup., charcoal del. Chicago	37.34	37.340	37.34	37.34
Gray forge, del. Pittsburgh	26.69	26.315	25.94	25.19
Ferromanganese, del. Pittsburgh	140.00	140.000	140.00	140.33

Scrap

Heavy melting steel, No. 1, Pittsburgh	$20.00	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
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.	13.75	13.75	13.75	13.35

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA schedules, except those for stainless steels which are now exempt from price control. Price schedule No. 6 covers semifinished and finished iron and steel products; by-product foundry coke, No. 29; relaying rails, No. 46; beehive oven coke, No. 77; bolts, nuts and rivets, No. 147; coke by-products, GMPR, except sulphate of ammonia, No. 205. Finished steel quoted in cents per pound and semifinished steel in dollars per gross ton, except as otherwise noted. Pricing on rails was changed to net ton basis as of Feb. 15, 1946.

Semifinished Steel

Carbon Steel Ingots: Fob mill base, rerolling quality, standard analysis, $33.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop, $46.80.

Rerolling, Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $39; Detroit, del., $41; Duluth (billets), $41; Pac. ports (billets), $51. (Andrews Steel Co., carbon slabs, $41; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co. $58.64, Pac. ports.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $47; Detroit, del., $49; Duluth, billets, $49; forging billets fob Pac. ports, $59.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 fob Toronto, O. Geneva Steel Co. $64.64, Pacific ports.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $56.16, del. Detroit $58.16, eastern Mich. $59.16.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $38. (Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, fob mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb, 2.05c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—⅜ in. inclusive, per 100 lb, $2.30. Do., over ⅜—11/64-in., incl., $2.45; Galveston, base, $2.40 and $2.55, respectively. Worcester add $0.10; Pacific ports $0.50.

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3: Pittsburgh, Youngstown, Chicago, Gary, Cleveland, Buffalo, Birmingham base, 20 tons one size, 2.50c; Duluth, base, 2.60c; Detroit, del., 2.60c; eastern Mich., 2.65c; New York, del., 2.84c; Phila., del., 2.82c; Gulf ports, dock, 2.85c; Pac. ports, dock, 3.15. (Sheffield Steel Corp., 2.75c, fob St. Louis; Joslyn Mfg. & Supply Co., may quote 2.55c, fob Chicago.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.81c; Detroit, del., 2.91c. (Texas Steel Co. may use Chicago base price as maximum fob Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.104	4300	$1.768
2300	1.768	4600	1.248
2500	2.652	4800	2.236
3000	0.52	5100	0.364
3100	0.884	5130 or 5152	0.468
3200	1.404	6120 or 6152	0.988
3400	3.328	6145 or 6150	1.248
4000	0.468	8612	0.676
4100 (.15-.25 Mo)	0.728	8720	0.728
(.20-.30 Mo)	0.78	9830	1.352

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 20,000-39,999 lb, 3.10c; Detroit, 3.15c; Toledo, 3.25c.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 3.48c; Detroit, del., 3.58c; eastern Mich., 3.63c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base, 2.35c; Detroit, del., 2.45c; eastern Mich. and Toledo, 2.50c; Gulf ports, dock, 2.70c; Pacific ports, dock, 2.75c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo, base, 2.35c; Detroit, del., 2.45c; eastern Mich. and Toledo, 2.50c; Gulf ports, dock, 2.70c.

Iron Bars: Single refined, Pitts., 4.76c; double refined, 5.84c; Pittsburgh, staybolt, 6.22c; Terre Haute, single ref., 5.42c; double ref., 6.76c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base, 2.425c; Granite City, base, 2.525c; Detroit, del., 2.525c; eastern Mich., 2.575c; Phila., del., 2.595c; New York, del., 2.665c; Pacific ports, 2.975c.

(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 2.60c on hot carbon sheets, nearest eastern basing point.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.275c; Granite City, base, 3.375c; Detroit, del., 3.375c; eastern Mich., 3.425c; New York, del., 3.615c; Phila., del., 3.595c; Pacific ports, 3.925c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base, 4.05c; Granite City, base, 4.15c; New York, del., 4.29c; Phila., del., 4.22c; Pacific ports, 4.60c.

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29-gage, per square, 3.73c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16-gage not corrugated, copper alloy, 4.15c; Granite City, 4.25c; Pacific ports, 4.60c; copper iron, 4.50c; pure iron, 4.50c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.60c.

Enameling Sheets: 10-gage: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.20c; Granite City, base 3.30c; Detroit, del., 3.30c; eastern Mich., 3.35c; Pacific ports, 3.85c; 20-gage: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 3.80c; Detroit, del., 3.90c; eastern Mich., 3.95c; Pacific ports, 4.45c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.90c	4.65c	4.00c
Armature	4.25c	5.00c	4.35c
Electrical	4.75c	5.50c	4.85c
Motor	5.425c	6.175c	5.525c
Dynamo	6.125c	6.875c	6.225c
Transformer			
72	6.625c	7.375c	.....
65	7.625c	8.375c	.....
58	8.125c	8.875c	.....
52	8.925c	9.675c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown base, 6-inch and narrower, 2.45c; Detroit, del., 2.55c; eastern Mich., 2.60c; Pacific ports, 3.10c; over 6-inch, base, 2.35c; Detroit, del., 2.45c; eastern Mich., 2.50c; Pacific ports, 3.00c.

Cold-Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less, 3.05c; Chicago, base, 3.15c; Detroit, del., 3.15c; eastern Mich., 3.20c; Worcester, base, 3.25c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland, base, 0.26-0.50 carbon, 3.05c. Add 0.20c for Worcester.

Tin, Terne Plate

(OPA ceiling prices announced March 1, 1946.)

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb base box, $5.25; Granite City, Birmingham, Sparrows Point, $5.35.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb base box, 0.25 lb tin, $4.60; 0.50 lb tin, $4.75; 0.75 lb tin, $4.90; Granite City, Birmingham, Sparrows Point, $4.70, $4.85, $5.00, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29-gage and lighter, 3.30c; Granite City, Birmingham, Sparrows Point, 3.40c; Pacific ports, boxed, 4.30c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted, 4.05c; Pacific ports, 4.80c.

Manufacturing Ternes (Special Coated): Pittsburgh, Chicago, Gary, 100-base box, $4.55; Granite City, Birmingham, Sparrows Point, $4.65.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I. C. 8-lb $12.50; 20-lb $15.50 (nom.); 40-lb $20.00 (nom.).

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.50c; New York, del., 2.69c; Phila., del., 2.55c; St. Louis, 2.74c; Boston, del., 2.82-3.07c; Pacific ports, 3.05c; Gulf ports, 2.85c.

(Granite City Steel Co. may quote carbon plates 2.65c fob D.P.C. mill; Geneva Steel Co., Provo, Utah, 3.20c fob Pacific ports.)

Floor Plates: Pittsburgh, Chicago, 3.75c; Pacific ports, 4.40c; Gulf ports, 4.10c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.75c; Gulf ports, 4.20c; Pacific ports, 4.40c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.35c; New York, del., 2.52c; Phila., del., 2.465c; Pacific ports, 3.00c; Gulf ports, 2.70c.

(Phoenix Iron Co., Phoenixville, Pa., may quote the equivalent of 2.45c, Bethlehem, Pa., on the general range and 2.55c on beams and channels from 4 to 10 inches.)

Steel Piling: Pittsburgh, Chicago, Buffalo, 2.65c; Pacific ports, 3.20c.

Wire and Wire Products

(Fob Pittsburgh, Chicago, Cleveland and Birmingham, per 100 pounds)

Wire to Manufacturers in carloads

Bright basic or bessemer	*$3.05
Spring (except Birmingham)	*$3.65

Wire Products to Trade

Nails and staples

Standard and cement-coated	†$3.25
Galvanized	††$2.90

Wire, Merchant Quality

Annealed	§$3.50
Galvanized	§$3.85

(Fob Pittsburgh, Chicago, Cleveland, Birmingham, per base column)

Woven fence, 15½ gage and heavier	72
Barbed wire, 80-rod spool	79
Barbless wire, twisted	79
Fence posts	74
Bale ties, single loop	72½

*Add $0.10 for Worcester, $0.05 for Duluth and $0.50 for Pacific ports.

†Add $0.30 for Worcester, $0.50 for Pacific ports.

††Add $0.50 for Pacific ports.

§Add $0.10 for Worcester, $0.70 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	53	30	½	21	0½
¼ & ⅜	56	37½	¾	27	7
½	60½	48	1-1¼	31	13
¾	63½	52	1½	35	15½
1-3	65½	54½	2	34½	15

Lap Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
2	58	46½	1¼	20	0½
2½-3	61	49½	1½	25½	7
3½-6	63	51½	2	27½	9
7-8	62	49½	2½-3½	28½	11½
9-10	61½	49	4	30½	15
11-12	60½	48	4½-8	29½	14
			9-12	25½	9

Boiler Tubes: Net base prices per 100 feet fob Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Elec. Weld— Hot Rolled	Cold Rolled
1"	13	...	$9.90	$9.36	$9.65
1¼"	13	...	11.73	9.63	11.43
1½"	13	$10.91	12.96	10.68	12.64
1¾"	13	12.41	14.75	12.10	14.37
2"	13	13.90	16.52	13.53	16.19
2¼"	13	15.50	18.42	15.06	18.03
2¼"	12	17.07	20.28	16.57	19.83
2½"	12	18.70	22.21	18.11	21.68
2¾"	12	19.82	23.54	19.17	22.95
3"	12	20.79	24.71	20.05	24.02
3½"	11	26.24	31.18	25.30	30.29
4"	10	32.56	38.68	31.32	37.52
4½"	9	43.16	51.29	.....	.....
5"	9	49.96	59.36	.....	.....
6"	7	76.71	91.14	.....	.....

Rails, Supplies

Standard rails, over 60-lb, fob mill, net ton, $43.40. Light rails (billet), Pittsburgh, Chicago, Birmingham, net ton, $49.18.

*Relaying rails, 35 lb and over, fob railroad and basing points, $31-$33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates $51 net ton, base. Standard spikes, 3.65c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb: Reg. carbon 15.15c; extra carbon 19.48c; special carbon 23.80c; oil-hardening 25.97c; high carbon-chromium 46.53c.

W	Cr	V	Mo	Base, per lb.
18.00	4	1	...	72.49c
1.5	4	1	8.5	58.43c
...	4	2	3	58.43c
6.40	4.15	1.90	5	62.22c
5.50	4.50	4	4.50	75.74c

Rivets

Fob Pittsburgh, Cleveland, Chicago, Birmingham

Structural	3.75c
⅞-inch and under	65-5 off

Washers, Wrought

Fob Pittsburgh, Chicago, Philadelphia, to jobbers and large nut and bolt manufacturers, lcl ..... $2.75-$3.00 off

Bolts, Nuts

Fob Pittsburgh, Cleveland, Birmingham, Chicago. Additional discounts: 5 for carloads; 10 for full containers, except tire, step and plow bolts.

(Ceiling prices advanced 7 per cent, effective Apr. 1, 1946; discounts remain unchanged.)

Carriage and Machine

½ x 6 and smaller	65½ off
Do., ⅝ 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, nuts separate, 71-10 off, nuts attached, 71 off; bulk, 80 off on 15,000 of 3-in and shorter, or 5000 over 3 in., nuts separate.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-in. and smaller	..	64
1-in. and smaller	62	
1⅛-in.-1-in.	..	60
1⅛-in.-1-in.	59	..
1⅛-in.-1½-in.	57	58
1⅝-in. and larger	56	..

Additional discount of 10 for full kegs.

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset 1-in. and smaller	71 off
Headless, ¼-in. and larger	60 off
No. 10 and smaller	70 off

Stainless Steels

(Open market prices. OPA price control suspended Oct. 11, 1945.)

