Welders work on section of inner stack casing of funnel at Ingalls shipyard. Page 82

Main Office

Penton Building, Cleveland 13, Ohio

Branch Offices

New York 17 ... 16 East 43rd St.
Chicago 11 ... 520 North Michigan Ave.
Pittsburgh 19 ... 2800 Koppers Building
Detroit 2 ... 6560 Cass Ave.
Washington 4 ... 956 National Press Building
Cincinnati 2 ... 2030 Carew Tower
Los Angeles 4 ... 130 North New Hampshire Ave.
London ... 2 Caxton Street, Westminster, S.W. 1

Published by The Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio, E. L. Shaner, President and Treasurer; G. O. Hays, Vice President and General Manager; R. C. Jaenke, Vice President; F. G. Steinebach, Vice President and Secretary; E. L. Werner, Assistant Treasurer.

Member, Audit Bureau of Circulations; Associated Business Papers, Inc., and National Publishers' Association.

Published every Monday. Subscription in the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $6; two years $10; all other countries, one year $12. Single copies (current issues) 25c.

Entered as second class matter at the postoffice at Cleveland, under the Act of March 3, 1879.

STEEL

The Magazine of Metalworking and Metalproducing

MAY 1, 1944

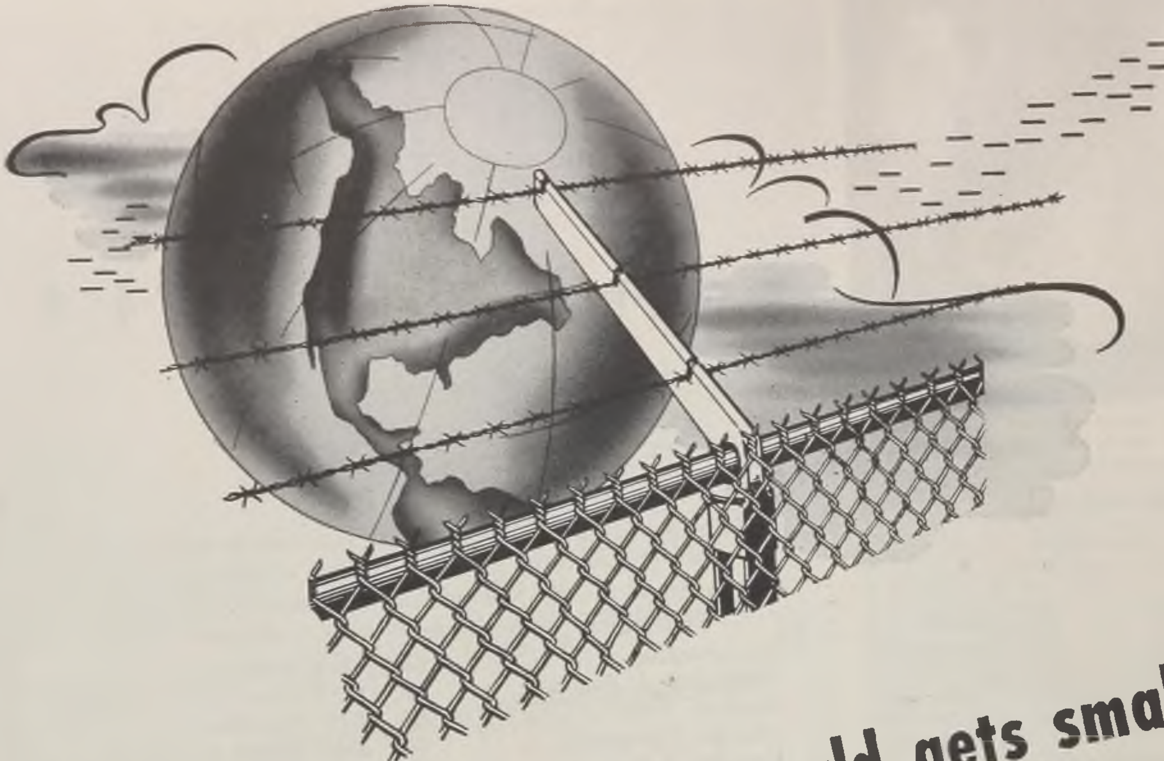
Volume 114—Number 18

NEWS

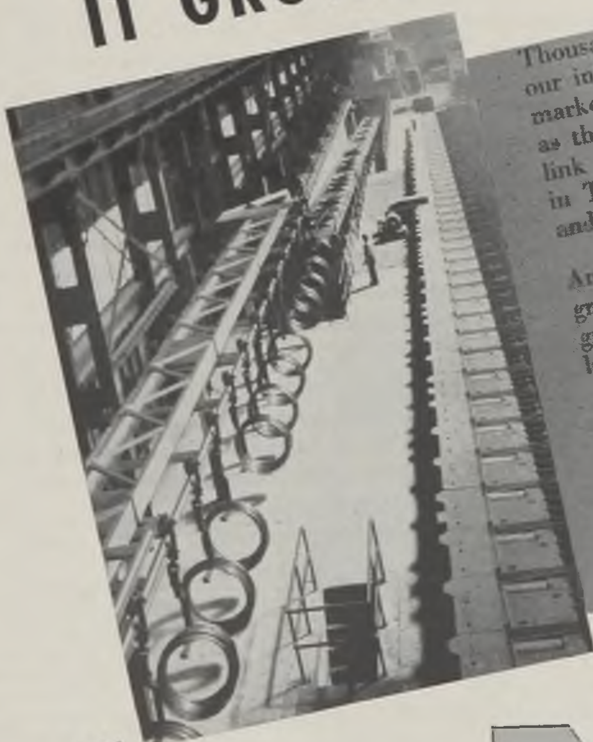
TECHNICAL

FEATURES

MARKETS



IT GROWS . . as the world gets smaller



Thousands of miles of chain link fence surround and protect our industries — in war and peace. Here is a market for steel that will grow in length as the world gets smaller. Rod — for bars, bolts, rivets, chain link mesh and cable; Merchant Shapes — in T's, angles and channel forms; Skelp — for U-posts and tubing . . .

And as this market grows it will call for wire rod and merchant shapes in greater tonnage, in better quality, at lower costs.

. . . A call that you can answer profitably on new Morgan Rolling Mills.

MORGAN CONSTRUCTION COMPANY
Worcester
Massachusetts

R-124

PLAN NOW WITH **MORGAN**

ENGINEERS AND BUILDERS OF ROLLING MILLS . . . WIRE MILLS . . .
GAS PRODUCER MACHINES . . . REGENERATIVE FURNACE CONTROL

STEEL
May 1, 1944

Long Pull or Short Pull?

One of the curious arguments being advanced by the CIO United Steelworkers of America in the steel wage case is the claim that labor's share of the national income has declined sharply since 1939.

The Union News Service of CIO of March 27, 1944, reports that labor's share of the national income dropped from 65.7 per cent in 1939 to 59.3 per cent in 1943, while during the same period the share of farmers rose from 5.9 to 7.1 per cent and that of "corporations" jumped from 8 to 13 per cent.

This, of course, is preposterous. As the New York Times points out, the government's own figures, compiled by the Department of Commerce, show that the share of the national income taken by wages and salaries rose from 62.4 per cent in 1939 to 69.0 per cent in 1943, while the net income of corporations remained at 5.9 per cent of the national income in both years.

CIO gets its fantastic result partly by naively counting as the corporate share of national income the net income of corporations before taxes. CIO also seems to forget that a corporation's income after taxes and dividends, is plowed back into the business for its future needs, among which is the future employment of labor.

What CIO probably is trying to infer is that labor is not sharing equitably with owners in the income of corporations. If so, this is an improper inference because the general trend for decades has been toward a larger share for wage earners and a lower return for stockholders. The financial history of United States Steel, covering 42 years, shows that in 1902 the employes' share of the corporation's sales revenue was 28.5 per cent and that with certain interruptions their share has increased steadily to 46.6 per cent in 1943. The owners' share, as measured by dividends, was 13.2 per cent in 1902 and it has dwindled, with some interruptions, to 3.0 per cent in 1943.

Incidentally, one of the years when employes received the largest share of income was 1932, when the corporation was deeply in red ink. In that year the corporation paid payrolls out of funds plowed back into the business in previous years.

In 1943, U. S. Steel had left only 0.2 per cent of sales revenue for future needs. What price a CIO victory for a sharp wage increase now if it drains the reservoir of future wage stability?

FOUNDRYMEN CONVENE: With transportation and hotel facilities strained beyond capacity, making travel increasingly difficult, it is amazing how the personnel of industry flocks to conventions in greater number than in peacetime. A plausible explanation is that the individual's urge to keep abreast of wartime developments outweighs his distaste of personal inconvenience.

A case in point was the forty-eighth annual convention of the American Foundrymen's Association and the Foundry and Allied Industries Show held in Buffalo last week. The attendance, obviously held down by the scarcity of room accommodations, nevertheless was phenomenal. Large, attentive audiences attended most of the technical sessions and it was evident from the discussions that foundrymen are tending toward a deeper appreciation of the importance of the more highly technical aspects of foundry operation.

The show was representative and impressive. Comparing some of the equipment exhibited with that shown in previous years, one seemed to sense a conscious move on the part of equipment manufacturers to cater to the smaller foundries. Now that

(OVER)

most of the larger casting plants are largely mechanized, perhaps we are entering a period of expanding mechanization in shops of moderate size

—p. 68

° ° °

POSTWAR EXPECTATIONS: In the fourth and final installment of the results of STEEL's survey on the future plans of the metalworking industry, companies which are prime contractors, subcontractors or both on war jobs express their opinions as to whether or not the present contractual practices will continue on an extensive basis after the war. Of prime contractors 67 per cent think subcontracting will be continued, as do 94.1 per cent of subcontractors and 89.1 per cent of companies now holding both primary and subcontracts.

However, the breakdown of replies into classifications of size and character of products reveals significant deviations from these general returns. For instance, manufacturers of aircraft parts and accessories — prime contractors, subcontractors and those holding both kinds of contracts—are agreed unanimously that subcontracting will continue. Manufacturers of heating, ventilating and air conditioning equipment, on the other hand, are far from unanimous in their expectations.

The replies to this question and as to whether or not contractors plan to purchase government-owned plants are enlightening. They reflect noticeable differences in the postwar outlook of certain industrial groups.

—p. 73

° ° °

GAS TURBINE PROGRESS: Achievements in two unrelated industries are likely to give important impetus to the development of the combustion gas turbine. On the one hand, metallurgists in developing materials for superchargers have produced alloys that are expected to withstand at least 1200 degrees Fahr. continuous service at the low operating pressures encountered in gas turbine work. On the other hand, aviation and wind tunnel research on airplane propellers and wings has contributed fundamental aerodynamic data on which high-efficiency compressor design is based.

These developments go far in overcoming two problems which have delayed progress in gas turbines, namely, operation at high temperatures and need of a highly efficient compressor.

In view of the possible applications of gas turbines to locomotives, airplanes, ship drives, power generation and processing, the accelerated progress in this prime mover may be worth watching carefully.

—p. 110

LONG ASSEMBLY LINES: A novel and exceedingly important feature of the shipbuilding program of World War II has been the extent to which structural shops, after having performed a remarkable job of fabricating steel for new war plants, turned over part of their facilities to making subassemblies for water craft.

Relatively few of these shops are adjacent to shipyards. Consequently we witness an unprecedented situation where scores of structural companies are assembling parts of ships at inland points and are shipping them to distant shipways for final assembly.

One of the best examples of this practice is found in the work of the Ingalls Iron Works at Birmingham, Ala. and the Ingalls Shipbuilding Corp. at Pascagoula, Miss. Subassemblies welded at Birmingham are shipped by rail, truck or trailer 350 miles to the Gulf Coast yard where they become parts of completed 18,000-ton cargo vessels.

Ship production in this country since Pearl Harbor has exceeded expectations by a large margin. A considerable portion of the credit for the excess of this program belongs to the inland structural shops.

—p. 82

° ° °

NEED MORE MACHINES? General Motors last week was host to chief engineers, electrical engineers and other officials of machine tool building companies. The purpose of the two-day conference was to enable General Motors engineers and operating men to compare notes with representatives of the machine tool builders on problems of machine tool operation and servicing.

The meeting is interesting for several reasons. For one thing, it is somewhat unusual for the customer to take the initiative in an affair of this kind. Secondly, G. M. already has indicated it will need about 45,000 new machine tools in the reconversion to peacetime production and last week's sessions conceivably may influence in some degree questions of design in connection with these pending purchases.

Concurrent with this meeting came mounting evidence that a revival in machine tool demand is near at hand. New factors, among which manpower shortage is prominent, are contributing to uncertainty in the industry at a time when an upward trend in new machine tool orders is definitely under way.

—pp. 66, 85

E. L. Shaner

EDITOR-IN-CHIEF

Positive Identification of Ryerson Alloys

Confirms Quality . . . . . Prevents Shop Errors

Each bar of alloy steel in Ryerson stock is painted on the end to indicate the type of alloy . . . and then stamped on the side near the end with the number of the heat from which the bar was rolled. Smaller size bars are bundled and tagged with similar identification.

This is important to you, because it offers an unmistakable means of verifying the alloy steel you receive from Ryerson. Also, both heat number and color marking are recorded on the Ryerson Alloy Steel Report that is furnished with each alloy shipment. The Report Sheet contains accurate data on the analysis, working temperatures and the heat treatment response for quenched ... of the steel you receive. This gives you reliable information for heat treatment that will produce the desired result.

This unique and valuable Ryerson alloy service is one of many reasons why it will pay you to concentrate your steel purchases with us.

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

RYERSON

The Chips are Down

NEVER before such high output of parts made of metal. Never such efficiency in turning them out.

One great aid to faster machining, not available during World War One, is now effected through the use of cutting and soluble oils developed by TEXACO.

Texaco cutting oils permit higher speeds and feeds, with improved surface finish. They lubricate the tools, and by carrying away the heat prevent chip welding and lengthen tool life, assuring greater output.

So superior have Texaco cutting and soluble oils proved that they are definitely preferred for many machining operations.

The Services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States.

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP ... MPTLY

LAUSON STONE
Chairman and President, Follansbee Steel Corp., Pittsburgh

Industry Spokesmen Say Union Demands Portend Inflation

Contend steelworkers are asking War Labor Board to write new social-economic plan during emergency. Show wages have increased faster than cost of living

B. F. FAIRLESS
President, United States Steel Corp., Pittsburgh

THE War Labor Board, created under emergency conditions to settle particular disputes threatening war production, is being asked by the United Steelworkers of America to write a new social-economic plan for the steel industry. Such a plan would breach the government's stabilization program, lead to uncontrolled inflation, and imperil the industry's opportunities to continue high production and probably ruin some of the smaller nonintegrated steel companies.

This was one of the charges made by steel industry spokesmen last week before a panel of the WLB hearing the affirmative arguments of the producers against the union's demand for a 17-cent hourly wage increase, guaranteed wage, increased vacation allowances, sick leave allowances and other concessions.

The hearing adjourned April 28, and because of a union convention will not be resumed until May 16. The industry's testimony is being co-ordinated by the Steel Case Research Committee, headed by John A. Stephens, vice president, United States Steel Corp., which represents 78 steel companies and 15 steel casting companies. The companies, however, are presenting their own cases.

In arguments presented to the board, spokesmen for the companies showed the steelworkers since January, 1941, base month of the Little Steel formula, have received increases in weekly earnings of more than 50 per cent, while impartial indexes of living costs have advanced only 20 to 23 per cent.

The industry spokesmen pointed out they could not absorb any further general wage increase without "very substantial" relief in the form of increased prices for steel products. They also pointed out that a rise in steel wages and a rise in steel prices inevitably would be followed by comparable rises in other wages and other prices, thus smashing the hold-the-line program.

Lauson Stone, chairman and president, Follansbee Steel Corp., Pittsburgh, in pointing out the danger to smaller steel companies and their employes if the demands were granted, said that in October and November, 1943, the two months preceding the steelworkers' demands, Follansbee sustained a loss averaging $90,000 a month. If the company were forced to increase its wage rates by 17 cents an hour, approximately $70,000 would be added to its costs and to the losses it already was sustaining.

"The result could conceivably be more ghost towns when every effort of the nation and its industries should be directed toward the maintenance of a high level job opportunity."

Other parts of the union's program, in addition to the 17-cent wage demand, Mr. Stone estimated would cost his company another $40,000 a month, so that the aggregate additional labor costs to Follansbee would be approximately $1,300,000 a year or $110,000 a month.

"Granting Demands Would Be Fatal"

The problems posed by the union's demands on the semi-integrated and nonintegrated companies cannot be minimized, said Mr. Stone. "They are material and differ in substantial degree from those confronting the larger integrated companies. Serious as are the demands on the ability of the larger companies to continue to operate and to provide jobs, as regards many of the ninety-odd companies before you, the granting of those demands would be fatal. What I have said, I am sure applies not only to Follansbee, for whom I am speaking, but to many companies whose situations are comparable to that of our company."

Mr. Stone said the union presentation contained nothing to show the true situation as it affects the smaller companies and he attacked the plan offered some weeks ago by Philip Murray to "Save Small Steel". The "plan" he termed a "scandalous piece of union propaganda" and suggested that it was designed to serve the purposes of the union in the present wage case.

Quoting from a pamphlet outlining the "plan", which has been entered as an exhibit in the wage case, Mr. Stone noted the union claimed the steelworkers were giving the small producers an annual wage subsidy of more than $4,000,000. The pamphlet contends: "The workers of these small producers have straight-time hourly earnings of 94 cents. This compares with straight-time hourly earnings in the entire steel industry of $1.02. Thus for each hour of work the workers of the twenty small producers give their companies an 8-cent subsidy."

"That is an inexcusable misstatement of fact, at least as far as Follansbee is concerned." Mr. Stone said that in January this year the earnings of hourly-paid workers at his plant were $1.05, and not 94 cents as reported by the union.

Mr. Stone said he could not see any benefit to the small companies in Mr. Murray's plan for selling them pig iron and battlefield scrap at prices below OPA ceilings in order to help them meet union wage demands aggregating several times the amount of the proposed government subsidy.

Mr. Stone said he firmly believed that in the steel wage case the WLB is going far afield from its proper functions and expressed concern over the effect upon of what the board might do.

B. F. Fairless, president of the United States Steel Corp., said the issues of the steel wage case are between the union, on one side, and the government and the public on the other.

Refuting the union's contention that living costs have increased more than wages, he cited the Labor Department's figures on steel wages. These figures show that in January, the steelworkers received an average of $52.49 weekly.

"That was $7.34 more per week than the January, 1944, average weekly earnings of workers in all manufacturing industries . . . Such average weekly pay . . . represented an increase of 56.2 per cent over their average weekly earnings in January, 1941."

According to the index of the Department of Labor, living costs increased 22.7 per cent between Jan. 15, 1941, and Feb. 15, 1944, said Mr. Fairless. The corresponding index of the National Industrial Conference Board showed an increase in living costs of only 20.2 per cent.

Answering the union's contention that the wage increase could be granted without any increase in steel prices, Mr. Fairless said:

"The union asserts that its wage demands can be met without any increase in steel prices. I challenge the accuracy of that assertion. The total business of 31 of the principal steel producing companies last year amounted to the huge sum of $6,294,000,000. Their operations were close to full capacity because of imperative war needs. Costs of one kind or another took practically all of this vast amount of money, only $171,000,000, or the small fraction of about 2¾ per cent of that large sum, remained as net income. Total receipts of most steel companies have steadily risen since Jan. 1, 1941, but their net income declined in 1942 and again in 1943. While the cost of the separate demands of the union is difficult to compute accurately, due to variable factors, it is estimated that the allowance of all such demands would impose increased annual costs of these 31 companies of at least $500,000,000. It is believed that the 17 cents an hour wage increase would alone increase their costs by more than $200,000,000 a year.

"Even after taking into account the reduced taxes which would result from an increase in wages, the actual additional cost would be a staggering burden for the steel industry to carry. Furthermore, the costs of materials and services, purchased by the steel industry, are bound to advance materially, as a direct consequence of any increase in the wages of steel workers. Wage advances could not then be confined to the steel industry generally.

Argues About Hidden Profits

"The steel companies cannot meet the further wage increases and have anything left for the owners or for future contingencies. The union argues, however, that there are large hidden profits and that the carryback provisions of the federal tax laws will provide funds that may properly be diverted from the purposes intended by Congress.

"The union leaders appear to rest their case on the assertion that there are such hidden profits and such available tax refunds. There are no such hidden profits. The policies adopted by Congress with respect to taxation can hardly be open to inquiry by this panel. That is a subject beyond the jurisdiction of the War Labor Board. However, the accusations which have been made against the carryback provisions of the present federal tax law will be answered later in these proceedings. I am confident that the wisdom, justice and propriety of these tax provisions can be fully demonstrated to you . . .

"What then becomes of the union's case? Certainly it cannot expect to get blood out of a stone. If the demands of the union are granted the public will have to foot the bill by paying increased prices for steel. The public will have to pay increased taxes to make up for any decrease in taxes of steel companies."

T. F. Patton, general counsel for Republic Steel Corp., termed the hearings the climax of a carefully planned attack on the Little Steel formula and the national stabilization program.

It was the union and not the steel companies, Mr. Patton said, that refused to bargain collectively. Even before the union's demands were presented to the steel companies, he said, the union petitioned the WLB to order all increases be made retroactive to the date of termination of existing contracts. Union negotiators, except the top international officers, were powerless to depart in any respect from the union's demands.

"I know," he said, "that it was clear from the discussions that took place at the conferences that the representatives of the union, there present, had no authority to make any changes in the 22 demands that were presented to the company at such conferences, without first consulting the top international officers of the union. None of such international officers attended the conferences."

GIANT INGOT: This ingot, largest ever produced at a Bethlehem Steel Co. plant, weighed 500,620 pounds. Mold it was cast in weighed 400,000 pounds

Chester McLain, Bethlehem Steel Co. counsel, charged that the union, in a desperate effort to break through stabilization lines, "lashes out furiously" against Congress and the administrative agencies charged with the development and maintenance of the stabilization program. "The union apparently believes that by smearing Congress, the administrative agencies and the companies, it can justify its demand for wage increases and gloss over the weaknesses of its case. It is obvious that this panel cannot in this case try the Congress, the administrative agencies and the companies on charges of sabotage, intimidation and profiteering."

Dr. Jules Backman, New York University economist, told the panel that higher industrial wages would tend to disrupt rather than increase production.

During the early stages of war mobilization, he said, wage increases often served to lure workers into essential war plants and the higher costs were absorbed because greater output lowered unit costs. The point now has been reached where higher wages no longer can facilitate output.

Envisions Major Consequences

Dr. Backman envisioned five major consequences which would follow approval of the union demands: (1) A general wage increase in other industries would follow a steel wage rise; (2) higher wages would contribute to a greater cost of the war; (3) strong inflationary forces would be set in motion; (4) a general wage increase would create new distortions in the war economy; and (5) distortions would be created in the postwar economy.

Dr. Backman pointed to fallacies of the union reasoning that wage increases will enable workers to improve their standard of living or keep up with increasing costs of living. "The size of the goods pie is fixed," he said, referring to production limitations. "Placing a larger number of dollars in the hands of workers cannot increase the size of that pie . . . . by giving wage increases to industrial wage earners who are already in a favorable situation because of the past expansion of their earnings, the effect inevitably will be increasing pressure on price ceilings."

"Any claim that wages should be increased to compensate wage earners for increases in the cost of living is based upon a fundamental fallacy," asserted Dr. Donald R. G. Cowan, Cleveland economist representing Republic Steel Corp. "Unfortunately, that fallacy has gained widespread currency in this country, especially during the war years.

"There has grown up a general belief there is some virtue in a policy of wage stabilization whereby wages are currently adjusted to changes in the cost of living. Actually, the pursuit of that policy would accelerate inflationary trends and defeat its own purpose."

Is WPB Shakeup in the Offing?

"Reorganizer" from White House staff prowls War Production Board offices studying reconversion setup and policy. Small business expected to figure more prominently in planning

DIFFERENCES within the War Production Board on reconversion of war industry may be settled through administration intervention, according to present indications.

A "reorganizer" from the White House staff has been moving about in WPB for several weeks, leading to reports that a shake-up of that agency impended. Since this individual's attentions in an agency have usually been followed by such a development the report has attracted considerable speculation in Washington.

No formal announcement of this reorganizer's presence has been made, and no statement of his plans. It is anticipated, however, that his recommendations will be confined to the reconversion situation, and as he was engaged with the Smaller War Plants Corp. and small business aspects of the matter just before going over to WPB, representation of smaller business in any ensuing solution is expected.

Chairman Nelson is reported as anxious to avoid having the reconversion problem on his shoulders, especially at this time. He also is anxious to meet the views of congressional interests, where reconversion is feasible without handicapping war production.

Any recommendations to be made, it is believed, will be concerned with lodging direction, within WPB, of reconversion matters, in some appropriate unit, possibly a revival of the Office of Civilian Requirements on an adequate scale, including small business representation.

WPB Creates Auto Industry Labor Advisory Committee

An Automobile Industry Labor Advisory Committee has been created to consult with the War Production Board on eventual reconversion of the automobile industry to peacetime production, Donald M. Nelson, chairman, WPB, announced last week.

First meeting of the committee was held in Washington on April 27. Items on the agenda which came under discussion were manpower, stabilization of employment based on reconversion, impact on labor of utilization of facilities, tools and equipment, and labor's recommendations for maintaining present automobiles on the road pending reconversion.

WPB Chairman Nelson last week told the Automobile Labor Advisory Committee he saw no chance of making passenger automobiles this year while John H. Middlecamp, director, WPB Automotive Division, said the problem of getting needed tools and making sufficient floor space available for reconversion preparations haven't yet been solved.

R. J. Thomas, president of the Auto Workers union, at the meeting presented a series of proposals looking to the return of automobile production, including guaranteed weekly wage in the industry, recommendations covering cutbacks, and proposals regarding the disposal of government-owned machinery.

Earlier, Mr. Nelson and other WPB officials met with the Automobile Industry Advisory Committee, which represents management, for the purpose of initiating advance planning to deal with the problems which the industry must face when reconversion becomes possible. Creation of the Automobile Labor Advisory Committee is in accordance with the announced policy of the WPB to consult equally with management and labor on all problems affecting resumption of civilian production.

Members of the labor committee are: R. J. Thomas, president, United Automobile, Aircraft and Agricultural Implement Workers of America, CIO; George F. Addes, secretary-treasurer, William C. Stevenson, executive board member, Richard E. Reisinger, executive board member, Walter Reuther, vice president, and Richard T. Frankenstein, vice president, all of the United Automobile, Aircraft and Agricultural Implement Workers of America, CIO; Lester Washburn, president, International United Automobile Workers, AFL, and Frank Fenton, director of organization, American Federation of Labor.

Present, Past and Pending

■ FLOODS THREATEN ST. LOUIS SCRAP SUPPLIES

ST. LOUIS—Floods which caused the Mississippi, Missouri and Illinois rivers to overflow their banks have hampered shipments of iron and steel scrap into this district, thereby aggravating an already tight situation.

■ NEARLY 300,000,000 POUNDS NICKEL PRODUCED IN 1943

TORONTO—Approximately 300,000,000 pounds of nickel were produced or refined last year, according to Robert C. Stanley, chairman and president of the International Nickel Co. of Canada Ltd.

■ REINFORCING BAR STUDY BEING INAUGURATED

NEW YORK—A basic st[illegible] uses of steel bars for concrete reinforcement will be made by the Committee on Reinforced Concrete Research recently organized by the American Iron and Steel Institute.

■ PULLMAN-STANDARD CAR STRIKE ENDS

HAMMOND, IND.—A five-day strike of approximately 2500 employes of Pullman-Standard Car Mfg. Co. ended April 25 when the War Labor Board requested the workers to return and directed the company to sign a previously agreed-upon contract with the United Steelworkers of America.

■ JANUARY ALUMINUM OUTPUT DOWN 10 PER CENT

WASHINGTON—Production of primary aluminum ingots in January amounted to 169,600,000 pounds, down 10 per cent from December output.

■ MAGNESIUM UNITS ORDERED TO SUSPEND

LAS VEGAS, NEV.—Basic Magnesium Inc. has been ordered to switch out four of its ten production units, but to keep them in condition for resumption. Management says there should be no widespread layoff of workers.

■ PREDICTS 15 PER CENT DROP IN STEEL OUTPUT

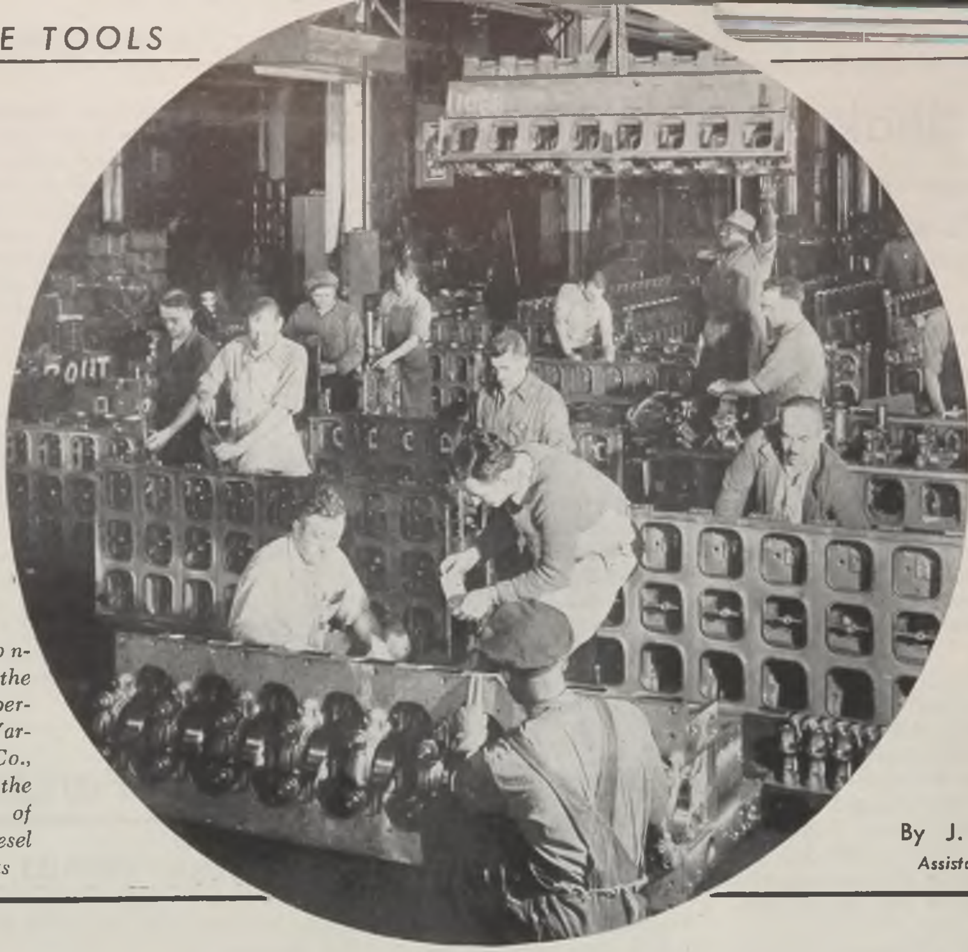
CHICAGO—Inland Steel Co. faces a 15 per cent reduction in production within a few months if present draft deferment policies are not revised, according to Wilfred Sykes, president.

■ NELSON EXPECTS PEAK WAR OUTPUT IN AUGUST

WASHINGTON—Peak war production will be achieved in August, WPB Chairman Donald M. Nelson predicted before the Senate Small Business Complaints subcommittee. He estimated August war output would total $6,370 million, gradually decline to $6,200 million in December, with 1944 total about $74 billion.

■ MAXIMUM PRICES SET FOR IMPORTED IRON AND STEEL SCRAP

WASHINGTON—Imported iron and steel scrap has been brought under the maximum prices in effect for domestic scrap. The new procedure establishes prices at the domestic level, f.o.b. port or point of entry.



Among subcontract jobs for the Navy being performed by Warner & Swasey Co., Cleveland, is the machining of welded steel diesel cylinder blocks

By J. C. SULLIVAN
Assistant Editor, STEEL

Pressure on Tool Builders Growing

Industry seeks to meet delivery schedules facing increasingly acute manpower shortage with unexpected resurgence in demand developing. Situation complicated by extensive subcontracting on other types of war production

MACHINE tool industry currently is facing a growing manpower shortage at a time when an unexpected resurgence in tool demand is developing.

Complicating the situation is the fact that in recent months 25 to 30 per cent of machine tool production facilities have been converted to subcontract work on numerous precision parts, in some instances complete units.

Augmented tool demand, anticipated over the next few months and expected to stem from the accelerated heavy artillery, truck and airplane engine programs, is certain to intensify the manpower pinch in the industry which has been developing recently as the tool builders steadily took on new war work. War Production Board authorities now estimate new tool requirements over the last three quarters of this year at $600 million.

Were the industry today similarly fixed in the matter of labor supply as it was six to nine months ago the influx of new orders would not be cause for undue concern. However, last year when demand for tools started downward the tool builders were forced to curtail production and let out many employes to other war work pending acquisition of other types of war work. Today, with working forces thinned out, the tool builders find themselves with an increasingly large volume of subcontract work to which now is being added a much larger volume of new tool business than had been anticipated earlier this year. Meanwhile, most of the workers released to other vital war industries are not returning to their old jobs in the machine tool field.

Reversing the downward trend of the preceding 11 months, machine tool output turned slightly upward during March to $50,799,000 or a gain of 1.5 per cent. Upturn in production reflects the 19.6 per cent gain in orders during March over the February total, which in turn was 12.7 per cent over January. Despite the gain in new orders recently, the tool industry's order backlog of $153,079,000 on March 31 was off 6.9 per cent from the preceding month.

Upward trend in orders continued throughout April. Based on projected requirements for the accelerated war programs, most tool builders expect the industry's output will increase further through May and June, and even during the usually slack summer months.

Toward the close of last year the tool builders felt 1944 production would not exceed $350,000,000, but these estimates have been revised upward in view of current projected new war requirements. For the first quarter this year, tool production amounted to $157,246,000, or less than 45 per cent of the first quarter 1943 output of $357,243,000.

WPB officials recently advised the Machine Tool Industry Advisory Committee that out of a total $1.8 billion machine tool "pool orders" placed through the Defense Plant Corp. during the period of peak machine tool demand, there remained only $35,000,000 worth of machine tools and attachments that had not been sold to war industries as of April 15. This represents less than 2 per cent of the total pool orders placed, and it is being steadily reduced by incoming orders from individual concerns.

What proportion of increased war tool needs can be met from the large amount of government-owned equipment now idle in contractors plants is unknown, but tool builders believe that the stepped up war programs will require many new tools.

The WPB Tools Division, it was learned last week, is making a survey of machine tool building capacity devoted to other war work to ascertain what capacity is available for machine tool production. The division is canvassing builders as to orders for other than machine tools now on hand.

The Machine Tool Industry Advisory Committee of WPB recently urged more drastic steps be taken to find and utilize idle tools, and pointed out that in view of the unexpected demands indicated by the armed services, currently planned production of the machine tool industry is inadequate. These new demands can be met only by utilizing a greater number of existing machines, it is said.

To the end that the tool industry may contribute its maximum to production of other vitally needed war materiel and to avoid wastage of scarce manpower and materials on production of new machine tools, the committee recommended an immediate thorough search for all available machines owned either by the government or by private companies, and their transfer to meet the tooling requirements of various new and accelerated production programs.