Base, Cents per lb

	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEELS					
302	25.96c	29.21c	36.79c	23.93c	30.30c
303	28.13	31.38	38.95	29.21	35.71
304	27.05	31.38	38.95	25.45	32.46
308	31.38	36.79	44.36	30.84	37.87
309	38.95	43.28	50.85	40.03	50.03
310	53.02	56.26	57.35	52.74	60.59
312	38.95	43.28	53.02	.....	.....
*316	43.28	47.61	51.94	43.28	51.94
†321	31.38	36.79	44.36	31.65	41.12
†347	35.71	41.12	48.69	35.71	45.44
431	20.56	23.80	31.38	18.94	24.35
STRAIGHT CHROMIUM STEEL					
403	23.93	26.51	31.92	22.99	29.21
**410	20.02	23.93	28.67	18.39	23.80
416	20.56	23.80	29.21	19.75	25.45
††420	25.96	30.84	36.25	25.70	39.49
430	20.56	23.80	31.38	18.94	24.35
††430F	21.10	24.35	31.92	20.29	26.51
440A	25.96	30.84	36.25	25.70	39.49
442	24.35	27.59	35.17	25.96	34.62
443	24.35	27.59	35.17	25.96	34.62
446	29.76	33.00	39.49	37.87	56.26
501	8.66	12.98	17.04	12.98	18.39
502	9.74	14.07	18.12	14.07	19.48
STAINLESS CLAD STEEL (20%)					
304	§§19.48	20.56	.....	.....	

*With 2-3% molybdenum. §With titanium. †With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

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	27.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c
Per pound fob works	
Phenol (car lots, returnable drums)	10.50c
Do., less than carlots	11.25c
Do., tank cars	9.50c
Eastern plants, per pound	
Naphthalene flakes, balls, bbl, to jobbers	8.00c
Per ton, bulk, fob port	
Sulphate of ammonia	$29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras. Quotations based on OPA mill prices announced March 1, 1946.

	Hot-rolled bars	Structural shapes	Plates	Floor plates	Hot-rolled sheets (10-gage base)	Hot-rolled strip (14-gage and lighter, 6-in and narrower)	Hot-rolled strip (12-gage and heavier wider than 6-inch)	Galvanized flat sheets (24-gage base)	Cold-rolled sheets (17-gage base)	Cold finished bars	Cold-rolled strip
Boston	4.294[1]	4.162[1]	4.162[1]	5.977[1]	3.999[1]	5.456[1]	4.356[1]	5.674[14]	4.969[14]	4.594[11]	4.965
New York	4.103[1]	4.008[1]	4.018[1]	5.824[1]	3.815[1]	4.324[1]	4.224[1]	5.460[12]	4.838[14]	4.553[21]	5.024
Jersey City	4.103[1]	3.997[1]	4.018[1]	5.824[1]	3.815[1]	4.324[1]	4.224[1]	5.460[12]	4.838[14]	4.553[21]	5.024
Philadelphia	4.072[1]	3.916[1]	3.855[1]	3.768[1]	3.743[1]	4.622[1]	4.172[1]	5.468[15]	5.097[25]	4.022[21]	5.022
Baltimore	4.052[1]	4.009[1]	3.844[1]	5.502[1]	3.619[1]	4.602[1]	4.152[1]	5.344[1]	5.077[25]	4.502[21]	.....
Washington	4.191[1]	4.180[1]	4.046[1]	5.591[1]	3.821[1]	4.741[1]	4.291[1]	5.646[17]	5.066[20]	4.491[21]	.....
Norfolk, Va.	4.315[1]	4.252[1]	4.221[1]	5.715[1]	3.996[1]	4.865[1]	4.415[1]	5.821[17]	4.490[24]	4.615[21]	.....
Bethlehem, Pa.°		3.70[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.°		.....	3.70[1]	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.°		.....	3.70[1]	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.60[1]	3.65[1]	3.88[1]	5.51[1]	3.575[1]	4.169[1]	4.069[1]	5.20[15]	4.625[10]	4.20[21]	4.919
Buffalo (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	4.060[1]	5.10[15]	4.525[10]	4.10[21]	4.60
Pittsburgh (city)	3.60[1]	3.65[1]	3.65[1]	5.25[1]	3.575[1]	3.95[1]	3.850[1]	5.20[13]	4.625[24]	4.20[21]	4.70
Pittsburgh (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[13]	4.525[24]	4.10[21]	4.60
Cleveland (city)	3.60[1]	3.838[1]	3.65[1]	5.438[1]	3.575[1]	3.95[1]	3.850[1]	5.327[13]	4.625[24]	4.20[21]	4.70
Cleveland (country)	3.50[1]	.....	3.55[1]	.....	3.475[1]	3.85[1]	3.750[1]	.....	4.525[24]	4.10[21]	4.60
Detroit	3.70[1]	3.911[1]	3.859[1]	5.531[1]	3.675[1]	4.050[1]	3.950[1]	5.450[13]	4.725[24]	4.25[12]	4.909
Omaha (city, del.)	4.293[1]	4.343[1]	4.343[1]	5.943[1]	4.018[1]	4.498[1]	4.393[1]	5.965[15]	5.668[24]	4.893[21]	.....
Omaha (country)	4.193[1]	4.243[1]	4.243[1]	5.843[1]	3.918[1]	4.393[1]	4.293[1]	5.865[15]	.....	.....	.....
Cincinnati	3.861[1]	3.941[1]	3.911[1]	5.541[1]	3.650[1]	4.025[1]	3.925[1]	5.275[12]	4.700[24]	4.461[21]	4.961
Youngstown°		.....	.....	.....	.....	.....	.....	4.85[13]	.....	.....	.....
Middletown, O.°		.....	.....	.....	3.475[1]	3.85[1]	3.750[1]	5.10[16]	.....	.....	.....
Chicago (city)	3.75[1]	3.80[1]	3.80[1]	5.40[1]	3.475[1]	3.95[1]	3.850[1]	5.681[15]	4.425[24]	4.20[21]	4.90
Milwaukee	3.887[1]	3.937[1]	3.937[1]	5.587[1]	3.612[1]	4.087[1]	3.987[1]	5.722[15]	4.562[24]	4.337[21]	5.037
Indianapolis	3.83[1]	3.88[1]	3.88[1]	5.48[1]	3.743[1]	4.118[1]	4.018[1]	5.368[15]	4.793[24]	4.43[21]	5.030
St. Paul	4.01[2]	4.06[2]	4.06[2]	5.66[2]	3.735[2]	4.21[2]	4.110[2]	5.707[15]	4.685[24]	4.811[21]	5.352
St. Louis	3.924[1]	3.947[1]	3.947[1]	5.547[1]	3.622[1]	4.097[11]	3.997[1]	5.622[15]	4.572[24]	4.481[21]	5.181
Memphis, Tenn.	4.265[1]	4.315[1]	4.315[1]	6.03[1]	4.190[1]	4.565[1]	4.465[1]	5.715[15]	5.005[24]	4.78[21]	.....
Birmingham	3.65[1]	3.80[1]	3.80[1]	6.153[1]	3.675[1]	4.05[1]	3.950[1]	5.20[15]	5.077[24]	4.99[21]	5.465
New Orleans (city)	4.35[4]	4.15[4]	4.15[4]	6.10[4]	4.288[4]	4.55[4]	4.450[4]	5.70[30]	5.304[10]	5.05[21]	5.679
Houston, Tex.	4.00[3]	4.50[1]	4.50[1]	5.75[9]	3.988[3]	4.663[3]	4.563[6]	5.763[26]	5.819[10]	4.10[22]	.....
Los Angeles	4.65[4]	4.90[4]	5.20[4]	7.45[4]	5.225[4]	7.10[4]	5.200[4]	6.45[13]	7.425[6]	6.033[22]	5.863
San Francisco	4.40[7]	4.60[7]	4.90[7]	6.60[7]	4.775[7]	6.10[7]	4.750[7]	6.80[15]	7.525[15]	5.783[21]	7.583
Portland, Oreg.	4.70[27]	4.70[27]	5.00[27]	6.75[27]	4.875[27]	6.65[27]	5.000[27]	6.20[15]	6.825[15]	5.983[15]	.....
Tacoma, Wash.	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.875[6]	5.80[6]	4.500[6]	6.40[15]	7.825[15]	6.233[21]	.....
Seattle	4.70[6]	4.70[6]	5.00[6]	6.75[6]	4.875[6]	5.80[6]	4.500[6]	6.40[15]	7.275[15]	6.233[21]	.....

°Basing point cities with quotations representing mill prices, plus warehouse spread.
NOTE—All prices fixed by Office of Price Administration in Revised Price Schedule No. 49, as amended. Deliveries outside 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 bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural) Lower Lake Ports

Old range bessemer	$4.95
Mesabi nonbessemer	4.55
High phosphorus	4.55
Mesabi bessemer	4.70
Old range nonbessemer	4.80

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, cif Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% mg.	Nom.
N. African low phos.	Nom.
Swedish basic, 60 to 68%	Nom.
Spanish, N. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% fob 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 fob cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oreg., 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	$39.75
48% 3:1	41.00
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	41.00

Domestic (seller's nearest rail)

48% 3:1	$43.50

less $7 freight allowance.

Manganese Ore

Sales prices of Office of Metals Reserve, cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective May 15, 1944. Price at basing points which are also points of discharge of imported manganese ore is fob cars, shipside, at dock most favorable to the buyer. Outside shipments direct to consumers at 10c per unit less than Metal Reserve prices.

Molybdenum

Sulphide conc., lb, Mo cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Basic open-hearth Electric furnace

Designation	Chemical Composition Limits, Per Cent						Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Billets per GT
	Carbon	Mn.	Si.	Cr.	Ni.	Mo.				
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	$0.780	$15.60	$1.300	$26.00
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.780	15.60	1.300	26.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.832	16.64	1.352	27.04
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.676	13.52	1.196	23.92
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.248	24.96	1.612	32.24
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.248	24.96	1.612	32.24

Extras are in addition to a base price of 2.808c, per pound on finished products and $56.16 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximum fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, Oct. 23, 1945, and March 15, 1946. 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	$27.50	$27.00	$28.50	$28.00
Newark, N. J., del.	29.03	28.53	30.03	29.53
Brooklyn, N. Y., del.	30.00	.....	.....	30.50
Birdsboro, Pa., base	27.50	27.00	28.50	28.00
Birmingham, base	22.88	21.50	27.50	.....
Baltimore, del.	28.11	.....	.....	.....
Boston, del.	27.64	.....	.....	.....
Chicago, del.	26.72	.....	.....	.....
Cincinnati, del.	26.56	26.06	.....	.....
Cleveland, del.	26.62	25.74	.....	.....
Newark, N. J.	28.64	.....	.....	.....
Philadelphia, del.	27.96	27.46	.....	.....
St. Louis, del.	26.62	27.54	.....	.....
Buffalo, base	26.50	25.50	27.50	27.00
Boston, del.	28.00	27.00	29.00	28.50
Rochester, del.	28.03	.....	29.03	28.53
Syracuse, del.	28.58	.....	29.58	29.08
Chicago, base	26.50	26.00	27.00	26.50
Milwaukee, del.	27.60	27.10	28.10	27.60
Muskegon, Mich., del.	27.69	.....	.....	27.69
Cleveland, base	26.50	26.00	27.00	26.50
Akron, Canton, del.	27.89	27.39	28.39	27.89
Detroit, base	26.50	26.00	27.00	26.50
Saginaw, Mich., del.	28.81	28.31	29.31	28.81
Duluth, base	27.00	26.50	27.50	27.00
St. Paul, del.	29.13	28.63	29.63	29.13
Erie, Pa., base	26.50	26.00	27.50	27.00
Everett, Mass., base	27.50	27.00	28.50	28.00
Boston, del.	28.00	27.50	29.00	28.50
Granite City, Ill., base	26.50	26.00	27.00	26.50
St. Louis, del.	27.00	26.50	.....	27.00
Hamilton, O., base	26.50	26.00	.....	26.50
Cincinnati, del.	27.61	27.11	.....	27.61
Neville Island, Pa., base	26.50	26.00	27.00	26.50
§Pittsburgh, del. No. & So. sides	27.19	26.69	27.69	27.19
Provo, Utah, base	24.50	24.00	.....	.....
Sharpsville, Pa., base	26.50	26.00	27.00	26.50
Sparrows Point, base	27.50	27.00	.....	.....
Baltimore, del.	28.49	.....	.....	.....
Steelton, Pa., base	.....	27.00	.....	.....
Swedeland, Pa., base	27.50	27.00	28.50	28.00
Philadelphia, del.	28.34	27.84	.....	28.04
Toledo, O., base	26.50	26.00	27.00	26.50
Youngstown, O., base	26.50	26.00	27.00	26.50
Mansfield, O., del.	28.44	27.94	28.94	28.44

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, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 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) $32.00

6.51-7.00	$33.00	9.01- 9.50.	38.00
7.01-7.50	34.00	9.51-10.00.	39.00
7.51-8.00	35.00	10.01-10.50.	40.00
8.01-8.50	36.00	10.51-11.00.	41.00
8.51-9.00	37.00	11.01-11.50.	42.00

Fob 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: Si 14.01 to 14.50%, $45.50 Jackson co.; each additional 0.50% silicon up to and including 18% add $1. low impurities not exceeding 0.005 P, 0.40 Si, 1.0% C, 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 phosphorus.

Fob 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. $26.00
Valley base 26.00

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Buffalo, N. Y., $32.00 base; $33.24, del. Philadelphia. Intermediate phosphorus, Central Furnace, Cleveland, $29.00.

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.

Exception 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.

Refractories

Per 1000, fob Works. Net prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky. $76.05

High Heat Duty

Pa., Ill., O., Md., Mo., Ky. 60.40
Ala., Ga. 60.40
N. J. 65.90

Intermediate Heat Duty

Ohio 52.95
Pa., Ill., Md., Mo., Ky. 54.80
Ala., Ga. 49.15
N. J. 54.80

Low Heat Duty

Pa., Md., Ohio 42.35

Malleable Bung Brick

All bases 70.45

Ladle Brick

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

Dry Press 36.45
Wire Cut 34.15

Silica Brick

Pennsylvania 60.40
Joliet, E. Chicago 69.30
Birmingham, Ala. 60.40

Magnesite

Domestic dead-burned grains, net ton fob Chewelah, Wash., net ton, bulk 22.00
net ton, bags 26.00

Basic Brick

Net ton, fob 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, fob 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, 1944, base price any grade $30.00.

Ferroalloy Prices

Ferromanganese, standard: 78-82% c.l. gross ton, duty paid, $135 fob 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 fob 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 carbon: Eastern zone: Special, 21c; regular, 20.50c; medium, 14.50c; central zone: Special, 21.30c; regular, 20.80c; medium, 14.80c; western zone: Special, 21.55c; regular, 21.05c; medium, 15.75c. Prices are per pound contained Mn, bulk carlot shipments, fob shipping point, freight allowed. Special low-carbon has content of 90% Mn, 0.10% C, and 0.06% P.

Spiegeleisen: 19-21% carlot per gross ton, Palmerton, Pa., $36; Pittsburgh, $40.50; Chicago, $40.60.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb 37.6c.

Chromium Metal: 97% min. chromium, max. 0.50% 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; fob 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; fob 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 0.25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, C 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.

Silicaz Alloy: (Sil. 35-40% cal. 9-11%, alum. 5-7%, zir. 5-7%, 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 $2.023, 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 ton, $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 $1.35, less, $1.60, pound of metal; $1.36 and $1.61 central, $1.40 and $1.65, 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. ¼ 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, 10,000 lb. or more, per lb. contained tungsten, $1.90; contract, $1.88; 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 ferrotitanium.

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 or package, per lb. of alloy 14.00c; 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. 5.50c; ton lots 6.00c. Spot ½ cent higher.

Siminal: (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 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, 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 maximum price regulation No. 4. 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

(Fob 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

BOSTON:

(Fob shipping points. Boston differential 99c higher, steelmaking grades; Providence, $1.09 higher)

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

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

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

°Shipping point.

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; cast grades fob shipping point, railroad grades fob tracks)

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	21.50
Rerolling rails	22.25
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

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:

(Delivered consumer's plant)

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; cast grades fob shipping point)

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	10.50
Shoveling Turnings	12.50
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	22.00
Breakable Cast	16.50
Stove Plate	19.00
Grate Bars	15.25
Brake Shoes	15.25

CINCINNATI:

(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
Machine Turnings	10.50-11.00
Shoveling Turnings	12.50-13.00
Cast Iron Borings	11.50-12.00
Mixed Borings, Turnings	10.50-11.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-22.00
Scrap Rails	20.50-21.00
Stove Plate	18.50-19.00

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.00
No. 2 Heavy Melt. Steel	14.00
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.00
No. 3 Bundles	8.50
Machine Turnings	7.00
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut, Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.00
Tin Can Bundles	14.50
No. 2 Steel Wheels	15.50
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.50
Uncut Frogs, Switches	15.50
Scrap Rails	15.00
Locomotive Tires	15.50

LOGEMANN
Presses for Sheet Scrap

THE NATION NEEDS YOUR SHEET SCRAP!

In mills, industrial plants and scrap yards, LOGEMANN SCRAP PRESSES are working day and night to prepare sheet scrap for the furnaces.

Sheet mills particularly recognize the value of the years of experience and the performance records which back up LOGEMANN designs and workmanship.

The line includes scrap presses *designed for mill Service,* presses *designed for automobile plant conditions,* presses *designed for general plant applications.* Write for details.

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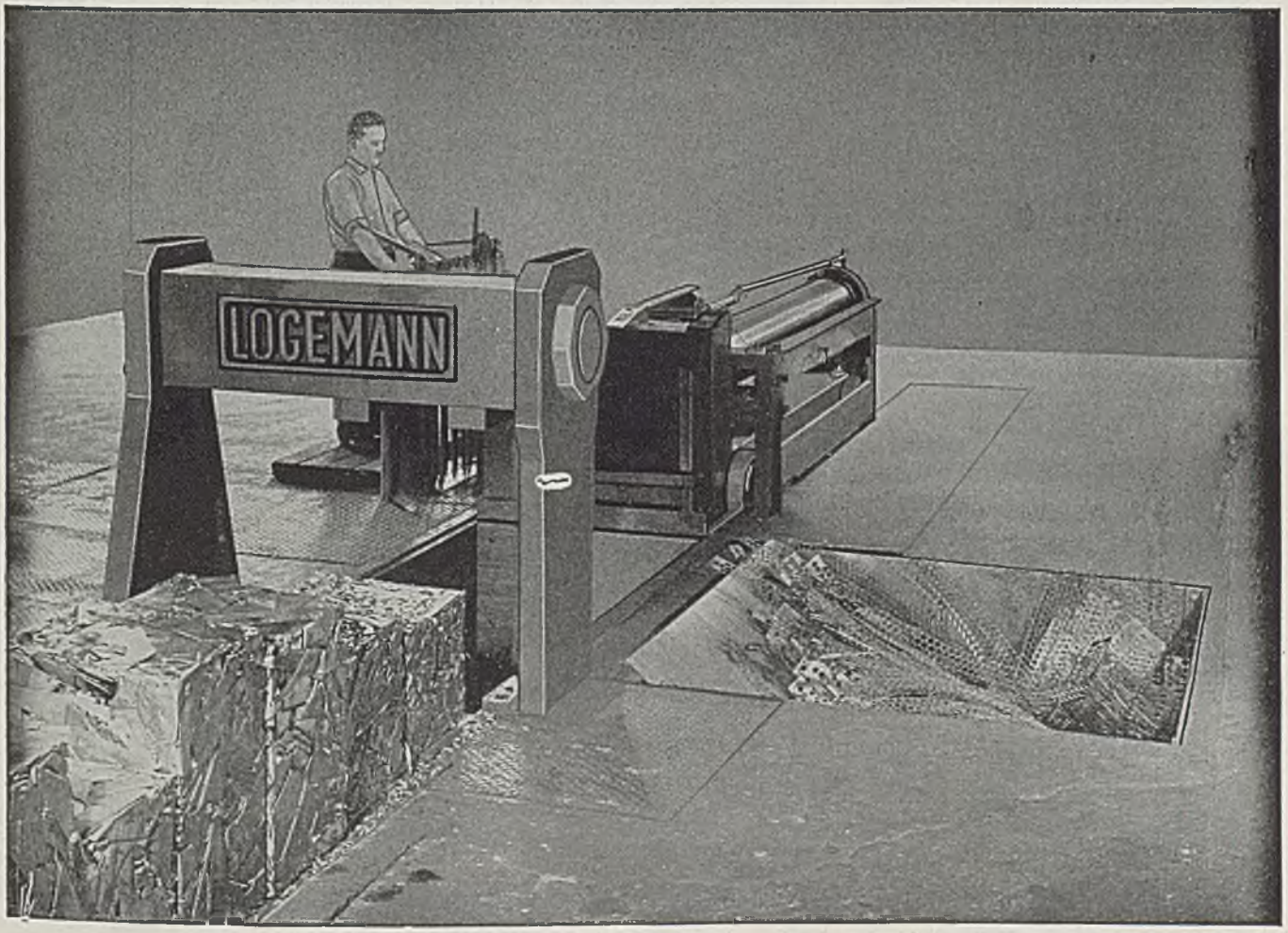


NONFERROUS METAL PRICES

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. Casting, 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) 15.75c; 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, 6.45c, corroding, 6.45, 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%) 8.00c to 8.25c, Grade 4 (85-90%) 7.75c; any other ingot containing over 1% iron, except PM 754 and hardeners, 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, fob 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., 1½c 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 fob 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 impurities, 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 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, fob 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, $103-$106 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.

Palladium: $24 per troy ounce.

Iridium: $165 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lb or more.)

Sheet: Copper 22.08c; yellow brass 20.81c; commercial bronze, 90% 22.40c, 95% 22.61c; red brass, 80% 21.48c, 85% 21.69c; phosphor bronze, grades A and B 5%, 38.77c; Everdur, Herculoy, Duronze or equiv., 27.33c; naval brass 25.83c; manganese bronze 29.33c; muntz metal 24.08c; nickel silver 5% 28.62c.

Rods: Copper, hot-rolled 18.60c, cold-drawn 19.60c; yellow brass 16.04c; commercial bronze 90% 22.35c, 95% 22.56c; red brass 80% 21.43c, 85% 21.64c; phosphor bronze grades A and B 5% 39.02c; Everdur, Herculoy, Duronze or equiv., 26.53c; naval brass 20.15c; manganese bronze 23.53c; muntz metal 19.90c; nickel silver 5% 30.87c.

Seamless Tubing: Copper 22.42c; yellow brass 23.55c; commercial bronze 90% 24.79c; red brass 80% 24.12c, 85% 24.33c.

Extruded Shapes: Copper 22.10c; architectural bronze 20.15c; manganese bronze 25.03c; muntz metal 21.15c; naval brass 21.40c.

Angles and Channels: Yellow brass 29.31c; commercial bronze 90% 30.90c, 95% 31.11c; red brass 80% 29.98c, 85% 30.19c.

Copper Wire: Soft, fob eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, fob eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered carlots 17.50c, 15,000 lb 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 fob 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 fob Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c fob 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 fob Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 35.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c fob Niagara Falls.

Brass Mill Allowances: Prices for less than 15,000 lbs. fob 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
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
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 fob 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 fob 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 fob 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 fob 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 fob 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 150

Demand for sheets and strip shows no sign of abating and much pressure is exerted for further contracts. Much shopping is being done as consumers fail to obtain requirements from regular sources. Expected effects of the coal strike are causing greater pressure for early deliveries.