Produces 40 Different Items

Indicative of the headway the industry has made in acquiring subcontract work is the following list of parts now being made by Warner & Swasey Co., Cleveland, which has over 20 different subcontracts for the manufacture of 40 distinctly different items. These include: Airplane wing fittings; radar parts; control units; gun recoil parts; driving mechanisms; drive shafts; crankcases, blower housings, end plates, covers, inner bearings, etc., for diesel engines; chain drive housings and cylinder blocks; airplane engine bearings; drives for cable reels; gun turret controls; power drives for gun directors; worms and gears for winches; recoil parts; transmission gears; hydraulic jacks; supercharger clutch assemblies; rotors and blades for fuel pumps and de-icer pumps; motor frames for hoists; steam cylinders and couplings; hydraulic cylinders for gun turrets; clutch disks for superchargers; units for cargo hoists; brackets and flange shafts. This subcontract work now represents about 75 per cent of the company's total output. However, it is well above the average for the industry, which is estimated at 25 to 30 per cent.

Even before the recent upturn in new tool orders the industry's manpower situation was becoming critical. In a number of instances shops were falling behind on delivery of vitally needed tools, while in many plants production of precision parts on a subcontract basis was falling behind schedule.

Warner & Swasey Co., for example, currently is in urgent need of 300 more shop employes. National Acme Co., Cleveland, is in need of over 200 men not only on machine tool work but also on electrical devices, etc. The same labor pinch is reported by other builders.

Peak war employment at Warner & Swasey Co. was over 6300, but currently is about 4200. Of this total, 29 per cent are women. Company officials state 900 men are in the draft age group, while 2450 are now serving in the armed forces. There are about 50 men who are under 26 years of age.

With the demand for machine tools declining sharply most of last year, tool builders curtailed production and released many employes pending the lining up of subcontract work and retooling. It was never felt that the labor required on subcontract work would entirely match the manpower needs experienced during the peak machine tool demand period. However, many builders have been unable to rehire even half the number of men they released six to nine months ago, for most of them have been either drafted or are employed in other war plants.

Indicative of the postwar outlook of machine tool builders in general is that of one large turret lathe manufacturer. During the period 1940-43 inclusive this company built and shipped 22,000 turret lathes, or 2000 more than in the period 1919 to 1939. Leading builder of multiple spindle automatics made 8200 unit during 1940-43, compared with 9100 in the period 1920 to 1940. Output rate of present machines is 2½ times that of the 1925 models.

Machine Tool Statistics

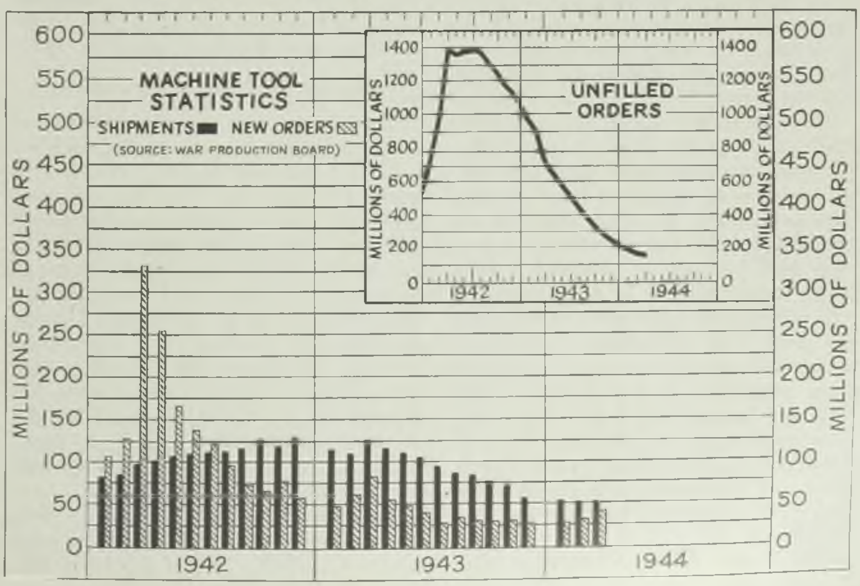
Source: War Production Board
(000 omitted)

	Unfilled Orders	Net New Orders	Shipments
1944			
March	$153,079	$40,007	$50,799
Feb.	164,424	33,270	50,098
Jan.	181,548	26,456	56,349
1943			
Dec.	210,606	27,603	60,861
Nov.	246,509	31,726	71,811
Oct.	286,600	30,800	78,300
Sept.	338,119	31,759	85,842
Aug.	386,792	33,378	87,827
July	441,220	28,713	97,541
June	511,478	38,322	108,689
May	578,226	48,241	113,859
April	643,643	57,359	118,031
March	704,922	84,980	125,445
Feb.	893,247	63,865	114,593
Jan.	970,616	48,829	117,384
1942			
Dec.	1,069,672	56,083	131,960
Nov.	1,129,610	76,116	120,371
Oct.	1,168,768	66,474	130,008
Sept.	1,248,965	74,343	119,883
Aug.	1,315,254	96,979	117,342
July	1,374,735	121,156	113,596
June	1,389,363	139,397	111,090
May	1,386,435	166,945	107,297
April	1,367,281	254,274	103,364
March	1,392,803	338,348	98,358
Feb.	1,000,838	127,356	84,432
Jan.	728,708	107,500	83,547
1941			
Dec.	576,568	....	81,435
Nov.	629,926	....	81,320
Oct.	616,542	....	84,178
Sept.	617,677	....	74,906
Aug.	595,000	....	70,069
July	572,000	....	63,019
June	525,000	....	69,070

Need for Superspeed Machines

To offset the huge accumulation of government-owned tools—now valued at $2.7 billion—and to meet the inroads of the rapid development of new plastic molding techniques, precision forging and casting—including centrifugal casting of steel and nonferrous metals—and powder metallurgy, the machine tool industry must develop super-speed machines and tools for the machining of steel as well as light metals and for meeting closer tolerances on materials.

Looking ahead to the postwar period machine tool builders are planning improvements and innovations in their tools. Searching analysis and cultivation of additional markets in this country and abroad are being pressed and development or acquisition of new products other than machine tools is receiving major attention.



REAR ADMIRAL A. H. VAN KEUREN
Director, Naval Research Laboratory, Washington

Wartime Achievement Of Foundries Reviewed At Buffalo Convention

Attendance at A.F.A. technical sessions and equipment exposition large. Industry's contributions to war effort cited by government officials. Difficult manpower problems discussed by various speakers

THIRD War Production Foundry Congress and forty-eighth annual convention of the American Foundrymen's Association played to a full house all last week in Buffalo. The convention and show closed Friday, April 28.

Record attendance was reported at the equipment exposition at which were displayed more foundry equipment and appliances than have been exhibited at foundry shows since before the war. The more than fifty technical sessions of the convention all were heavily attended with delegates anxious to learn of the latest developments in foundry practice, metallurgical progress, manpower problems, and employe training.

Highspots of the week's sessions included a record-breaking jam at the Buffalo preview of the exposition, held the evening of April 24 for the benefit of foundrymen in the Buffalo area; manpower sessions on Monday and Wednesday; sessions on foundry costs and renegotiation on Friday; the annual business and awards session on Thursday and the annual banquet Friday evening.

The convention offered seven sessions devoted to operating practices. Under the auspices of the Gray Iron Division, four sessions on gray iron shop practice were held, while the Sand Shop Course Committee held three evening discussions and lectures on practical aspects of the sand problem in the foundry.

Continuing the practice established last year, four educational lectures on gating and risering covering gray iron, steel, aluminum and magnesium, and brass and bronze were held. These sessions were under the guidance of W. G. Reichert, winner of this year's Joseph Seaman Gold Medal, and president of the W. G. Reichert Engineering Co., Newark, N. J.

The second A.F.A. Foundation Lecture was presented by Dr. H. W. Gillett, technical advisor, Battelle Memorial Institute, Columbus, O. Dr. Gillett's paper was on the subject of "Cupola Raw Materials", and was presented at the annual business and awards meeting.

New officers and directors for the ensuing year were elected at this session. This year's vice president, Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., was advanced to the presidency, while Fred Walls, International Nickel Co., New York, was named vice president. Five directors' terms expired this year, and the five new men chosen as directors are Joseph M. Sully, Sully Brass Foundry Co. Ltd., Toronto, Ont.; Ralph T. Rycroft, Jewell Alloy & Malleable Inc., Buffalo; Frank J. Dost, Sterling Foundry Co., Wellington, O.; Samuel D. Russell, Phoenix Iron Works, Oakland, Calif.; and Lee Wilson, Reading Steel Casting division, American Chain & Cable Co., Reading, Pa. Terms of these new directors expire in 1947.

Discuss Methods of Upgrading

Committee on Foreman Training, under the chairmanship of W. G. Conner Jr., Walworth Co., Washington Park, Ill., sponsored an unusual and profitable session on that currently tough problem. Methods of upgrading workers on the job, training them to become foremen while they work, so to speak, were discussed by F. K. Dossett, Thompson Aircraft Products Co., Cleveland. Peculiar difficulties facing foremen who must handle women workers were described by F. C. Wartgow, American Steel Foundries, Chicago, in a paper prepared by W. J. Hebard, Continental Foundry & Machine Co., Chicago.

Training women to become foremen of all-female work crews is a special problem in itself. How it has been handled in one plant was described by S. M. Brah, Rustless Iron & Steel Corp., Baltimore.

Conference methods of foreman training and successful application of those methods at the Peoria, Ill., plant of Caterpillar Tractor Co., which has demonstrated unusual technique in this problem, were outlined by Steven G. Garry of that company. Some intelligent guessing on the place of the foreman in postwar industry was done by T. H. Booth, Walworth Co., Washington Park, Ill.

In welcoming delegates at the opening session of the congress, Lee C. Wilson, president of the association, emphasized that the keynote of the four-day convention was the production of superior weapons which would aid the United Nations in speeding victory.

Frank E. Bates, Worthington Pump &

RALPH J. TEETOR
Newly elected president of the American Foundrymen's Association. He is president, Cadillac Malleable Iron Co., Cadillac, Mich.

H. S. COLBY
Consultant to deputy vice chairman for production, WPB

Machinery Corp., Buffalo, and chairman of the Western New York chapter of the association, briefly welcomed all foundrymen to Buffalo at this same session.

Pointing his remarks along the keynote struck by Mr. Wilson, Rear Admiral A. H. Van Keuren, director, Naval Research Laboratory, Washington, cited the importance of the foundry industry to the war effort in tracing the NRL's activities in the field of castings research for naval purposes. The laboratory's program has been under way for more than 15 years, having been started to study steel castings but later enlarged to take in other metals as well. The fact that a destroyer requires approximately 9000 valves and fittings and a battleship some 15,000 castings exclusive of structural members makes the Navy's concern over the soundness of castings a natural one, Admiral Van Keuren pointed out.

Metallurgy will always be an important part of naval research, the speaker stated, adding the prediction that the trend toward use of combination cast and welded structures likely will continue.

The foundry industry is faced with a difficult task in attempting to maintain production in the face of shrinking manpower supply, it was stated by H. S. Colby, consultant to the deputy vice-chairman for production, War Production Board, Washington. Addressing the first war production manpower session of the congress, he traced the history of attempts by WPB and other government agencies to relieve the manpower problems which foundries have faced for many months—problems which have become intensified lately by the heavier inroads of Selective Service into the ranks of younger workers.

While foundries originally were not given sufficient recognition in establishing the essentiality of workers of certain skills, this situation subsequently was corrected. Wage adjustments, in some cases accompanied by revisions in casting prices, also proved helpful. However, the recent move by Selective Service to limit deferments among workers under 30 years of age appears likely to impose a severe handicap. Foundry workers under 26 represent slightly less than 5 per cent of the total, but extension of the more thorough draft to the 26-30 year age group will affect 15 per cent or more of all workers and probably will cause a critical situation from the production standpoint.

Output of foundries has increased 15 per cent since last September while the number of workers has increased only 2 per cent, but Mr. Colby expressed doubt that the industry can maintain this improved production if faced with the loss of 15 per cent of its employes. He indicated that WPB is concerned with seeking a solution to the problem.

By taking advantage of the plasticity of certain coals when heated, it may be possible to salvage for the production of cast and malleable iron loose machine shop turnings which are now one of the big salvaging headaches of both industry and the War Production Board, according to Dr. H. W. Gillett, Battelle Institute, Columbus, O., speaking on raw materials for cupola operation. He described experiments at Battelle in which machine shop turnings, borings, and chips were made into briquets suitable for charging foundry cupolas by mixing this loose scrap with certain types of coal, then coking the mass into briquets. If the economics of the process can be proved feasible, it may offer a solution to the problem of how to utilize fine scrap from the nation's war industries in the manufacture of cast and malleable iron, he said.

Gigantic Presses Used

It is impossible to use fine scrap in loose form in the foundry cupola because of the technology of the cupola process, said Dr. Gillett. Gigantic presses are used to press fine scrap into briquets in plants where the volume of such scrap is great, but few industries produce enough scrap of this type to keep a huge press in operation. As a result, large tonnages of such scrap usually end up in outside "storage" of industrial plants, where it rusts and deteriorates before it is eventually sold at depreciated value to steel manufacturers for use in open hearths or blast furnaces. A cheap means of converting fine scrap into briquets for cupolas while it is still in the plant of its origin and where its composition is known would make practical the use of the material in local foundries.

Coke-bonded briquets, according to Dr. Gillett, can be handled with a magnet and will stand storage and shipment almost like pig iron. It is believed that under local conditions this method of briqueting might be the solution to salvage problems.

Gray Iron Shops Urgently Need 21,865 Workers

Nationwide survey by Gray Iron Founders' Society shows manpower shortage in the industry is pinch-point

GRAY iron foundries are in urgent need of a minimum of 21,865 additional workers to keep abreast of their war assignments, a nationwide survey by the Gray Iron Founders' Society reveals.

"The manpower shortage of this small-business industry, critical for months, is a definite pinch-point in the landing craft and military engine programs and one of the worst of the war work bottlenecks, but it will get worse before it gets better, with further marked declines in vital castings production, unless there is quick, wider recognition of the highly essential character of the foundry worker," W. W. Rose, the society's executive vice president, commented as he disclosed results of the survey.

A total of 1954 gray iron foundries—approximately 80 per cent of the industry—replied to the questionnaire.

Shortages are widespread but most pronounced in the East North Central and Middle Atlantic states where 631 gray iron foundries need an additional 14,834 workers to meet the demand for castings. In the New England area 91 plants are vainly seeking a total of no less than 2000 workers, and another 2000, at least, are the immediate requirement of 107 foundries in the West North Central states.

Eighty-five Illinois gray iron plants require 2855 more workers, including 133 women, and the urgent needs of 115 Pennsylvania foundries run above 2400. Michigan gray iron castings producers can immediately place at least 2200; Ohio plants want a minimum of 1750; there is a deficiency of 1650 gray iron workers in New York state; and gray iron foundries in Indiana and Wisconsin are working 3150 too few men and women.

There are vacant jobs in practically every gray iron foundry classification but foundries list their most critical needs as molders, coremakers, grinders and chippers, semiskilled and unskilled workers. At least 10 per cent of the pre-Pearl Harbor industry is down for the duration due to manpower stringency, limitation orders and other reasons.

Employment in the industry has fallen off by a minimum of 22,900 from normal as a result of losses to the armed forces and quits for jobs in other war industries, and despite an increase of 116 per cent in the number of women workers, the society found.

U. S. Steel's Overall Business Not Yet Affected by Cancellations

Chairman Irving S. Olds says operations unaffected by numerous cutbacks. Holds granting of union's wage demands would be serious blow to stabilization. Corporation's first quarter net up compared with like period of 1943

WHILE United States Steel Corp. subsidiaries are still receiving numerous cutbacks and cancellations, there has been no overall loss in business, Chairman Irving S. Olds revealed at his press conference following the directors' quarterly meeting last week.

Steel production of the corporation, he said, is at a high level, with operations for the week at around 98 to 99 per cent. He also pointed out that if the industry as a whole maintained the schedule set up, the weekly production would be the heaviest on record.

The corporation's first quarter net profit totaled $17,027,616, equal to $1.23 a common share, compared with $15,-406,597, or $1.04 a share, for like 1943 period. Dividend of $1 a share on common was declared, payable June 12 to record May 12.

Federal tax provisions totaled $15,-200,000, and $6 million was set aside for additional war costs during the period. In the comparable 1943 quarter the corresponding amounts were $28,100,000 and $6 million respectively.

Higher costs of labor and other increases in expenses more than absorbed the increase of $41,645,131 in sales revenues during the initial quarter over a year ago, and eliminated income subject to excess profits taxes. This resulted in a substantial reduction in income taxes for the quarter.

Commenting on wage hearings in Washington, Mr. Olds said that the granting of labor demands would be a serious blow to the country's stabilization program.

Mr. Olds looked for the third quarter to bring a real stringency in manpower to the corporation. To date, he said, the overall effect of the labor shortage has not been very serious for the corporation, except in some special fields, the shipyards, in particular.

Flash strikes are an increasing source of difficulty. During the first quarter, the corporation lost 209,000 tons as a result of such strikes.

Insofar at least as the Steel corporation is concerned, he said he anticipated no scrap shortage, and remarked that the corporation had more iron ore on hand than a year ago. Adequate supplies of manganese and tin appeared available—and if not in the corporation's own stocks, in government stocks.

Mr. Olds said that all of the corporations new tin lines, except one at Birmingham, Ala., where it was still awaiting certain equipment, have been completed. However, the company has not operating all those lines which have been completed. The structural mill at Geneva, Utah, is expected to be completed in about 90 days, he said.

He revealed that of the ex-service men now employed, 5000 or 6000 were former employes of the corporation. Number of employes on payrolls in the quarter averaged 323,938 against 335,868 in the like 1943 period. Total payrolls amounted to $222,700,000 or $26.6 million higher than for the larger number of employes in the comparable 1943 period.

Bethlehem Steel's First Quarter Net Is $6,432,538

First quarter earnings of Bethlehem Steel Corp., Bethlehem, Pa., totaled $6,-432,538, equal to $1.61 a common share, compared with $6,228,693, or $1.54 a share, in like 1943 period.

Shipments of rolled and finished steel products during the first quarter of 2,-402,217 net tons established a new record, exceeding previous peak in third quarter 1943 by 91,000 tons, Eugene G. Grace, president, states. He pointed out that net billings of nearly $450 million for the first quarter represent about what the company will average during the remainder of the year provided there is no change in the military program. There is a capacity demand for steel indicated for the balance of the year, he said.

Sheet & Tube Co. Has Profit of $1,636,369

Net income of Youngstown Sheet & Tube Co., Youngstown, totaled $1,636,-369, equal to 85 cents per common share, in the initial quarter. This compares with $2,147,023, or $1.16 a share, in like 1943 period. Tax provisions amounted to $4,222,000 last quarter, against $6,-761,000 a year ago.

Sharon Steel Reports Net Income of $166,511

Net profit of $166,511, or 23 cents a common share, is reported by Sharon Steel Corp., Sharon, Pa. Comparable 1943 quarter earnings were $445,465, equal to 94 cents on common.

First quarter federal tax provision totaled $595,000, against $1,593,000 in like 1943 period. Postwar war contingency provision amounted to $75,000, compared with $150,000 a year ago.

Net of $123,612 Earned By Superior Steel Corp.

Superior Steel Corp., Pittsburgh, had net profit of $123,612 in the initial three months, equal to $1.09 a share on capital stock. This compares with $151,015, or $1.33 a share, in corresponding 1943 quarter. Tax provisions were more than 50 per cent below a year ago, at $845,-175.

American Rolling Mill Co. Earns $1,229,035

First quarter 1943 net income of American Rolling Mill Co., Middletown, O., amounted to $1,229,035, or 25 cents per common share. This compares with $1,535,205, or 36 cents a share, in like 1943 quarter.

Directors declared a dividend of 20 cents per common share, payable June 15 to record May 15.

Jones & Laughlin Has Profit of $1,708,352

Jones & Laughlin Steel Corp., Pittsburgh, had first quarter 1943 net profit of $1,708,352, equal to 61 cents per common share, compared with $2,399,-369, or $1.04 a share, in like 1943 period.

Federal income tax provisions amounted to $2,417,000, against $6,398,050 in corresponding period last year.

Lukens Steel's Profit Totals $277,998

Lukens Steel Co., Coatesville, Pa., had net income of $277,998 for the first half of the fiscal year ended March 25 last, compared with $591,968 in the corresponding period of the previous fiscal year. Net sales were $22,963,583 and $24,851,530 respectively for the two periods. Directors declared a common dividend of 25 cents a share, payable May 12 to record April 28.

Acme Steel Has First Period Net of $420,987

Acme Steel Co., Chicago, first quarter net of $420,987, equal to $1.28 a share on capital stock, compared with $422,-316, or $1.28 a share, in period ended March 31, 1943.

Pittsburgh Steel's First Quarter Net Is $114,939

Pittsburgh Steel Co., Pittsburgh, reports first quarter net profit of $114,939, equal to 70 cents a common share, compared with $600,121, or $3.69 cents a share, in like 1943 quarter.

Income tax provisions for the latest period totaled $95,600, against $1,755,-300 a year ago. Directors declared a dividend of $1.375 a share on 5½ per cent prior preferred stock, payable June 1 to record May 16.

Rustless Iron & Steel Has Net of $544,067

Rustless Iron & Steel Corp., Baltimore, March quarter net profit of $544,-067, equal to 56 cents a common share, compared with $822,680, or 86 cents a share, in like 1943 period.

Keystone Steel & Wire Earns $269,600

Keystone Steel & Wire Co., Peoria, Ill., had net profit of $269,600, or 35 cents a share on capital stock, in March quarter, against $220,854, or 29 cents a share, during same 1943 period.

Woodward Iron Earns 75 Cents on Capital Stock

Woodward Iron Co., Woodward, Ala., net income of $252,728, or 75 cents a share on capital stock, for first quarter, against $251,815, also equal to 75 cents a share, recorded in the first quarter of 1943.

Sloss-Sheffield Steel's Profit Totals $170,522

Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., had net profit in March quarter of $170,522, equal to 25 cents a common share, compared with $354,-367, or $3.13 a share, in corresponding period last year.

M. A. Hanna Co.'s First Period Net Is $843,413

M. A. Hanna Co., Cleveland, net profit of $843,413, equal to 67 cents on common stock, against $854,058, or 68 cents a share, in like 1943 period.

Directors have asked stockholders to approve a program under which the present issue of $5 preferred stock, of which $12,853,100 stated value is outstanding, would be retired and a new $10 million preferred issue created with annual dividends of $4.25 a share.

Inland Steel Earns Net Profit of $2,512,396

Inland Steel Co., Chicago, reports first quarter net profit of $2,512,396, equal to $1.54 a share on capital stock, compared

(*Please turn to Page* 178)

Third Quarter Steel Needs Being Estimated by Claimant Agencies

War Production Board expected to make allotments for period around May 15. Requests to be closely scrutinized with some trade observers anticipating a decline in production due to manpower shortage and hot weather

NEW YORK

WITH the claimant agencies now drawing up their requests for third quarter steel, the War Production Board will likely make its allotments for that period within the next couple of weeks, probably around May 15, according to information here.

Requests will continue to come in for special scrutiny not only because of the sustained volume of demand for the war program as a whole, but because of the probability that steel production in the next quarter will be down at least 7 or 8 per cent, and possibly more, in the opinion of some trade leaders—down because of the growing stringency in manpower and because of hot weather.

At present the outlook with respect to military inductions is still highly confusing. However, indications point to a further substantial drain on industrial manpower. In steel, it is estimated that 5 per cent of the employes fall in the group ranging from 18 to 26 years of age, and the industry is already much reconciled to losing most of its physically fit men in this category.

When it comes to the older classifications, however, a more determined effort will probably be made to obtain exemptions. The group from 26 to 29 years, inclusive, comprises about 10 per cent of the industry's enrollment, and the group from 30 to 37 years, inclusive, about 20 per cent. The men in these groups naturally are more skilled and experienced, and any marked inroads in these classes will be keenly felt by the industry. However, what success the industry will have in obtaining exemptions remains to be seen, with some industrial leaders not too hopeful.

All in all, the prospects are for a much greater stringency by summer. There is not only the question of military induction but of men working on 16-hour shifts, as is now being done in various cases. Hot weather makes such schedules extremely difficult.

Moreover, the steel industry feels that it is fast approaching a point where it can no longer obtain additional relief by the employment of women, as they are now filling most jobs they are able to fill.

Maritime Commission Asks for Less

So, requests for third quarter steel will undoubtedly be closely scrutinized, particularly with many war demands pressing. Some agencies will ask for less steel than heretofore, but, it is understood, WPB officials look for the overall demand for steel in third quarter to continue high.

Interestingly, the Maritime Commission is reported to have already submitted its request for third quarter steel, approximately 1,800,000 tons, or about 400,000 tons less than requested for the current quarter. But how much will be approved finally has not been definitely indicated.

March Pig Iron Output Sets New All-Time Record

Pig iron production in March by blast furnaces in the United States established a new all-time record with 5,434,240 net tons, 110,502 tons over the prior high mark of 5,323,738 tons made in October, 1943, according to the American Iron and Steel Institute.

This represents production at 96.2 per cent of capacity, which is now 66,660,-020 tons annually, compared with 96.3 per cent in February. In March, 1943, production was 5,314,201 tons, which was at 98.7 per cent of capacity then estimated at 63,367,130 tons annually.

Aggregate production for three months this year is 15,838,717 tons, compared with 15,290,952 tons in the same period in 1943. Details in net tons follow:

			Total		
District	Pig iron	Ferro, spiegel	March	Year to date	Per cent capacity
Eastern	965,674	23,187	988,861	2,930,904	91.1
Pittsburgh-Youngstown	2,211,897	28,868	2,240,765	6,426,721	98.5
Cleveland-Detroit	561,059	.....	561,059	1,575,889	100.0
Chicago	1,137,509	.....	1,137,509	3,414,459	98.9
Southern	349,702	11,515	361,217	1,082,751	96.4
Western	144,829	.....	144,829	407,993	72.0
Total	5,370,670	63,570	5,434,240	15,838,717	96.2

American Iron and Steel Institute. Companies included above during 1942 represented 99.8 per cent of total blast furnace production.

Biddle Questions Authority of Clayton To Direct Disposition

Attorney General believes new legislation necessary to give administrator adequate powers after hostilities end. Cites more than 200 statutes now on books relating to sale of government goods

QUESTION as to the authority of William L. Clayton, administrator of the Surplus Property Board, to direct disposition of government-owned property has been raised by Attorney General Francis Biddle in testifying before the War Contracts Subcommittee of the Senate Military Affairs Committee.

Before Mr. Biddle's testimony, it was generally believed that the executive directive given Mr. Clayton, under the War Powers acts, gave him ample power. Mr. Biddle indicated that while this was true for the purposes of the war, new legislation is needed to cover disposal of such property after hostilities end.

"There are a large number of statutes dealing with the management and disposition of government property," said Mr. Biddle. "If we exclude statutes authorizing particular transactions, there are more than 200 that relate to disposition of government property. In most cases, the authority conferred by these statutes is limited to a particular kind of property or to property of a particular group. These statutes are satisfactory for the purposes for which they were enacted, but they do not give the government the general authority that will be required to manage and to dispose of surplus property promptly, economically, and pursuant to a considered and consistent plan."

Seeks Clear Legal Authority

Mr. Biddle took the attitude that general enabling legislation is necessary and that such legislation should be enacted as soon as possible. Such a statute should clearly confer and define legal authority to manage and to dispose of surplus property. Mr. Biddle pointed out that S. 1823, a bill which senators appeared to have regarded as taking care of this matter, actually does not do so. "It does not contain such a statement of authority," declared Mr. Biddle. "It is only by inference that authority to sell or dispose of the property can be found in that bill. In a matter of this importance the scope of authority should not be left to inference."

The grant of authority contained in Section 205(b) of S. 1730, Mr. Biddle thought, would take care of needs if revised as follows:

"Subject to the provisions of this act, the director, notwithstanding the provisions of any existing law, may dispose of any surplus property acquired by him or reported to him, by sale, exchange, lease, transfer, or other disposition, upon such terms and conditions as he deems proper, and may prescribe regulations to govern the disposition of such surplus property by other government agencies."

He thought the paragraph might be even further improved by making it clear that the director has the power to conserve, store and to manage property pending its final disposition.

Mr. Biddle thought well of proposals to set up a central agency to deal with problems of industrial demobilization and thought it desirable for Congress to pass a law or laws defining responsibilities and outlining policies. In dealing with problems of demobilization, however, we should continue to have some of the discretion and freedom of choice that was necessary for carrying on the war, he said. "If the administrative structure, as first set up, is too rigid; if it is frozen while the war is still going on before we have had much experience with the new problems that will arise, the results may be unfortunate," he warned.

He opposed the idea of manning a top policy board with representatives of business, labor and agriculture. Administrative and practical difficulties are likely to arise when representatives of avowedly private interests are given official status in a government agency. He recommended that views, suggestions and ideas be obtained by the top board from advisory committees representing the interested groups.

POSTWAR PREVIEWS

What's ahead for the

METALWORKING INDUSTRY?

SPECIAL REPORT TO INDUSTRY

Disposal of government-owned plants and facilities to present troublesome problem in some sectors of the metalworking industry though percentagewise few companies will be affected. Expectations high for continued extensive subcontracting after the war

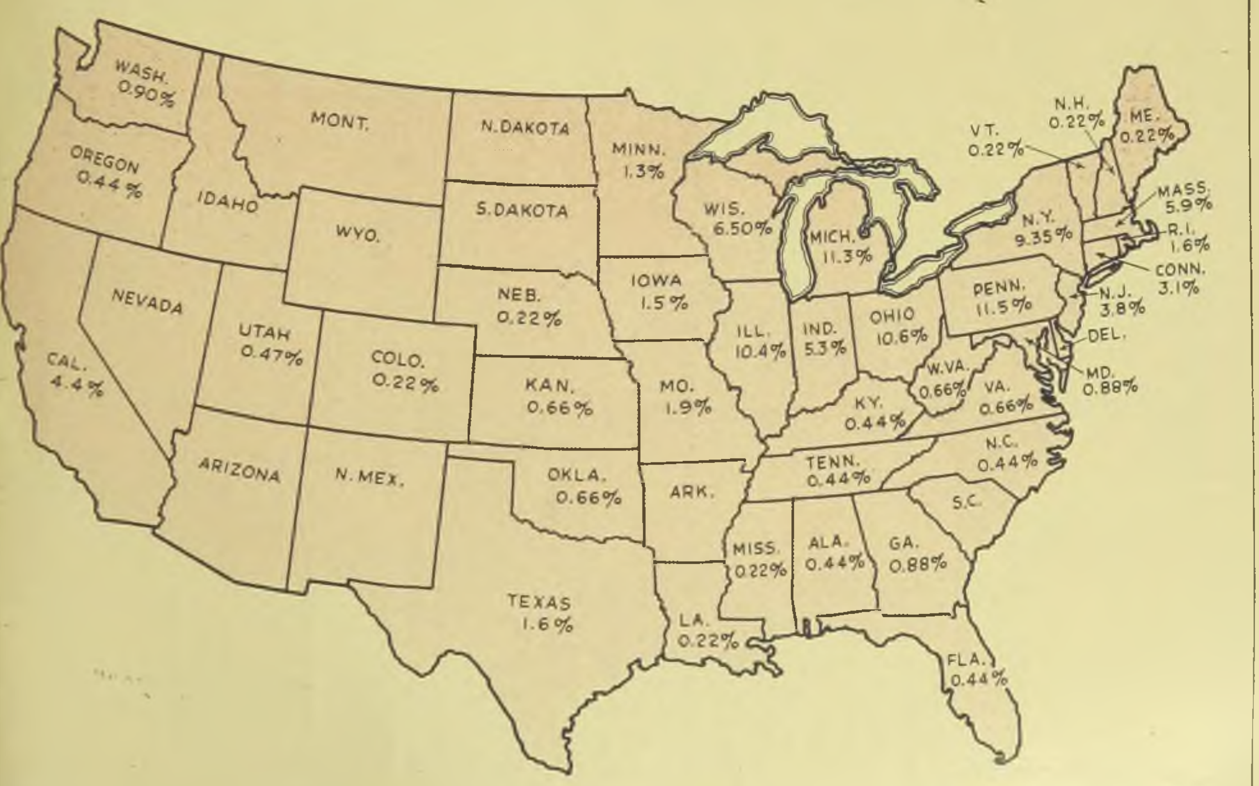
SINCE 1939 close to $20 billion have been invested in new war production plants and facilities, roughly $15.5 billion by the government and the remainder by private industry. As a result it is estimated total manufacturing capacity of the nation has been enlarged at least one-third, possibly one-half.

Disposal of the vast government-owned plants and facilities will present one of the most complex problems of the reconversion period. In fact, speedy transition from a war to a peacetime economy will hinge in considerable measure on how disposition is accomplished. As pointed out some time ago by the National Planning Association, industrial and economic patterns of the country for the next generation may be largely determined by the disposition and use of government-owned war plants.

The problem presented raises these questions: Will these plants and facilities be operated by the government? Will they be scrapped? Will they be held in reserve for possible future emergencies? Will they be sold or leased to private industry, and, if so, on what terms?

All government-owned plants and facilities will not figure in the disposal problem. Baruch and Hancock, in their recent report on war and postwar adjustment policies, figured that between $4 billion and $5 billion of the government's investment is in plants especially designed for production of munitions and which would have little or no peacetime prospects. Another $1.5 billion went into improvements or expansions of government arsenals and Navy yards. Thus, less than $10 billion is left of the government's investment with peacetime production possibilities, this falling into three broad groups: 1—More than $1 billion in so-called scrambled plants;

DISTRIBUTION OF GOVERNMENT OWNED PLANTS



Expectations on Continuance of Present Extensive Subcontracting

(Given in percentages based on replies in Steel's Survey)

	Prime Contractors	Expect Sub-contracting to Continue Yes	Expect Sub-contracting to Continue No	Subcontractors	Expect Subcontracting to Continue Yes	Expect Subcontracting to Continue No	Both Prime and Subcontractors	Expect Subcontracting to Continue Yes	Expect Subcontracting to Continue No	Neither Prime Nor Subcontractor	Total All Plants Yes	Total All Plants No
Bar Products—Bolts, nuts, rivets, screw machine products	...	...	...	49.3	89.6	10.4	42.4	84.2	15.8	8.3	87.5	12.5
Wire Products—Wire specialties, cable, wire fabric, welding electrodes	12.1	25.0	75.0	36.3	64.0	36.0	43.9	61.7	38.3	7.7	61.7	38.3
Sheet and Strip Products—Light gage tubing, stampings	6.2	71.4	28.6	44.7	75.0	25.0	40.4	91.1	8.9	8.7	81.9	18.1
Plate Fabricators—Including welded pipe	7.4	100.0	...	41.0	71.4	28.6	47.0	56.7	43.3	4.6	63.5	36.5
Structural Fabricators	7.6	50.0	50.0	36.4	72.2	27.8	53.0	76.0	24.0	3.0	73.3	26.7
Ornamental and Wrought Iron Fabricators	8.0	...	100.0	44.0	63.6	36.4	44.0	70.0	30.0	4.0	63.6	36.4
Job Galvanizing, Plating, Heat Treating and Welding	4.0	...	...	76.0	58.8	41.2	20.0	80.0	20.0	...	63.6	36.4
Contract Machine Shops	3.7	50.0	50.0	53.7	70.4	29.6	25.9	92.9	7.1	16.7	76.8	23.2
Dies and Molds—For stamping, forging and plastics	10.4	33.3	66.7	58.3	56.0	44.0	27.1	46.2	53.8	4.2	51.2	48.8
Building Hardware and Trim—Prefabricated buildings, sheetmetal working	7.4	...	100.0	46.3	54.1	45.9	43.2	70.3	29.7	3.1	59.7	40.3
Heating, Ventilating and Air-conditioning Equipment	8.2	...	100.0	31.1	60.0	40.0	48.4	65.7	34.3	12.3	54.6	45.4
Metal Furniture—Cabinets, kitchen equipment	13.8	100.0	...	27.5	77.8	22.2	52.5	86.7	13.3	6.3	85.4	14.6
Containers and Hollow Ware—Light pressure vessels	15.9	16.7	83.3	21.7	60.0	40.0	42.0	66.7	33.3	20.4	53.1	46.9
Light Metal Products—Specialties, light hardware	8.1	100.0	...	34.4	100.0	...	52.5	97.9	2.1	5.0	98.6	1.4
Plate Products—Boilers, processing equipment, stokers, pressure vessels	10.4	40.0	60.0	29.9	55.0	45.0	47.7	64.0	36.0	12.0	58.0	42.0
Ships, Cars and Locomotives	61.3	100.0	...	6.5	100.0	...	19.3	100.0	...	13.9	100.0	...
Aircraft Parts and Accessories	5.6	100.0	...	47.2	100.0	...	47.2	100.0	...	...	100.0	...
Machine Parts	6.9	66.7	33.3	41.9	87.5	12.5	39.1	91.1	8.9	22.1	88.5	11.5
Truck Bodies, Trailers, Airframes	15.2	20.0	80.0	23.9	87.5	12.5	54.3	92.3	7.7	6.6	76.9	23.1
Small Tools—Cutlery and Flatware	15.3	80.0	20.0	30.6	89.2	10.8	42.6	89.2	10.8	11.5	88.5	11.5
Plumbers' Supplies—Steam specialties and valves	8.0	100.0	...	40.0	91.6	8.4	48.0	94.7	5.3	4.0	93.9	6.1
Agricultural Implements	13.5	...	100.0	25.0	37.5	62.5	13.5	100.0	...	48.0	53.8	46.2
Contractors' Equipment—Trenchers, scrapers, road-building machinery	32.4	66.6	33.4	32.7	58.3	41.7	39.6	52.9	47.1	5.3	57.1	42.9
Automobiles, Trucks, Tractors, Airplanes	45.4	100.0	...	5.0	100.0	...	31.8	100.0	...	17.8	100.0	...
Electrical Equipment—Industrial, including motors	10.3	28.6	71.4	31.0	81.2	18.8	51.7	86.4	13.6	7.0	75.6	24.4
Electrical Appliances and Assemblies	18.9	100.0	...	27.0	75.0	25.0	51.3	100.0	...	2.8	93.7	6.3
Materials Handling Equipment—Power trucks, cranes, hoists, conveyors	24.6	50.0	50.0	21.9	54.5	45.5	39.7	93.3	6.7	13.8	75.0	25.0
Engines, Pumps, Compressors and Hydraulic Equipment	12.0	33.4	66.6	29.0	72.7	27.3	53.0	61.5	38.5	6.0	60.7	39.3
Heavy Machinery	23.1	100.0	...	30.8	50.0	50.0	43.5	56.2	43.8	2.6	59.2	40.8
Special Machinery	9.3	100.0	...	41.6	88.0	12.0	33.8	82.3	17.7	15.3	86.0	14.0
Metalworking Machinery	4.2	100.0	...	20.8	100.0	...	54.2	71.4	28.6	20.8	80.0	20.0
Machine Tools	12.0	100.0	...	24.0	100.0	...	50.6	70.0	30.0	13.4	81.2	18.8
Machine Tool Accessories—Tools, dies, jigs, and fixtures	10.5	100.0	...	50.0	84.3	15.7	30.2	56.2	33.8	9.3	76.4	23.6
Time and Recording Instruments	15.9	37.5	62.5	21.7	75.0	25.0	57.4	66.6	33.4	5.0	64.8	35.2
Office Machinery and Equipment—Typewriters, calculating machines, etc.	27.4	100.0	...	36.3	...	...	36.3	50.0	50.0	...	66.6	33.4

2—about \$5.5 billion in industries which can produce for peace as for war; 3—less than \$3 billion in plants which could be converted to peacetime production but only after some physical alterations and changeover.

As a general thing, the principal responsibility for returning to peacetime production and for maintaining full employment opportunity will rest with private industry. Consequently, it is assumed that government-owned plants and facilities for which no postwar government need will exist will be disposed of to private enterprise on reasonable terms and in such way as to make possible the most effective utilization of total productive capacity without throwing the economy out of balance.

Disposal will present a particularly troublesome problem in some sectors of the metalworking industry since a large part of the government-financed facilities is in that field. The recent survey by STEEL, however, indicates that only a relatively small percentage of the companies in the industry hold government capacity, 17.2 per cent to be exact.

Most of this government-owned metalworking capacity is held by the larger companies, STEEL's data showing that only about 7 per cent of the companies employing fewer than 50 have any, compared with 40.1 per cent of the plants employing between 500 and 1000, and 59.2 per cent of those employing more than 1000.

As is to be expected most of the government metalworking facilities are in the highly industrialized Midwest and Northeastern sections of the country. Something like 87.5 per cent of government capacity is in sixteen states with Pennsylvania having 11.5 per cent, Michigan 11.3 per cent, Ohio 10.6 per cent, New York 9.3 per cent and Illinois 10.4 per cent. See chart on page 73.

Fairly wide variation in the matter of government-owned plant is shown by product classification. For example, 40.7 per cent of the locomotive, car and ship builders are operating government facilities; 41.2 per cent of the automobile, airplane, truck and tractor manufacturers; 17.7 per cent of the machine tool builders; and 14.5 per cent of the materials handling equipment manufacturers. See table on page 76.

Of those metalworking firms with government capacity 62.7 per cent intend to buy it, assuming it will be available to them on reasonable terms, while 37.3 per cent indicate they are not interested. It is pertinent to note in this connection that of the plants employing fewer than 25 only 30.3 per cent intend to buy the government facilities they are operating compared with 77.8 per cent of those plants employing 250 to 500, and 69 per cent of those employing more than 1000.

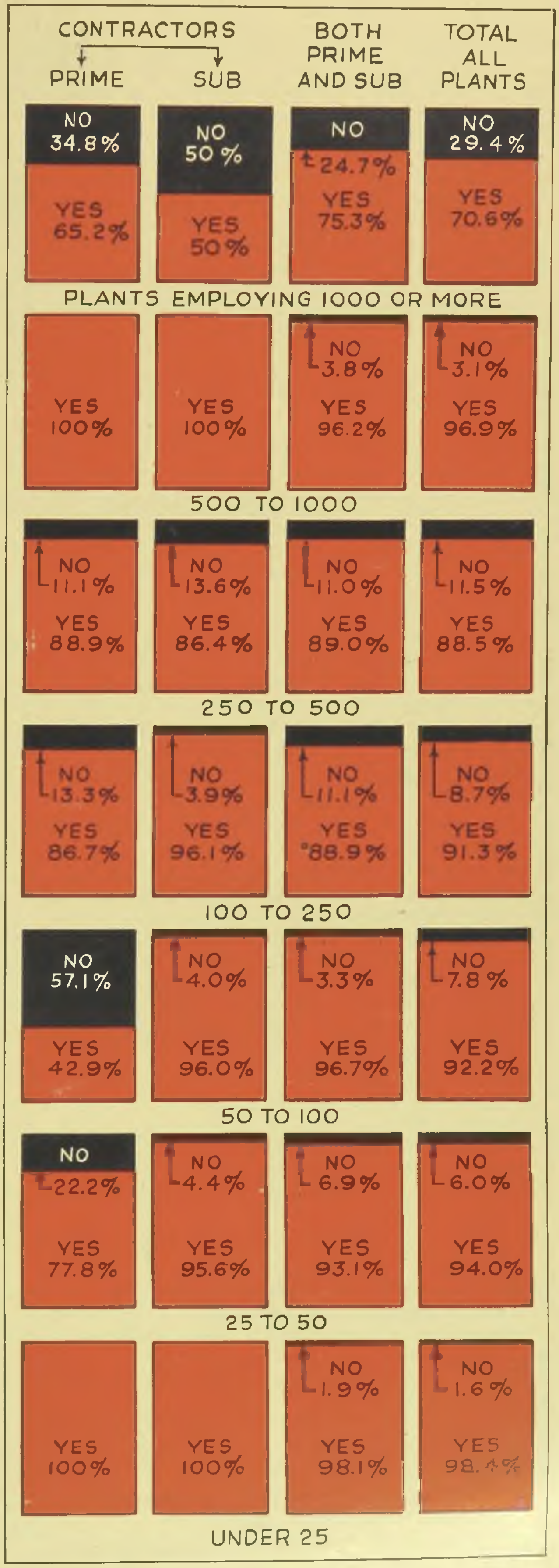
Views with respect to acquisition of government-owned facilities are fairly uniform whether plants changed or did not change product manufacture during the war. Of those plants that changed, 63.3 per cent indicate they intend to buy the government facilities they hold, while of those plants that did not change 61.9 per cent plan to do likewise.

On a product classification basis 81.8 per cent of the locomotive, car and ship builders plan to buy their government facilities, as do 76.2 per cent of the automobile and machine parts makers, 71.4 per cent of the automobile, tractor, airplane and truck builders and 70 per cent of the airplane parts and accessory manufacturers. See table on page 76.

Closely related to the problem of government-owned plant disposal is the question concerning the future extent of subcontracting. The war gave tremendous impetus to the farming out of work on a large scale, and it is obvious considerable plant now being operated by subcontractors will not be needed by many companies in the postwar era if subcontracting is substantially reduced in volume.

Will extensive subcontracting be continued in the postwar era? On the basis of replies received in STEEL's survey of the metalworking industry the answer is an unequivocal "Yes". The data show that 67 per cent of prime contractors, representing 11.7 per cent of those participating in the study, think

Subcontracting Expectations



STEEL's survey shows a high percentage of the metalworking industry expects subcontracting to continue on a broad scale in the postwar period. Accompanying chart gives, in percentage, replies to the question: Will present extensive subcontracting methods continue on peacetime production?

present extensive subcontracting will be continued as do 94.1 per cent of the subcontractors, representing 35.4 per cent of the total, and 89.1 per cent of those doing both prime and subcontracting. Of all the plants in the survey, 89.4 per cent expect present subcontracting will be continued against 10.6 per cent that do not think it will. The degree of optimism on this point is much higher with the medium and smaller plants than it is with the larger. Of those employing fewer than 25, for example, 99.4 per cent look for a continuance of broad subcontracting, as do 96.9 per cent of those employing 500 to 1000. On the other hand, of plants employing more than 1000 but slightly more than 70 per cent expect subcontracting to continue on the present large scale. See chart on page 75.

That a high degree of optimism prevails in all sectors of the metalworking field with respect to postwar continuance of extensive subcontracting is shown by replies on the basis of product classification. Not a single classification falls below the 50 per cent mark in its expectations that present subcontracting policy will be continued. See table on page 74.

In the main it can be said that postwar subcontracting on the present extensive scale depends upon the way the overall demobilization and reconversion of industry to peace-time production are effected. Should the inevitable dislocation accompanying the ending of the war result in a period of economic uncertainty and distress there is little question that subcontractors will encounter rough weather. Further the sound financial position of the subcontractors must be assured through prompt termination and settlement of war contracts if they are to be in position to properly prepare for new types of work which may require considerable new investment in equipment. It is not unlikely, however, that, provided a proper approach to the reconversion problem has been charted by the time transition gets under way in earnest, the tremendous pent-up demand for durable consumer goods over the war years will assure subcontractors an indefinite period of large-scale activity with prime contractors pressed to the limit to meet the unrelenting demands of a goods-starved public on a spending spree.

With this article STEEL concludes presentation of its special report to industry of opinion in the metalworking industry on various important reconversion problems. Previous articles appeared in the March 20, April 3, and April 17 issues. Readers' comments are welcomed by the editors.

Government-Owned Plant Capacity and Equipment

(Given in percentages based on replies in Steel's Survey)

	Plants With Government Capacity	Plants That Do Not Have Government Capacity	Plants That Will Buy	Plants That Will Not Buy
Bar Products—Bolts, nuts, rivets, screw machine products	22.9	77.1	62.5	37.5
Wire Products—Wire specialties, cable, wire fabric, welding electrodes	12.1	87.9	50.0	50.0
Sheet and Strip Products—Light gage tubing, stampings	13.4	86.6	55.0	45.0
Plate Fabricators—Including welded pipe	8.3	91.7	40.0	60.0
Structural Fabricators	4.8	95.2	33.3	66.7
Ornamental and Wrought Iron Fabricators	9.1	90.9	100.0	
Job Galvanizing, Plating, Heat Treating and Welding	14.3	85.7	33.3	66.7
Contract Machine Shops	18.0	82.0	33.3	66.7
Dies and Molds—For stamping, forging and plastics	16.7	83.3	100.0	
Building Hardware and Trim—Prefabricated buildings, sheet-metal working	9.0	91.0	75.0	25.0
Heating, Ventilating and Air-Conditioning Equipment	15.9	84.1	50.0	50.0
Metal Furniture—Cabinets, kitchen equipment	14.7	85.3	45.5	54.5
Containers and Hollow-Ware—Light pressure vessels	17.7	82.3	27.3	72.7
Light Metal Products—Specialties, light hardware	15.7	84.3	52.2	47.8
Plate Products—Boilers, processing equipment, stokers, pressure vessels	11.5	88.5	42.9	57.1
Ships, Cars, Locomotives	40.7	59.3	81.8	18.2
Aircraft Parts and Accessories	29.4	70.6	70.0	30.0
Machine Parts	22.6	77.4	76.2	23.8
Truck Bodies, Trailers, Airframes	14.0	86.0	66.7	33.3
Small Tools—Cutlery and flatware	16.1	83.9	51.9	48.1
Plumbers' Supplies—Steam specialties, valves	18.9	81.1	63.2	36.8
Agricultural Implements	15.9	84.1	80.0	20.0
Contractors Equipment—Trenchers, scrapers, road machinery	18.2	81.8	70.0	30.0
Automobiles, Trucks, Tractors, Airplanes	41.2	58.8	71.4	28.6
Electrical Equipment—Industrial, including motors	18.0	82.0	64.3	35.7
Electrical Appliances and Assemblies	37.2	62.8	60.0	40.0
Materials Handling Equipment—Power trucks, cranes, hoists, conveyors	14.5	85.5	40.0	60.0
Engines, Pumps, Compressors and Hydraulic Equipment	27.0	73.0	79.2	20.8
Heavy Machinery	25.0	75.0	88.9	11.1
Special Machinery	17.9	82.1	56.8	43.2
Metalworking Machinery	8.7	91.3	100.0	
Machine Tools	17.7	82.3	83.3	16.7
Machine Tool Accessories—Tools, dies, jigs, fixtures	19.8	80.2	92.9	7.1
Instruments—Time and recording	10.9	89.1	70.0	30.0
Office Machinery—Typewriters and calculating machines	54.6	45.4	83.3	16.7

Maverick Asks Guarantees for Subcontractors

SWPC chairman suggests smaller plants be allowed to resume production of civilian goods as manpower and materials become available

THREATS to the financial solvency of subcontractors because of inadequate protection under existing laws were stressed by Maury Maverick, chairman and general manager, Smaller War Plants Corp., testifying recently before the War Contracts Subcommittee of the Senate Military Affairs Committee.

In this respect his testimony corroborated that previously submitted by Frederick C. Crawford, president, Thompson Products Inc., Cleveland, and chairman, National Association of Manufacturers (STEEL of April 24, p. 70).

"There are weasel-worded clauses in the agreements between prime and subcontractors under which the prime is not liable to any damage to the subcontractor in the event of termination," said Mr. Maverick. "Many of these contracts contain a clause that settlement may be made by the prime contractor 'and/or' the government. When a contract contains these 'and/ors' it means trouble. Many contracts placed with subcontractors provide that no money is to be paid until the final settlement.

"The plain fact," continued Mr. Maverick, "is that under many of these contracts the subcontractor has no assurance at all as to what treatment he will receive from the prime contractor. On the other hand, he has absolutely no assurance that he will get any assistance whatever from the government. He should have the same protection that the prime contractor enjoys—and it is up to Congress to pass the necessary legislation."

Not only is there no effort to get terminated contractors and idle workers going on civilian production of badly needed goods, said Mr. Maverick, but, rather, there are efforts to prevent them from going into civilian production. He cited a recent WPB Production Executive Staff Memorandum No. 42, signed by Operations Vice Chairman L. R. Boulware, but not made public. This prohibited any increase in production of nonmilitary items in Group 1 and 2 labor areas in the second quarter as compared with the first quarter, even though first quarter production was below the permitted quantity. The memorandum, which was signed April 7, specifically prohibited consideration of any appeals covering plants and labor in Group 1 areas and sharply limited the appeals that might be considered covering plants in Group 2 areas.

MAURY MAVERICK
Chairman and general manager of Smaller War Plants Corp. and former congressman from Texas

Mr. Maverick protested to Donald M. Nelson, he told the committee, that this order was needlessly inflexible and threatened the existence of many small businesses whose labor requirements are small. Mr. Nelson, he said, agreed the order is too severe and should be eased.

"Unemployment Does Not Aid War"

"I never recommended resumption of any unnecessary civilian production if that hurts the war," said Mr. Maverick, "but men now are out of work and that does not help the war. The Bureau of Labor Statistics estimates that employes in war plants on March 1 numbered about 600,000 fewer than last November due to cutbacks and more efficient use of labor. We estimate that further cutbacks are going to increase this number to more than 1,000,000 before the end of the year. It will not help our war effort to have a lot of idle people when the materials situation has eased as it has."

Mr. Maverick complained sharply against a trend of thought he said he encounters; that is that small firms should not be permitted to resume manufacture of restricted peacetime products until such time as the large competitors are able again to produce these products. Such a policy, he declared, will cause many small companies to dry up.

Protest against the sale of surplus manufacturing equipment for export also was uttered by Mr. Maverick. "I have learned," he said, "that such equipment as jigs, dies and small machines is being quietly bought by foreign interests. This should be forestalled now, or American manufacturers will face a shortage of equipment when they are ready to start civilian production."

In its capacity as the agency designated by Congress and the administration to look after the interest of small business, said Mr. Maverick, the SWPC is getting ready to help terminated subcontractors to protect their interests. "We are preparing ourselves and our nation-wide organization to co-operate with the contracting agencies in instructing and advising small war contractors as to the policies and procedures of settling terminated contracts as well as the rights and obligations of contractors."

SWPC, Mr. Maverick continued, has evidence that a large number of smaller war contractors will emerge from the war period with inadequate working capital. He urged prompt enactment of a law to take care of this situation; at this time, he said, interim financing is the pressing problem. Private financial institutions, he said, should be looked to to furnish most of the financial assistance required, but SWPC and Reconstruction Finance Corp. would continue to have authority to use their judgment in making direct loans when necessary.

"I would also suggest that you consider a law authorizing the SWPC to insure bank loans secured by termination claims. This is nothing new—we have used it in housing and other banking operations. Insurance of bank loans and guarantees of bank loans are not the same thing," he said. "Guarantees must be made on an individual piece-meal basis. From the point of view of mass production they are no more useful than direct loans. Insurance, however, abandons individualistic treatment and substitutes spreading the risk. An insurance system can underwrite a thousand risks while one loan or guarantee is being considered."

Testimony of Donald M. Nelson, War Production Board chairman, was along the same lines as that of Mr. Maverick. He felt that the SWPC should be encouraged to finance the reconversion of small firms which appear to have prospects but cannot get bank credit.

Metal Exports to American Republics Off in 1942

United States exports to other American republics of metals and manufactures showed pronounced declines in 1942 from the high 1941 levels, although the United States government made every effort to supply essential requirements.

Total iron and steel mill products, which had expanded from an aggregate of $39 million in 1938 to $111 million in 1941, fell off 44 per cent in 1942 to a value of $61,900,000.

Each of the important items on the steel list declined both in value and volume. Exports of wire decreased 70 per cent in quantity from 1941, to about half the 1938 volume. Tin plate and taggers' tin fell off only 11 per cent and exports were about three and one-third times greater than in 1938.

Export of advanced manufactures of iron and steel decreased about one-third, from a total value of $31,800,000 in 1941 to $21,500,000 in 1942.

Getting Tough

TRADE association executives who have been asked by members to attempt to obtain deferments for key workers under 26, who have been reclassified 1-A by local draft boards, and where state directors have refused to over-rule the local boards, report selective service officers in Washington are even tougher than local boards and state directors. One reason is the record that industry has built up in war production. Key army officers are so impressed with the ability of industry to do the impossible they firmly believe it will find ways and means of getting out production even though young men it regards as indispensable are drafted. Apparently nothing short of a bad falling off in production can change this attitude.

Close Postwar Market

Legislation recently approved in Bermuda closes the postwar market there for most American-made automobiles. Under the new law, automobiles and taxicabs may not have more than 10 horsepower. Vehicles now meeting this specification are those allocated by the British Colony Supply Mission.

Marked Improvement

Much progress has been made in planning for public works after the war, according to Alan Johnstone, general counsel, Federal Works Agency. It takes many months to make surveys and blueprints of projects such as highways, he said, and in recent months there has been a marked improvement in speeding up such planning to the end that contracts can be let promptly when the time is propitious. It is essential, he said, that every state, county, city, and hamlet should make plans now for public works and improvements they will want done in the postwar period and be in a position to place contracts when employment in private business slackens off.

Seek Forecasts

Lack of an adequate top agency with authority to make forecasts on which all other government agencies might base their planning was the subject of complaint by National Housing Administrator John B. Blandford Jr. at a recent hearing of the Murray War Contracts Subcommittee of the Senate Military Affairs Committee.

"We are trying to forecast the volume of postwar house construction," he said. "We know that, if demand is to be met, we could have a program of 1,000,000 new housing units annually for a period of 10 years. But that will depend on a number of things. We are making a study aimed at giving us some idea as to the size of the national income in the postwar era."

Housing is going to be among our important markets after the war, Mr. Blandford believes. He estimates construction of 1,000,000 units annually would result in direct expenditures of between $5,000,000,000 and $7,000,000,000 and would create 3,000,000 to 4,000,000 jobs. He believes all of this business should be turned over to private enterprise, with the National Housing Agency furnishing needed financial assistance.

Iron and Steel Consultant

Appointment of Donald B. Stough, Hubbard, O., as senior economic analyst of the Metals and Minerals unit, Bureau of Foreign and Domestic Commerce, has been announced by Amos E. Taylor, director. Mr. Stough will serve as an advisor and consultant for business organizations and other government agencies in matters pertaining to production, distribution, prices, and uses and foreign trade in iron and steel, and related products. He will serve under general direction of Walter A. Janssen, chief of the unit. Mr. Stough will study and report upon the utilization of iron and steel manufacturing facilities and provision of adequate supplies of steel mill products for production of war materials. His experience with the iron and steel industry covers many years in various capacities; formerly assistant priorities administrator with an organization in Youngstown, O., which manufactured plane parts and office equipment, he also was employed for about 15 months in 1941 and 1942 by Rebublic Steel Corp. as an engineer.

EXPANSION REPORT

Preparation by the War Production Board's Steel Division of a comprehensive report on all steel expansion projects set up within the industry between Jan. 1, 1940, and June 30, 1944, was discussed at a recent initial meeting of the Steel Forms and Reports Industry Advisory Committee. W. A. Hauck presiding officer, explained the projected report will cover the entire field, from ore mining to finished products, and will be broken down company by company.

Committee members were told of the extent of the information being supplied by WPB to the Office of Price Administration in connection with the latter's studies on steel prices, and of the information being developed by the Steel Division, at the request of the War Department, to enable steel producers, by use of an overall industry formula, to arrive at the proportion of government shipments subject to negotiation on "B" products, shipments to warehouses and shipments for further fabrication.

Draws Enemy's Fire

Losses of Allied airplanes are being reduced by dropping thin strips of paper-backed aluminum foil. These become the target of radar-directed antiaircraft guns, allowing the aircraft to move out of the line of fire. The aluminum foil is only 0.0008-inch thick and the strips range from 1/16 to ¼-inch wide; they are so light that it takes about two hours for them to drop to the ground from a height of 30,000 feet. The strips are being made by the Reynolds Metals Co. on what is reported to be the largest single foil contract ever placed.

NE Steels Pushed

Manufacturers of machine, wood and sheet metal screws, at a recent meeting of their WPB industry advisory committee, were urged to make greater use of the triple alloy steels known as NE steels. Strangely enough, it developed at the meeting that this industry has had little experience with the new war emergency steels. The manufacturers were urged to begin working with these steels at once and study their heat treatment, with a view to switching to them for regular production.

Expedite Inspection

Two new machines expedite Ordnance Department's inspection of shells. Big 155-mm. high explosive shells are placed on a revolving belt which feeds them through a 1,000,000-volt X-ray machine which photographs a number of them at one time to detect cracks in the shell or small cavities in the load. Ordnance officers estimate it will permit examination of 3000 to 5000 shells a day and will pay for itself in a year. The other, known as a "Sonotest", is a 70-pound portable instrument which tests small shells by analysis of sound waves generated by striking or dropping the shell on an anvil. If the shell is free of cracks or other defects, a green light flashes; if defective, a red light shows.

Hearty Support

Despite recent rumors, there will be no production of new passenger cars in the next six months. But, WPB officials realize something has to be done to keep in operation some 10,000,000 cars used in getting essential workers to and from their jobs, not to speak of many other cars whose occasional use is essential. The automobile industry is now anticipating cutbacks which will create some unemployment in former automobile plants and, according to John H. Middlekamp, director, WPB Automotive Division, whenever these facilities become available they are being scrutinized with a view to whether they can make replacement parts. Arrangements often are made to have the parts manufactured on a subcontract with one of the prewar suppliers.

There are many GOOD THINGS AHEAD . . .

The world's largest magnesium sheet and strip mill has recently gone into production.

Synthetic sapphires and rubies for the jeweled bearings of instruments and for spray nozzles, gages and spinnerets cost from three to six cents per carat while diamonds for this purpose cost about three dollars per carat. The making of these is an American war baby with a future.

NE alloys now make up as much as 20% of the tonnage of steel for aircraft.

A way has been found to put the "flags" (characteristic of natural bristles) on the ends of synthetic bristles for use in paint brushes.

The American chemical industry promises that it will employ more workers after the war than it did before.

Bituminous Coal Research, Inc., supported by the industry, has announced a $2,500,000 program, covering five years, with improvement in the use of soft coal as its object.

Dip-painted parts are being passed through an electrical field which removes the "tear-drop" in which the excess paint collects.

Electronic traffic control may replace the familiar signs and lights by signalling the driver through his dash radio.

The strongest natural fiber is Ramie, cultivated in Egypt 4,000 years ago. It is now being grown in this country and, if practical processing methods can be devised, it is expected to appear among our new textiles.

The new Orthicon camera has an "eye" composed of 400,000 pieces of light-sensitive silver which store voltage proportional to the light cast on them. It will be used in television and is said to be ten times as efficient as the iconoscope previously used.

Photo-electric cells check hand grenades at the rate of 4,000 per hour. When a defective unit appears on the conveyor, the mechanism rings a bell, lights a lamp, puts a dab of paint on the grenade, and makes a mark on a chart.

A new process for drying the paint on army tanks does the work in four minutes while the operator drives the tank through the "oven."

The use of the thyratron tube as a rectifier makes possible the use of an A. C. current supply to drive D. C. motors, the advantage being in very exact control of speed.

Extremes of temperatures encountered in flying have made necessary the development of new and better cements to replace the Canada balsam formerly used in the making of lenses.

The cost of Diesel-produced electric power is expected to be cut in half as the result of war-time developments.

Street cars designed for post-war production will be lighter, quieter, better looking, and more economical in operation. They will have more comfortable seats and the windows will be higher to give strap hangers a better view.

A new fluorescent lamp, about the size of a marble, uses only two cents worth of current a year.

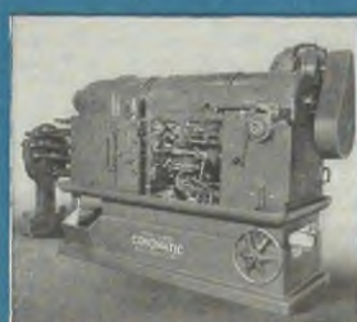
A new electronic method of sorting metals detects differences in material, alloys, heat treatment and thickness.

Success of the "bazooka" against enemy tanks has called public attention again to the rocket or reaction engine as a source of power. Such a motor has been constructed, for experimental use, that develops 260 horsepower for each pound of its weight. One horsepower per pound is the approximate output of the lightest internal combustion engines.

It will pay you to keep AHEAD with us.

This unique job is produced on a 2¼", 8 spindle Conomatic equipped with a Cone Groove-Roll Attachment. The transmission shaft is 9⅞" long and 1 23/32" in diameter and the material is SAE 4140 barstock.

The rolling of the oil groove in this shaft is one of 17 machining operations all completed in a 44 second cycle and illustrates the tooling facility offered by the Conomatic. A device or attachment that increases facility without interfering with a machine's trunk-line efficiency is a device of merit.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

5

PRIORITIES–ALLOCATIONS–PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

INSTRUCTIONS

CLASS B FACILITIES: Applications for priorities assistance and allotments of materials with which a person will make a class B facility for his own use should be filed with the nearest WPB field office. WPB erroneously stated previously that such applications should be filed with WPB in Washington.

STEEL STAPLES: All types of steel staples, as well as steel wire, used in the manufacture of footwear may be treated as operating supplies under provisions of Controlled Materials Plan regulation No. 5.

VALVES AND PIPE FITTINGS: Manufacturers of valves and pipe fittings have been directed to reschedule their shipments of these items for use in destroyer escort vessels in accordance with the schedules issued by the Bureau of Ships, Navy Department, through the Office of the Inspector of Naval Material. Manufacturers whose schedules are now frozen under M-293 will have them revised by regional scheduling officers.

MILITARY VEHICLES: Manufacture is now permitted of a sufficient quantity of replacement parts to maintain about 21,000 military vehicles purchased in this country by the British Supply Mission in 1943. These vehicles include snowplows, tractors, trailers, amphibians and trucks.

CMP REGULATIONS

ALUMINUM: Definition of aluminum "distributor" in CMP regulation No. 4 has been modified to include all persons who buy surplus stocks of aluminum under the terms of order M-1-j for resale. Requirement has been removed that aluminum distributors must reject orders calling for delivery at any one time to any one person at any one destination of more than 2000 pounds of any gage, alloy and size of aluminum sheet, or more than 900 pounds of any alloy, shape, and size of aluminum wire, rod or bar, or more than 600 pounds of any alloy shape and size of aluminum tubing, extrusions or structural shapes. (CMP No. 4)

L ORDERS

COOKING STOVES: 'Domestic cooking stoves again may be constructed with storage compartments. Production of five models of fuel oil circulating stoves also is permitted. Manufacturers must file a monthly production report on or before the tenth day of each month on form WPB-3249. (L-23-c)

CONSTRUCTION: Public highway and street construction under jurisdiction of a federal, state or other government agency has been exempted from provisions of order L-41. Certain railroad construction jobs, including tunnels, overpasses, underpasses, or bridges where the cost of materials is $2500 or less, also are exempted. (L-41)

OIL BURNERS: Pot type oil burners now may be purchased by consumers without a preference rating. (L-74)

CHAINS, LINKS, SPROCKETS: A 45-day inventory limit on sprocket chains, attachment links and sprocket chain wheels that may be acquired by anyone has been established. Deliveries by manufacturers of those items have been made subject to the same restrictions. (L-193-a)

CONSTRUCTION MACHINERY: Restrictions have been removed on the manufacture of 3½ cubic feet portable construction concrete mixers, by including the size in schedule V of order L-217. Appeals from provisions of the order are filed in the nearest field office. (L-217)

PADLOCKS: Restrictions have been removed on the use of zinc in padlocks while manufacture of certain sizes formerly prohibited is now permitted. (L-236)

WELDING EQUIPMENT: Requirement that owners of used and idle resistance welding equipment report their stocks to WPB has been revoked. Each manufacturer must file by the 15th of each month, however, an operations report on form WPB-2830. No manufacturer or dealer may accept an order for, or deliver any new resistance welding equipment unless the order or delivery is specifically authorized by WPB on form WPB-2752. (L-298)

INDEX OF ORDER REVISIONS

M ORDERS

ALUMINUM: Persons not heretofore engaged in the business are permitted now to acquire stocks of aluminum from excess inventories, largely in the form of obsolete shapes and forms in the hands of airplane manufacturers, and to dispose of them under regulations applicable to existing aluminum distributors. Persons entering the business of aluminum distribution since April 1, 1944, may place orders with producers when authorized by WPB. (M-1-j)

TANTALUM: Quantity of tantalum which may be delivered or received without WPB authorization has been increased from one ounce a month to three kilograms. A person desiring to accept delivery of tantalum in June and July, 1944, must file separate applications covering each of these months by May 7. Applications for delivery in any month after July must be filed by the seventh of the second month preceding the month in which delivery is required. Forms WPB-1097 and 1102 (formerly PD-487 and 488) are used for these reports. Each processor of tantalum ores or concentrates must file by May 15 and by the 15th of each succeeding month a report on form WPB-1096 (formerly PD-489). (M-156)

P ORDERS

CONSTRUCTION: Restrictions have been lifted on the construction of certain railroad operating facilities, such as tunnels, overpasses, underpasses and bridges not exceeding $2500 in cost of materials used. Operators may acquire the exempted amount of materials either by placing new MRO supply orders under P-142 or they may withdraw this quantity of materials from priority-obtained inventories. After the operator gets specific authorization in writing from WPB for construction of facilities in excess of $2500, he may withdraw amounts over those limits from his inventory of materials acquired with priorities assistance. Replacement in inventory of materials so withdrawn, however, may be made only by using the ratings and allotments assigned by the specific authorization. (P-142)

PRICE REGULATIONS

MACHINE TOOLS: An alternative pricing method has been provided for second-hand machine tools and extras which were purchased new after March 1, 1941. In such cases, the price at which the item was purchased new may be used as the base price. Where a machine tool or attachment is rented for a specific period of time which results in a maximum total rental of less than $5, the maximum total rental for that period shall be $5. The maximum weekly rental is established at one-quarter of the maximum monthly rental. Selling prices need only be reported on forms filed with OPA. A portable machine tool has been redefined to mean "a machine tool which in normal use is held or guided by hand and not customarily attached to a permanent support." Several changes have been made in the appendix which lists March 1, 1941, prices. (No. 1)

COPPER SCRAP: Maximum charge for the processing of copper and copper-base alloy scrap to produce brass or bronze ingot has been established as the charge approved by OPA, following requests for the approval of such toll or conversion charge made by letter addressed to the Nonferrous Metals Branch, OPA. A preparation premium of 1.25 cents per pound now is permitted on No. 1 copper borings and 1 cent per pound on No. 2 copper borings on sales or deliveries to buyers other than copper refineries or brass and bronze ingot manufacturers. Base price for plated rolled brass sheet, pipe and reflectors has been raised 1 cent to 7.50 cents per pound, applicable only to sales to a buyer other than a copper refinery or brass and bronze ingot maker. (No. 20)

IRON AND STEEL PRODUCTS: Following changes have been made in warehousing of iron and steel products: Removing requirement that the premises where the products were received and unloaded must not be "a public warehouse"; warehousing operations now must be performed on premises maintained and operated by an owner of the material at the time it is put through such operation; material must be purchased by the reseller under authority to deliver into stock for resale in substantially the same form as received. (No. 49)

ROAD CONSTRUCTION EQUIPMENT: A specific method for computation of overtime labor costs for operating and maintenance services that are rendered in connection with the rental of construction and road maintenance equipment has been determined. The addition of "out-of-pocket" expenses, such as payroll taxes and insurance, may be included with the actual amount of overtime labor costs incurred; while any markup on the overtime charges is expressly excluded. (No. 134)

MACHINES AND PARTS: Manufacturers' maximum prices for modified machines and parts for which there was an established price on the base date are to be determined by adding to or subtracting from, the maximum price of the original machine or part the increase or decrease in factory costs resulting from any change in the machine or part since the base date. Net increases or decreases in factory costs caused by change in design, specifications or equipment are to be computed by using direct material costs, labor costs and certain factory overhead costs.