New York — No let-up in sheet demand appears, notwithstanding inability of producers generally to make firm delivery promises. This is ascribed primarily to the fact that consumers are unable to buy anywhere near the amount of tonnage they require, or that they could use, from their regular souces and are consequently shopping around for sheets elsewhere. The situation now has been made more stringent again because of the bearing the soft coal strike is having on steel production and is likely to have should the strike be prolonged.

Due to complications arising from the coal strike, one large sheet producer has abandoned his idea of shortly setting up quotas for the entire last six months of the year instead of continuing on a quarterly basis.

Boston — Fabricators of sheets are realigning earlier estimates of production goals with a weather eye on tonnage likely to be available over the balance of this year. They fall in two categories, those who have orders in for a long period ahead, generally under quotas, and those with less forward coverage or with new contracts for which steel is required. The former is pressing for delivery against heavy carryovers and the latter shops for the earliest opening. Prospects for openings on many flat-rolled products are uncertain, with mills filled well through the year. But openings do occur in best regulated schedules. There is no easing in sight, however, although consumers in a few cases are voluntarily lowering estimates as to requirements; demand may well become more intense once final settlement of the electrical equipment strike is reached. Narrow cold strip mills cannot schedule far ahead because of mixed hot strip deliveries; confusion blankets production and a firm setup for a week's run without revision is difficult.

Buffalo — Fear is expressed that tentative deliveries on sheets, which already extend through most of the year, will be upset by production loss during the coal strike. Mills find it increasingly difficult to meet schedules, which are being extended. Orders continue to come in and production is unsteady. Backlogs of a leading producer at least equal the highest during the war.

St. Louis—All sheet production has been shut down three weeks due to a strike of machinists. Negotiations have been deadlocked a week and arbitration attempts have failed. Sheet schedules before the shutdown were filled through 1946.

Cleveland—Effect of the coal strike on sheet and strip deliveries was irregular last week and in no instance had become serious. Decline in receipts of steel at finishing mills is expected to gain momentum this week and will curtail output soon. Some cold rollers had several weeks' suppy of raw materials at the beginning of the strike and expect to maintain delivery schedules rather closely during second quarter. Sheet producers who are selling on a quarterly quota basis are filled up for the present quarter and will not set third quarter quotas until they can estimate production fairly closely. Some overruns are reported at mills but these are being allocated immediately to customers whose orders have been cut, rather than to new customers.

Cincinnati—Pressure on sheet mills for position on schedules and for more liberal tonnages, is unrelaxed. Andrews Steel Co. has resumed steelmaking, after being shut down by the steelworkers' strike and then delayed by other factors.

Birmingham—Sheet demand is exceptionally strong, accentuated by farm needs. Even with extended deliveries, consumers are insistent in efforts to get on mills books and will take whatever tonnage is available.

Philadelphia—Pressure for sheets is increasing as more consumers get back into substantial operation after labor setbacks. Only one large consumer in the immediate Philadelphia district, the Westinghouse Electric Corp., is still strikebound. Consumers not already protected by mills find it difficult to get tonnage on schedules this year and those protected will not get as much tonnage as needed. Some hot-rolled sheets may be picked up for shipment before the end of the year, but not in any large amounts.

Chicago — Sheetmakers report no easing in demand for all grades of sheet and strip and see no way that consumers can have their needs satisfied in any reasonable time. Consumers press for deliveries, pointing out that their manufacturing operations are stymied and in some instances they have had to cut working hours.. Cold-rolled and galvanized sheets and narrow strip are the items in worst position.

Steel Bars . . .

Bar Prices, Page 150

Mills are in receipt of bar orders in excess of shipments and backlogs are growing, most being filled for the remainder of the year on small sizes of hot and cold-drawn. Larger diameters are easier and alloy bars can be obtained much earlier than carbon.

New York — Bar backlogs continue to increase and while production has not yet been seriously affected by the coal strike, this is considered an early possibility. At present sellers generally are covered for the remainder of the year on small sizes of hot and cold-drawn carbon bars, and apart from heavy flats, have little to offer in any size of carbon grades before fourth quarter. Certain producers, in fact, appear to be out of the market entirely. Sellers of hot alloy bars are still quoting late June and July.

Boston — Maintenance of operations on a pickup basis of steel procurement is becoming increasingly difficult with most bar fabricators. Users of smaller sizes are shopping for spot tonnage with mills sold through fourth quarter generally on all grades. Improvement in delivery on volume booked months ago is retarded by heavy carryovers in hot-rolled while depleted inventories of that grade are extending cold-drawn tonnage. On most grades mills are behind schedule on shipments to jobbers by 60 days. Heavier sizes are not as badly jammed, but demand for large bars is relatively light. While there is a slight improvement in alloy buying, cold-drawn in alloy grades, small sizes, is also sold into next year. Indicative of the size factor in delivery schedules is the fact one mill can promise June on ⅝ to 3 ⅝-inch cold-drawn alloy rounds, but goes to December on ½ to 9/16-inch.

Cleveland—Shipments of bars were only slightly below schedule during the first two weeks of April but will start to decline sharply this week unless the coal strike is terminated. While some mills have not yet reduced output perceptibly, others have cut operations as much as 50 per cent. Cold finishers are in a much better position than hot bar producers, since some had as much as 60 days' supply of bars when the coal strike started. Cold-finished bar market has tightened recently, however, and some who had been selling rather freely are planning to go on a quota basis. While most hot-rolled bar sellers are out of the market for this year, cold finishers are offering September on sizes over ½-inch and under 3 inches.

Philadelphia—Hot carbon bar sellers are forced to revise schedules again, because of the coal strike. However, eastern mills have not yet been seriously affected. Broadly speaking, and with allowances for quota systems followed by some producers, there is little or no small carbon bar tonnage available for this year. Medium sizes are in much the same position. Large flats are available for early fourth quarter. Cold carbon bar deliveries are becoming more extended with little offered before fourth quarter. Hot alloys are offered for June and July. Confusion still exists as to application of the 4 per cent increase recently approved by OPA on various alloys.

Steel Plates . . .

Plate Prices, Page 151

Miscellaneous outlets for steel plates are asking increased tonnage and mill backlogs are growing. Interruptions by the coal strike are expected to make deliveries considerably later. Most producers are booked well into fourth quarter, with occasional possibility of third quarter delivery.

New York — Tank fabricators continue to place substantial orders for plates. There is uncertainty as to the effect of the recent CPA building limitation, but fabricators are confident that it will not affect most public utility work and believe that it will not restrict industrial work to the extent first indicated, although possibly delaying various jobs which may eventually be approved.

One of the largest tank jobs noted recently involves 2250 tons for a public utilities gas holder in New Brunswick, N. J., to be fabricated by Bartlett-Hayward Co., Baltimore.

Most platemakers are now booked well into fourth quarter on all tonnage, with one or two reported out of the market entirely. On the other hand, one large producer is still able to book a little sheared plate for late third quarter and another some universal plate for about that time.

Boston — Plate mills, 30 to 45 days behind delivery schedules on jobber and other commitments, have been making some progress in catching up on other than smaller sizes, but continued gains are endangered by the coal strike. Buying is still good, but has slackened some; shipyard demand is for scattered fill-in

lots, but miscellaneous industrial requirements are maintained. Wide plates, 84 to 96-inch in lighter gages, are active; welded tank inquiry has receded only slightly. Most boiler plant expansions or replacements will go ahead, as indicated by the authorization of a new structure to house four boilers, two having been condemned by boiler inspectors.

Pittsburgh — Railroad car and locomotive construction programs, as well as miscellaneous tanks, ship repair and barge construction, soon are expected to be retarded if the coal strike continues. Plate output at Carnegie-Illinois Steel Corp.'s plants here already has been curtailed. Fabricators' inventories are well below normal, for there has not been sufficient time since the steel strike to replace stocks. Sellers report no significant volume has been canceled or temporarily suspended as result of new construction regulations. Jones & Laughlin Steel Corp. plans to reopen its McKeesport Works at Port Vue and develop it inito its major fabricating division.

Philadelphia — While eastern plate mills have been running at the highest rate since early January important capacity in other districts has been affected by the coal strike and another week will see plate mills here handicapped by lack of fuel. Two eastern mills now are out of the market for the year and refuse to accept tonnage for 1947. Boiler and tank shops are consuming at a high rate and jobbers are not getting nearly enough tonnage to meet demands.

Rails, Cars . . .

Track Material Prices, Page 151

New York — Car buying continues light, with orders this month small and spotty. Recent awards include 20 covered hoppers for the Soo Line and 16 coaches for the Chicago & North Western, both going to American Car & Foundry Co., New York, and four sleeping cars for the Chicago, Rock Island & Pacific, to the Pullman-Standard Car Mfg. Co., Chicago. New inquiry includes two streamlined passenger trains, each comprising eight cars, for the Norfolk & Western.

Tubular Goods . . .

Tubular Goods Prices, Page 151

Pittsburgh — Increased output of tube rounds and skelp for nonintegrated mills is held improbable under present price schedules. However, greater spread between tube rounds and skelp, and finished pipe and tubing prices will aid nonintegrated interests to meet higher wage costs. Coal strike has begun to force curtailment of pipe production in a few plants. By the end of this week additional companies are expected to begin tapering operations, and this soon should be reflected in further reduction of jobbers' inventories, which have been unbalanced and well below normal for some months.

The Navy's Material Redistribution and Disposal office here will take bids April 16 on about 8000 feet of finished stainless steel tubing, located at National Tube Co.'s Ellwood Works, Ellwood City, Pa.; same office will accept bids April 18 on about 25,000 feet of seamless boiler tubing, located at Babcock & Wilcox Tube Co., Beaver Falls, Pa.

Cleveland — Pipe and other tubular products mills in this district have maintained operations at a fairly steady rate so far this month but expect to be forced to curtail operations this week. Pipe mills will receive smaller shipments of skelp and those operating on coke gas will get an increasingly smaller flow of that fuel. Some mills producing electrically welded tubes have a satisfactory supply of strip and will be able to maintain present rate of operations for several weeks. These mills have been reducing arrears in shipments which developed during the steel strike.

Wire . . .

Wire Prices, Page 151

Boston—Orders for 1947 delivery of wire specialties are not unusual. Buying is heavy and inquiries are sometimes accepted on a split basis. If urgent, part is taken to be scheduled as soon as possible, the remainder going into more extended backlogs. Most high-carbon capacity is sold through this year, with automotive pressure increasing, notably for valve spring stock. Selectivity in acceptance and scheduling is marked by withdrawal from production of low-margin and nonprofitable items, intensified by the revised price structure. Mills, therefore, are heavily loaded with some items and keep away from others. In this trend nonintegrated mills are hampered in scheduling too far ahead by tight rod supply, although some rods are available from Buffalo, which normally would be taken by affiliated mills. While demand for low-carbon is substantial, weight of inquiry is for high-carbon, in which deliveries are more extended. Increase of $7 per ton on bed and furniture spring wire is increasing production but the springmaker is in a price squeeze until an adjustment is made.

New York—Demand for wire exceeds production, which is somewhat higher at several mills. With rod producers utilizing more for wire drawing nonintegrated mills with reductions in quotas seek substantially more tonnage. Larger producers are out of the market for new accounts. Demand for welding wire has dropped and there have been cancellations. Patenting continues a bottleneck in furniture spring and bedding wire, although prices on that grade are better. Rope wire is sustained to fill a large rope order for Russia and need for warehouse replenishment.

Structural Shapes . . .

Structural Shape Prices, Page 151

Boston — On small sizes, plain structural bookings have crept into next year and shapes are generally in fourth quarter. Warehouse pressure for structurals is especially strong; there are indications of duplicate inquiry, but actual multiple ordering is restricted by mills holding to quotas. Cancellations or revisions stemming from ban on some heavy construction projects might mean more tonnage for warehouses, but the prospects in volume are not too bright.

John Hancock Insurance Co., Boston, has been authorized to sink about 1600 steel bearing piles, build a concrete basin and do incidental masonry work for the foundation for a 26-story building, largest active structural steel project. Work authorized will cost estimated $950,000 and about 10,000 tons of steel are involved; the superstructure will take eventually 7500 tons of fabricated structural steel.