Price of the machine or part sold to the class of purchasers commanding the lowest net price is the maximum price of the machine or part to which the net increase or decrease in factory costs is to be added or subtracted. Maximum price to every other class of purchaser is to be figured by applying to the new lowest net price the same percentage price differential as was in effect between the former lowest net maximum price and the former net maximum price.

Either before or within 10 days after first quoting a price for modified machine or part, the manufacturer must file a report with the OPA. If OPA approves the submitted maximum price or fails to disapprove within 30 days after receiving the report, the submitted maximum price may be used in all subsequent sales and deliveries. Before receiving the approval of any proposed price from OPA or before expiration of the 30-day period after filing the required report, the submitted price may be tentatively quoted and charged but no more than 75 per cent of the submitted price may be accepted until a maximum price has been established. (No. 136)

CRANES AND SHOVELS: A heavy-duty crane or shovel, designed for construction work and operated by independent power, and a used motor vehicle on which it is mounted may now be priced under schedule No. 136 as one unit, providing the value of the crane or shovel is greater than the value of the used vehicle upon which it is mounted. If the value of the used vehicle is higher than the value of the crane, or shovel, the used vehicle is priced under the used commercial motor vehicle regulation, No. 341, and the crane, or shovel, is priced under the machinery and parts regulation, No. 136. (Nos. 136, 341)

New Limitation on Brass Mill Product Deliveries

Beginning May 15, 1944, a new limitation will apply to deliveries of brass mill products from warehouse stocks, the War Production Board announced last week. Under the new limitation, no person shall place orders for delivery from warehouse stock of any item of brass mill product to any one destination during any calendar week which aggregate more than 500 pounds gross weight.

Neither this new limitation nor the former 2000-pound monthly limitation, which is retained in the order, applies to condenser tubes or to resale of brass mill products obtained by a brass mill warehouse through an authorization issued by a regional office of WPB.

Canning Machinery Output Quotas Nearing Completion

More than 70 per cent of the current fiscal year's requirements program for canning machinery already has been completed with the remainder of scheduled production assured of completion during the next three months, according to the War Production Board. While no official estimates of the 1945 production program have as yet been presented to canning machinery manufacturers, it is believed that the figure will remain at or about the 110 per cent of base period total used to compute the 1944 program.

Maintenance and repair orders, on priority ratings of AA-1, are expected to displace between 18 and 20 per cent of new equipment orders placed on the normal priority ratings of AA-3.

Only Six Metals Now Classified As Insufficient for Essential Needs

Cadmium, columbium, malleable iron castings, nickel, sodium and tin are retained in group I of WPB's Material Substitutions and Supply List. . . Continuation of favorable trend depends largely on progress of the war

FAVORABLE changes in supply requirements over the past few months of several essential materials, notably metals and ferroalloys, have resulted from cutbacks in military programs, conservation measures, improved control over distribution and use, completion of facilities, a more conservative inventory and purchasing policy by industry, and increased efficiency. Maintenance or improvement of these favorable positions from now on depends largely on the progress of the war, the War Production Board said recently.

Metals classified in group I in the latest "Material Substitutions and Supply List" total only six compared with about 21 when the list was first issued about two years ago. Supplies of the following metals are insufficient for war plus essential industrial demands within the limits imposed by existing administrative controlling orders: Cadmium, columbium, malleable iron castings, nickel, sodium and tin.

Supplies of the following metals, in group II, are at present sufficient to meet war demands plus essential industrial demands within the limits imposed by existing administrative controlling orders: Aluminum, beryllium, bismuth, refined copper, lead, magnesium, platinum, silver, tantalum, zinc, low-carbon ferrochromium. Steel is listed in group II, except as included in the following group III items. Gray iron castings, pig iron, all types of reinforcing steel, and rerolled rail.

Manpower shortages plus a few facility shortages combine to render certain fabricated metal forms considerably tighter than the metals themselves. In the ferrous group, for instance, most important and critical of these shortages now are in seamless steel tubes, steel plates, rails, hot-rolled sheets, malleable iron castings.

In the nonferrous group, the shortages are in: Brass strip; copper alloy rod, ½-inch and smaller; copper alloy tubing, 5 inches and over plus condenser tubing; copper wire mill products; brass and bronze heavy and centrifugal castings; copper alloy ingot, 74 per cent copper or over; tungsten and molybdenum rod, wire and sheet.

To help offset these shortages, continued and increased use of those materials and facilities adapted to such low unit labor processes as stamping, die casting and moulding, automatic screw machines, etc., is vitally needed, the Conservation Division, WPB, said.

When large metal tonnages are involved, first consideration still should be given to the ferrous materials to avoid disrupting the supply of smaller tonnage nonferrous or plastic materials.

Shortage of Miners and Smelters Remains Critical

Although stockpiles of the majority of strategic metals are satisfactory at this time, manpower shortages in certain divisions of the mining and smelting industry present problems that may be serious later this year, Paul V. McNutt, chairman of the Manpower Commission, said recently.

Release of 3200 soldier-miners for work in the copper mines last August and September, together with cutbacks in small arms ammunition, helped meet the needs in that field, he said. Operators, however, still need about 2700 additional men for mines just coming into production and to expand operations in others. Copper smelters are demanding about 1500 men workers.

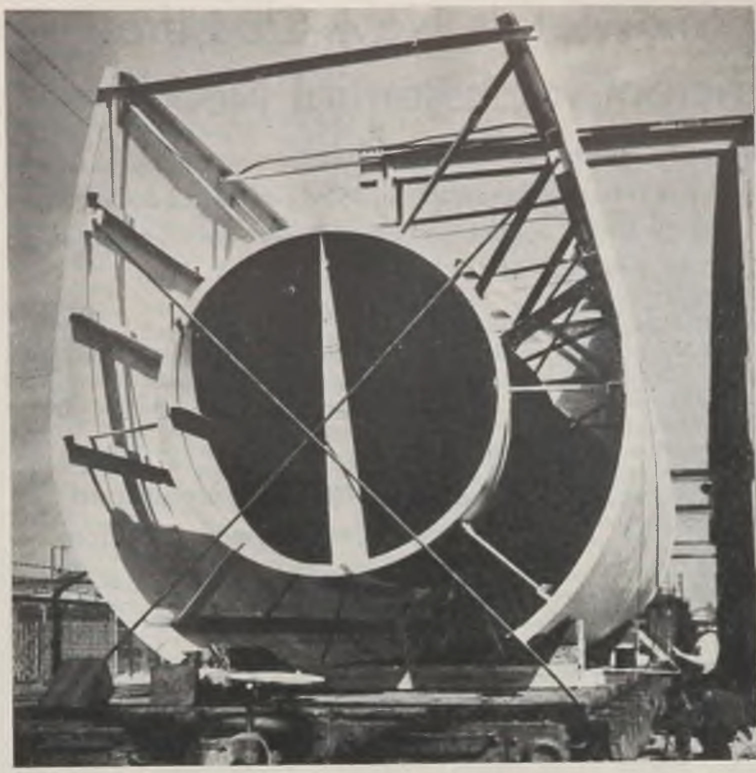
Fear that the Army may withdraw furloughed soldiers is troubling operators of molybdenum mines, according to Mr. McNutt. Rumors that molybdenum is no longer critical and that wholesale layoffs are threatened in this field have resulted in heavy turnover. Although the actual number of workers needed in this industry is small, recruitment is difficult.

Production of zinc and lead, Mr. McNutt said, must be maintained at 1943 levels throughout the present year not only because of the need for the primary metals but also because bismuth and cadmium, which are needed badly and which are in limited supply are byproducts of zinc-lead smelting.

Labor shortages are seriously impairing production at zinc smelters at Amarillo and Dallas, Tex. Three lead smelters are experiencing labor shortages hampering production and most of the 14 establishments reporting have indicated a need of additional workers to produce at capacity.

Appointments-Resignations

Charles F. Weiler, chief, Materials Control Branch, Office of War Utilities, has been named assistant to Edward Falck, OWU director. He will be succeeded as chief of the Materials Control Branch by Harry Lowe.



350-Mile "Assembly Line" Pride of Ingalls Shipbuilding Corp.

PREFABRICATED units and subassemblies for 18,000-ton C-3 type ships are being built by the Ingalls Iron Works Co.'s fabricating plants at Birmingham, Ala., and transported over a 350-mile "assembly line" to the company's subsidiary, Ingalls Shipbuilding Corp. at Pascagoula, Miss., for erection into completed cargo vessels. The Pascagoula yard is one of the first to be designed and built to employ welding methods exclusively.

Eighty per cent of the steel required in building the large cargo ships is transported by railroad flat cars, gondolas and highway tractor-trailers from Birmingham to the Gulf coast yard.

Largest single unit shipped south preassembled is the forward section of the funnel above fidley top. This section weighs 28,565 pounds. The smokestack section and the aft section, or teardrop extension, weigh 25,985 and 7373 pounds, respectively. They are shipped anchored to flat cars.

Shaft-alley sections of bulkhead-to-bulkhead length also are shipped by flat car. Bulkheads, deck sections, foundations, small hatches, work desks, sea chests, brackets and other units are stacked in gondolas or trailers for shipment.

Ingall's system of supplying prefabricated units and subassemblies from its Birmingham iron works is the outgrowth of a prewar sharing of a barge construction contract with another Gulf coast company. When the Pascagoula yard was opened the plan was used more extensively and developed into a system.

The Pascagoula yard, with only a few alterations and additions, could be arranged to handle all the work involved in constructing a vessel, including prefabrication and subassembling. However, the company has found its present method superior. One reason for this was the availability of experienced ironworkers in the Birmingham area.

Supply 80 Per Cent of Steel

The company's Birmingham yards also supply 80 per cent of the steel which goes into ships built at its Decatur, Ala., yards, which is 80 miles north of Birmingham. This yard builds ocean-going cargo ships, barges, and other floating equipment for the Army and Navy.

Both the Pascagoula and Decatur yards are, in the main, assembly plants. The Birmingham-built sections in most cases are ready to be lifted from railway cars by cranes for installation on ships.

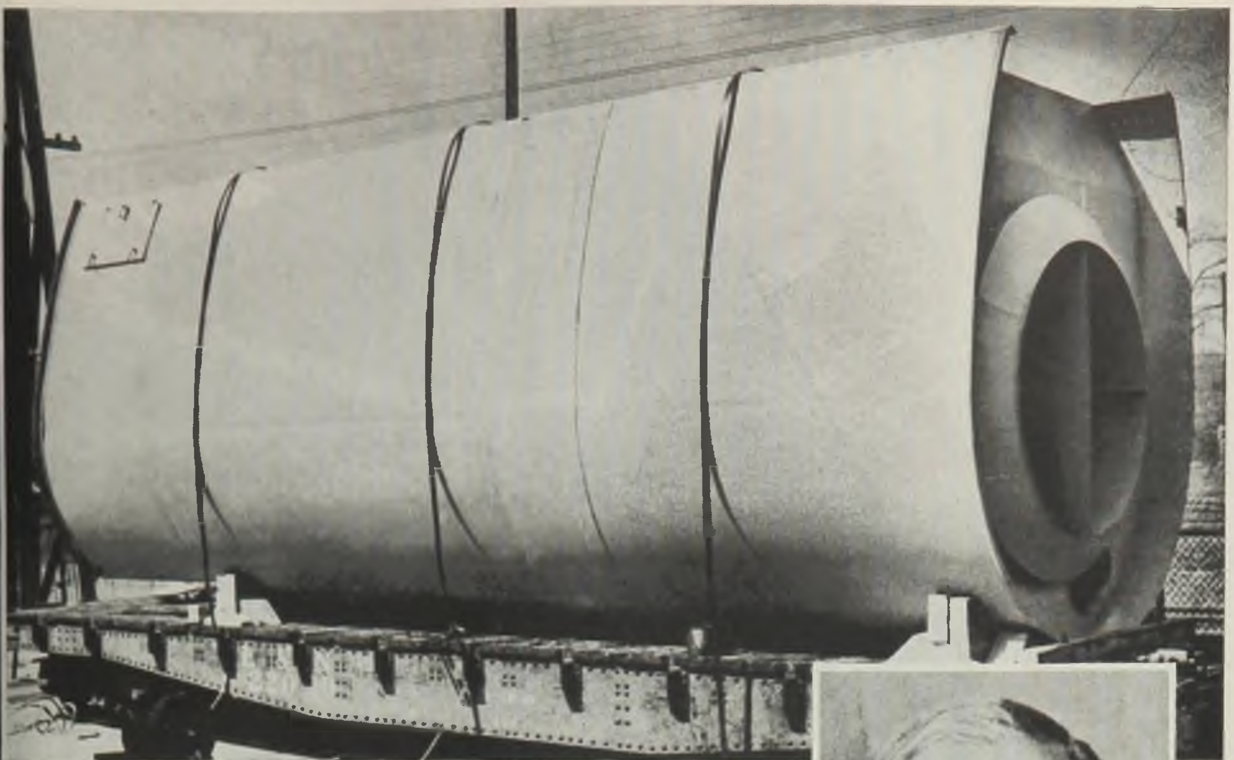
The Pascagoula yard builds, in addition to the 18,000-ton C-3 type, aircraft carriers, submarine and seaplane tenders, and at present is concentrating on troopships to be used by the Navy as flagships in convoys.

Designs and drawings of a streamlined cruise-liner for Tennessee river travel which the Ingalls company expects to build at its Decatur, Ala., shipyard after the war have been completed by George C. Sharp, New York naval architect.

The luxurious 300-passenger boat, which will make 1300-mile round trips between Knoxville, Tenn., and Paducah, Ky., weekly in the postwar era, is a drastic departure in design from any boats plying the rivers before the war. The boat is designed as a pleasure craft and will carry no freight.

The Tennessee Waterways Conference, of which Earl P. Carter is president, has voted to sponsor the preliminary plans for construction and operation of the boat.

The revolutionary craft, with a top speed of 18 miles per hour, will be 250 feet long, with a beam of 50 feet and a draft of 8 feet. She will have a swimming pool on a huge sundeck (165 feet long, partially covered by awning), an observation lounge 100 feet in length and a club room of the same measurement to accommodate all passengers for dining and dancing.



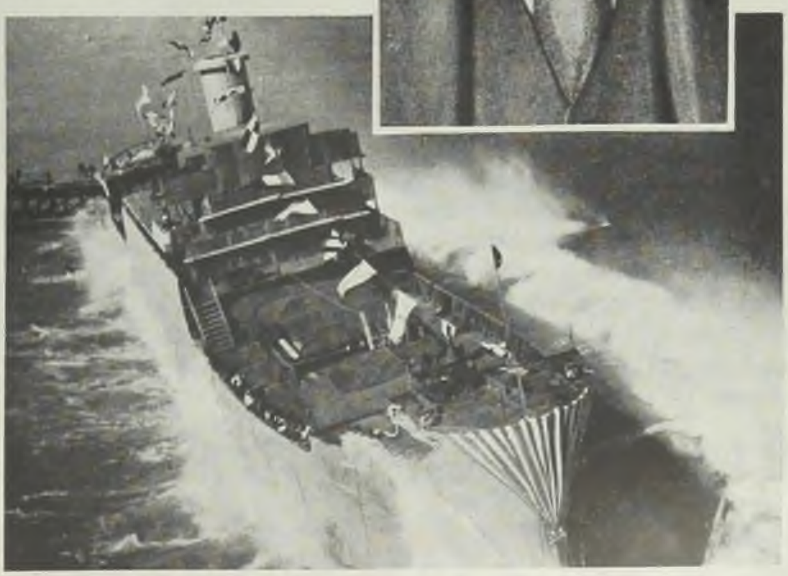
Sections and subassemblies made at Birmingham iron works transported by rail, highway to Pascagoula for assembly into 18,000-ton C-3 ships, aircraft carriers, submarine and seaplane tenders, and troopships

Above left, a funnel above fidley top, 34 feet long and 13 feet in diameter, is ready for shipment to the Ingalls Shipbuilding Corp. yard at Pascagoula, Miss., after being constructed at Ingalls' Birmingham plant 350 miles away. Section weighs 28,565 pounds

Center above, welders work on a section of the inner stock casing, forward section, of funnel above fidley top for a ship being constructed at Pascagoula

Right above, a funnel above fidley top, minus the tear-drop section, takes up an entire flat car. The tear-drop section will be shipped separately

At right, Robert I. Ingalls Sr., chairman of the board of the Ingalls Shipbuilding Corp. and the Ingalls Iron Works Co. He recently was appointed a member of the war contract termination committee of the National Association of Manufacturers



At right, an Ingalls-built vessel for the Maritime Commission is launched sideways at the Decatur, Ala., yard

MIRRORS of MOTORDOM

Engineering officials of machine tool builders confer with General Motors engineers in Detroit to work out difficulties and problems in operating and servicing motors, drives, hydraulic and electrical systems

DETROIT

UNPRECEDENTED in industrial circles was the two-day meeting held here last Thursday and Friday in the ballroom of Hotel Statler, at which General Motors Corp. and 150 general managers, master mechanics and plant engineers from all its divisions through the country were hosts to about 140 chief engineers and electrical engineers from 60 leading machine tool building companies.

Purpose of the meeting, which included sessions Thursday afternoon, Friday morning and afternoon, a dinner Thursday evening and a luncheon Friday, was to examine some of the problems and difficulties in operation and servicing of machine tools from the standpoint of motors, drives, hydraulic systems and electrical systems.

Idea for the meeting was conceived by the GM standards division, headed by Harold T. Johnson, who directed the extensive planning and preparatory work which was required, and supervised the selection of attendants. Plant engineers and master mechanics from many of the motor company's divisions had been reporting troubles with servicing and maintenance of hydraulic and electrical accessories on lathes, milling and drilling machines, shapers, planers, gear cutters and grinders. It was felt the best way to bring these complaints and suggestions for improvement to the attention of top engineering officials of the tool builders would be to invite them to Detroit for an intensive two-day conference where they could sit down with GM engineers and obtain the first-hand story of troubles being encountered.

The meeting opened Thursday afternoon with brief remarks by C. L. McCuen, GM vice president in charge of engineering. Then followed presentation of a series of over 100 lantern slides showing in detail the machines operated in various plants and the difficulties being encountered in their operation and maintenance.

At the dinner meeting, T. P. Archer, GM vice president in charge of manufacturing, addressed the gathering and explained the general purpose behind the sessions. J. Y. Scott, Van Norman Machine Tool Co., and president of the National Machine Tool Builders Association, spoke in behalf of the tool company guests.

Other features of the two-day conference included presentation by the Delco Products Division of an analysis of its motors as applicable to machine tools, a moving picture detailing a motion study made on machine tool operation at GM plants, an address on this motion study, and the presentation of a machine tool electrification standard, developed by the GM standards section and introduced by Mr. Johnson. The Friday afternoon session was given over to detailed consultations between the various machine tool company representatives and GM engineers, at which a wide variety of subjects was discussed, ranging all the way from operating efficiency of different types of machines to such related matters as chip disposal, location of controls, simplification of control systems to aid untrained workers, accessibility of motors and drives for servicing, standardization of hydraulic and electrical systems, etc.

Limited to Engineering Personnel

General Motors kept news of the meeting very quiet, issuing no advance publicity and suggesting that the attendance be limited to engineering personnel, excluding sales representatives. Accommodations were so jammed that it was even felt advisable to rule out detailed reporting of the discussions by the press.

Timing of the gathering was well planned, since the National Machine Tool Builders Association has a meeting scheduled in Cleveland next week, while the Westinghouse machine tool electrification forum is in session in Pittsburgh this week. It appears to have been a wise decision for General Motors to transmit its ideas to the machine builders in advance of these affairs.

Certainly it is an epochal event when the customer plays host to his suppliers for the express purpose of advancing suggestions on how to improve the product. Obviously there are important postwar connotations, inasmuch as the engineering discussions held last week doubtless contained many valuable pointers bearing on the design and construction of future machine tools. General Motors standards engineers, however, did not stress this point and preferred to consider their recommendations as being immediate in nature.

The corporation has gone on record as being in the market over the next few years for an estimated 45,000 machine tools, with a value probably close to a quarter of a billion dollars. If service records and service problems can be translated into improved designs and more efficient performance, General Motors will have insured getting the maxi-

MOBILE TRAFFIC TOWER: Mounted on a Chevrolet 1½-ton truck, this mobile traffic tower was designed for use on newly won airfields at the war front. The vehicle carries its own electric plant and is used to guide pilots onto the fields mum value from its future purchases, and at the same time will have done all industry a distinct service.

Wartime conditions in plants had an important effect on the decision to schedule the conference. At one time a few years ago, it was possible for almost any machine tool company representative to walk into a customer's plant and observe his machine in action and to receive at first-hand any complaints on operating or maintenance difficulties. With wartime restrictions on plant visitors, this is no longer possible, and many machine tool builders never see their equipment after it has left their shipping rooms. Result is that service problems are received either second-hand or not at all.

It proved to be a difficult matter to narrow down the list of those in attendance to the representatives of only 60 machine tool companies, but the physical restrictions of the meeting place forced this measure, along with the original desire to prevent the assemblage from becoming too large and destroying all informality and productive results. Naturally, a number of the 200-odd builders of machinery were not present, but those who were on hand represented the leading old-line manufacturers of purely metal cutting machinery. No sheet metal machinery or portable tool company representatives could be included.

If the machine tool industry feels the discussions of last week should be brought to the direct attention of a larger number of its plants—and there seems every reason to believe that such will be the consensus—then Mr. Johnson will take his slides, movies and discussions to future meetings of a similar character in other sections of the country. It has been suggested that Worcester, Mass., Cincinnati and Rockford, Ill., might be logical scenes of future conferences, although they have not been scheduled definitely.

Although sharp cutbacks have been experienced in most of the shell manufacturing programs undertaken by the motor industry plants, reports are heard of new activity in this field, requiring both retooling of present equipment and installation of some new machinery. Oldsmobile, for example, one of the principal sources of "firepower" for the armed forces, is in process of equipping to make a new type of gun barrel, said to be around .60-caliber size for antiaircraft uses. The barrel itself is some 60 inches in length.

A flurry of production developments is evident in the field of rocket shells, a new type of ordnance which several manufacturers have contracted to supply. One type is to be built by Chrysler Corp. and machinery requirements are now being filled. The shell itself is around 3-inch diameter, comprising a steel tube, bored and threaded to receive a forged steel nose.

Little information has been released by the Army on the subject of rocket shells, although pictures have been published showing British installations of batteries firing rocket shells against enemy aircraft. The Bazooka, or M-1 antitank rocket, was one of the first to be publicized in this country. Antiaircraft rocket shells are presumably fired from troughs, which suggests many problems in accuracy of fire. On the other hand, accuracy may not be a consideration, if the desired purpose is simply to blanket a threatened area with a sufficient number of self-propelled shells.

INDUSTRIAL SOLDIERS: Workers in the foundry of the Dodge Chicago plant cleaning off rough edges of cylinder heads for aircraft engines for the Superfortress and other Army Air Force planes

Hoarding of machine tools by the armed services against possible future needs is an unfortunate development, but numerous instances of it are reported. In one case, a machinery builder shipped some equipment over a year ago for use on an antiaircraft gun contract which later was cut back. Only in recent weeks have these standard-type machines been "pried loose" and redirected to other plants having need for them. Similar occurrences are said to have resulted from cutbacks in armor plate contracts. It may be, of course, that these machines have just become buried in clerical red tape, but they point to the enormous task ahead in preparing accurate inventories of government-owned machinery so that they can be disposed of equitably when the need for them has lapsed.

To determine labor urgency ratings of war plants in areas outside the Detroit region, the local WPB office and the regional area Production Urgency Committee has set up modified area committees in Muskegon, Kalamazoo, Benton Harbor-St. Joseph, and Toledo, O. Each of these cities centers in an area of acute labor shortage as defined by the War Manpower Commission. Chairmen of committees in each locality will report to the Detroit committee, headed by E. T. Gushee. The various committees will not review military supply or facility contracts, but will simply determine the urgency rating for each plant within their respective areas. From these will be determined priority ratings in the procurement of additional labor if needed.

Industry Committee To Set Quotas

Establishment of production quotas for the various automobile plants for the initial resumption of motor car output, whenever that comes, probably will be left in the hands of a committee representing the entire industry.

The work of the committee will be to review the production totals requested by each individual plant, then balance them against WPB limitations, materials and manpower availability and then adjust the requests accordingly. Beyond any doubt, this is going to work hardships on some plants, but that will be just part of the price of reconversion.

Packard's aircraft and marine engine output for March alone equaled a peacetime schedule of 50,000 cars in dollar value, and set a new monthly record. The company now has 4,600,000 square feet of productive floor space busy on engines, and since the start of war production has shipped nearly 35,000 engines rated close to 47,000,000 horsepower.

Since December, Packard has added 139 new subcontractors to the list of 600 which up to that time had been furnishing fabricated parts and assemblies for the Rolls-Royce and marine engines. This does not include suppliers of raw materials or standard parts.

MORE ACCURATE

HYDRAULIC PRESSURE CONTROL

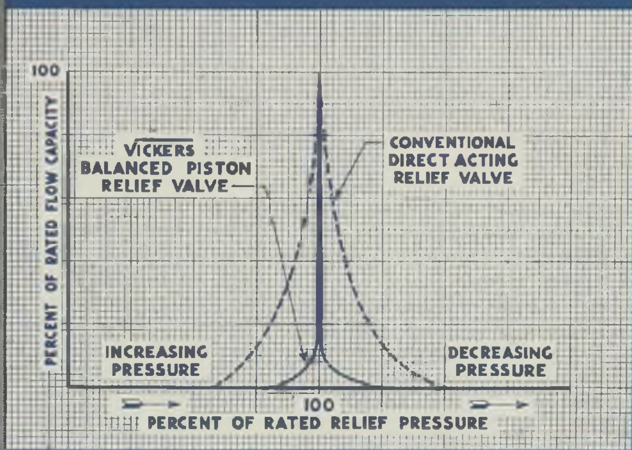


CHART SHOWS PRESSURE READINGS OBTAINED DURING A VARIATION OF FLOW RATE FROM ZERO TO MAXIMUM AND BACK TO ZERO

VICKERS

Balanced Piston Type

RELIEF VALVES

As indicated by the chart above, Vickers Balanced Piston Type Relief Valves have a negligible pressure variation throughout their capacity range. In these valves a hydraulically loaded and balanced piston takes the place of the customary spring-loaded direct-acting relief mechanism. This means more sensitive operation as well as greater accuracy throughout the wide pressure range.

This accuracy of control prevents pressure override when sudden changes in pressure occur in the hydraulic system. Compact design, longer operating life, installation directly in the pressure line, quiet operation, and simple adjustment are other advantages of these Vickers Balanced Piston Relief Valves. See Bulletin 38-3 for complete information.

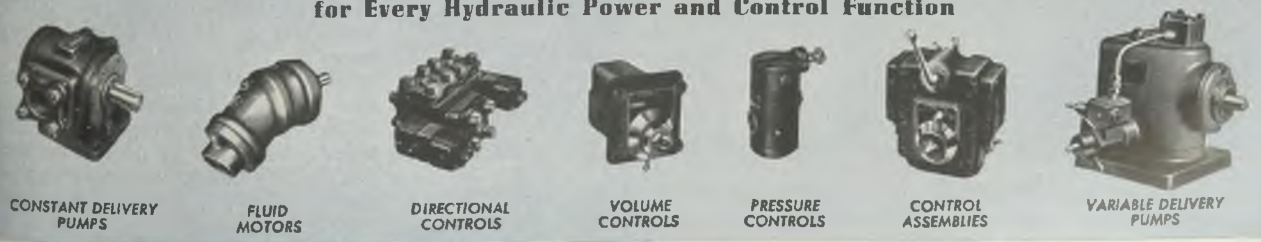
Vickers Application Engineers will gladly discuss with you how Vickers Hydromotive Controls can be used to your advantage.

VICKERS *Incorporated*

1480 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



"Wilder" Wildcat carrier-based fighter plane has faster rate of climb, shorter take-off, lower landing speed than predecessor. Eastern Aircraft Division of General Motors has produced more than 2500 since January, 1942

A "WILDER" Wildcat fighter plane has been revealed by Eastern Aircraft Division of General Motors.

The new version of the Wildcat is designated the FM-2 and is claimed to possess performance characteristics not previously available in a small carrier-based fighter.

According to operational reports, the FM-2 can climb faster than its predecessor, the FM-1, or F4F4, as it was known by Grumman, its original designer. Other improvements include a considerably shorter take-off and lower landing speed—both extremely advantageous aboard the confined flight deck of the flat-top carriers.

The new model Wildcat is powered by a hitherto unannounced Wright engine with a number of new features including forged cylinder heads in place of the usual cast variety. Despite sizeable increase in horsepower over the engine previously used, the weight has been decreased.

Recently Eastern Aircraft christened the 2500th Wildcat produced at its converted automotive plant in Linden, N. J., since the formation of the division in January, 1942. Eastern Aircraft, with plants in Trenton, and Bloomfield, N. J., as well as Linden, Baltimore, and Tarrytown, N. Y., also produces the Avenger torpedo bomber.

Lockheed C-67 Sets New Transcontinental Mark

Maiden nonstop transcontinental flight of the Lockheed C-69 Constellation, from Burbank, Calif., to Washington, recently was an event dressed up with plenty of ceremony, and indeed it did mark a milepost in aviation transport, the huge 57-passenger ship completing the 2600-mile flight in just under 7 hours, averaging close to 370 miles an hour.

However, the Constellation is not strictly speaking a brand new airplane, since its initial flight was made in January, 1943, at Burbank. Illustrations and description of the transport appeared in STEEL for Feb. 1, 1943, p. 72. Shortly thereafter it was grounded by Army orders at the Burbank hangar, because of troubles which had been encountered with the Wright Duplex Cyclone 2200-horsepower engines on another large plane. Engines were removed from the Constellation for modification and meanwhile plans went ahead to build several more of the ships at the Lockheed plant in Burbank, to be used as hospital transports for the evacuation of wounded from battle fronts all over the world.

Complete One Constellation

Next development was the suspension of work on the additional order for Constellations because of the desire to concentrate on the Lockheed P-38 Lightning fighter plane. So far as is known, the matter rests here, and only one of the C-69's has been completed. It carries the TWA airline insignia, but reportedly is now being turned over to the Army.

Doubtless the engine difficulties have been overcome by this time. Power plant used is the Wright 3350 type, which Wright Aeronautical Corp. builds at Wood Ridge, N. J., and which Chrysler Corp. is beginning to assemble at the Dodge Chicago engine plant. The same engine is used in the B-29 Superfortress.

The Constellation is an ungainly ship on the ground, because of the peculiar "shark-body" shape of the fuselage and because of the fact an unusually high tricycle landing gear is necessary to insure the four propellers clearing the ground. Wingspread is 123 feet, about 13 feet more than the B-24 and B-17 four-engine bombers, but well under the wingspread of the B-29. Use of Fowler flaps permits a landing speed of only 77 miles an hour, and additional "maneuvering" flaps, which telescope into the wings, provide further ease of control in bad weather and improve the rate of climb. Cruising speed is 275 miles an hour, indicating the presence of a good tail wind on the Burbank-Washington hop. Cabin is pressurized, to provide comfort at the cruising altitude of 20,000 feet. Gross weight is about 40 tons, with payload better than 14 tons.

In a radio interview after the transcontinental flight, the engineering supervisor aboard said that while the airplane lived up to expectations, it did not exceed them.

Howard R. Hughes, one of the designers of the Constellation, was at the pilot's controls, along with Jack Frye, president of TWA and actively associated with the development of the plane. It was the second record-breaking transcontinental flight for Hughes, who in 1937 flew from Burbank to Newark, N. J., in a specially designed smaller plane at average of 327 miles an hour.

Board To Investigate Fighter Plane Crash

Central Procurement District of the AAF has disclosed naming a three-man board of inquiry to serve with a Wright Field engineer as investigators, to examine into details of the recent crash in Cleveland of a P-75 fighter plane, new experimental model developed by General Motors Corp. Appointees are Maj. N. H. Pederson, Capt. H. C. Webster and Capt. A. M. Patterson, the latter a South Pacific air force hero and resident representative at the Fisher Body plant in Cleveland where the P-75 was built.

Lightweight Aircraft Starter in Production

A new aircraft starter, which cranks 2000 horsepower aircraft engines and yet weighs only 32 pounds, is now in use on every fighting front. The development was revealed recently by the Philadelphia Division of Bendix Aviation Corp. where the devices are in mass production for the aircraft of the armed forces.

The flywheel of the starter, a circular piece of metal that delivers the "kick" which starts the motor, weighs only 5 pounds, but, spun by an electric motor to a speed of 28,000 revolutions per minute, it delivers a punch of more than 1200 foot-pounds.

In order to build up this flywheel

Blunt-nosed new FM-2 Wildcat, featuring a new Wright engine with forged cylinder heads, shown in flight. It is produced at the Eastern Aircraft Division of General Motors

The limitations of

HARDENABILITY TESTS

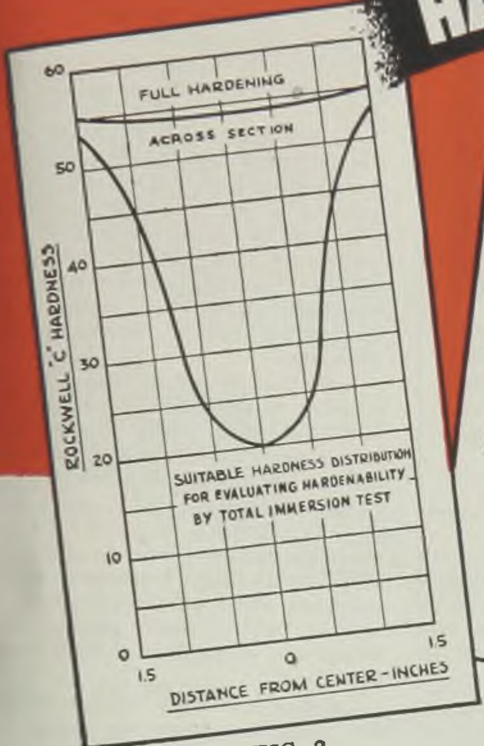


FIG. 2

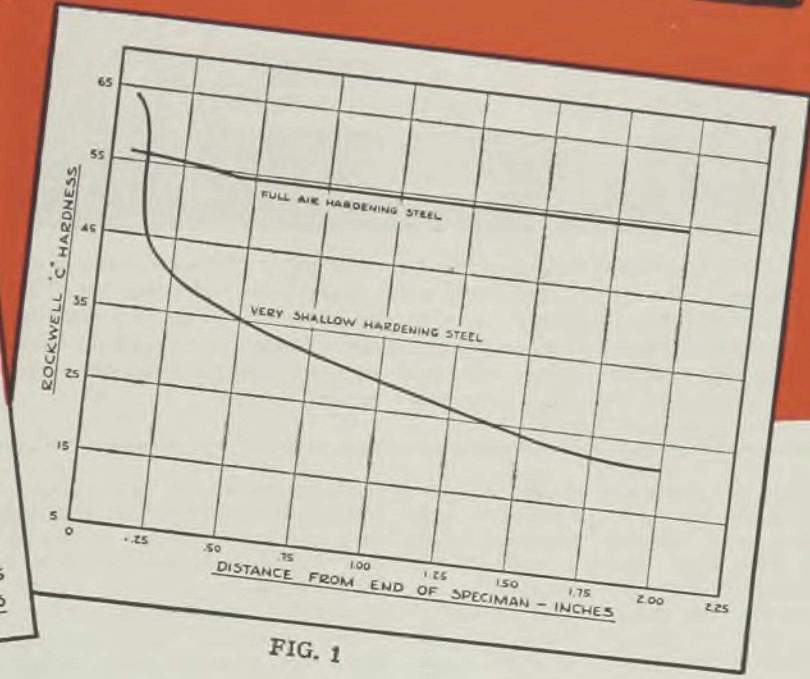


FIG. 1

Although hardenability tests are generally a valuable index of the hardness distribution of as-quenched commercial parts, there are some conditions under which these tests are inadequate.