Pittsburgh — Structural mills have not experienced the large volume of suspension orders expected as result of recent construction regulations. However, these schedules, extended into December, are in for some extensive revisions unless the regulations are eased considerably.

New York — Notwithstanding uncertainties created by the recent CPA building limitation order, some fair sized tonnages are being placed, including 1250 tons for a plant for the Continental Can Co. at Utica, N. Y., and 1200 tons for an apartment at 52nd St. and Second Ave., New York. Several other awards are noted, ranging 400 to 500 tons. New inquiries, however, appear to be off somewhat.

Seattle — Fabricating shops are handicapped by lack of steel, present allocations being far below normal requirements. One plant usually using 1000 tons or more per month is restricted to 100 tons. Demand for shapes is strong but shops hesitate to bid because of uncertainty of delivery. Pacific Car & Foundry Co. has booked 125 tons for a Seattle telephone building and 100 tons for silos for the Seattle plant of the Permanente Cement Co. Puget Sound Navy Yard will receive bids Apr. 23 for three bridge cranes and Apr. 22 for two concrete piers and ten sheet piling moorings.

Philadelpha — Relatively few cancellations have resulted from the building limitation order by Civilian Production Administration and nearby shape mill schedules are not affected. Delivery promises on shapes appear as tight as ever, with leading producers having little to offer for the remainder of the year. One district fabricator continues down because of inability to get shapes, having used its inventory during the steel strike.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 151

Denver — Largest buyer of concrete reinforcing bars currently is the Bureau of Reclamation, distributing contracts for approximately 8000 tons already bid, including one inquiry for 5100 tons. The total may approach 10,000 tons shortly. Bureau of Reclamation purchases direct most of its reinforcing bars, most steel piling and other steel for its project; contractors quote only on placing the materials.

Seattle — Bureau of Reclamation projects in the Pacific Northwest involve considerable tonnage of reinforcing steel on which bids will be taken within the next 30 days. Bids will be opened Apr. 17 on five 3000-barrel steel silos, hoppers, conveyors and feeders for the Columbia Basin project. Bids will be taken Apr. 29 at Boise, Idaho, for a line canal pumping plant requiring 225 tons of reinforcing steel, a 300-ton crane and miscellaneous items calling for about 300 of reinforcing. Bids will be asked tons of shapes and a total of 500 tons soon on a 10,000-foot South Coulee dam, first of four projects to irrigate 400,000 acres.

Pig Iron . . .

Pig Iron Prices, Page 153

In face of threatened curtailment of pig iron production because of lack of

fuel demand is increasing as foundries find the labor situation better. No marked reduction in foundry operations has been made yet but continuance of the coal strike will affect them seriously.

Pittsburgh — Merchant pig iron output here continues far short of essential needs and most foundries are forced to reduce badly depleted inventories. Normally considerable tonnage of merchant iron is distributed into this area from Erie, Cleveland and other districts; however, volume of this tonnage has been well below normal in recent months. The lone merchant iron producer here has about one month supply of coal.

Buffalo — Pig iron sellers are in receipt of heavy requests for iron at the same time output is being reduced from lack of fuel. Bookings already had covered expected full production for second quarter. In addition many foundries ask more iron because the labor situation has improved. Some relief to coke supply may result from the fact that the leading commercial producer supplies gas for domestic needs in this city and may be allowed preference in emergency shipments of coal.

St. Louis — Pig iron supply remains tight, although a strike at this district's major steelworks has enabled the principal basic iron producer to spread its output and ease slightly the pressure elsewhere. Production rate remains level at 50 per cent of capacity, half of which is idle because of government ownership of one furnace. No immediate curtailment because of the coal strike is foreseen.

Boston—There is slight chance of any material increase in melt until supply of iron is increased. This does not appear probable this quarter and shipping schedules are geared accordingly. Furnaces are barely able to maintain deliveries on tonnage already promised and frequently must fill emergency requirements. Practically all consumers are under the 30-day limit, some considerably less.

Cincinnati—Shipments of pig iron into this district have been slowing, those of northern iron off about 50 per cent and those of southern less seriously affected so far. Foundries are in precarious position, few having 30-day stocks of pig iron.

Birmingham—Pig iron is tighter each week, as production is down. Sloss-Sheffield Steel & Iron Co. has put one stack on ferromanganese and Woodward Iron Co. has blown out a stack for relining. Demand is at peak and many industries are suffering, notably cast iron pipe makers. Some automobile casting orders are coming here and a number of small foundries have been established here recently.

Philadelphia—One district blast furnace scheduled to go down last week has been able to continue and it is the expectation that it will be able at least to get out sufficient tonnage to meet April requirements of foundry customers. This stack probably will be banked the latter part of this week if the coal strike continues. Some other stacks will be banked of the mine deadlock continues. Meanwhile consumers of both basic and foundry grades are pressing for every ton possible.

New York — At least two furnaces supplying iron to this district are expected to be banked this week should the coal strike continue. One seaboard

furnace scheduled to go down last week has been able to carry on a little longer. However, most foundries in this district will be able to sustain their melt fairly well in April, it is believed.

Chicago — Foundries, which for months have operated on narrow iron inventories, are about to suffer further handicap. The coal strike is not only forcing some blast furnaces to bank, but is cutting down coke production. As compared with two weeks ago, ten blast furnaces in this district have banked, these all being stacks of Carnegie-Illinois Steel Corp. The same company is operating only 8 of its 17 coke oven batteries.

Scrap . . .

Scrap Prices, Page 154

Tightness in scrap has not been relieved and consumers are anxious for further supply, paying high springboards and accepting all material offered. Lack of industrial scrap is particularly evident and railroads offer much less than normal.

Pittsburgh — Consumers are accepting all good quality scrap available. Consumers still are paying springboards up to $2.50 per ton on heavy melting steel, $1.50 on carbon machine shop turnings and $5.50 on cast scrap, indicating the keen interest in limited scrap available. Shortage of cast scrap is becoming more acute as foundries attempt to conserve pig iron stocks. Railroad lists have been meager in recent months. Some interests believe the railroads are behind on orders and are resorting more and more to reciprocity in disposal of tonnage. More scrap is being charged into open hearths as blast furnace operations are suspended or put on reduced wind.

Detroit—Scrap prices hold at ceiling, with supplies starting to improve mildly as General Motors plants swing into production. Steel mill here are comfortable as far as scrap stocks are concerned, although foundry grades continue to be tight. Brokers report principal demand currently comes from Valley mills.

Buffalo — Scrap shipments by lake are expected to be far short of the 1945 movement, the first cargo this season being only 850 tons, from Detroit. A cargo from Duluth is expected soon but indications are that accumulations on the upper lakes are small. Local supply is no better as industrial production is limited.

St. Louis — Scrap supply is improving somewhat, with dealers reporting increased shipments because of better weather and a slightly improved manpower situation. The coal strike has failed to affect demand and mills are taking all they can get. Cast iron and railroad scrap demand is exceptionally heavy. Foundries are curtailing orders a bit, principally because they want cheaper grades. Mill reserves remain at 30 to 45 days. Prices are at ceiling.

Philadelphia — Heavy melting steel scrap is moving a trifle more freely. Industrial scrap is somewhat freer, now that most labor disputes have been settled. However, there is ample demand for all available material, with strong demand here from outside consumers. Some unprepared scrap continues to move to outside points but there is plenty of local demand for all prepared grades. Recently 200 tons of miscellaneous unprepared scrap at the Phila-

delphia Navy Yard has been bid on, with an additional lot of 100 tons of army tank scrap to be bid Apr. 15 at Frederick, Md.

Boston—While shipbreaking may contribute toward increasing overall scrap supply in future, few ships are expected to be broken up in this area. Demand is high with strictly No. 1 melting steel tight. Inventories being low generally, any curtailment by the coal strike is not expected to halt scrap buying immediately. Unprepared commands strong prices, which in some instances means shading usual per ton cost for preparation.

Cleveland — Scrap brokers are hard pressed to obtain material for regular customers and pressure for delivery is strong. Springboards are being paid to move material from a distance but even this fails to increase tonnage materially. Steelmaking in this area has not been affected by the coal strike but adjacent districts have suffered, though this has not reduced scrap demand.

Cincinnati—Demand for scrap in all grades is heavy, with stocks of some melters so low that emergency truck shipments are occasionally necessary to avoid shutdowns. Although there is gain in volume of production scrap, this source is not yet up to normal and has not appreciably eased the tight supply.

Birmingham—Scrap is in heavy demand, due in part to shortage of pig iron. Shipyards and industrial plants are shipping much less tonnage. Shipments of railroad scrap are expected to increase soon but this will not ease the situation materially.

New York — Scrap brokers here are figuring on 4800 tons of chrome nickel plate material and 2800 tons of chrome nickel mixed turnings and solids owned by the Navy at the Harrison, N. J., plant of the Crucible Steel Co. of America, with bids opening Apr. 15. Demand for heavy melting steel and cast grades continues active, with Pittsburgh consumers as well as seaboard buyers in the market.

Chicago — The coal strike is not affecting demand for scrap here, mills pressing actively for material. Only steelmaker which has curtailed operations to date is Carnegie-Illinois Steel Corp. and this company produces most of its own scrap. If the mine shutdown continues, other mills will reduce schedules, but efforts to acquire material are not expected to suffer. Foundries are finding it difficult to satisfy requirements for cast grades.

Warehouse . . .

Warehouse Prices, Page 152

Boston — Warehouses are rationing numerous products because of depleted stocks, notably flat-rolled and small carbon bars, with demand well ahead of supply. Deliveries from mills are slightly heavier, but most steel is against orders due to have been shipped last quarter. In contrast to carbon products, alloy inventories are in fair balance, although cold-finished alloys in smaller ranges are tightening; plates are also coming in better.

New York — Unless a new ruling is forthcoming, distributors of bolts and nuts will absorb the 7 per cent increase in those products, rivets and screws. Margin in nails in this area has roughly been reduced from 24 to 10 per cent,

base period prices, since price controls. Nails continue to be one of the tightest with warehouses. Demand for most products with jobbers is far in excess of ability to fill orders, notably in light gages and small sizes.

Philadelphia — Jobbers report slightly increasing business by virtue of bette receipts from mills. However, incoming tonnage falls far short of meeting demand and stocs continue unbalanced.

Pittsburgh — Steel distributors' inventories of popular items are nearly depleted, while new inquiries approximate record volume. Mill receipts on most steel products have been only a fraction of previously scheduled deliveries since th first of the year. In addition to not receiving adequate replacement tonnage for regular customers, steel distributors have been swamped with inquiries from companies which normally purchase their steel requirements from mills.

Ferroalloys . . .

Ferroalloy Prices, Page 153

New York — While ferroalloy shipments this month will depend somewhat upon the influence of the soft coal strike on steel production, leading sellers are inclined to think that the movement will prove more active than in March. Continuation of the coal strike will restrict steel output in increasing measure, but ferroalloy stocks at consumer plants are low and there is a disposition to build them up. Consequently shipments may run fairly heavy regardless of the coal situation.

Trade estimates indicate a drop of about 30 per cent in shipments of ferroalloys during the quarter recently ended. Fourth quarter of last year, in turn, was off about 10 per cent from the third period. Incidentally, there was little variation in the month to month movement during the last quarter of last year, with shipments in October, November and December about equal. Indicative of the movement last month, one leading seller reports shipments off about 25 per cent from the fourth quarter average. The steel strike generally had ended before March 1, but its influence carried on for a while; and, in fact, some steel plants were still strikebound during a portion of March. The decline of about 30 per cent for first quarter as a whole is ascribed to the steel strike.

Low-Carbon Ferromanganes Price Reduced as of Apr. 1

Effective April 1, the price of low-carbon ferromanganese has been reduced Electro Metallurgical Sales Corp., New York, has announced. Price for the special grade, a typical composition of which is 90 per cent manganese, 0.06 per cent phosphorus, and a maximum of 0.10 per cent carbon, has been reduced from 23 cents to 21 cents a pound of contained manganese. New prices for regular grades, which analyze 80 to 85 per cent manganese, now range from 20.5 cents (0.10 per cent carbon) down to 19 cents (0.50 per cent carbon). These prices are for carload lots in bulk of lump size material in the eastern zone, with correspoding price reductions effective for the central and western zones as well.

The schedule of the new contract prices, effective April 1, on low-carbon ferromanganese, on the basis of manganese contained, lump size, fob shipping point, freight allowed for the eastern zone are:

	Carloads	Ton	Less than Ton
0.10% max. C, 90% Mn Typical 0.06% P	21.00c	21.40c	21.65c
0.10% max. C, 1% or 2% max. Si	20.50	20.90	21.15
0.15% max. C, 1% or 2% max. Si	20.00	20.40	20.65
0.30% max. C, 1% or 2% max. Si.	19.50	19.90	20.15
0.50% max. C, 1% or 2% max. Si	19.00	19.40	19.65

Central zone prices are 0.30 cents higher for carloads, 1 cent higher for ton lots and less; western zone prices, 0.55 cents higher for carlots and 2 cents higher for ton lots and less.

Refractories . . .

Refractories Prices, Page 153

Pittsburgh — Producers expect to be hard pressed meeting heavy demand for refractories through the remainder of this year. Manpower shortage continues the major retarding factor. Sellers' backlogs are extended into June and July. Recent increase of 11 per cent on clay and silica brick prices for producers in the St. Louis district and east of the Mississippi river, is expected to compensate sellers, at least in part, for advance of 18.5 cents an hour in

wages recently put into effect in most of the industry. Producers were granted a 3 per cent increase in prices in January last year, the first advance since March, 1942. Prices were increased an equivalent amount in June, 1945.

Aluminum Co. Raises Price On Some Fabricated Goods

Effective Apr. 10 Aluminum Co. of America has made some adjustments and increases in prices of certain fabricated products where increased labor and other costs have made such action necessary. In spite of the general wage increase recently granted there will be no change in its price for aluminum ingots.

Canada . . .

Toronto, Ont. — While the advance in steel prices has cleared the air it has not tended to ease supply and consumers continue to complain of difficulty in obtaining steel. Labor leaders also are becoming more aggressive in demands for wage increases and in some respects demands run to greater lengths than they did previous to the increase in steel prices. Steel producers report increasing backlogs, with some materials booked heavily through third quarter despite efforts to curb buying beyond second quarter. Production of both pig iron and steel are well above the average for the last half of 1945, but output has not attained the record high rate of some war years.

While iron and steel production in February fell slightly below January, the decrease was entirely due to the shorter month. Following are comparative production figures in net tons:

	Steel Ingots Castings	Pig Iron	Ferro Alloys
Feb., 1946	233,893	143,171	10,872
Jan., 1946	244,623	143,685	10,878
Feb., 1945	250,464	149,487	13,402
2 Mos., 1946	478,516	286,856	21,750
2 Mos., 1945	519,186	305,456	25,532
2 Mos., 1944	472,038	274,006	31,215

Steel in Europe . . .

London—*(By Cable)* — February exports by Great Britain were 25 per cent of output, highest since 1939. Fuel position is improving. Increasing tonnage of plates is needed for shipbuilding and railroad construction.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

8000 tons, engine manufacturing plant, Peoria, Ill., for Caterpillar Tractor Co., to American Bridge Co., Pittsburgh.

4650 tons, engine shop and engineering building, Pontiac, Mich., for Truck & Coach Division, General Motors Corp., to Whitehead & Kales Co., Detroit.

2110 tons, farm machinery parts building, Hopkins, Minn., for Superior Separator Corp., to American Bridge Co., Pittsburgh.

1250 tons, plant at Utica, N. Y., for Continental Can Co., to Utica Steam Boiler Co., Utica, with some fabrication reported let to Utica Structural Steel Co.; Walter Kidde Co., New York, general contractor.

1200 tons, apartment, 57th St. and Second Ave., New York, to American Bridge Co., Pittsburgh, through Emery Roth & Sons, architects, 18 East 48th St., New York.

900 tons, regulating gates, Redding, Calif., for Bureau of Reclamation, to American Bridge Co., Pittsburgh.

800 tons, paper mill, Clark, N. J., for United States Gypsum Co., to American Bridge Co., Pittsburgh.

725 tons, Bureau of Reclamation, Denver, Colo., spec. 1160, to Pacific Coast Steel Co., San Francisco.

600 tons, beam and girder spans, West Virginia, for Baltimore & Ohio Railroad, to American Bridge Co., Pittsburgh.

475 tons, state bridge Whitney Point, N. Y., to American Bridge Co., Pittsburgh.

475 tons, factory building, General Foods Corp., 250 Park Avenue, New York City, to International Steel Co., Evansville, Ind.

440 tons, factory building, Industrial Installation Corp., Brooklyn, N. Y., to Shanus Iron Works, Brooklyn.

400 tons, project at Trenton, N. J., to Utica Structural Steel Co., Utica, N. Y., through Gibbs & Hill, New York.

400 tons, warehouse, Ceco Steel Products Co., Hillside, N. J., to unstated fabricator.

400 tons, warehouse for Ceco Steel Products Co., Hillside, N. J., to H. R. Goeller Inc., Newark, N. J.

300 tons, buildings, Grafton, W. Va., for Washington Engineering & Construction Co., to American Bridge Co., Pittsburgh.

300 tons, glue factory, Johnstown, N. Y., to American Bridge Co., Pittsburgh, from George W. Randall.

300 tons, boiler house, Minneapolis, to American Bridge Co., Pittsburgh, from Johnson Drake & Piper & Fegles.

300 tons, bridge C-152, Los Angeles, Calif.,

for Atchison, Topeka & Santa Fe Railway, to American Bridge Co., Pittsburgh.

250 tons, underpass, 47th Street, Chicago, for Cook county, Illinois, to American Bridge Co., Pittsburgh.

150 tons, manufacturing building No. 10, Kankakee, Ill., for American Marietta Co., to South Shore Iron Works, Chicago; Sill Construction Co., Chicago, contractor; bids March 1.

125 tons, telephone building addition, Seattle, to Pacific Car & Foundry Co., Seattle.

100 tons, silos for Permanente Cement Co., Seattle, to Pacific Car & Foundry Co., Seattle.

STRUCTURAL STEEL PENDING

1200 tons, library at Princeton University; bids closed Apr. 10 by Turner Construction Co., New York.

1200 tons, theater building, Mexico.

1000 tons, transmission towers, Greencastle, Ind., for Indiana Public Service Co.

1000 tons, general service building, Ann Arbor, Mich., for University of Michigan; bids March 28.

960 tons, new maintenance shops, Ecorse, Mich., for Great Lakes Steel Corp.; bids March 25.

865 tons, steel superstructure, bridge, Penobscot river, Enfield-Howland, Me.; bids April 17, state highway commission, Augusta.

682 tons, bridge, route 25, section 32A, Newark, N. J.; bids April 28, Spencer Miller Jr., state highway commissioner, Trenton, N. J.

300 tons or more, cranes and other items, Boise project; bids to Bureau of Reclamation Apr. 29.

560 tons, 1946 bridge requirements, various locations, for Chicago, Rock Island & Pacific railroad; bids April 1.

550 tons, plant for United States Industrial Chemical Co., Newark, N. J.; W. J. Barney Corp., 101 Park Ave., New York, general contractor.

480 tons, warehouse for International Text Book Co., Scranton, Pa.

475 tons, superstructure, 605-foot four-span continuous deck girder bridge, route 105, Sheldon Springs, Vt.; bids lump sum April 26 to H. E. Sargent, commissioner of highways, Montpelier.

450 tons, reconstruction of engine house, Englewood station, Chicago, for New York Central railroad; bids March 29.

445 tons, including 195 tons Z-piling and 250 tons accessories, tunnel, Milwaukee, for Blatz Brewing Co.; Edward E. Gillen Co., contractor.

400 tons, sheet piling, lock and guide wall extension, dam No. 11, Dubuque, Iowa, for U. S. Engineer, Rock Island, Ill.; bids extended from April 16 to April 30.

350 tons, Sacred Heart Hospital, Norristown, Pa.; new bids to be asked.

235 tons, warehouse building, Spec. 1249, Hungry Horse dam, Columbia Falls, Mont., for U. S. Bureau of Reclamation, Denver; bids April 15.

225 tons, factory building, Galesburg, Ill., for Gale Mfg. Co.

200 tons, sheet piling, dam No. 2, Hastings, Minn., for U. S. Engineer; bids April 9.

200 tons, warehouse, Sylvania Electric Products Inc., Danvers, Mass.

193 tons, bridge, route 25, sections 32A and 16C, Newark-Elizabeth, N. J.; bids April 28, Spencer Miller Jr., state highway commissioner, Trenton, N. J., also 38 tons reinforcing steel.

155 tons, bridges, Connecticut, including 100-ton plate girder, Manchester; balance beam spans.

123 tons, new plant, Paxton, Ill., for Bear

Brand Hosiery Co.; bids March 25.

100 tons, five galvanized steel transoceanic towers 300 feet, six inches, above insulators and approximately 323 feet above foundation base, bids April 17, inv. 3286, to Civil Aeronautics Administration, Washington.

Unstated tonnage, galvanized steel towers and appurtenances, Bureau of Reclamation, spec. 1162. American Bridge Co., Pittsburgh, low at $451,353.

Unstated tonnage, 150-ton gantry crane, Bureau of Reclamation, Denver, for Odair, Wash., Washington Iron Works, Seattle, low at $52,095 f.o.b. Seattle.

Unstated, steel work, barge for Coulee dam; bids to Denver, May 2.

Unstated, miscellaneous items for Hungry Horse dam; bids to Denver, April 15.

Unstated, one 60-ton crane, Anderson Ranch dam; bids to Bureau of Reclamation, May 2.

Unstated, three bridge cranes; bids to Puget Sound Navy Yard, Apr. 23.

REINFORCING BARS . . .

REINFORCED BARS PLACED

350 tons, building, Lansing, Mich., for Michigan State College, to Capitol Steel Corp., Lansing, Mich.

335 tons, addition to retail store, Gary, Ind., for Sears, Roebuck & Co., to Carnegie-Illinois Steel Corp., Chicago.

300 tons, foundation for Philadelphia Inquirer building, Philadelphia, to American Steel Engineering Co., Philadelphia, through McNichol Paving & Construction Co., Philadelphia, general contractor.

150 tons, miscellaneous repairs, Chicago, for Department of Public Works, to Olney J. Dean Steel Co., Chicago; bids Feb. 27.

REINFORCING BARS PENDING

5100 tons, including 4750 tons ¾-inch and larger, 125 tons, ⅝-inch and 125 tons ½-inch, bureau of reclamation, Denver; bids in.

500 tons or more, Boise project; bids to Bureau of Reclamation, April 29.

490 tons, flood wall improvements, near Cairo, Ill.; bids May 1, U. S. engineer, Memphis; also 98,600 square feet sheet piling, 26,500 linear feet steel bearing piles with 200 splices and 61 tons, structural and miscellaneous steel.

305 tons, mesh, route 25, sections 32A and 16C, Newark-Elizabeth, N. J.; bids April 28, Spencer Miller Jr. state highway commissioner, Trenton.

245 tons, Elkins flood protection project; bids in to U. S. engineer, Pittsburgh.

229 tons, bridge, route 25, section 32A, Newark; bids April 28, Spencer Miller Jr., state highway commissioner, Newark.

210 tons, mesh, highway, route 25, section 32A, Newark, N. J.; bids April 28, Spencer Miller Jr., state highway commissioner, Trenton, N. J.

200 tons, lock gates and construction, Hastings, Minn., bids May 7 to U. S. engineer, St. Paul, also 26 tons steel floor plates.

135 tons, flood protection work, near Mound City, Ill.; U. S. engineer, Louisville, Ky.