For instance, the Jominy end-quench test is not sensitive enough for measuring small differences in the depth of hardness when the steel is air-hardening to a marked degree as in some heats of SAE 4340, or when it is extremely shallow hardening as in the case of certain high carbon steels. These conditions are shown in Figure 1.

Similar limitations apply to the total immersion test, which lacks sensitivity if used on steels that are fully hardened across the section. Best results are obtained in this method by choosing the section size and quenching conditions so that full hardening is attained on the surface without penetrating completely through the section. Examples of hardness distribution curves illustrating these points are given in Figure 2.

The interpretation of hardenability data and their application to both design and production problems has been the subject of considerable study and research by the Timken technical organization. The outstanding quality and uniformity of Timken Electric Furnace and open hearth steels are the results of similar research programs. We invite you to consult with us on your metallurgical problems.

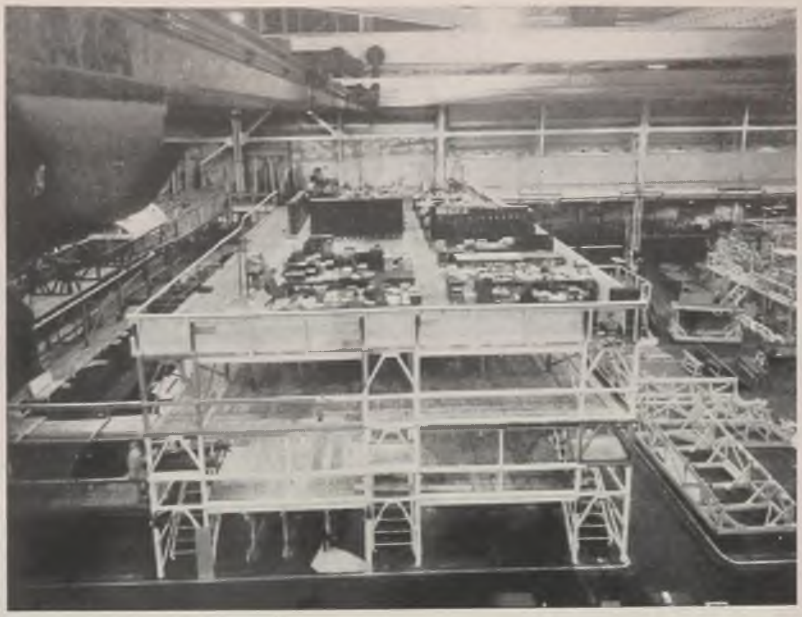
This is number 3 of a series of advertisements on hardenability published to promote a better understanding of this important subject among buyers and fabricators of alloy steels. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ALLOY STEELS

USE TIMKEN ALLOY STEELS
FOR EVERY PURPOSE
WHERE QUALITY IS IMPORTANT



SPACE CONSERVER: One of the two emergency office buildings at the Glenn L. Martin Co., Baltimore, which have been converted from PBM hull fixtures that no longer were needed as result of improved assembly methods. Created as an emergency measure to meet a critical floor space shortage, the new offices will house electrical workers and light manufacturing groups

speed, the motor first revolves counterclockwise, turning the flywheel through gears in a clockwise direction. When an 8000 r.p.m. speed is attained, the motor instantaneously reverses its direction. The motor, then revolving in a clockwise direction, builds up the speed of the flywheel to 28,000 r.p.m.

Cooling Fan Aids Airplane Climb 20 Per Cent

Latest auxiliary to be installed on certain Wright radial engines powering combat aircraft is a large cooling fan which is claimed by Wright Aeronautical Corp. engineers to permit an increase in rate of climb of as much as 20 per cent by reducing the drag of cooling air leaving the engine through cowling.

Test crews have found that an airplane moving at 150 miles per hour at 30,000 feet required 456 horsepower from each engine to overcome the cooling air drag. With the new cooling fan, this horsepower requirement is reduced to 120.

Of aluminum construction, the fan is of approximately the same diameter as that of the radial engine, and is mounted directly in front of the engine and behind the propeller. It is a multiple-blade unit, operating in a special type of housing, with vanes to direct the cooling air properly over the plane's engine cylinders.

Helldivers Equipped with More Powerful Engines

The Navy's Curtiss SB2C Helldiver dive bombers are now rolling off the mile-long assembly line at the Curtiss-Wright Corp. Airplane Division plant at Columbus, O., equipped with an even mightier engine and four-bladed propeller.

General Manager J. P. Davey of the Curtiss-Wright Columbus plant revealed that the latest models of the Helldiver are powered by an air-cooled Wright Cyclone able to turn up substantially more horsepower than the 1700-horsepower Cyclones with which earlier types were equipped. Horsepower rating of the new engine still is restricted military information.

Replacing the three-bladed Curtiss propeller which was standard on earlier Helldivers is a Curtiss Electric constant-speed, full-feathering propeller with four six-foot hollow steel blades.

Already boasting speed enough to keep up with the latest U. S. Navy fighter types, the Helldiver with its new power plant now also has a better rate of climb —a factor which will prove invaluable in combat, where quick getaway after bombs are dropped is of vital importance.

Labelled the Navy's "Sunday Punch", the Helldivers went into action last Armistice day during an assault on Jap-held Rabaul, and have teamed with the new Avenger torpedo-bombers and Hellcat and Corsair fighters in many actions since to give the fleet greater aerial striking power than any other nation.

They Say:

"We believe that we can compete favorably with government lending agencies in the matter of money rates on loans of this type (long term loans). We will make no attempt, however, to extend social or political credit. . . . In private lending you must expect to get your money back."—**A. L. M. Wiggins**, president, American Bankers Association.

• • •

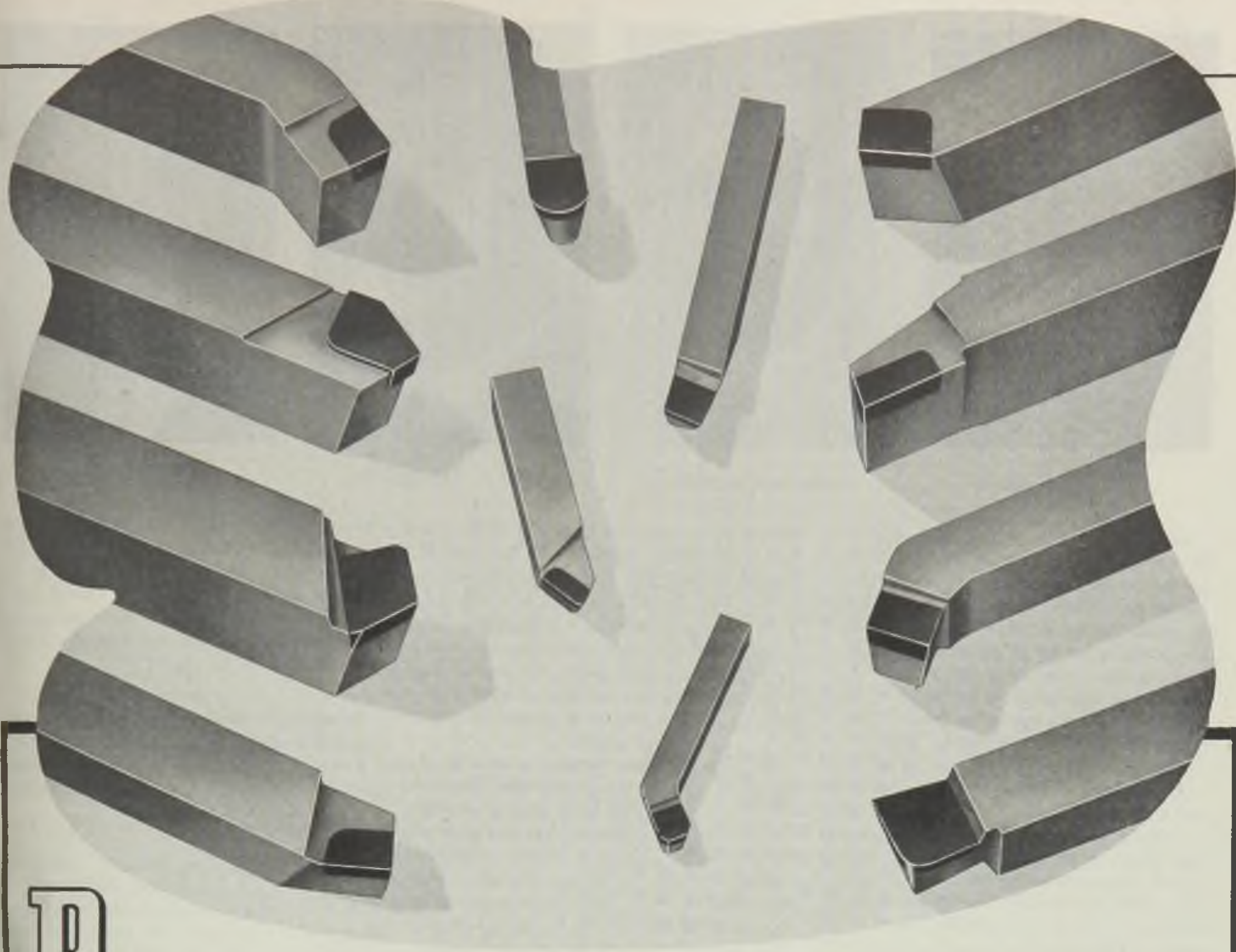
"The National Association of Manufacturers is opposed to national service legislation because it believes that compulsion of labor would be disastrous to production. The confusion that would result would upset the morale of American workers and would impair the production of capable men and women now doing a good job."—**Robert M. Gaylord**, president, National Association of Manufacturers.

• • •

"If manpower is available we shall be able to harness to consumers' durable goods or service equipment the metalworking capacity that by the year's end is scheduled to be unhitched from ground-army munitions contracts. If labor is not available, in the sense that the employes of closed-down plants are vitally needed for other war work in the same or different localities or even if they are needed for other non-military work judged to be more important, the shuttered plants will stay closed down."—**Stacy May**, director, Bureau of Planning and Statistics, WPB.

• • •

"Present indications point to automobile prices approximately 25 per cent higher after the war than when production stopped in 1942. . . . If Washington gives the go-ahead, Packard can build some cars along with its continued war manufacturing. We can start producing cars about four months after we get the green light, providing materials are made available."—**George T. Christopher**, president, Packard Motor Car Co.



Prompt, Economical Service On All Types Of "MADE TO ORDER" Single Point Carboloy Tools

Complete facilities are available at Carboloy to fill your exact requirements for all types of "made-to-order" single point Carboloy tools. Designed for maximum tool economy and operating efficiency, "made-to-order" Carboloy tools are supplied finished ground ready for the job, or "milled and brazed" (you grind).

Most users specify low cost *STANDARD* Carboloy Tools for 60% to 80% of their machining applications—and use "made-to-order" tools principally where large quantities of special styles are required or where shapes cannot be adapted from "standards" by rapid grinding.

Whether your carbide requirements cover "standards" or "made-to-order",—or *both*, specify "Carboloy" for prompt, economical service.

Send for New Catalog . . . GT 175

CARBOLOY COMPANY, INC.
11141 E. 8 MILE BLVD., DETROIT 32, MICHIGAN
Birmingham • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle • Thomaston, Conn.

CARBOLOY

TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES ★ ★ ★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

JAMES H. MARKS

WILLIAM KERBER

FRED H. HAGGERSON

NORMAN F. SMITH

James H. Marks, active with Packard Motor Car Co., Detroit, for 28 years, has been named executive vice president. He started with the company in 1916 as plant engineer. In 1919 he entered the manufacturing division, a year later heading the twin-six production. Mr. Marks was appointed industrial engineer in 1922, purchasing manager in 1925, and a vice president in 1940.

—o—

E. F. Judge, formerly vice president and treasurer, Scullin Steel Co., St. Louis, has been elected president, succeeding **Col. Harry Scullin**, who has been elected board chairman after 46 years as president. **W. H. Chickey**, formerly secretary, has been named vice president and controller, **William J. Monahan** becomes secretary and treasurer, and **Edwin L. Kaiser**, previously cashier, succeeds Mr. Monahan as assistant secretary and assistant treasurer.

—o—

Deane C. Crawford has been appointed general sales manager of the full finished cap screw department, Cleveland Cap Screw Co., Cleveland, **William C. Cooke** has been named sales manager of the Aeronautical and Alloy Steel division, and **A. G. Thomas** is general purchasing agent.

—o—

J. A. Drain Jr. has been elected vice president in charge of product engineering, research and development, Sullivan Machinery Co., Michigan City, Ind. Mr. Drain was formerly assistant to the president, and prior to joining the company was president of Stefco Steel Co., Michigan City. **O. J. Neslage**, previously general sales manager of Sullivan Machinery Co., has been elected vice president in charge of sales in the United States and Mexico.

—o—

Henry N. Wheeler has been appointed sales manager, Hartford Electric Steel Corp. and Roxbury Steel Casting Co., Hartford, Conn.

—o—

J. B. Montgomery Jr., previously executive vice president of Empire Steel Corp., Mansfield, O., has been elected president, to succeed **James M. Hill**, who becomes board chairman. **Samuel E. Magid**, associated with Hill, Thompson & Co. Inc., New York, has been elected a director. **Clarence F. Beddard**, formerly assistant sales manager, has been appointed general sales manager, and **George L. Gaalaas** has been named manager of sales of electrical sheets.

—o—

William Kerber, deputy assistant director of the Steel Division, WPB, and chief of the WPB Raw Materials and Plant Facilities Division, has resigned to rejoin Hanna Furnace Corp., Buffalo. Before joining WPB in August, 1941, Mr. Kerber was eastern district sales manager for the Hanna Furnace Corp.

—o—

Fred H. Haggerson, vice president and director, Union Carbide & Carbon Corp., New York, has been elected president, to succeed **Benjamin O'Shea**, who becomes board chairman. **Ralph R. Browning** and **Paul P. Huffard**, vice presidents of the corporation, and **Homer A. Holt**, an attorney and former governor of West Virginia, have been elected to the board of directors.

—o—

Harold Brayman has been appointed director of the public relations department, E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., succeeding the late Theodore G. Joslin, who died April 12. Before joining the company two years ago as assistant director of the public relations department, Mr. Brayman was a Washington correspondent and columnist.

—o—

C. P. **Ross**, formerly assistant secretary and assistant treasurer, Waukesha Motor Co., Waukesha, Wis., has been elected treasurer of the company, to succeed the late Edward R. Estberg, and **L. W. Youker** has been named assistant treasurer.

—o—

Joseph F. Gaffney has been appointed manager of H. K. Porter Co.'s new service and engineering office in the Alliance Bank building, Rochester, N. Y. **R. W. Steves** heads a similar office in Carew Tower, Cincinnati. **W. T. Campbell** has been appointed manager for the Philadelphia district office, and **J. L. Cunningham** has been named field service engineer for northern New Jersey for the Chemical Process and Quimby Pump divisions of H. K. Porter Co.

—o—

Norman F. Smith, vice president and general manager of the Osborn Mfg. Co., Cleveland, has been re-elected president of the American Brush Manufacturers' Association.

—o—

W. G. Gray has become associated with Pittsburgh Steel Co., Pittsburgh, as railway development engineer, with headquarters in Chicago. Mr. Gray had been master mechanic for the Virginian railway for the past three years.

—o—

Lloyd E. Tracy has been appointed general manager of sales, Oil Well Supply Co., Dallas, Tex., subsidiary of United States Steel Corp. Mr. Tracy will be assisted by **F. D. Smith** and **A. C. Michaelis**. **R. R. McAfee** succeeds Mr. Smith as manager of the Eastern division, and **K. B. Winstead** succeeds Mr. Tracy

CECIL W. ARMSTRONG

Who has been named chief development engineer, Plastics division, Continental Can Co. Inc., New York, as announced in STEEL, April 24, p. 86.

CHARLES L. TURNER

BURTON T. SWEELY

ALBERT P. LEONARD

WALLACE JOHNSON

as manager of the Midwest division. **L. L. Mitchell** has been appointed assistant treasurer of the company and is succeeded as manager of the California division by **Warner F. Parker. M. D. Routzon** has been made assistant manager of the used equipment and merchandise claims departments. District manager appointments include: **Harold Wright**, Ohio district; **C. L. Benezette**, Michigan district, and **C. A. Bell**, Gulf Coast district.

—o—

Charles L. Turner, since 1939 controller for Buffalo Bolt Co., North Tonawanda, N. Y., has been named vice president in charge of sales.

—o—

Burton T. Sweely, formerly director of research, has been elected vice president in charge of research, Chicago Vitreous Enamel Product Co., Cicero, Ill. Mr. Sweely is a charter fellow and member since 1916 of the American Ceramic Society.

—o—

C. Homer Butts, president, Niles Rolling Mill Co., Niles, O., has been elected a vice president of Sharon Steel Corp., Sharon, Pa. **George E. Whitlock**, president of Mullins Mfg. Co. of Warren and Salem, O., has been elected a director of Sharon Steel Corp., to succeed the late W. G. Kranz. **G. Roy Johnston,** formerly assistant secretary and assistant treasurer of Sharon Steel, has been named comptroller, and **K. O. Swanson** is auditor.

—o—

Walter G. Schwartz has been made an active partner in the Christensen Diamond Tool Co., Detroit. For the past ten years, Mr. Schwartz has been associated with J. K. Smit & Sons, importers and manufacturers of diamond cutting tools.

—o—

T. M. Price, formerly works manager, Kaiser Co. Inc., Fontana, Calif., has been named vice president in charge of operations of the Iron and Steel division with headquarters in Oakland, Calif. **Frank Backman** remains general superintendent of the Fontana plant, in complete charge of the Fontana and Vulcan operations, and **Tom Hart** has been named assistant general superintendent. **George Vrieland,** chief consulting engineer, moves his headquarters to Oakland, and **J. W. Thompson** has been appointed to fill Mr. Hart's former position as superintendent of the Coke and By-products division.

—o—

Albert P. Leonard has been appointed manager of the New York office, Farrel-Birmingham Co. Inc., Ansonia, Conn., to succeed **Edward S. Coe Jr.**, who has been transferred to the main office at Ansonia as assistant to the plant manager. The company is moving its New York office from 79 Wall street to 3700 Chrysler building.

—o—

Thomas Gallagher, assistant treasurer and manager, Handy & Harman of Canada Ltd., has been elected a director.

—o—

N. H. Brodell, formerly metallurgical sales engineer for Copperweld Steel Co., Warren, O., has been appointed Cleveland district manager.

—o—

Richard W. Wenzel, formerly affiliated with the Truck & Coach division and Fisher Body division of General Motors Corp., Detroit, has been appointed plant manager, Wilson Foundry & Machine Co., Pontiac, Mich.

—o—

Frederick A. Stevenson, president, and **John E. Rovensky,** chairman of the executive committee, American Car & Foundry Co., New York, have been elected directors of American Car & Foundry Export Co., and Mr. Rovensky was elected a member of the executive committee.

—o—

Essington Lewis, director-general of munitions and director-general of aircraft production for Australia, has been awarded the Bessemer Gold Medal for 1944 of the British Iron and Steel Institute in recognition of his outstanding services to the iron and steel industries of Australia. Mr. Lewis is chief general manager of Broken Hill Proprietary Co. Ltd., and is managing director of Australian Iron & Steel Ltd., and is a director of various other companies. **Lieut. Col. Sir John Greenly,** until recently president of the British Institute of Metals, has accepted an invitation to become an honorary vice president of the Iron and Steel Institute.

—o—

Wallace Johnson, for the past year assistant general manager, Pomona Pump division of the Joshua Hendy Iron Works, Sunnyvale, Calif., has been appointed general sales manager for the company. **Morris Levit** is head of sales for the Joshua Hendy division, **C. L. Barrett** is sales manager at Pomona division, and **L. T. Warner** is manager of sales for the Crocker-Wheeler division.

—o—

Leonard C. Truesdell, formerly with Frigidaire division of General Motors Corp., in Dayton, O., has been appointed assistant commercial manager, Manufacturing division, Crosley Corp., Cincinnati.

—o—

Sidney D. Kirkpatrick, editor of *Chemical & Metallurgical Engineering,* has been elected president of the Electrochemical Society Inc. Mr. Kirkpatrick is a past president of the American Institute of Chemical Engineers.

—o—

Frank G. Kennedy, Simplex Wire & Cable Co., Cambridge, Mass., has been elected vice president, New England Purchasing Agents Association, and **Harold V. Chisholm,** Walworth Co., Boston, has been elected a director for two years.

—o—

Louis M. Brown, for the past two years counsel for Reconstruction Finance Corp., assigned to Defense Plant Corp., has resigned to engage in law practice as an associate of Pacht, Pelton, Warne, Ross & Bernhard, Los Angeles.

—o—

James Tate, formerly director of industrial and marketing research, Dumore Co., Racine, Wis., has been named director of marketing. Prior to joining the Dumore Co. a year ago, Mr. Tate was vice president and general sales manager of Delta Mfg. Co., Milwaukee.

—o—

George C. Gordon, president, Park Drop Forge Co., Cleveland, and **George Gund**, president of the Cleveland Trust Co., have been elected directors of Hercules Motors Corp., Canton, O.

—o—

Donald W. Graham has been appointed St. Louis district sales manager, Pennsylvania Salt Mfg. Co., Philadelphia, succeeding **Michael B. Dwyer**, who is retiring after 58 years with the company.

—o—

A. J. Tigges has been appointed manager of consulting engineering for all divisions and subsidiaries of Baldwin Locomotive Works, Philadelphia. Since 1923 Mr. Tigges was associated with the engineering firm of Jackson and Moreland, Boston.

—o—

Chris F. Tonne, formerly advertising and sales promotion manager, Hough Shade Corp., Janesville, Wis., has joined All-Steel-Equip Co., Aurora, Ill., as advertising manager.

—o—

F. H. Frankland, director of engineering for the American Institute of Steel Construction, has resigned to engage in private practice as a consulting engineer, with offices at 271 Madison avenue, New York.

—o—

George Russell has been appointed assistant treasurer of General Motors Corp., Detroit, and **Roy E. Hammond** has been named assistant comptroller.

—o—

F. H. Herndon has been appointed manager of the Coal Stoker division, Link-Belt Co., Chicago, and **K. C. Ellsworth** has been named sales manager of the Stoker division.

—o—

F. C. Margolf has been appointed manager, Home Laundry Equipment Sales division, Edison General Electric Appliance Co., Chicago.

—o—

Anthony A. Aponick has been appointed service engineer in the Buffalo territory for Park Chemical Co., Detroit. For the past nine years Mr. Aponick has been associated with Brown Instrument Co., Philadelphia.

OBITUARIES . . .

E. A. Hagerman, 58, general manager and a director, Worth Steel Co., Claymont, Del., died April 23 in West Chester, Pa. Mr. Hagerman, a member of the American Iron and Steel Institute, had been affiliated with the company for 21 years and prior to that had been associated with Midvale Steel & Ordnance Co., Coatesville, Pa.

—o—

Charles F. Burroughs, 71, president, Burroughs Engineering Co., Newark, N. J., and a pioneer in the plastics industry, died April 21 in Maplewood, N. J. Mr. Burroughs, whose father founded the company, went to work for the organization in 1889.

—o—

J. A. Evans, president of the Ellwood City Forge Co., Ellwood City, Pa., died April 9.

—o—

David J. Carson, 75, retired owner of the Carson Foundry & Mfg. Co., Tecumseh, Mich., died in Grand Rapids, Mich., April 16. Mr. Carson was at one time manager of the American Malleables Co., Lancaster, N. Y. He purchased the Acme Steel & Malleable Iron Co., Buffalo, in 1915 and served as president and general manager of that company until he sold his interests in 1925. For about eight years prior to becoming president and treasurer of Carson Foundry & Mfg. Co. Mr. Carson served as vice president and general manager of the H. Brewer & Co., Tecumseh.

—o—

Alfred B. Bower, 83, who before his retirement in 1943 had been affiliated with Lamson & Sessions Co., Cleveland, and with one of its predecessor companies for more than 65 years, died recently in Cleveland. Mr. Bower began working as a boy of 17 with the old Lake Erie Bolt & Nut Co. and in May, 1939, when he was vice president of that organization he was honored by Cleveland industrialists as the man who had the longest period of service with any Cleveland industry. The Lake Erie Bolt & Nut Co. was later absorbed by Lamson & Sessions Co. and Mr. Bower was put in charge of the foreign sales department.

—o—

Gustave Benjamin, 83, who founded the Benjamin Iron & Steel Co., Buffalo, in 1890, and served as its president until the concern went out of business in 1939, died recently in Buffalo.

—o—

Thomas J. Sturtevant, president, Sturtevant Mill Co., Boston, died there April 20. A native of Framingham, Mass., and a graduate of Massachusetts Institute of Technology in 1890, Mr. Sturtevant had spent his entire engineering career with the Sturtevant Mills Co.

—o—

Walter S. Saunders, 55, president and general manager, American Forging & Socket Co., Pontiac, Mich., died April 22 at his winter home in Hollywood, Fla. Mr. Saunders was one of the organizers of the company and had been associated with it for 29 years. He held numerous patents on storage battery installations, motor heat indicators and other automotive devices.

—o—

Clement O. Miniger, 69, chairman of the board of Electric Auto-Lite Co., Toledo, O., died April 23 in Toledo. Mr. Miniger organized Electric Auto-Lite Co. in 1911 and served as president and general manager until 1937 when he became board chairman. He was vice president in charge of production of Willys-Overland Motors Inc., Toledo, during World War I.

—o—

Lloyd W. Coale, 56, factory manager, Austin Western Mfg. Co., Aurora, Ill., died April 22 in Naperville, Ill.

—o—

Frank J. Cunneen, 53, Washington representative of Cochrane Corp., Philadelphia, Nordberg Mfg. Co., Milwaukee, and LeRoi Engine Co., Milwaukee, died in Washington recently. During World War I Mr. Cunneen was an officer in the United States Navy on submarine duty. He was a member of the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers.

—o—

William R. Faithful, former open hearth superintendent of Central Iron & Steel Co., Harrisburg, Pa., died April 14. Mr. Faithful also had been associated with the engineering department of the Pennsylvania Engineering Works, New Castle, Pa., and with the open hearth department of the Illinois Steel Co., Gary, Ind.

—o—

Robert C. Sandman, 39, manager of the mechanical research and testing department, Addressograph - Multigraph Corp., Cleveland, and associated with that company for more than 20 years, died April 25 in Boston.

—o—

Jules A. Endweiss, 61, controller, Kennecott Copper Corp., New York, died April 20 at Saranac Lake, N. Y. As a young man Mr. Endweiss went to Mexico to engage in mining and remained there 30 years. Other positions Mr. Endweiss held were: Controller of the Braden Copper Co., subsidiary of the Kennecott corporation; treasurer, Kennecott Sales Corp., and controller and a director of Mines Products Corp.

—o—

John C. Markley, 52, chief engineer of the Marine and Navy division, Babcock & Wilcox Co., New York, died April 18 in Barberton, O. Mr. Markley had been identified with the company for the past 25 years.

—o—

John N. McElravey, 47, superintendent of open-hearth furnaces of the Carnegie-Illinois Steel Corp., Pittsburgh, died recently.

—o—

Joseph Daly, 62, metal parts manufacturer, died in Fond du Lac, Wis., April 16.

—o—

William D. Jamison, 39, executive in the personnel department of the Newark, N. J., plant of Joshua Hendy Iron Works, died April 18 in Orange, N. J.

Open Hearth and Blast Furnace Groups Set Attendance Record

Interest in operating problems intensified by need for more and better steel for war in the face of manpower and materials shortages. Chicago to be host at 1945 conference of mining and metallurgical engineers

INCREASED interest in operating problems, accentuated by the necessity for producing more and better steel for war purposes under difficulties of manpower and materials shortages, was reflected at this year's meeting of the National Open Hearth and Blast Furnace and Raw Materials Conference of the American Institute of Mining and Metallurgical Engineers, William Penn hotel, Pittsburgh, April 20-21.

Registration at the meeting totaled 1085 to establish a new record and eclipse the previous high of 835 recorded a year ago. The 1945 meeting will be held in the Palmer House, Chicago, April 25-26, with E. L. Ramsey, superintendent of the steel and blooming mill departments, Wisconsin Steel Division, International Harvester Co., as chairman of the committee on arrangements.

The McCune award went to J. W. Hailey and G. M. Plimpton Jr., Inland Steel Co., Indiana Harbor, Ind., for their paper on "Segregation of Rimming Steel." Second place winners were W. O. Philbrook and J. H. Jolly, Wisconsin Steel Division, International Harvester Co., for their paper on "Survey of Slag Control Methods."

Some of the highlights brought out at sessions of the basic open hearth group (See also STEEL, April 24, p. 68) were:

Frontwalls laid up with basic brick at an open hearth in the Chicago district showed a campaign of 90 to 100 heats before repairs were necessary; replacement with silica brick made it possible to obtain 55 to 60 additional heats.

During the rebuilding of 30 furnaces in a Pittsburgh plant, the use of a tractor and loader made possible a reduction of 6 to 7 per cent of the maintenance crew. At the same plant, a tractor unit is employed to load manganese and spiegel and replaces a 10 to 12-man crew.

A vacuum cleaner with a suction of 18 inches water gage is being used in furnace cleanouts. The cleanout on one furnace was accomplished in 80 man-hours with this system, compared with 600 man-hours using conventional methods.

Discussion of the use of briquettes in the open hearth brought out the fact that by briquetting roll scale in a cement block machine and using it in this form rather than loose reduces the time of the heat from 15 to 20 minutes.

Aluminum dross as a substitute for fluorspar affords no advantage. One operator experimenting with salt as a fluorspar substitute found that evaporated salt passed off in fumes, coating the furnace on the outgoing end. Cattle salt fumes off as fast as evaporated. No. 2 rock salt gave slightly better results. Recommended practice was the use of 75 per cent fluorspar and 25 per cent salt.

Wartime pressure for open-hearth tonnage has caused the life of furnaces to decrease in some cases from 2 to 3 per cent. At some plants where operators were obliged to go from high scrap charges to high metal practice the consumption of refractories has increased. Other difficulties result from a lower grade of scrap, increased amount of turnings used, lower quality of fuel oil, and inexperienced furnace crews.

Program Announced for General Meeting of Steel Institute

ATTENDANCE at sessions of the 53rd general meeting of the American Iron and Steel Institute, to be held at the Waldorf-Astoria, New York, May 25, will be restricted to individual members of the institute. Because of the war, the banquet will be omitted from this year's meeting.

The program includes a general session, starting at 10 a. m., luncheon at 12:45 p. m., and a technical session starting at 2:15 p. m.

The general session will include the address of the president, Walter S. Tower; an address by Leo Wolman, professor of economics, Columbia University; five-minute talks by representative members of the industry.

H. G. Batcheller, president, Allegheny Ludlum Steel Corp., will preside at the technical session. The following papers will be read in abstract for discussion:

"Development of Special Steels for Ordnance Purposes," Col. John H. Frye, office of the Chief of Ordnance, War Department.

"Development of Special Steels for Naval Uses," Lieut. Comm. R. A. O'Brien, Research and Standards Branch, Bureau of Ships, Navy Department.

"Stresses in Welded Structures," H. C. Boardman, director of research, Chicago Bridge & Iron Co.

"The Weldability of Steel," Prof. Wendell F. Hess, Rensselaer Polytechnic Institute.

"Problems Involved in Determining Hardenability Limits for Alloy Steels," Wilbur Bischoff, metallurgical engineer, Timken Steel & Tube Division, Timken Roller Bearing Co.

"Electrometallurgical Treatment of Ores," Charles Hart, president, Delaware River Steel Co.

"Accident Prevention," W. A. Irvin, chairman, board of trustees, National Safety Council.

Steel Distributors To Consider War Problems at Chicago Convention

MEMBERS of the American Steel Warehouse Association Inc., attending the thirty-fifth annual meeting of the association at the Drake hotel, Chicago, May 9 and 10, will concentrate upon problems directly related to the war program.

The current steel situation will be reviewed by Norman W. Foy, director, Steel Division, War Production Board. J. R. Stuart, chief of the Warehouse Branch, WPB, will outline some of the fundamental objectives of M-21-b-1 and CMP Reg. No. 4 which control the acquisition and resale of steel by warehouse distributors. Problems of establishing and enforcing maximum ceiling prices on steel obtained from surplus and excess stocks will be discussed by Everett L. Wyman, head of the Warehouse and Jobbers section, Iron and Steel Price Branch, Office of Price Administration.

Walter S. Doxsey, president of the association, will summarize achievements of the association during the preceding year as well as near-future objectives.

An insight into postwar conditions to be faced by steel distributors will be given by Herman W. Steinkraus, president, Bridgeport Brass Co., and by R. E. Zimmerman, vice president in charge of research, United States Steel Corp.

On May 10, Mr. Stuart and Mr. Wyman will hold a series of ten-minute conferences with individual members of the industry.

Meetings, preceded by luncheons, will be held during the afternoons of the two days. At the dinner on the evening of May 9, members and guests will hear Gen. Henry J. Reilly talk on "America's Strategy in the War."