107 tons, lock and guide wall extension, dam No. 11, Dubuque, Iowa, for U. S. Engineer, Rock Island, Ill.; bids extended from April 16 to April 30.

107 tons, approach improvement guide wall extension, lock and dam No. 11, near Dubuque, Ia.; bids April 16, U. S. engineer, Rock Island, Ill.; also 28,300 square feet sheet piling, 40 tons steel forgings, 52 tons structural steel and 55 tons wall armor.

170 tons, mesh, route 25, section 32A, Newark, N. J.; bids April 28, Spencer Miller Jr., state highway commissioner, Trenton.

105 tons, bridge and highway, Sheldon Springs, Vt.; bids April 26, to H. E. Sargent, state highway commissioner, Montpelier, Vt.

100 tons, Bushnell Park pumping station, Hartford, Conn.; bids about May 15, U. S. Engineer, Providence, R. I.

Unstated, two concrete piers, also 10 sheet steel pile mooring, Puget Sound Navy Yard; bids April 22.

PLATES . . .

STEEL PLATES PLACED

2250 tons, public utility gas holder, New Brunswick, N. J., to Bartlett-Hayward Co., Baltimore.

PLATES PENDING

Unstated, five 3000-barrel capacity cement silos for Columbia Basin project; bids to Denver April 17.

PIPE . . .

CAST IRON PIPE PLACED

258 tons, for Tacoma and Union Gap, Wash., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

CAST IRON PIPE PENDING

700 tons, for Seattle; H. G. Purcell, Seattle, low.

RAILS, CARS . . .

RAILROAD CARS PLACED

Chicago & North Western, 16 coaches, to American Car & Foundry Co., New York.

Chicago, Rock Island & Pacific, four sleepers, to Pullman-Standard Car Mfg. Co., Chicago.

Soo Line, 20 covered hopper cars, to American Car & Foundry Co., New York.

Metal Cutting Problems Discussed at ASTE Show

(*Concluded from Page* 69)

should be based on performance which also applies to the evaluation of sulphurized oils. The speaker asserted that the tool engineer should get closer to cutting oils inasmuch as their problems are the same. In conclusion Mr. Oldacre said he was amazed at the number of shops that are completely ignorant of materials with which they work despite the fact they have such well-equipped metallurgical laboratories just around the corner.

Discussion brought out an important factor governing the machining of metal and the type of cutting oil employed. The best type of cutting oil is not chosen by chemical analysis. Instead it was suggested that six or more samples of cutting oil of any well-known manufacturer be selected and used several months under careful metallurgical supervision. At the end of the test run it will be possible to determine the best oil for use with a specified job.

A. H. D'Arcambal, vice president, consulting metallurgist, Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., in describing German precision cutting tools and gages at the Tuesday evening session made it plain that while their machine tools were of good design and performed fairly well, yet the design of their cutting tools and gages didn't look any different than those made in America. He observed that the Germans didn't stock as many designs of cutting tools as is done in this country. The Germans depended on dial indicating gages even for internal gaging, he stated. Workmanship of German cutting tools is not to be compared with that done in America. Before the war, he explained, German cutting tools were made from oil-hardened steel; during the war they were compelled to make them from ball bearing grades. In fact, 80 per cent of all German high-speed cutting tools made during the war had 1 per cent carbon, from 2 to 2.50 tungsten, 3.00 vanadium and 2.50 per cent molybdenum. By quenching at 2180 to 2200°F, he stated, the tools were nearly as good as the 18-4 grades.

German hardening equipment is similar to ours though it is not arranged in the shop nearly as well as in American plants.

In discussing carbide possibilities in single point turning, J. F. Allen, project engineer, Warner & Swasey Co., Cleveland, stated that during the past year or two the wide publicity given to the use of negative rakes on carbide cutters, both in milling and in turning work, and the resultant increase in performance, has undoubtedly created in many minds the impression that all present-day machine tools are on the verge of complete obsolescence.

This impression is an erroneous one, the speaker contended. Cutter performance is only one of many factors involved in machine tool development and the impact or influence exerted on machine tool design by the appearance of new cutting materials and the development of new techniques will depend largely upon the complexity of the other factors involved.

Development of an automatic form-turning machine, with which it is possible to turn or bore a work-piece of circular cross section to any predetermined longitudinal contour from a thin sheet metal template, was described at the Wednesday afternoon session by K. T. Kuck, chief engineer, Monarch Machine Tool Co., Sidney, O. In actual operation the tool is guided in the work by an electric tracer which engages a thin sheet metal template the exact cross section of the work-piece. Alternate longitudinal and cross feeds are secured from magnet clutches driving the carriage and cross slide of the lathe. The pressure of the tracer against the template is only a few ounces, thereby eliminating the necessity of using hardened and ground template.

O. W. Boston, professor of metal processing, University of Michigan, Ann Arbor, Mich., who spoke on "Research in Tool Engineering" Wednesday afternoon, mentioned that subzero or deep-freeze treatment of all high-speed steels has been the object of a great deal of experimentation during the past 2 years. This treatment, he explained, is involved and may call for the cooling of the steel to 100 to 120°F below zero before single or double tempering, between temperings, or after single or multiple tempering to complete the transformation of austenite to martensite. Many experiences have shown real benefits in tool life resulting from this low temperature treatment, but experience also has shown that tools properly heat treated show no improvements while some tools believed improperly treated have shown improvements.

Wide Range of Equipment Shown to Tool Engineers

(*Concluded from Page* 69)

turing the first thing which was transferred to machines was skill—thus multiplying that tremendously. Next, intelligence was transferred to automatic machinery. Now it appears that the same cycle has been followed in tooling and in measuring.

CONSTRUCTION AND ENTERPRISE

CALIFORNIA

EMERYVILLE, CALIF.—Marchant Calculating Machine Co., Powell St., plans plant expansion to cost $1,500,000 on plans by A. F. Roller, Crocker First National Bank Bldg., San Francisco.

LOS ANGELES—Wells Aircraft Parts Co. has building permit for a storage building 33 x 75 feet at 4127 Whiteside Ave., City Terrace Dist., to cost about $3000.

LOS ANGELES—Air Speed Tool Co. has been organized by H. J. Thiessen and associates and has established its plant at 1500 West Slauson Ave.

LOS ANGELES—United Tool & Supply Co. has been formed by Harry Katz and has established operations at 3852 City Terrace Drive.

ONTARIO, CALIF.—General Electric Co., 234 East Main St., has let contract to C. T. & W. P. Stover, 116 North Alexander Ave., Claremont, Calif., for a plant addition to cost about $100,000.

RIVERSIDE, CALIF.—Donald Allbright is building a concrete machine shop at 3743 Fairmount Blvd. 40 x 105 feet, to cost about $20,000.

SUNNYVALE, CALIF.—Woolridge Mfg. Co., Hendy Ave., has let contract to Earl W. Heple, 494 Delmas Ave., San Jose, Calif., for a machine shop building and tool rooms.

VERNON, CALIF.—Baah-Ross Tool Co. has building permit for a steel frame addition and craneway at 5612 South Boyle Ave., to cost about $3500.

VERNON, CALIF.—Norris Stamping Co., 5215 South Boyle Ave., has building permit for alterations and improvements at its plant, to cost about $11,000.

CONNECTICUT

BETHEL, CONN.—Republic Foil & Metal Mills, 233 Broadway, New York, plans a one-story 80 x 245-foot plant costing over $40,000. F. Thompson Inc., 211 State St., Bridgeport, Conn., is architect.

BRIDGEPORT, CONN.—Underwood Corp., 575 Broad St., has let contract to Hewlett Construction Co., 600 Lindley St., for a boiler plant costing over $40,000. Lockwood Greene Engineers Inc., 10 Rockefeller Plaza, New York, is engineer.

WALLINGFORD, CONN.—General Electric Co., 1 River Rd., Schenectady, N. Y., plans a plastic molded parts plant to cost about $2 million.

GEORGIA

ATLANTA, GA.—Armstrong Cork Co., Macon, Ga., plans pulp and paper mill near Atlanta, estimated to cost $1 million.

ILLINOIS

CHICAGO—General Motors Corp. is building a one-story 90,000 square foot parts warehouse at Roosevelt Rd. and Cicero Ave. to replace former warehouse turned over to the government during the war.

CHICAGO—Pyramid Metals Co., 1355 North Wells St., will build a one and two-story plant and office building 220 x 300 feet. E. O. Sessions & Co., 1 North LaSalle St., are architects.

CHICAGO—Bulldog Lock Co., 4642 North Ravenswood Ave., plans a one-story 50 x 150-foot plant. E. Steinborn, 176 West Adams St., is architect.

CHICAGO—Diebel Die & Mfg. Co., 3654 North Lincoln St., plans a plant building 100 x 270 feet on plans by W. Reichert, 2639 West Grand Ave.

WOOD RIVER, ILL.—Shell Oil Co., New York will build a two-story laboratory building at its Roxana plant. Jamieson & Spearl, 812 Olive St., St. Louis, are architects. W. C. E. Becker, 411 North Seventh St., St. Louis, is engineer.

INDIANA

EAST CHICAGO, IND.—St. Clair Refining Co., 3500 Indianapolis Ave., plans to modernize and build addition to refinery at cost of about $3 million.

WHITING, IND.—Standard Oil Co. of Indiana, 910 South Michigan Ave., Chicago, has let contract to Gust K. Newberg Co., 9 South Clinton St., Chicago, for laboratory research buildings to cost about $2 million. (Noted Dec. 3).

MARYLAND

BALTIMORE — Harbison-Walker Refractories, Farmers Bank Bldg., Pittsburgh, plans refractories plant here costing about $500,000. D. B. Hendryx, same address, is consulting engineer. (Noted Apr. 1).

BALTIMORE—General Motors Corp. has completed plans for a one-story building 100 x 280 feet on Washington Blvd., Halethorp, for diesel motor repair. J. M. Josephs is company engineer in charge. Is also building a 110,000-square foot warehouse on East Monument St. and is enlarging automobile and truck assembly plants on Broening Highway.

BALTIMORE—Liberty Motors & Engineering Corp. has completed a 36,000-square foot unit in Arbutus and is erecting a 70,000-square foot addition. Company, R. Bruce Livic, president, will move from 922 Park Ave., to the new location and will manufacture compressors, condensing units, tools and test equipment for aviation.

BALTIMORE—Tomke Aluminum Co., Donald S. Levinson, president, will erect a storage building 32 x 80 feet, one story.

BALTIMORE—Baugh Machine & Tool Co., Long Green, Baltimore county, is building a one-story addition 28 x 90 feet for general machine shop and general stampings production.

MICHIGAN

BAY CITY, MICH.—Consumers Power Co., Jackson, Mich., has plans under way for a power plant addition to cost about $5 million.

DETROIT—Airplane Forging Die Co., 5850 Crane Ave., has been incorporated with $25,000 capital to manufacture drop forging dies, by Russell Eckenboy, 8012 Merrill Ave.

DETROIT—Flex Tool Co., 19200 Mt. Elliott Ave., has been incorporated with $25,000 capital to manufacture tools, by Eugene Sturza, 13174 Charest Ave.

DETROT—Manco Tooling Inc., 20950 Greenfield Rd., has been incorporated with $50,000 capital to do tool, die and machine work, by William S. Morrison, same address.

DETROIT—Thero-O-Blast Co., 91 East Milwaukee Ave., has been incorporated with 3000 shares no par value to manufacture heating devices, by Harry E. Knupp, 19670 Chesterfield Rd.

DETROIT—Sterling Burner Corp., 14015 Hamilton Ave., has been incorporated with $1000 capital to manufacture fuel and gas

burners, by Frank Feinberg, 873 West Boston Blvd.

GRAND RAPIDS, MICH.—Jelens Die & Stamping Inc., 1811 Wilbert St., has been incorporated with $50,000 capital to manufacture metal tools, stampings and dies, by Bert Jelens, same address.

JACKSON, MICH.—Jackson Drop Forge Co., plans a one-story forge plant and power house, to cost about $75,000.

MUSKEGON, MICH.—Consumers Power Co., Jackson, Mich., is having plans drawn for a 120,000-kw steam-electric plant to cost over $5 million.

ROCHESTER, MICH.—Pontiac Stoker & Mfg. Co., 520 Woodward Ave., has been incorporated with $24,000 capital to manufacture stokers and oil burners, by Fred Lalone, 2955 Watkins Lake Rd., RFD No. 9, Pontiac, Mich.

ROYAL OAK, MICH.—Nichols Sheet Metal Co., 1420 Woodward Ave., has been incorporated with 100,000 shares no par value to operate an industrial sheet metal and welding business, by W. J. Fitzgerald, 4202 Cooper Ave., Royal Oak.

ST. JOSEPH, MICH.—Nineteen Hundred Corp., St. Joseph, plans plant buildings and bonderizing plant costing about $125,000 and warehouse estimated to cost $750,000.

MINNESOTA

ST. PAUL—St. Paul Machinery Mfg. Co., 215 Como Ave., has let general contract to Lovering Construction Co., 616 Guardian Bldg., for a one-story 50 x 100-foot plant and warehouse to cost about $60,000.

WINONA, MINN. — Northwest Co-Operative Mills, 739 Jackson St. NE., Minneapolis, plans a fertilizer plant here, to cost about $400,000. Feldhausen & Coughlen, Columbus Bldg., Green Bay, Wis., are engineers.

MISSOURI

ST. LOUIS—Lever Bros., 50 Memorial Drive, Boston, has let contract for design and construction of a soap and soap products plant in St. Louis county to Stone & Webster Engineering Corp., 90 Broad St., New York, estimated to cost $10 million.

ST. LOUIS—A. Kilpatrick & Sons Foundry Co., 625 East Carrie Ave., plans a one-story machine shop addition 50 x 82 feet, to cost about $40,000, with equipment. Henri Rush & Co., 4049 West Pine Blvd., is architect.

ST. LOUIS—Sterling Aluminum Products Co., 2940 North Market St., has let contract to John Hill Construction Co., 915 Olive St., for a one-story 33 x 80-foot plant addition.

ST. LOUIS—Peerless Welding Co., 3205 North Broadway, has let contract to Bonded Hauling Co., 3820 North Broadway, for a one-story welding shop 30 x 60 feet. Vernon Hugo, 6880 Delmar Blvd., University City, Mo., is architect.

ST. LOUIS—Francis O'Hare, 2104 Randolph St., has let contract to Standard Construction Co., 6704 Scanlan Ave., for a one-story 70 x 130-foot foundry, to cost about $40,000, including equipment. E. Crutcher is engineer, care company.

ST. LOUIS—Francis O'Hare, 2104 Randolph St., has let contract to Standard Construction Co., 6704 Scanlon Ave., for a one-story 70 x 130-foot foundry building at 2140 Clark Ave.

ST. LOUIS—Car-Anth Mfg. & Supply Co., 6801 South Broadway, has let contract to John B. Gutman Construction Co., 220 North Fourth St., for a one-story plant building 64 x 86 feet, to cost about $40,000. A. F. & Arthur Stauder, 3608 South Grand Blvd., are architects.

ST. LOUIS—A. Kilpatrick & Sons Foundry Co., 625 East Carrie Ave., has let contract to Henri Rush & Co., architects, to design and supervise a one-story machine shop addition 50 x 82 feet, to cost about $40,000, with equipment.

NEW JERSEY

NEWARK, N. J.—Ronson Art Metal Works Inc., Aronson Square, is having plans drawn for a plant expansion estimated to cost about $250,000.

PAULSBORO, N. J.—Socony Vacuum Oil Co. Inc. plans chemistry and physics building and lubricating oil pilot plant at research laboratories, estimated to cost $1 million.

UNION, N. J.—Adams Stamping Corp., 322 Adams St., Newark, N. J., plans a plant 225 x 350 feet, to cost about $300,000.

NEW YORK

BROOKLYN, N. Y.—Harris Industrial Corp., 20 Wythe Ave., plans a sheet metal shop 200 x 220 feet, to cost about $75,000. M. A. Gordon, 129 West 89th St., New York, is architect.

OHIO

ASHTABULA, O.—Reliance Electric & Engineering Co., J. E. Corey, president, 1088 Ivanhoe Rd., Cleveland, plans a plant for small motor manufacture, to cost about $750,000. A. E. Rowe, 1900 Euclid Ave., Cleveland, is consulting engineer.

CLEVELAND—Bloch Brass Co., 12217 Euclid Ave., Leon Bloch, manager, has applied for state charter with $2000 common and $40,000 preferred stock and plans considerable expansion of plant.

CLEVELAND—Belleville Foundries Inc. has been formed by Cleveland interests to operate a foundry at Belleville, O., near Mansfield. An existing building has been acquired and equipment is being installed. Thomas M. Victory, Union Commerce Bldg., is interested.

CLEVELAND—Towmotor Corp., 1226 East 152nd St., is having plans drawn for a two-story 157 x 220-foot building for office and manufacturing, at Woodworth Rd. and Wemple Ave, to cost about $125,000. C. B. Rowley, Keith Bldg., is architect.

MANSFIELD, O.—Mansfield Metal Vault Co., 210 West Longview Ave., is erecting a one-story plant addition 70 x 240 feet. Elmer Hadean is in charge.

MANSFIELD, O.—Ohio Brass Co., 380 North Main St., plans a foundry addition costing about $50,000. C. W. Conklin, Farmers Bank Bldg., is architect.

MAPLE HEIGHTS, O.—Cuyahoga Steel & Wire Co., Longwood Ave., John T. Awerter, vice president, is erecting a plant addition 60 x 60 feet, to cost about $15,000.

PAINESVILLE, O.—Silvon Machine Shop & Mfg. Co., 439 Richmond St., C. H. Silvon, manager, will build an office and manufacturing building 60 x 85 feet, to cost about $15,000.

PENNSYLVANIA

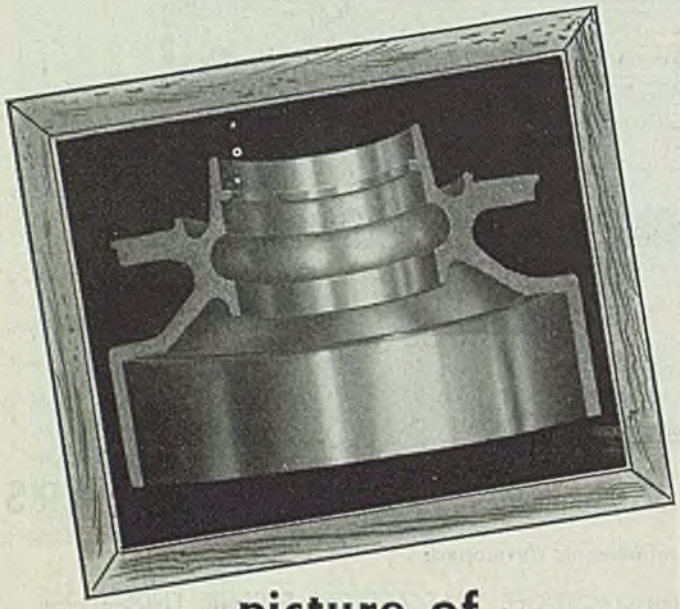
CORAOPOLIS, PA.—Homestead Valve & Mfg. Co., has asked bids on substructure of 100 x 400-foot manufacturing plant to cost about $200,000. R. A. Wallace, Clark Bldg., Pittsburgh, is consulting engineer.

CORRY, PA.—Ajax Iron Works is having plans made for two additional plant buildings, to cost about $50,000.

ERIE, PA.—Swanson Tool & Machine Products Inc., L. Swanson, president, 814 East Eighth St., plans a one-story plant building for its tool division, estimated to cost about $50,000

ERIE, PA.—Talon Inc., Meadville, Pa., plans addition here, 88 x 140 feet, to cost about $100,000. Wilbur Watson & Associates, 4614 Prospect Ave., Cleveland, are architects.

PHILADELPHIA—Reyburn Mfg. Co., Indiana Ave. and Sixteenth St., has let contract to Henry E. Baton Inc., Presser Bldg., to cost about $100,000.



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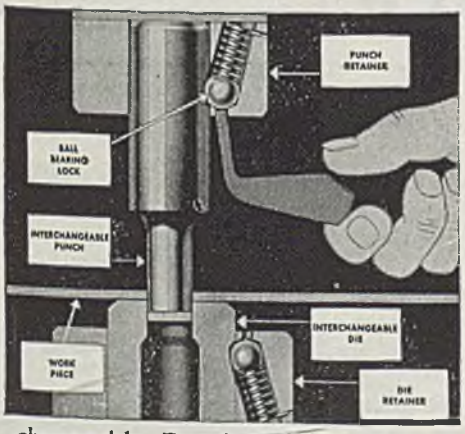

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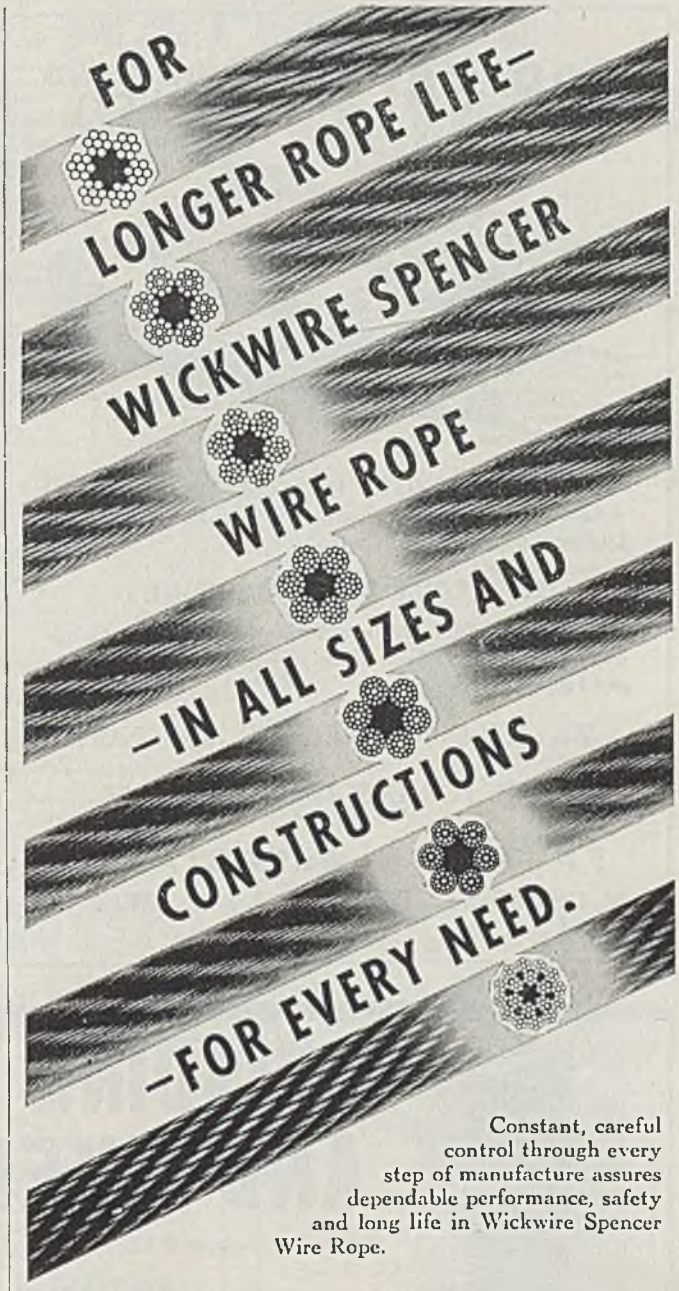

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Table of Contents Page 59
Classified Advertisers, Pages 177, 178, 179