48-Hour Week In Steel Saves 47,300 Men

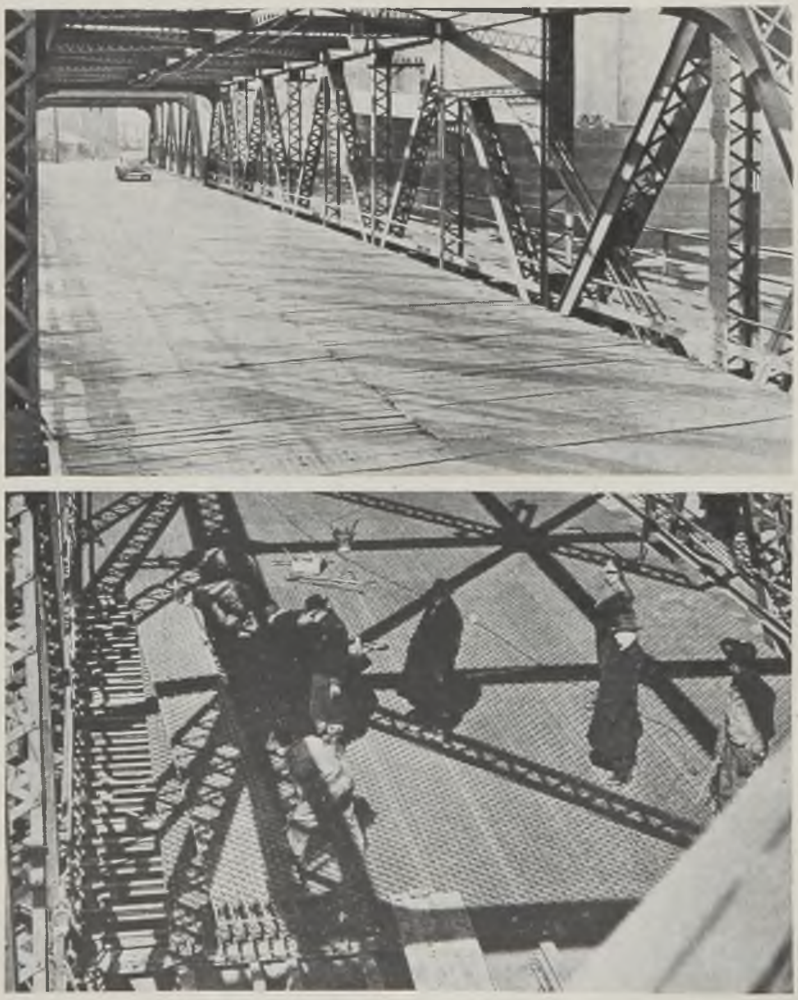
Average hours worked have increased 3.1 since War Manpower Commission's order was issued

THE 48-hour week in the iron and steel industry has saved 47,300 men for other industries and the armed services, according to Paul V. McNutt, chairman of the War Manpower Commission. The longer work-week was ordered by the WMC May 1, 1943, and the saving in manpower was accomplished in a period in which steel production topped all previous records that were established.

In the month before the order was issued the average hours a week individuals worked was 43.5. A review of the industry's experience in operating under the orders shows that by the end of the year the average work week had increased to 46.6 hours, Mr. McNutt said. This, he explained, was equivalent to a scheduled work week of more than 48 hours, since the absence of some workers must be taken into account.

Employment in 282 firms, accounting for 95 per cent of the workers in all 400 of the establishments covered by the order, declined, the survey shows, from 690,900 in March, 1943, to 665,200 in January, 1944.

The study of the industry's experience shows, Mr. McNutt said, that only a handful of workers were laid off as a result of the order and that the reduction in employment was accomplished without hampering production. He added that if establishments with 665,200 employes working an average of 46.6 hours a week in December had still been working only 43.5 hours a week, they would have required 712,500 employes to maintain the rate of production achieved.



RECONDITIONED: The Ohio Street bridge at Buffalo had a wood plank flooring a few weeks ago (see photo above) which was beginning to show the effects of wear. City engineers had it refloored with open steel mesh decking, produced by the Irving Subway Grating Co., New York, and it now has the appearance of a new bridge (lower view)

BRIEFS . . .

Lukens Steel Co., Coatesville, Pa., recently congratulated one of its employes, Samuel H. Forbes, for completing 60 years of employment without a lost-time accident.

—o—

Savory Inc., Buffalo, has opened negotiations to purchase the Lisk Mfg. Co. Ltd., Canandaigua, N. Y., which produces a similar line of containers.

—o—

Hole Engineering Service, Detroit, has moved to enlarged quarters at 13722 Linwood avenue.

—o—

Lovejoy Tool Co. Inc., Springfield, Vt., recently appointed two new sales representatives. They are Walter F. Greene, Indianapolis, and Don Hall Tool Co., Chicago.

—o—

Allis-Chalmers Mfg. Co., Milwaukee. reports that new scale models of unit substation equipment will soon help executives and plant engineers work out perplexing power distribution problems right on their desks.

—o—

Cook Electric Co., Chicago, has made available the services of experts in specialized bellows applications through its new Metalastics division.

—o—

International Products Corp., Baltimore, reports the development of an inorganic material designed for insulating purposes in the field of electronics in high frequency requirements.

—o—

Crosley Corp., Cincinnati, announces appointment of Schwander Appliance Co., St. Louis, Mo., as distributor for its products in St. Louis and surrounding territory.

—o—

Goodyear Tire & Rubber Co., Akron, O., has developed a new type of hose for carrying away welding fumes in the hulls of vessels undergoing construction.

—o—

Fort Pitt Bridge Works, Pittsburgh, has greatly expanded its pressed plate production facilities by addition of a huge 36-foot hydraulic press, described in a new bulletin just published.

—o—

Department of Interior, Washington, has prepared a short report on some chromite occurrences in central Baranof island, a nickel prospect at Silver Bay and the results of a magnetometer survey of a chromite body at Red Bluff Bay, Alaska.

—o—

Irving Subway Grating Co., Long Island, N. Y., has appointed the following sales representatives: H. W. Stovall, Richmond, Va.; General Marine &

BACK FOR REPAIRS: Amphibian tractors, damaged in the Tarawa invasion, return to a naval landing force equipment depot at Albany, Calif., for rehabilitation. These marine-manned vehicles were in the van of the assault on the Japanese atoll, suffered heavy punishment from machine gun and cannon fire. NEA photo

Big Magnesium Extrusion Plant In Operation

DPC plant at Baltimore, operated by Revere Copper & Brass Inc., fitted with latest equipment

IN A NEW $6,000,000 DPC plant at Baltimore, to which a $1,000,000 addition is already being added, Revere Copper & Brass Inc. is now operating one of the largest magnesium extrusion plants in the country.

At the extrusion plant, the company is preparing one of the largest shops in the world for the production of magnesium in the form of sheets, strip, extruded tubes, rods, and shapes for a wide variety of uses. The equipment in the plant, which is housed in an area covering several acres, is of very latest design.

Rounding out the production activities of the company's Magnesium and Aluminum division are its facilities for rolling magnesium sheet and strip, located in its mill at Canton, O.

Supply Co., Charleston, S. C.; Illingworth Engineering Co., Jacksonville, Fla.; Leo Magnus, Memphis, Tenn., and Rittelmeyer & Co., Atlanta, Ga.

—o—

Mack Trucks Inc., New York, reports its employes purchased $1,650,000 of War Bonds during 1943. Approximately 2900 employes entered the armed forces last year.

—o—

Farrel-Birmingham Co. Inc., Ansonia, Conn., has released an eight-page bulletin describing its couplings.

—o—

Elwell-Parker Electric Co., Cleveland, has reissued its instruction manual regarding the training of women in the form of a pocket size booklet.

—o—

General Electric Co., Schenectady, N. Y., received orders totaling $391,901,000 during the first quarter of 1944, compared to $422,047,000 for the corresponding period of 1943.

—o—

Allen Corp., Detroit, has available for distribution eight new pieces of literature describing some of its ventilating equipment.

—o—

Rome Mfg. Co., Rome, N. Y., recently opened a sales office in the New York Central building, New York, to better serve its metropolitan customers.

—o—

Drake Supply Co., Los Angeles, announces change of name to Drake Steel Supply Co.

AWARDS . . . .

Additional war plants honored with Army-Navy-Maritime emblems for outstanding achievement in the production of war materials

Artos Engineering Co., Milwaukee.
Bead Chain Mfg. Co., Bridgeport, Conn.
Cheney Bigelow Wire Works, Springfield, Mass.
Crown Products Corp., Philadelphia.
M. M. Davis & Sons Inc., Solomons, Md.
Fafnir Bearing Co., Holland, Mich.
Firestone Tire & Rubber Co., Nebraska Ordnance Corp., Fremont, Nebr.
M. P. Heinze Machine Co., Chicago.
Hemphill Co., Pawtucket, R. I.
Industrial Brownhoist Corp., Bay City, Mich.
Radio Corp. of America, Lancaster, Pa.
Spicer Mfg. Co., Hillsdale Steel Products, Hillsdale, Mich.
Superior Tube Co., Norristown, Pa.
Worthington Pump & Machinery Corp., Worthington-Gamon Meter Co., Newark, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., plants at East Pittsburgh, Trafford, Derry, and Lawrenceville, Pa., awarded third star.
American Bridge Co., Gary, Ind.
American Car & Foundry Co., Wilmington, Del., shipyard, awarded fourth renewal.
Askania Regulator Co., Chicago, receives first star.
Atwood Vacuum Machine Co., Auburn, Ind.
Auburn Mfg. Co., Auburn, Ind.
Balloffet Dies & Nozzle Co., Guttenberg, N. J.
Bendix Aviation Corp., Scintilla Magneto division, Sidney, N. Y.
Electric Sprayit Co., Sheboygan, Wis.
Evans Products Co., Detroit.
Ford Motor Co., Ypsilanti, Mich.
Ithaca Gun Co., Ithaca, N. Y.
Lion Oil Refining Co., El Dorado, Ark.
Littlefuse Inc., Chicago.
Machine Metals Co., West Conshohocken, Pa.
National Union Radio Corp., Lansdale, Pa.
Ray-O-Vac Co., Clinton, Mass.
Blake Mfg. Co., Clinton, Mass.
Remington Rand Inc., Syracuse, N. Y.
Smith Devices, Philadelphia.
Sparling Bros. Machine Co., New Bedford, Mass.
Reed Products division, Standard Products Co., Cleveland.
Western Electric Inc., Chicago.
Metals Refining Co. division, Glidden Co., Hammond, Ind.
American Type Founders Inc., Fitchburg, Mass.
Fargo Mfg. Co., Poughkeepsie, N. Y.
Gilman Engineering Works, Janesville, Wis.
High Standard Mfg. Corp., Hamden, Conn.
Moore Enameling & Mfg. Co., West Lafayette, O.
Morse Instrument Co., Hudson, O.
O'Keefe & Merritt Co., Los Angeles.
Sillcocks-Miller Co., South Orange, N. J.
Sturgeon Bay Boat Works, Sturgeon Bay, Wis.
Sturgeon Bay Shipbuilding & Dry Dock Co., Sturgeon Bay, Wis.
Tampa Marine Corp., Tampa, Fla.
Lodge & Shipley Machine Tool Co., Cincinnati, adds fourth star.
American Car & Foundry Co., Wilmington shipyard, Wilmington, Del., adds fourth star.
Soule Steel Co., Los Angeles.
Aro Equipment Corp., Cleveland, adds white star.
Detroit Gasket & Mfg. Co., Marine City, Mich., plant.
Briggs Clarifier Co., Washington, adds star.
American Bridge Co., Gary, Ind.
Heine Boiler division, Combustion Engineering Co. Inc., St. Louis, Mo., receives "M" pennant.

Greater Efficiency Fails To Offset Labor Shortages

INDUSTRIAL activity is well sustained at near peak levels, bolstered by a steady influx of war orders resulting from expanding military needs. War costs continue to increase, with outlays for the first half of April about 5 per cent over comparable March period.

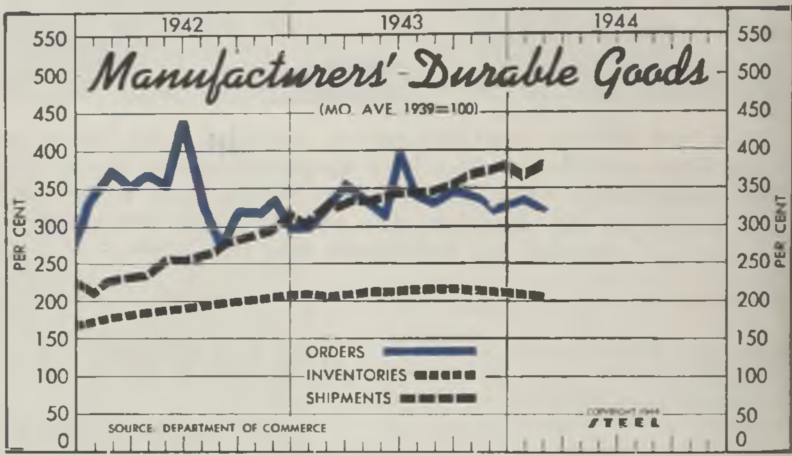
Labor shortages are still hampering output in many instances, although the work week has been extended and production per worker substantially increased.

Upturn in military requirements is reflected in the further extension of deliveries on many steel products, while the steel industry's operations continue at practical capacity. During the latest period gains were recorded in electric power consumption, petroleum production, engineering construction awards and revenue freight carloadings. Business failures continued to tend downward in the latest week, while bituminous coal and automobile and truck production also recorded moderate declines.

SMALL BUSINESS—Nearly 50 cents of every dollar spent by the army goes to small business establishments—defined as plants employing fewer than 500 persons—the War Department recently reported to Congress. Under Secretary of War Robert P. Patterson said that 62.8 per cent of all army contracts went to such firms in 1943, while the dollar value of $4.5 billion represented 12.6 per cent of the total value of all the War Department supply outlays. A survey made by the department indicated that 36 per cent of the money spent through contracts awarded to larger firms found its way directly or indirectly to subcontractors and suppliers in the small plant category.

FREIGHT MOVEMENT — Volume of freight traffic handled by Class I railroads totaled 62.5 billion ton-miles during March, or 2.1 per cent over the like 1943 period. For the first three months this year freight volume was 6.8 per cent over the comparable period of 1943. In an effort to maintain the carriers' rolling stock to meet the peak traffic loads and replace cars forced out of service because of complete breakdowns, etc., Class I railroads had 36,727 new freight cars on order April 1 or more than double those on order the like date a year ago. Net operating income for these carriers during February totaled $84,493,179, compared with $105,834,247 in same month a year ago.

MANUFACTURERS' SHIPMENTS—Deliveries of manufacturers' durable goods established a new record during February, the most striking gain occurring in the transportation equipment industry. However, declines were recorded in new orders and inventories during this period. The Department of Commerce index on durable goods shipments rose to 388, compared with 368 in January and 337 in February, 1943. New orders receded to an index figure of 322.6, against 331.5 in January, while the index on inventories stood at 207.9 compared with 212.0 at the close of January.



Index of Manufacturers Durable Goods

	Orders		Shipments		Inventories	
	1944	1943	1944	1943	1944	1943
January	331.5	293.5	368	208	212.0	211.3
February	322.6	326.6	388	337	207.9	209.6
March	....	349.2	...	330	....	210.7
April	....	329.8	...	338	....	213.5
May	....	313.0	...	338	....	213.5
June	....	392.7	...	343	....	212.5
July	....	338.7	...	346	....	211.4
August	....	325.0	...	354	....	213.4
September	....	339.5	...	356	....	214.9
October	....	339.5	...	371	....	214.0
November	....	316.1	...	373	....	213.3
December	....	324.2	...	380	....	212.8
Average	....	332.3	...	339	....	212.7

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	98.5	98.5	98.0	99.0
Electric Power Distributed (million kilowatt hours)	4,344	4,307	4,400	3,925
Bituminous Coal Production (daily av.—1000 tons)	1,958	2,030	2,038	1,970
Petroleum Production (daily av.—1000 bbls.)	4,425	4,432	4,385	3,581
Construction Volume (ENR—unit $1,000,000)	$51.4	$32.9	$29.4	$83.2
Automobile and Truck Output (Ward's—number units)	16,905	17,330	17,810	18,995

*Dates on request.

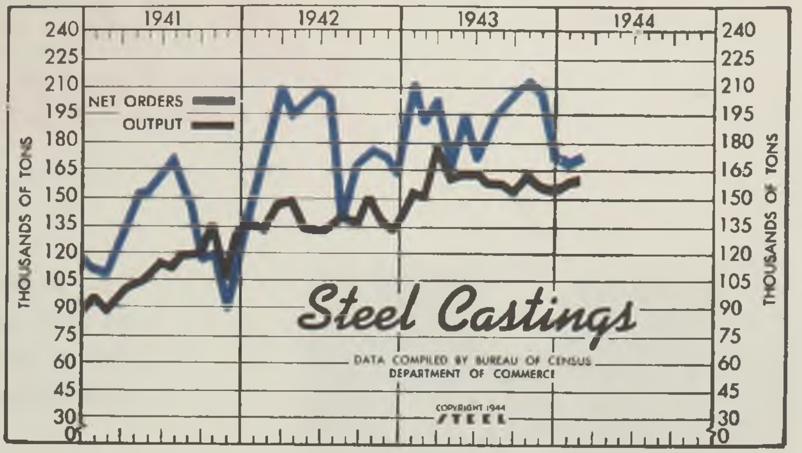
TRADE	Latest Period	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars)	810†	800	786	794
Business Failures (Dun & Bradstreet, number)	20	33	29	96
Money in Circulation (in millions of dollars)‡	$21,334	$21,295	$21,006	$16,500
Department Store Sales (change from like week a year ago)‡	+23%	+32%	+11%	+28%

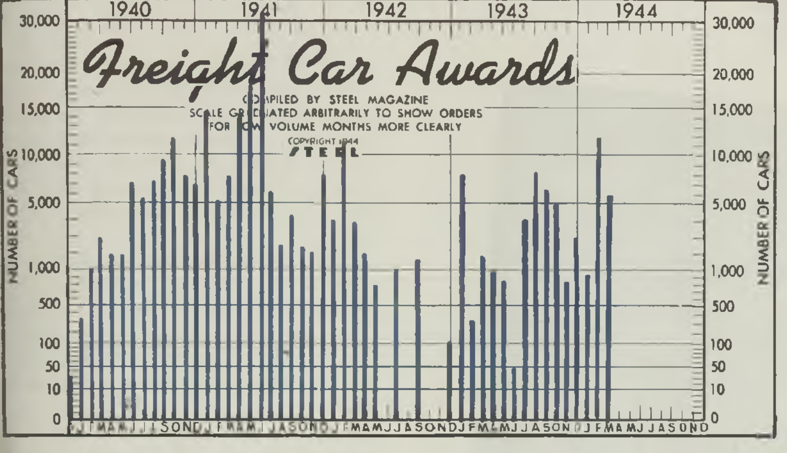
†Preliminary. ‡Federal Reserve Board.

Commercial Steel Castings

(Net tons in thousands)

	Orders 1944	Orders 1943	Production 1944	Production 1943
Jan.	167.7	213.1	159.8	154.7
Feb.	173.6	191.2	161.4	151.5
Mar.	.....	202.7	.....	176.5
Apr.	.....	165.8	.....	161.4
May	.....	192.5	.....	163.8
June	.....	171.7	.....	163.9
July	.....	187.2	.....	158.7
Aug.	.....	200.8	.....	158.8
Sept.	.....	214.1	.....	157.8
Oct.	.....	211.3	.....	163.9
Nov.	.....	209.3	.....	158.8
Dec.	.....	173.6	.....	158.6
Total	.....	2,333.4	.....	1,928.6





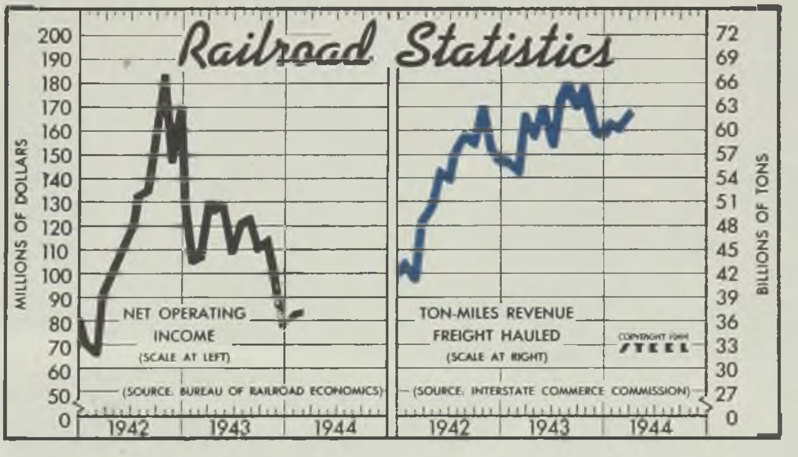
Freight Car Awards

	1944	1943*	1942	1941
Jan.	920	8,365	4,253	15,169
Feb.	12,340	350	11,725	5,508
March	6,010	1,935	4,080	8,074
April	.....	1,000	2,125	14,645
May	.....	870	822	18,630
June	.....	50	0	32,749
July	.....	4,190	1,025	6,459
Aug.	.....	8,747	0	2,668
Sept.	.....	6,820	1,863	4,470
Oct.	.....	5,258	0	2,499
Nov.	.....	870	0	2,222
Dec.	.....	2,919	135	8,408
Total	.....	41,355	26,028	121,499

*Including reinstatements.

Statistics of Class I Railroads

	Net Operating Income 1944	1943	1942	Ton-Miles Revenue Freight 1944	1943	1942
	(millions)			(billions)		
Jan.	$82.8	$105.1	$66.8	60.5	55.1	43.0
Feb.	84.5	105.8	64.4	59.4	54.4	40.8
Mar.	....	129.6	90.6	62.5	61.2	48.3
Apr.	....	127.1	101.6	....	59.1	50.0
May	....	128.2	109.7	....	62.1	54.2
June	....	109.7	118.7	....	58.0	53.9
July	....	120.6	133.6	....	63.7	57.0
Aug.	....	124.6	135.9	....	65.1	58.6
Sept.	....	110.2	154.6	....	62.5	58.2
Oct.	....	113.1	184.7	....	65.0	62.2
Nov.	....	96.4	148.9	....	59.6	57.0
Dec.	....	76.9	170.9	....	59.4	55.0
Avg.	....	$113.5	$122.9	....	60.5	53.2



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,135	$8,125	$9,028	$9,803
Federal Gross Debt (billions)	$187.0	$187.0	$187.4	$128.5
Bond Volume, NYSE (millions)	$51.4	$52.7	$56.9	$52.2
Stocks Sales, NYSE (thousands)	3,909	3,395	7,484	4,672
Loans and Investments (millions)†	$51,596	$51,633	$52,903	$42,250
United States Government Obligations Held (millions)†	$38,089	$37,961	$38,522	$29,475

†Member banks, Federal Reserve System.

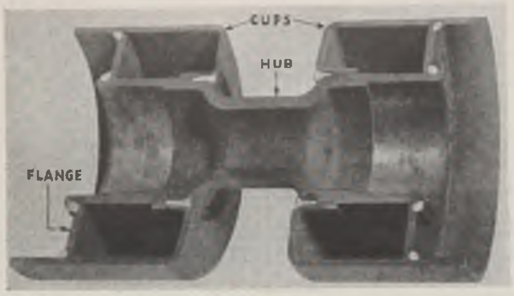
PRICES

	Latest Period*	Prior Week	Month Ago	Year Ago
STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	249.7	249.7	251.5	‡‡
Industrial Raw Materials (Bureau of Labor index)‡	113.9	113.6	113.3	112.8
Manufactured Products (Bureau of Labor index)‡	100.9	100.9	100.6	100.8

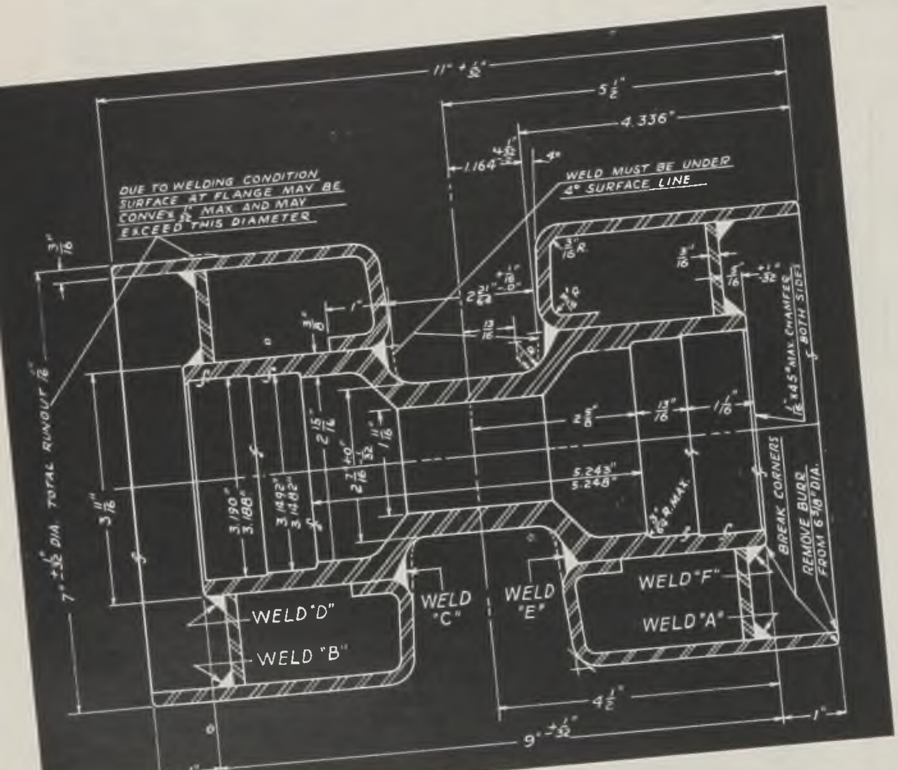
†1931 = 100; Friday series. ‡1926 = 100. ‡‡Holiday.

By G. W. BIRDSALL
Associate Editor, STEEL

Automatic Ar



. . . proves effective method for producing parts on mass production basis, as evidenced by procedure employed by Cleveland Welding Co. in making upper rollers for half-tracs



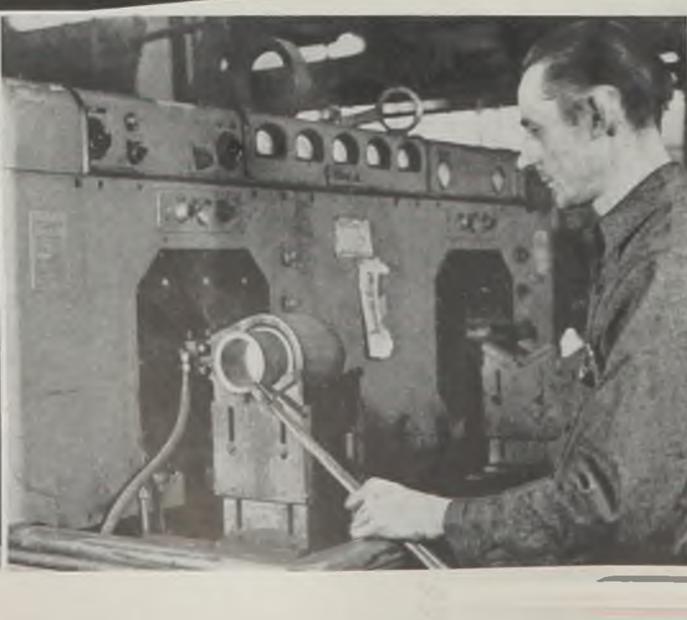
INCREASING significance of automatic arc welding processes in mass production work has been emphasized by several welding authorities. For instance, Robert E. Kinkead, well known Cleveland welding engineer, back in the Jan. 5, 1942 issue of STEEL, p. 305, said:

"The plain inescapable fact is that manual arc welding for large scale operations (mass production) . . . is doomed. It is too slow, involves too much human element, does not produce as good weldments as available machine welding processes. . . ."

And the trend grows, for in Jan. 3, 1944, STEEL, p. 395, he notes, "Vendors of automatic welding processes are already experiencing the beginning of a postwar boom for this type of equipment."

Fig. 1—Left: Diagram of section through "top" roller, used on Army half-tracs to support continuous caterpillar track as it returns along upper portion of its travel

Fig. 2—At top: Roller sectioned to better picture construction. Lincoln Electric photo



Welding

As manufacturers look toward reconversion and begin to make plans for new products, Mr. Kinkead points out that they will do well to investigate improved automatic arc welding processes: "National security demands that full details of many new and improved automatic welding processes be not yet revealed publicly. Suffice it to say that every manufacturer now using or contemplating the use of arc welding on repetitive production operations should be sure he overlooks none of the advances in welding methods now available."

Perhaps typical of the advantages to be gained by intelligent application of automatic arc welding is the production of upper rollers for half-tracs at Cleveland Welding Co., Cleveland. This "top" roller supports the continuous caterpillar tread as it returns along the top or upper portion of its travel.

The design described here was suggested by Homer Mueller, vice president, after he had been called in by Diamond T, Autocar and White Motor to discuss means for reducing rejections from out-of-balance which ran as high as 20 per cent in regular production.

"The composite design effectively licked the out-of-balance condition, for not a single unit has been rejected, from this or any other cause," reports Mr. Mueller. This would indicate that the design as well as the production methods employed permit manufacturing operations to be easily and accurately controlled in mass production work.

Machining: Weight of former design before machining was 42 pounds, with 14½ pounds machined away to give 27½ pounds finished weight. Weight of new design before machining is 25½ pounds with 1½ pounds to be cut away to provide finished weight of 24 pounds, according to Mr. Mueller.

Simple Design: As will be seen from accompanying illustrations, the roller is made from seamless steel tubing for the hub with rolled steel plate for cups and closing end flanges. These are assembled to form a one-piece unit by arc welding. Perfect concentricity is assured by correct design of the blanking and forming dies. Because the parts are made from plate whose thickness is accurately controlled in rolling, distribution of metal is exactly where wanted. Thus perfect balance is inherent in this unit.

Mass Production: Because all the processing operations involved lend themselves readily to handling on high production equipment, this roller is particularly suitable for manufacture by mass production methods, that of course being the purpose of its design. Most of the forming is done on heavy presses with the exception of the hub. This part is formed or "spooled" down on a revamped rim roller. And, the joining operations are done on specially engineered automatic welding setups.

Assembly operations are completed on a straight line production basis, the various welding stations being connected by roller conveyor sections which eliminate the necessity of handling work between each operation. There is no need to store partial assemblies in process as the gravity conveyor sections provide a bank of work ahead of each operator.

Costs: Harry Kranz, president, states processing costs have been reduced to $6.69 by the present method at a saving of $4.31 per unit.

Forming the Cups: The cups, see Figs. 1 and 2, are made by blanking from hot-rolled SAE-1010 steel plate, 3/16-inch thick. Two operations in 500-ton presses complete the forming of the cup and inner flange with its re-entrant shoulder that seats on the hub when assembled. The face or flange portion of the cup has a 4-degree taper towards the center.

Outside diameter at open end or edge of cup is held to 7 inches within a tolerance of plus or minus 1/32-inch. Total runout permitted is 1/16-inch. Inside diameter of portion of cup which fits over the hub is held at 3.692/3.685 inches. Axial length of cup is 4 15/32 inches plus 1/32 minus zero. These are the tolerances held in forming operations on the cup.

Flanges: The rings or end flanges are used to position the cup and to close the

Left to right, across bottom of both pages:

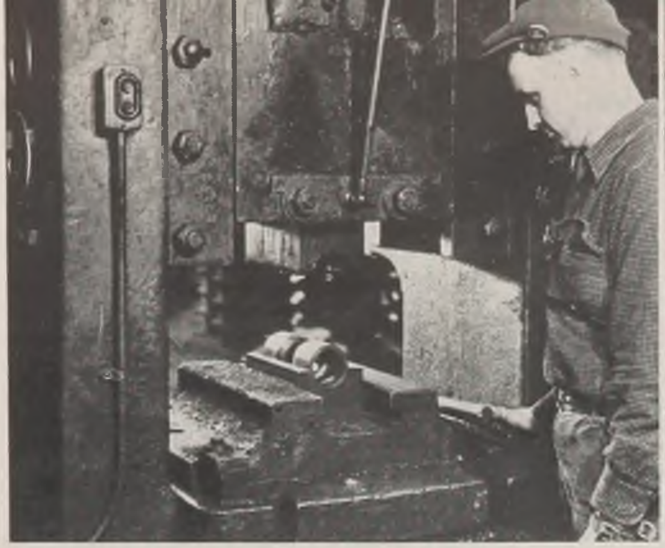
Fig. 3—Setup for automatically welding the cup-and-flange subassembly by making welds "A" and "B", Fig. 1, as used at plant of Cleveland Welding Co.

Fig. 4—Electric induction-heating station for raising the central section of the hub to forging temperature prior to "spooling". This 50-kilowatt unit heats a 3½-inch long section of the 3¾-inch diameter tube to 1800 degrees Fahr. in 68 seconds

Fig. 5—Heated hub is positioned between two lower rolls of heavy forming machine—a revamped rim roller—used for "spooling down" the center portion of hub

Fig. 6—Here power-driven work roll of forming machine is moved down against hub, 10 tons of pressure causing the hub to take the shape of the work roll. Note massive gearing and framework. Work roller and head is lifted, lowered by hydraulic cylinders. Photos by Birdsall

Fig. 7—Gang drill is used to remove excess metal on upset portion of hub, employing 3-lip drills. Two work heads allow two pieces to be drilled simultaneously



cup "innards" when assembled on the hub, Figs. 1 and 2. These flanges are blanked from 3/16-inch hot-rolled SAE-1010 steel. Inside diameter is 3.692/3.685, same as that of the cups. Outside diameter is 6.610/6.615 to assure a minimum clearance of 0.005-inch for an easy slip fit into the cup whose inside diameter is held within 6.620/6.630 inches. The flanges must fit into the cup without forcing.

Subassembly: Before assembling cups to the hub, the flanges are first welded into the cups as shown in Fig. 3. To position the parts for welding, the cup is placed over a close-fitting fixture with the open end of the cup up. Then three steel fingers which have been folded to allow the cup to slip over them are let down so they extend at right angles to axis of cup to provide a support for a flange which is then set on them inside the cup.

Next a cap is placed over the flange and locked into an axially moving portion of the fixture which then is actuated to securely clamp the flange in the precise position desired for assembly. Now cup is secured in position against lower face of the fixture by turning two locking levers which engage the top of upper lip of cup as shown in Fig. 3.

During this assembly of parts into the

Fig. 8—Left: Outside diameter of spooled hub is sized cold in this 500-ton press

Fig. 9—Right: First step in final assembly—pressing cup-and-flange subassembly on one end of hub

fixture, the automatic welding head is tilted up out of the field of operation. The arm which supports the head from the floor stand is pivoted near its center, and a counterweight is provided to balance the welding head so it can be swung up and will stay in any position wanted. Head is held in operating postion by a latch which prevents inadvertent movement from spoiling the weld once the machine has been started.

Welds "A" and "B", Fig. 1, are made in this manner, using 3/16-inch diameter welding wire, a straight carbon type with 0.18 to 0.20 per cent carbon. This material is supplied in coils and comes covered with a light dipped coating of flux.

Actual arc time for welds "A" and "B" is 75 seconds each, welding with 350 amperes of direct current. Cup-and-flange subassemblies then are ready for final assembly onto the hub.

"Spooling" The Hub: Possibly most interesting of the various forming operations in manufacture of these rollers is the "spooling" of the hub from a piece of SAE-1020 seamless steel tubing. First, 28-foot mill lengths of 3¾-inch diameter tubing are cut into pieces 9¼ inches long with a tolerance of plus 0.062, minus zero. Wall thickness is ⅜-inch plus or minus 0.047-inch.

Next, hub at center must be reduced down to 2 7/16 inches in diameter. Several methods of doing this were tried but the one described below proved best of all.

A 3½ to 3¾-inch long section at the center of the hub is heated in the 50-kilowatt electric induction heating machine shown in Fig. 4. This unit is fed by a motor-generator set delivering pow-

Fig. 10—Left: Operator adjusting automatic head prior to striking arc to make weld "C", Fig. 1. Work is mounted in 3-jaw self-centering lathe chuck which rotates it under automatic welding head. Operating controls are on box at left, welding set in left background

Fig. 11—Right: Gravity roller conveyors carry work from station to station Note flexible hose of system used to exhaust welding fumes

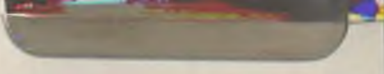


Fig. 13—Weld "F" completes assembly, joining flange to hub in 60 seconds with 350 amperes welding current. Note work is tilted for most efficient deposition

er to the inductor block at 9600 cycles. Automatic controls apply current for 68 seconds which is sufficient time to heat the central section of the hub to a temperature of about 1800 degrees Fahr. in preparation for rolling or "spooling down".

As soon as current is cut off, a signal lamp lights up on the control board in front of the operator in Fig. 4 telling him that the hub is ready for rolling. Then he picks up the hub from the twin V-blocks which position it in the inductor and places it on the two lower rolls of the revamped rim roller shown in Fig. 5. These two lower rolls are about 3 inches in diameter and are supported in ball bearings so they can rotate freely. No power is applied to them, they merely back up the hub during the rolling operation.

The large diameter upper roller is driven by a 40-horsepower motor through V-belts and special gearing. This roll and its inner and outboard bearings are mounted in an H-block which straddles two vertical guides. Vertical movement is supplied by connecting with hydraulically operated piston, not shown but just above the center of the machine in Fig. 5.

The upper roller carries a raised section along its center of the correct size to produce the desired spooling of the hub when the upper roller is forced against the hub. While revolving at about 150 revolutions per minute, upper roll is forced against the heated hub section under 10 tons pressure. Resulting action causes hub to assume contour of upper roller face. The two lower rolls have collars at each end which position the hub endwise with fair accuracy, so the spooling action occurs at the exact center of hub.

Special "Spooling" Machine: Fig. 6 reveals more of the structures of this machine, for it shows the massive frame, gearing and a portion of the mechanism for raising and lowering the upper roller assembly. Main member which carries outboard bearing extends through first or front housing on to the second or rear housing, extreme right, Fig. 6. This extension carries a sleeve with a pinion gear at each end which engages stationary racks on both housings.

In addition, a moveable rack engages the gear in the front housing. This rack is connected to piston of the hydraulic cylinder mounted overhead to furnish means for raising and lowering the upper roller assembly. The rack-and-pinion system mechanically doubles the pressure exerted by the hydraulic cylinder, and the pinion in the rear housing helps steady the whole upper roller assembly with its large overhung weight.

In addition to the 10-ton downward pressure exerted by the main hydraulic cylinder, an auxiliary or pick-up head provides a 2-ton lift for raising the upper roller assembly.

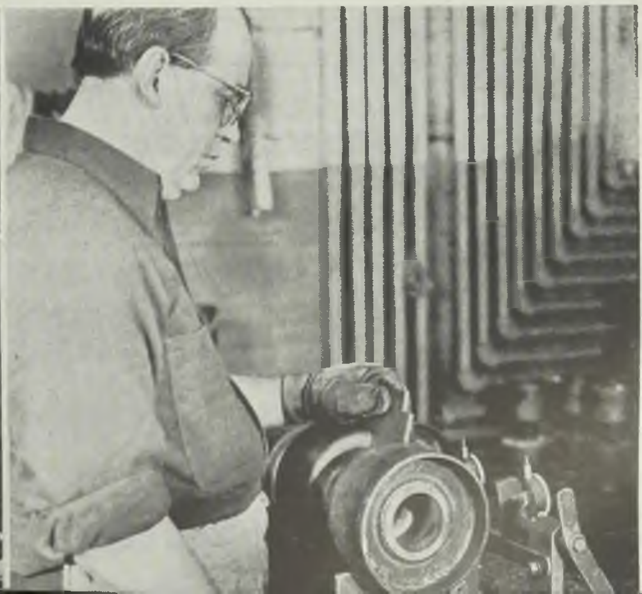
When rolling of hubs is completed, operator lifts upper roller assembly, pushes completed hub out of lower rolls onto chute in foreground, Fig. 6, where it is allowed to cool.

Excess Metal: Due to the upsetting action during the spooling operation, the wall of the hub in the central portion where hub diameter is reduced is increased from ⅜ to ⅝-inch in thickness. Since the original wall thickness of ⅜-inch is ample, this excess metal is re-

(Please turn to Page 138)

Fig. 12—Left: Weld "E" must be made by hand for there is insufficient room for head of automatic welder here. Work held in chuck is rotated by drive mechanism located under table

Fig. 14—Right: Final inspection, checking clearance between cups. Out-of-round is tested with dial indicators on frame at right, which are swung up to contact roller. Revolving the roller then checks for roundness



Sulphurized Cutting Oils

. . . . *no cure-all for machining difficulties but find wide usage where better heat transfer, more rapid cutting and smoother surface finish are important factors*

By A. F. BREWER*
Technical and Research Division
The Texas Company
New York

THE PETROLEUM industry has manufactured and marketed cutting oils ever since F. W. Taylor in the late nineties had the courage to predict the importance of the cutting fluid as an adjunct to surface finish in metal cutting. This research played an important part in later machine tool developments. During the period which followed, up until the late twenties the need primarily was for the conventional types of mineral-lard oil mixtures. For the type of pipe-threading and metal cutting which then prevailed they were moderately satisfactory. As cutting tool speeds increased and alloy steels became more common however, an oil of better cutting ability was required. It was found that when a mineral-lard oil is overworked, it may break down chemically, then it becomes rancid, develops an objectionable odor and often is quite harmful to the skin.

This prompted renewed study of the problems of metal cutting. Leading members of the petroleum industry had anticipated this trend and had been studying cutting oil components for some time previously and had developed experimental cutting oils containing sulphur. This element, when added correctly to mineral oils or mineral-lard oil, increases the cooling and lubricating ability and helps to prevent welding of the chip to the tool. Sulphurized cutting oils also have the ability to penetrate more readily to small crevices. This ability, along with added film strength, was found to give better surface finishes on steels which are difficult to machine.

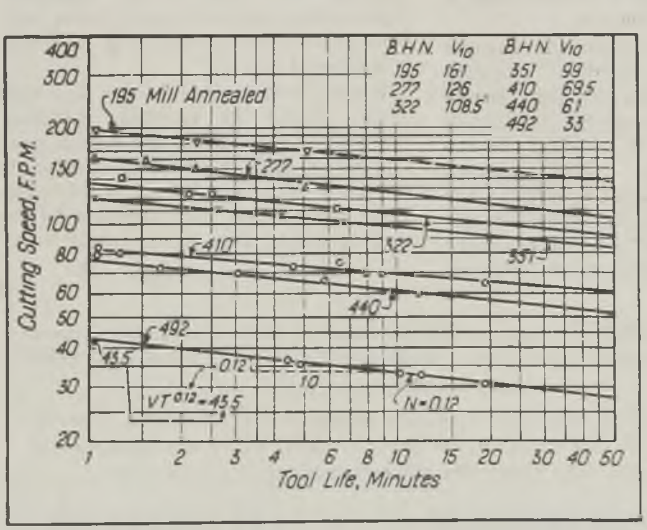
The use of sulphur as a component of cutting oils dates back to about 1888. Free sulphur had been added to mineral lubricating oils for some time previous, but the potential benefits in cutting oils remained obscure until research study was directed to perfecting better methods of mixing. These were indicated by the use of "sulphochlorinated" compounds. Any excess sulphur chloride or any hydrochloric acid which formed when fats were treated with sulphur chloride, could be neutralized by a suitable alkali or certain terpenes or olefins, thus insuring a product which would not be reactive.

From that period until about 1918, there was a lull. Then, with interest aroused perhaps by World War I, and the demand for munitions, the so-called second stage in the history of cutting oil research developed, and sulphur base oils became more seriously considered.

It has been known for years that the

(*Please turn to Page* 141)

*The article by Mr. Brewer also was presented in The Texas Company's publication "Lubrication" of which he is the editor. The charts prepared by O. W. Boston are from *Screw Machine Engineering.*



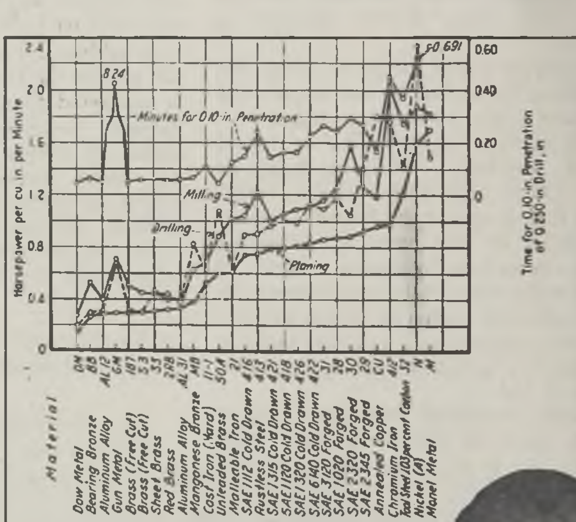


TABLE I

Speeds and feeds with rake and relief angles recommended for high-speed steel milling cutters of the production type over 3 inches in diameter. A cutting fluid should be used whenever possible. Carbon steel tools should operate at speeds from one-third to one-half of those of high speed steel tools. The relief angles should be increased 25 to 50 per cent for cutters less than 3 inches in diameter.

Metals	Cutting Speed feet per minute	Feed Inches per minute	Angles in Degrees Rake	Relief
Aluminum	500-1000	10-24	20-40	10-12
Bakelite	100-200	8-10	5-10	5-7
Brass	100-200	10-24	0-10	10-12
Bronze	30-200	10-24	0-10	4-10
Cast Iron	50-120	24	8-10	4-7
Cast iron, malleable	80-100	10-24	10	5-7
Copper	100-200	10-24	10-15	8-12
Monel metal	70-80	4-6	10	5-8
Steel, alloy, heat-treated	30-50	4-6	10-15	4-5
Steel, alloy, not heat treated / Steel, annealed high-carbon	60-70	7-8	10-15	5-6
Steel, low-carbon, cold-finished	80-100	10-24	10-20	5-7
Steel, stainless	60-90	4-6	10	5-8

Fig. 1—(Center, right,) Sulphurized cutting oil is being used here in cutting SAE 4615 molybdenum steel spur gears at high speed on this Fellows gear shaper. Cutter speed is 63 surface feet per minute

Fig. 2—(Below) Increased broach life was reported rifling .30 calibre machine gun barrels on this machine. The cutting medium was a sulphurized type oil

Fig. 3—The chart (right, opposite page) shows net values of horsepower per cubic inch of metal cut per minute for a variety of metals as determined for drilling, milling and planing. The drill used was ¾-inch in diameter, had a 30-degree helix and was operated at 153 revolutions per minute and 0.012-inch per revolution feed. The planing tool was of the end-cutting type ½-inch wide, having a 15-degree back rake, no side rake and operated at a speed of 20 feet per minute when taking a depth of cut per stroke of 0.010-inch. The milling cutter was of the end-cutting type 0.25-inch wide, 3.5 inches in diameter and having 15 degree back rake, no side rake when taking a depth of cut of 0.125-inch, and a feed of 0.010-inch per tooth. The penetrator drill indicating machinability was ¼-inch in diameter, had a helix of 24 degrees and operated under a feed load of 94 pounds at 500 revolutions per minute

Fig. 4—Shown in log chart (left, opposite page) is relationship between cutting speed and tool life in minutes for a feed to 0.0127-inch and a depth of cut of 0.050-inch when turning SAE 4340 steel, heat treated to give various degrees of hardness. The cutting tools had an 8 degree back rake, 14 degree side rake, 15 degree side cutting edge angle and 3/64-inch nose radius. They were of 18-4-2 steel

Metal Cutting Terminology

By way of review, some of the more common metal cutting terms are discussed here briefly:

Relief Angle:

Relief Angle is the angle of the flank below the cutting edge to clear the work. It was formerly known as *clearance* angle. This is now an American Standard.

Rake Angle:

Rake Angle is the slope of the top face of the tool from the cutting edge. Back rake means toward the shank; it is the slope toward the center of the cutter. On a shank type tool it is measured from the cutting edge toward the shank (back rake) or from the cutting edge to the side at right angles to the shank (side rake).

Built-up Edge:

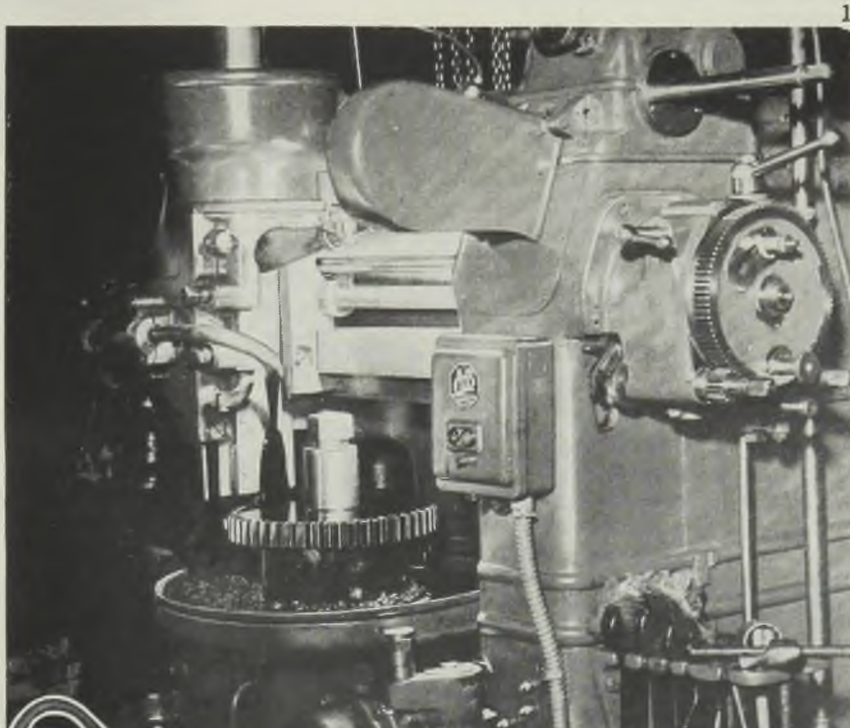
Almost immediately after starting a cut, a small particle of the material being cut is trapped on the face of the tool and forms what is known as a *built-up edge*. The built-up edge is somewhat triangular in shape, being thickest directly ahead of the cutting edge, becoming thinner as it extends backward over the face of the tool.

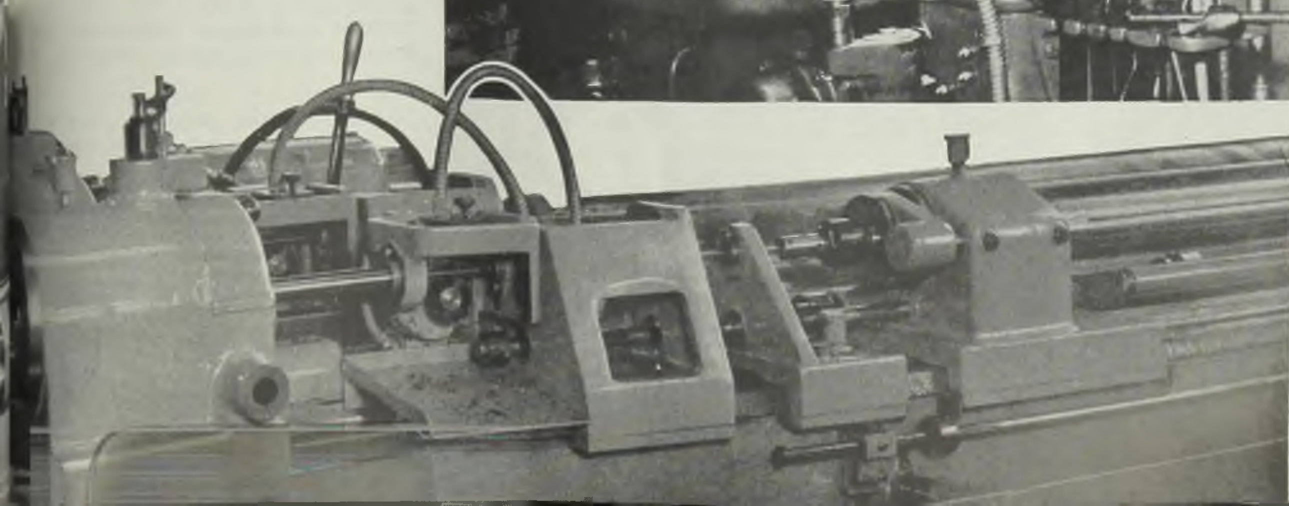
Surface Finish:

The finish on the cut surface is improved as the built-up edge is reduced in size. This reduction may be accomplished by increasing the rake of the tool, increasing the speed, reducing the size of the cut, or introducing a cutting fluid, any one, or a combination of which is commonly used to secure better finish.

Tool Wear:

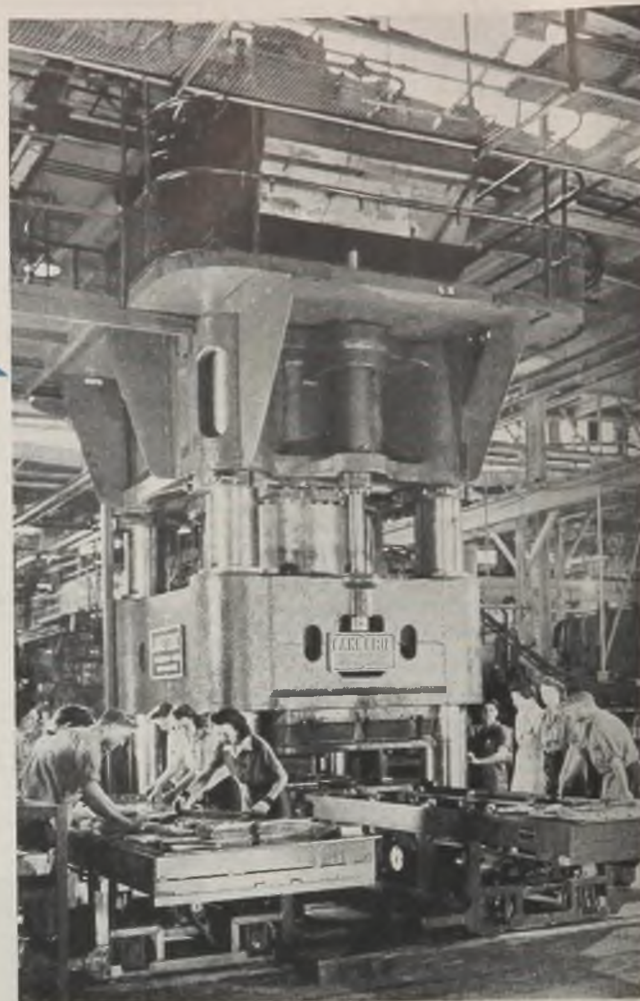
When cutting steel with tools of carbon tool steel, tool failure is usually caused by wear on the flank of the tool directly beneath the active cutting edge. When cutting steel with tools of high speed steel, normal tool failure is caused by a gradual cupping of the tool on its face. After the chip is formed, it slides over the built-up edge protecting the cutting edge, and rubs against the face of the tool some distance back from the cutting edge.





5000 Ton Press

. . . . turns out 24,000 aircraft parts daily



BELL AIRCRAFT CORP., Buffalo, is obtaining average production of 24,000 aircraft parts every 24 hours from a 5000-ton hydraulic press equipped with four motorized loading carriages or tables which make the operation practically continuous.

The press, built by the Lake Erie Engineering Corp., Buffalo, is of the single-action rubber-pad type with a stroke of 48 inches and opening of 60 inches. Platens measure 64 x 128 inches and the rubber forming pad 49 x 110 inches in area by 9 inches thick. A better conception of its size may be obtained by noting that it stands 26 feet above the floor with auxiliary equipment mounted on top of the press adding an additional 54 inches. The press weighs 560,000 pounds, including 60,000 pounds for the tables. The main cylinder is 67 inches in diameter. Four supporting columns are 18 inches in diameter.

The hydraulic system, including the tank, motor and pump, is mounted on the four supporting columns. The reservoir has a capacity of 2200 gallons from which a pump supplies oil to the hydraulic system under 3000 pounds pressure. The circulation system is equipped with a heat exchanger which continuously cools and filters the oil which is maintained at a temperature of about 100 to 120 degrees Fahr. Turbine oil is the medium used.

Feature of the press is the four transfer carriages, a pair of which is mounted on rails on either side of the press. This arrangement was designed and put in use by Clarence Graham, supervisor of metal preparation at Bell Aircraft. One pair may be seen in photograph above. An identical pair is located on the back side of the press.

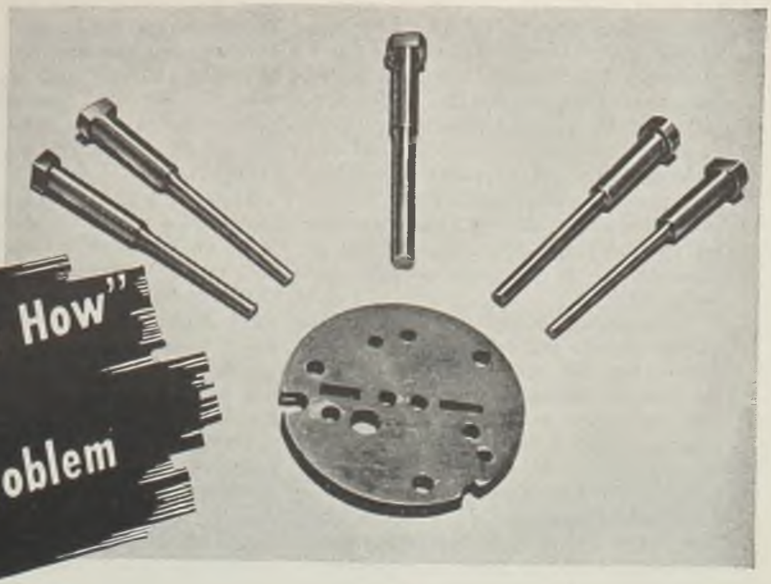
Each transfer carriage is equipped with a drive to move it from the blank supply table to the center line of the press and back. One supply table will be noted at the extreme left in Fig. 1, the other at the extreme right. Each carriage also has a top plate or shuffle board on which the dies are placed and which may be moved in and out of the press when the entire table is in the proper position. A permanent section of the table is used for stacking a number of each type of part, making them readily available to the operators as will be noted by again referring to accompanying photo.

Each carriage is individually controlled by push button switches, the

(Above)—This 5000-ton press in the plant of the Bell Aircraft Corp., Buffalo, turns out an average of 24,000 aircraft parts every 24 hours. Feature of the press is four transfer carriages for handling the parts, two of which are shown in the foreground

(Left)—In this close-up, a loaded top plate is shown in position ready for the forming operation

How Heat Treating "Know How" Helped to Lick a Tough Hardening Problem



Here is an on-the-job story of how Carpenter tool steel and the practical knowledge of a Carpenter representative teamed up to solve a tough tool steel problem. The facts are summarized below. The tools and work involved are shown in the photograph.

THE JOB:

Punching ¾ hard brass (Rockwell B-79), .137" and .150" thick, in a double acting 250-ton punch press. The holes to be punched vary from .099" to .167".

PROBLEM:

Preventing cracking of punches under the head during hardening, avoiding decarburization and keeping the punches straight in quenching. About 75% of the punches hardened had been cracking in the shoulder under the head in the hardening process.

SOLUTION:

The Carpenter representative, when asked for advice, made the following suggestions: First, to use the recommended furnace atmosphere of 2% to 4% oxygen. Second, to switch from a tap water quench to one of 10% brine. Third, to heat the punches in a piece of ¾" round iron pipe (both ends open)—so that the punches can be dropped vertically into the brine to get a full quench under the head.

RESULT:

On the first try following these recommendations, some 200 punches made from Carpenter Green Label Drill Rod were hardened, using a temperature of 1450° F. with an atmosphere of 2% to 4% Oxygen. The problem was licked! Decarburization was eliminated and all were O.K. for straightness. In production they averaged 100,000 holes per punch.

• If *you* have a tool steel problem—or if you should like help in getting tools that give longer uninterrupted production runs—your nearby Carpenter representative will be glad to give you every assistance. He can supply you with helpful printed matter—he can render personal "on the spot" service—and he will keep you in touch with the Carpenter Metallurgical Department.

THE CARPENTER STEEL COMPANY
139 W. Bern St., Reading, Pennsylvania

Carpenter MATCHED TOOL STEELS

first of which moves it to the center line of the press where it is held by a thruster. The second button actuates the chain drive, sliding the loaded top plate into the press. A limit switch prevents functioning of the press until the plate is in the proper position between the platens. The third push button brings the table back to proper position on the carriage. The carriage then is returned to its original position for reloading.

Each carriage is individually operated so that in case one table can be loaded faster than the others it may be run through the stamping cycle oftener; or the four may be operated in regular sequence. All four tables may be run in and out of the press in turn in a matter of 1½ minutes. Loading of the blanks on the dies can, of course, be done while the carriage is in motion.

Operation of the press is completely automatic, its functioning being handled by the operator at the push button control board shown in Fig. 2. When a table of loaded parts is in the proper position, the operator pushes a single button which closes the press, builds up maximum pressure, decompresses the hydraulic chamber and returns the cylinder to the "up" position. A special decompression valve controls the outflow of oil, thus providing shockless reversal.

The upper platen can be stopped in any position during the downward movement of the press by simply releasing the "down" button. An "inching" device permits close control of the downward stroke if necessary. The upward stroke may be similarly controlled. The stroke is adjustable so that clearance may be set at a minimum of 1 inch or a maximum of 48 inches.

Material processed, of course, is aluminum alloy for Bell's new fighter plane. Maximum thickness of the material is $\frac{1}{16}$-inch. Certain work is polished at points where extreme elongation of metal is required. This runs 10 per cent of all work. The remaining 90 per cent of work requires no polishing. The forming dies are of mild carbon steel. Bell engineers report rejections are practically nonexistent.

New Reinforcing Bar Improves Load Transfer

A revolutionary type of concrete reinforcing bar, which represents the first real improvement in the bonding value of concrete reinforcing bars in more than 30 years and called "Inland Hi-Bond," has been announced by the Inland Steel Co., Chicago.

It is expected to have far-reaching effects in the design of reinforced concrete structures. This development may lead to revisions of existing building codes to take advantage of the greater bond strength, thereby resulting in more efficient structures through conservation of materials and labor.

The bar increases effectiveness of reinforcing steel in concrete through greatly improved load transfer. This is accomlished by means of reversed double helical ribs of proper height which extend between diametrically opposed longitudinal ribs. The bearing area is more than double that of usual commercial types of reinforcing bars.

Sponge Iron Research Program

Regarded encouraging by Bureau of Mines

BUREAU OF MINES officials are highly encouraged over results to date in the bureau's sponge iron research program. They also are pleased over the interest that steel companies are showing in this work. Much progress has been made in developing "know-how" in treating different iron ores.

One of the interesting studies of the bureau is that under way at the plant of the Plastic Metals Co., Johnstown, Pa. This plant is equipped with a rotary furnace so that when the bureau undertook work there it was with the idea of developing practice to be applied later at the bureau's large rotary demonstration plant at Laramie, Wyo. Some interesting results have been obtained from the experiments at Johnstown, notably the conclusion that this work may pave the way for development of a successful method of producing steel from low-grade iron ore, similar in some respects to the "Krupp blooming" process used to treat low-grade ore in Germany. The sponge produced at Johnstown has contained, after magnetic separation, 90 to 91 per cent iron and 0.05 to 0.06 per cent sulphur.

Interesting results also have been obtained in the experiment at Canton, O., where the bureau is producing some 500 to 700 tons of sponge iron in periodic kilns at the plant of the Stark Brick Co. Sponge being produced there contains 87 to 90 per cent metallic iron and 90 to 95 per cent total iron. Using magnetite ore, the sponge averages around 0.01 per cent sulphur, and sulphur at no time has run higher than 0.02. Phosphorus has been running in the neighborhood of 0.03 per cent, this varying with the ore used. The only problem so far has been the difficulty of holding down the silica content; silica has averaged 5 to 6 per cent. The sponge gave no trouble when charged into electric furnaces, but open hearth operators have used it with some misgivings because of the high silica content. One steel company has suggested that mill scale be mixed with the ore before reduction; mill scale usually runs between 2 and 3 per cent silica so that the silica content of the resulting sponge would be lowered.

Another project on which the bureau now is engaged is expected to result in production of some 500 to 600 tons of sponge iron in a tunnel kiln at the plant of the Isenhour Brick Co., Salisbury, N. C. In a small pilot mill now being built at the magnetite mine at Cranberry, N. C., the bureau proposes to turn out a concentrate containing at least 70 per cent iron. This concentrate, in turn, will be reduced in the tunnel kiln to a sponge expected to contain around 92 per cent iron, 1 per cent silica, 0.01 per cent phosphorus and 0.1 per cent titanium. In other words, the bureau hopes to produce sponge equal in quality to Swedish sponge iron, as well as to demonstrate the possibility of using sponge iron to offset any shortage of heavy melting scrap.

Another project about to be launched involves the establishment of a pilot plant at Daisy, Tenn., where treatment of Tennessee iron ores will be studied. This plant also will be devoted to study as to best utilization of sinter produced by the Tennessee Copper Co. as a by-product in the manufacture of sulphuric acid.

The 2-diameter rotary kiln pilot plant at Laramie, Wyo., is the largest sponge iron demonstrating plant of the bureau. It has an estimated capacity of 30 to 50 tons of sponge iron daily. The plant has been completed and "breaking-in" operations were started in February of this year. Operations so far are said to have been satisfactory but significant operating data will not be obtained until all adjustments have been made and the kiln is operated in long campaigns with constant conditions.

All the above-mentioned projects employ or will employ solid fuels as reducing agents. Other pilot plants not yet mentioned will employ gaseous reducing agents. Cost of producing sponge in periodic brick kilns is high compared with the price of heavy melting scrap but with experience it shows a tendency to go down. For instance, it has been found that coal $2 a ton cheaper than the coal used up to the present time can be used satisfactorily. The cost of production in rotary kilns will not be known until experience has been accumulated with the Laramie plant.

Sponge iron from these pilot plants has been used with encouraging results in electric furnaces, open-hearth furnaces and in a wrought iron puddling plant. Bureau spokesmen point out, however, that numerous heats will be required to establish the effect of any change in steelmaking or wrought iron practice and the major part of the investigation remains to be completed in the coming months.

What about the future of the... COMBUSTION GAS TURBINE?

By F. K. FISCHER
Steam Engineer
and
C. A. MEYER
Development Engineer
Westinghouse Electric & Mfg. Co.
South Philadelphia, Pa.

THERE ARE many future uses of the gas turbine because it potentially promises higher efficiency at very high temperatures than most engines and prime movers used today. Future applications range from electric power generation to power plants for propelling airplanes, trains and ships.

Advantages of the gas turbine cycle as compared to the conventional steam system include: (1) No boiler is used; (2) water is not required for the simple open-cycle system; (3) promises greater efficiency improvement at high temperature and (4) high horsepower per pound output for short life applications.

Present disadvantages include: Over-optimism; fuel limited to high grade oils instead of low grade oil and coal; little field experience and need of time to complete technical developments in metallurgy and component parts of the gas turbine system. To a large degree, the future application of the gas turbine depends upon developments in the field of metallurgy, aerodynamics, combustion and heat exchange. Present knowledge in these fields permits building and operating simple gas turbines for certain purposes. Experience with some of the simple forms of gas turbine plants has been successful and encouraging. In the postwar period, industry will benefit from the developments now being engineered for national defense. These developments will accelerate the application of gas turbine plants to new and larger fields.

The fundamental directness of the gas turbine power cycle, in which all the hot gases of combustion are led straight to the turbine, has intrigued engineers for years. Versatile Leonardo da Vinci devised a crude version. In 1791, John Barber, an Englishman, took out the first patent on a turbine operated by gases. Since that time there has been an almost continuous stream of developments.

Progress toward a practical gas turbine power unit has been delayed because the thermal efficiency required to make it competitive with the highly developed steam cycle required: (1) Operation above 1000 degrees Fahr; (2) a highly efficient compressor; and (3) a highly efficient turbine. Two seemingly unrelated industries have recently made important contributions to help solve these problems. Metallurgists, in developing materials for superchargers have produced alloys that are expected to withstand at least 1200 degrees Fahr. continuous service at the low operating pressure encountered in gas turbine work. Aviation and wind tunnel research on airplane propellers and wings have contributed fundamental aerodynamic data on which high efficiency compressor designs are based. The research in these two industries plus the accumulated steam experience of many years has made possible the necessary high-efficiency turbine and compressor elements.

The open cycle combustion gas turbine eliminates a big and expensive step in providing power to drive generators or machinery. In its power cycle, all the hot gases of combustion go straight to the turbine, thus eliminating the steam boiler. By contrast, in the highly developed steam cycle, the fuel energy must be converted to steam, at a comparatively low temperature, before expending its energy in the turbine. In the combustion gas turbine system of power generation there are two basic cycles—the open cycle for moderate capacities and the closed-cycle for very large units.

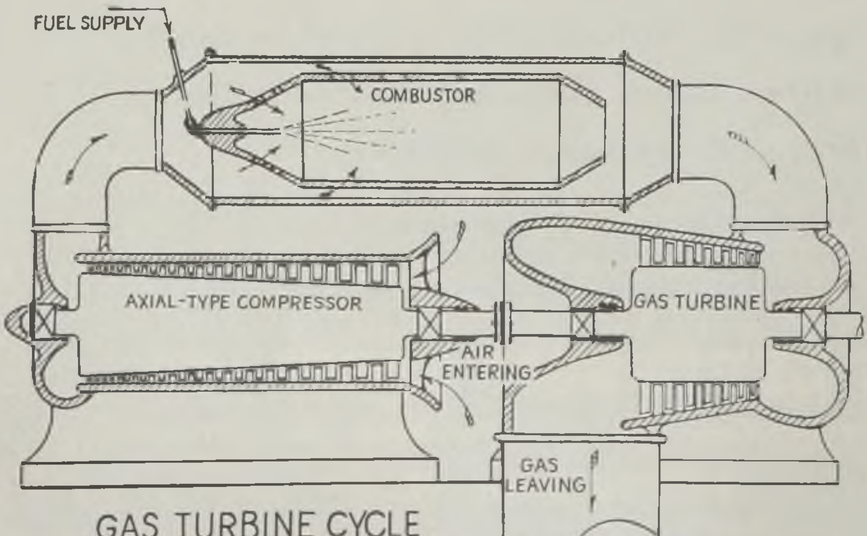
Simplest Power Cycle Known

The gas turbine employs the simplest power cycle known, consisting of three major elements: A compressor, a combustor and a gas turbine. A general idea of what the elements are like are shown as longitudinal sections in true relative size in the accompanying illustration. The gas turbine resembles the straight reaction, noncondensing steam turbine. Gas turbine blades look more like air foil sections than reaction steam turbine blades due to the small pressure drop and large gas volume involved. The axial-flow compressor also resembles a straight reaction turbine, with the gas to be compressed passing axially through the compressor. The action of the blades in the axial flow compressor is the reverse of the action of expansion in a reaction turbine.

This physically small compressor handles the large volume of gas efficiently. The combustor is the burner in which the energy of the fuel oil is converted into heat energy, by burning the fuel with sufficient excess air to obtain the desired temperature. The hot product of combustion from the combustor is the gas, which, expanding to a lower pressure and temperature in the gas turbine, converts some of its heat energy into mechanical energy at the turbine shaft.

The combustion gas turbine cycle in its basic form comprises three major elements previously mentioned: Compressor, combustor and gas turbine; plus a generator or shaft for transmitting the useful power output, and a means of starting. This simple arrangement is called the open cycle system. To start a combustion gas turbine some external

(*Please turn to Page* 154)



GAS TURBINE CYCLE
MAJOR ELEMENTS

Improved Cleaning of... FORGINGS

Recent developments now permit application of high production conveyorized systems for cleaning aluminum forgings, thus solving one of the problems of the forging industry

MASS PRODUCTION of aluminum forgings has received new impetus with the successful development of a conveyor method for cleaning and etching forgings as they come from the dies. Equipment developed features the use of packless pumps, an acid-proof conveyor and a method of actually flooding the work.

Aluminum forgings must be cleaned and etched because they are discolored by the graphite compound used to lubricate the dies. A thorough inspection of the forging can be made only after this discoloration has been removed.

The forgings are etched with a hot 20 per cent caustic solution which removes the graphite and attacks the aluminum slightly, leaving a finely etched surface. This etching process deposits a coating of black copper oxide on the forging which is removed by washing with a solution of nitric acid.

After this process is completed, the forging should be perfectly clean and bright. Any small cracks or seams will show a thin black line where the caustic has penetrated but the copper oxide deposit has not been completely cleaned out by the nitric acid. Without this cleaning, a thorough inspection of aluminum forgings would be virtually impossible.

This use of caustic and nitric acid creates very real production problems. Usually this operation is performed by placing the forgings in large basket-like holders attached to an overhead hoist running on a monorail. The basket is then dipped successively into the four tanks—caustic, rinse, nitric acid, and rinse.

This technique requires considerable labor to load and unload the baskets and to operate the overhead hoist. Moreover, if the forgings are open at one end, they will carry solution over from one tank to another, lessening the quality of the cleaning and increasing operating costs by quickly contaminating the solutions.

Open tanks of caustic and nitric acid, with their noxious fumes, create a health hazard and the forgings often rest against each other as they are carried in the baskets, thus interfering with proper cleaning.

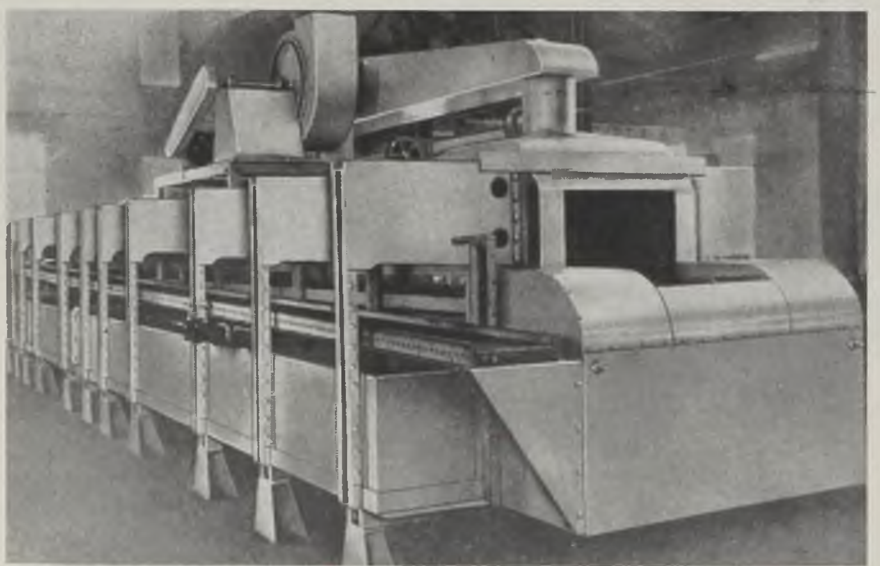
Experience so far indicates this operation can be handled more efficiently by a conveyor type machine. By carrying the work on a conveyor belt, much labor is saved; carry-over from one tank to another is reduced; and a better cleaning job is likely as the forgings cannot touch each other.

The cleaning engineers of N. Ransohoff Inc., Cincinnati, approached this problem at the request of a large manufacturer of aluminum forgings. It was necessary to overcome three major difficulties that interfered with the successful application of a conveyor type machine.

First, since nitric acid attacks ordinary steel, some way had to be found to prevent the acid from corroding the conveyor belt itself, and even more difficult, from attacking the chains to which the conveyor belt is attached. This has been solved in the Ransohoff machine by using a conveyor belt made of acid-resistant stainless steel bars, bent into a U-shaped pattern to permit rapid drainage.

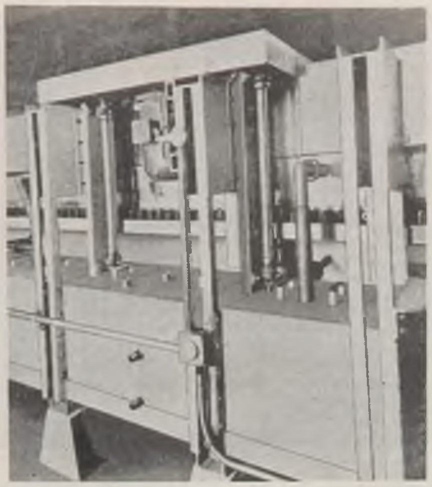
The conveyor chains have been placed outside of the tunnel, away from the caustic and nitric sprays. The conveyor bars are equipped with articulated splash guards at that point where they extend through the sides of the tunnel.

The second problem was that of ob-



Loading end of typical conveyorized cleaner system, shown at left, above. Note roller return conveyor built in side of unit

Discharge end of cleaning and etching conveyor unit. Work is carried through on slat type conveyor, a portion of which can be seen at lower left



(Left)—Closeup of nitric acid and nitric rinse pumps in conveyorized cleaning and etching unit

(Right) — Slow-speed packless pump obviates many former difficulties in handling solutions

taining pumps that could handle hot caustic solution and nitric acid. These solutions, of course, will destroy most pump packings and the acid will attack the pump itself. This difficulty has been overcome through the use of a packless pump mounted in the tank, thus eliminating the necessity of stuffing boxes. The use of a large impeller operating at low speed makes it possible to build this pump with a long overhang. The rigid shaft is supported by bearings placed above the solution level and is driven through a V-belt by a standard motor placed outside the tank.

The third problem involved providing a flooding action equivalent to that obtained by dipping the forgings into a tank. A powerful spray was unnecessary and undesirable, because that would not only waste power, but would tend to splash off the irregularly shaped work (in this case, pistons and cylinder heads) and contaminate the solution in the next section. The necessary flooding action has been provided by the use of pressure chambers or manifolds instead of spray pipes, thus obtaining large volume of solution at a low pressure. These chambers have holes drilled in them in a pattern that will insure complete coverage of the work. Through this technique a 5-foot head at the opening of the manifold has been obtained, providing the required flooding action rather than a spray.

With the solution of these three problems, it was possible to build a conveyor type cleaning and etching machine for aluminum forgings. It is indicated by experience accumulated to date that the continuous process can be adapted to aluminum forgings as well as stampings of varying size and shape and that so doing increases production as well as lowers costs compared to previous batch handling method.

Manual on Mechanical Drive Steam Turbines

The first publication issued by NEMA pertaining to single and multistage mechanical drive steam turbines is a reference manual (Recommended Standards) Pub. No. 43-88, which provides standards dealing with the following subjects: Nomenclature, basis of ratings, pressure and temperature standards, turbine load capacities, overspeed protective devices, relief valves for turbine discharge connections, speed governed by external devices and standard features and accessories.

This manual should prove useful to consulting engineers, manufacturers and users of these particular turbines. It is available from National Electrical Manufacturers Association, 155 East Forty-fourth street, New York 17 at 50 cents a copy.

Protective Coating for Plastic Surfaces

A liquid coating to guard plastic surfaces in airplanes during fabrication and which may be used for protective metals not subject to oxidation, is now being produced in quantity by Reserve Research Co., 1637 Superior avenue, Cleveland 14. It dries rapidly, forming a protective coating against scratching and abrasion and is impervious to grease, paints and paint solvents. It may be applied by dipping or spraying on such aircraft plastic surfaces as window lights, instrument panel plastic installations, etc., including Methyl, Methacrylate, Plexiglass, Lucite, Cellulose Acetate and laminated safety glass.

Blueprint Reading

Blueprint Reading, by Fred Nicholson and Fred Jones; cloth, 141 pages, 7 x 9¾ inches; published by D. Van Nostrand Co. Inc., New York, for $2.

Fifty lessons and an equal number of blueprints are presented, something new being added in each. Best procedure is to take the student into the shop and show him the tools, machines and measuring instruments required for the job. Next best is what has been done in this book, to acquaint him with the tools and shop procedures by showing illustrations and giving adequate instruction as to their use.

A brief review of arithmetic is included as many students are handicapped by inability to solve ordinary mathematical problems. The aim is to teach not only how to read a blueprint but also to interpret the language of industry and know what must be done in the shop to accomplish the purpose of the designer.

Protects Steel Parts

A combined rust preventive, cleaner and fingerprint neutralizer is announced by E. F. Houghton & Co., 240 West Somerset street, Philadelphia, for use in internal plant protection of steel parts between processing or machining operations. This product, Cosmoline No. 805, is not intended to remove rust but to neutralize the causes of corrosion, particularly acid perspiration from workers handling the parts. It also is effective in protection against corrosion caused by a chemical, fumes, high humidity, and the like.

It is a fluid product which conforms to requirements of Ordnance Technical Manual TM 38-305. According to the company it will meet and exceed 24-hour salt spray and humidity tests.

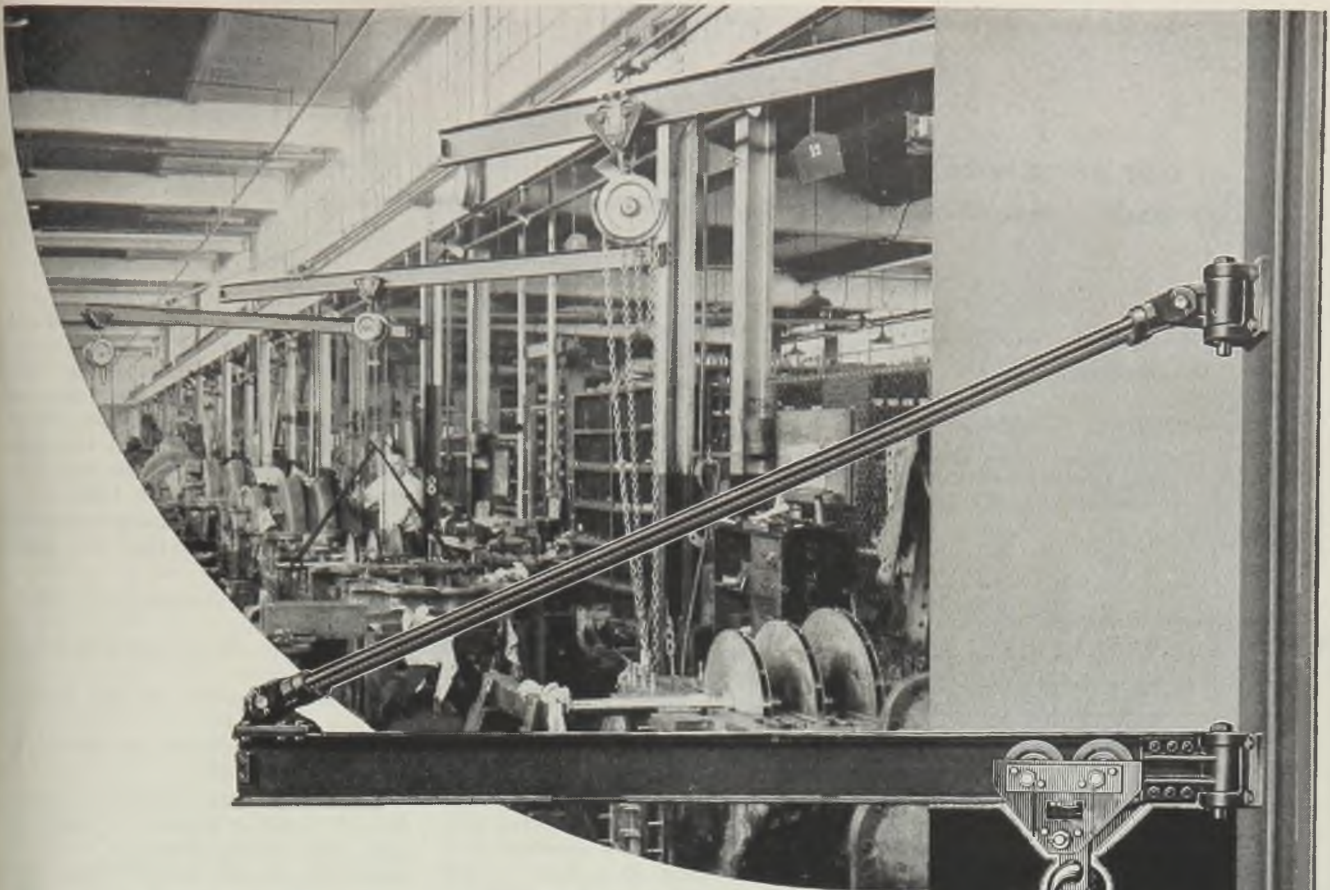
Trolley System Aids in Servicing Light Fixtures

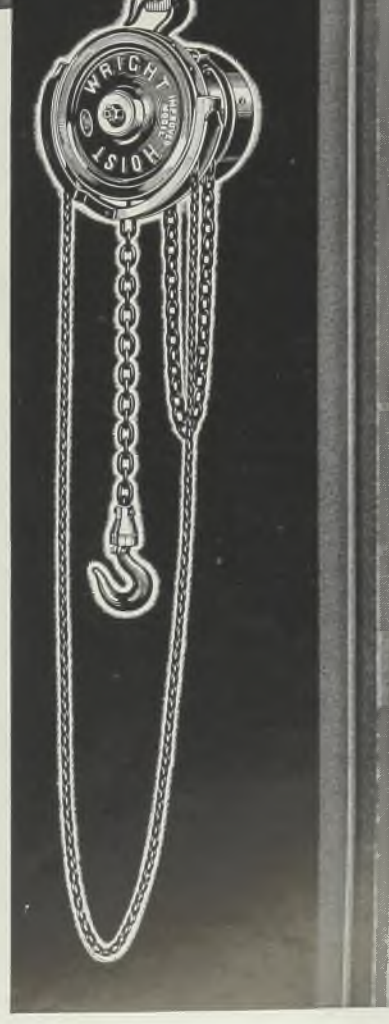
Cleaning and relamping high bay lighting fixtures is quickly, easily and safely done three times a year at the East Pittsburg, Pa., plant of Westinghouse by a trolley system.

The fixtures are hung from trolleys that ride on inclined steel cables which are suspended between the way of the building and the vertical center support of the roof truss. The entire assembly is pulled to the catwalk that runs lengthwise of the building center. The cable is inclined to insure return of the fixture to the correct location at which point a cable clamp is placed.

Chemists List Issued

Association of Consulting Chemists and Chemical Engineers Inc., 50 East Forty-first street, New York, has issued the eighth edition of its directory.





The WRIGHT COMBINATION for Production

WRIGHT'S WALL BRACKET JIB CRANE, used in conjunction with either the **WRIGHT HAND-OPERATED CHAIN HOIST** or the **WRIGHT ELECTRIC HOIST,** is the **right** combination for more efficient production. This combination is extremely desirable for supplementary use to the overhead traveling crane or monorail track, or for individual use on the side of shops, or in bays as illustrated.

Your local **WRIGHT** distributor is well-qualified to suggest methods for both speeding production and saving money. You will find him listed in your metropolitan classified telephone directory. If your problem is special, ask your distributor to call a **WRIGHT** engineer, who has had years of experience in solving material-handling problems.

WRIGHT MANUFACTURING DIVISION

York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT • CONNECTICUT

ACCO TRADE MARK

In Business for Your Safety

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

NATIONAL EMERGENCY

. . . may prove to be permanent and valuable addition to list of alloy steels, maker of aircraft parts finds in making extensive tests

By NORMAN E. WOLDMAN
Chief Metallurgical Engineer
And
ROBERT C. GIBBONS
Eclipse—Pioneer Division
Bendix Aviation Corp.
Teterboro, N. J.

INTRODUCTION of the National Emergency steels was greeted hesitantly by the aircraft industry because weight restrictions had demanded only the highest quality steels. In an effort to co-operate to the fullest extent, the Eclipse-Pioneer Division of Bendix Aviation Corp. is making a thorough investigation of the most promising of these steels to determine which would be most satisfactory as replacements.

Such tests were absolutely necessary since aircraft equipment parts are not large in size but are highly stressed. Furthermore, the physical properties of these steels at various hardnesses must be accurately determined so that the proper margin of safety will be retained while still keeping weight at minimum.

Steels selected for the first tests were two steels of medium carbon content which could be oil quenched to a hardness of about 50 rockwell C and would have applications that might replace the largest tonnage of alloy steels used before the war.

As with other aircraft manufacturers, all steels are purchased in aircraft quality grade. The two steels selected were Aeronautical Material Specifications steels AMS-6320 and AMS-6322, composition of which conforms to NE-8735 and NE-8740 respectively. These NE numbers which were in effect during 1942 have since been replaced, but it may be noticed that the chemical composition reported 'on the steels tested also conforms with grades NE-8635 and NE-8640 adopted in December, 1942.

In the course of this investigation the following properties of these two steels were examined:

—Heat treating characteristics, including hardenability.

—Physical properties in tension in heat treated condition.

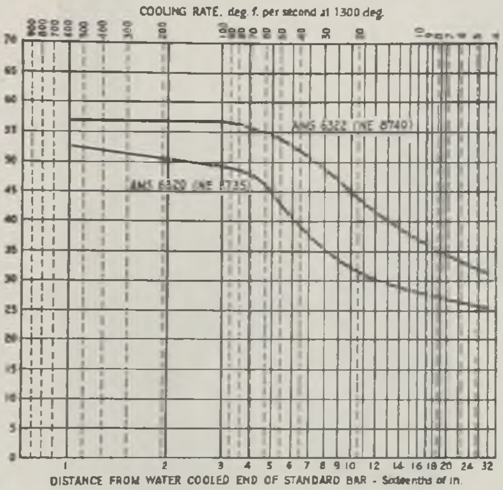
—Impact properties in heat treated condition.

—Physical properties in torsion in heat treated condition.

Other properties, including fatigue strength, wearing qualities of hardened parts, and machinability have not been completed at the present time, but enough has been learned to know that these should follow the general trend of alloy steels at the same hardness.

The steel used in these tests was obtained from Copperweld Steel Co. and analyzed as shown in Table I.

Tables given in the literature show the following as the approximate critical



Type of Steel: NATIONAL EMERGENCY STEELS   Source: COPPERWELD STEEL CO.
Notes: AMS 6320 (NE 8735) and AMS 6322 (NE 8740)

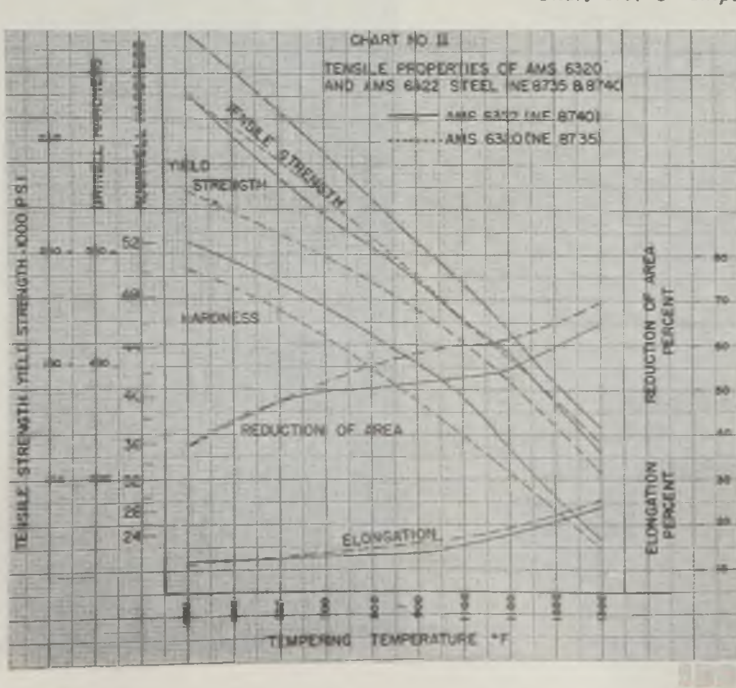
STEEL ANALYSES AND QUENCHES

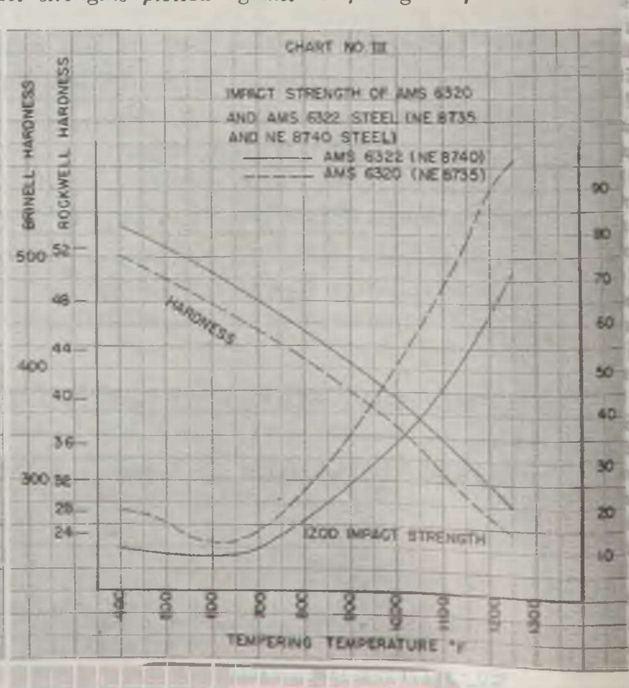
Steel	C	Mn	P	S	Si	Ni	Cr	Mo		Quenching Temperature	Grain Size	Heat Number
AMS 6320	0.34	.88	.007	.016	.24	.48	.57	19		1525° F	6-7	60271
AMS 6322	0.44	.83	.006	.015	.26	.47	.54	.25		1500° F	6-7	60272

Chart No. 1—Left: SAE hardenability chart of AMS-6320 (NE-8735) and AMS-6322 (NE-8740)

Chart No. 2—Tensile properties plotted against tempering temperatures

Chart No. 3—Impact strengths plotted against tempering temperatures





STEELS

points (degrees Fahr.) of these two steels:

	AMS-6320 (NE 8735)	AMS 6322 (NE 8740)
Ac1	1350	1350
Ac3	1460	1450
Ar3	1330	1300
Ar1	1200	1180

Preliminary tests of several samples showed that satisfactory hardening could be obtained by heating for 45 to 60 minutes for each inch of heaviest cross section. These steels have low chromium and molybdenum content and do not require the longer soaking time of those steels having larger quantities of these alloys. However, they do not have the low quenching temperature of the high nickel alloys. Our tests showed that a full hardening could be obtained by using the following quenching temperatures:

1525 degrees Fahr. for AMS-6320 (NE-8735)

1500 degrees Fahr. for AMS-6322 (NE-8740)

Hardenability Tests

While these are not the absolute minimum, lower temperatures are not recommended if full hardness is expected, unless a prolonged soaking time is used.

Jominy hardenability tests were made in the usual manner using a 1-inch test sample. Average hardnesses found at various distances were plotted in Chart No. 1, where the rockwell C hardness was plotted against the distance from the quenched end. SAE semi-logarithmic paper was used.

These curves indicate that the maximum hardness that may be expected with AMS-6320 (NE-8735) steel would be about 53 rockwell C, and with AMS-6322 (NE-8740) steel would be about 57 rockwell C. The slant of the curve is greater with AMS-6320 steel indicating that heavy sections would have a lower hardness in the center in comparison with the surface hardness.

Since the cooling rate at the center of a 1-inch round bar quenched in agitated oil has about the same cooling rate as the spot ¼-inch from the end of a Jominy bar, the hardness at the center of a 1-inch round bar of AMS-6320 steel quenched in agitated oil should be about 48 rockwell C, and that of AMS-6322 steel under the same conditions would be about 55 rockwell C. Normalized bars in 1-inch round sizes would be slightly less than the lowest points on the curve or about 25 and 30 rockwell C hardness respectively. Both steels might show evidence of hard spots in the normalized condition in small sizes because of some air hardening.

TABLE I—CHEMICAL ANALYSIS OF STEELS TESTED, PER CENT

	AMS-6320 (NE-8735) Actual	AMS-6320 (NE-8735) Specified	AMS-6322 (NE-8740) Actual	AMS-6322 (NE-8740) Specified
Carbon	0.34	0.33-0.38	0.44	0.38-0.43
Manganese	0.88	0.75-1.00	0.83	0.75-1.00
Silicon	0.24	0.20-0.35	0.26	0.20-0.35
Sulphur	0.016	0.040 max.	0.015	0.040 max.
Phosphorus	0.007	0.040 max.	0.006	0.040 max.
Nickel	0.48	0.40-0.60	0.47	0.40-0.60
Chromium	0.57	0.40-0.60	0.54	0.40-0.60
Molybdenum	0.19	0.20-0.30	0.25	0.20-0.30

The McQuaid-Ehn grain size on both steels was 6-7 on ASTM chart.

(The analyses specified are those of the AMS grades and conformed to the NE grades in use during 1942. The revised list showing NE-8635 and NE-8640 are changed only slightly in composition and the above steel analysis of the heats used come within the new NE specifications also.)

TABLE II—RECOMMENDED TEMPERATURES

Quenching Temperature AMS-6320 NE-8735	Quenching Temperature AMS-6322 NE-8740	Tempering Temperature AMS-6320 NE-8735	Tempering Temperature AMS-6322 NE-8740	Rockwell C Hardness AMS-6320 NE-8735	Rockwell C Hardness AMS-6322 NE-8740
1525°F	1500°F	500°F	600°F	48	48
1525	1500	700	800	44	44
1525	1500	875	950	40	40
1525	1500	1000	1075	36	36
1525	1500	1100	1150	32	32
1525	1500	1175	1200	28	28

TABLE III—PHYSICAL PROPERTIES OF AMS-6320 AND 6322 STEELS COMPARED WITH OTHER ALLOY STEELS AT THE SAME HARDNESSES

	Tensile Strength	Yield Strength	Red. of Area	Elongation	Izod Impact	Rockwell C	Brinell
SAE 2330	125,000	90,000	60	22	55	28	270
SAE 3135	125,000	118,000	61	22	65		
SAE 3250	132,000	110,000	65	22	64		
SAE 4135	138,000	115,000	62	20	80		
SAE 4350	130,000	123,000	60	24	78		
SAE 4640	130,000	111,000	59	21	55		
SAE 6150	139,000	130,000	57	20	77		
AMS 6320	135,000	123,000	64	22	88		
AMS 6322	136,100	125,000	62	22	74		
SAE 2330	140,000	105,000	57	20	37	32	297
SAE 3135	145,000	138,000	60	20	52		
SAE 3250	145,000	122,000	56	19	47		
SAE 4135	145,000	122,000	60	18	70		
SAE 4350	145,000	137,000	54	20	60		
SAE 4640	145,000	129,000	57	20	50		
SAE 6150	152,000	145,000	53	18	67		
AMS 6320	149,000	139,000	61	20	73		
AMS 6322	149,800	139,000	59	19	62		
SAE 2330	165,000	132,000	55	17	20	36	332
SAE 3135	168,000	158,000	59	18	37		
SAE 3250	161,000	142,000	52	17	31		
SAE 4135	161,000	133,000	57	17	45		
SAE 4350	165,000	153,000	50	18	50		
SAE 4640	160,000	140,000	54	17	40		
SAE 6150	165,000	157,000	49	15	32		
AMS 6320	167,000	157,000	59	17	56		
AMS 6322	168,000	159,000	55	17	50		
SAE 2330	190,000	165,000	50	15	11	40	372
SAE 3135	190,000	178,000	56	16	20		
SAE 3250	187,000	162,000	47	14	18		
SAE 4135	186,000	160,000	50	13	22		
SAE 4350	185,000	177,000	45	15	30		
SAE 4640	181,000	162,000	50	15	26		
SAE 6150	187,000	174,000	45	14	23		
AMS 6320	192,000	178,000	58	15	39		
AMS 6322	186,000	177,000	52	15	34		
SAE 2330	218,000	192,000	42	13	9	44	415
SAE 3135	214,000	195,000	50	14	7		
SAE 3250	220,000	195,000	41	11	9		
SAE 4135	220,000	184,000	43	11	14		
SAE 4350	215,000	200,000	41	12	19		
SAE 4640	205,000	180,000	46	13	20		
SAE 6150	217,000	197,000	41	12	17		
AMS 6320	219,000	195,000	52	13	16		
AMS 6322	210,000	197,000	52	13	22		
SAE 2330						48	460
SAE 3135							
SAE 3250	239,000	209,000	38	10	8		
SAE 4135	240,000	210,000	39	10	11		
SAE 4350	245,000	220,000	36	10	8		
SAE 4640	227,000	210,000	45	10	15		
SAE 6150	240,000	218,000	39	12	10		
AMS 6320	250,000	217,000	44	12	11		
AMS 6322	248,000	221,000	47	13	8		

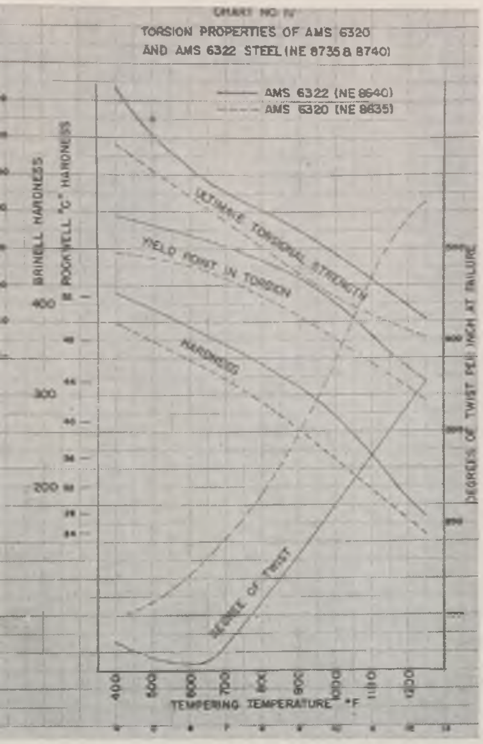


Chart No. 4—Torsion properties as they vary with tempering temperatures

TABLE IV—TORSIONAL PROPERTIES

Steel	Torsional Strength	Yield Strength	Degrees Twist/in.	Hardness Rockwell	Hardness Brinell
SAE-3250	123.000	87,000	450		
SAE-4350	122,000	87,000	480		
SAE-6150	117,000	85,000	420	28	270
AMS-6320	116,000	87,000	520		
AMS-6322	122,000	89,000	340		
SAE-3250	128,000	96,000	370		
SAE-4350	130,000	95,000	400		
SAE-6150	126,000	94,000	320	32	297
AMS-6320	124,000	98,000	460		
AMS-6322	132,000	100,000	308		
SAE-3250	138 000	107,000	320		
SAE-4350	139,000	105,000	320		
SAE-6150	136,000	104,000	260	36	332
AMS-6320	134,000	112,000	360		
AMS-6322	144,000	112,000	278		
SAE-3250	151,000	121,000	260		
SAE-4350	152.000	122,000	240		
SAE-6150	148,000	119,000	180	40	372
AMS-6320	150 000	125,000	290		
AMS-6322	155,000	127,000	228		
SAE-3250	165,000	135.000	120		
SAE-4350	168 000	139,000	150		
SAE-6150	165,000	133,000	100	44	415
AMS-6320	174,000	142,000	182		
AMS-6322	174,000	148,000	148		
SAE-3250	193.000	152,000	40		
SAE-4350	190.000	155,000	48		
SAE-6150	187,000	150.000	48	48	460
AMS-6320	210 000	155 000	115		
AMS-6322	194,000	164,000	56		

From these curves the predicted hardness at the center of various sized round bars as quenched in agitated oil have been calculated, as follows:

Size of Round Bar Inch	Rockwell C Hardness at Center AMS-6320	AMS-6322
0.500	50	56
0.750	48	55
1.000	46	53
2.000	30	42

It is to be noted that the AMS-6322 steel tested was on the high side of carbon analysis and the average heat of this steel would be lower in hardness than the curves noted in this report. These figures are for an average heat of AMS-6322 steel. It should be noted that the carbon content of the AMS-6320 steel was on the low side of the carbon range, and hence, most of the heats of AMS-6320 and AMS-6322 steels would have properties and hardnesses between those of the two steels. This would be true of the following curves also, and they have been reported together to make comparison easy.

For convenience in heat treating these steels, the quenching and tempering temperatures in Table II are recommended for obtaining the hardness of small sections, about one-half inch in diameter. These temperatures will vary with variation in analysis of the steel, with variations in the size, and with variations in the heat-treating methods.

Tension Tests: Standard tensile test bars were made up from both steels, heat treated in rounds having 0.530-inch gage diameter, ground to 0.505-inch gage diameter, and tested in tension. Tensile tests were made at hardnesses of 24 to 52 rockwell C in 4-point hardness increments, using three test bars at each hardness. The results of ultimate tensile strength, yield point in tension, elongation, and reduction of area are shown graphically in Chart No. II with physical properties plotted against tempering temperature.

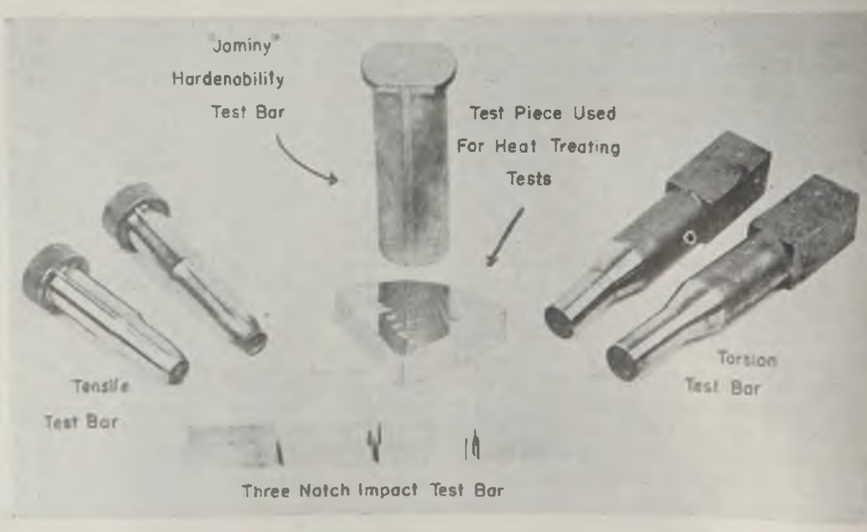
A better comparison of the properties of these steels at a given hardness can be obtained by referring to Table III, in which these physical properties are compared with other alloy steels heat-treated to the same hardness. Some of the results of the other alloy steels were obtained from tests made in our laboratory while others were taken from the literature.

It can be noted that when properly hardened all of the alloy steels have ultimate tensile strengths that fall within a very narrow range at any given hardness. The two AMS steels have strengths well up toward the higher edge of that range, at any of the hardnesses listed.

The yield strength varies through a wider range but here also the AMS steels show relatively high values in comparison with standard alloy steels. Part of the variation in yield strength may be due to variations in methods of determination, and accuracy of the readings.

The reduction of area of both AMS steels rates high at all hardnesses and shows exceptional values at the hardnesses of 44 and 48 rockwell C. The elongation of all steels follows a very narrow range and the two AMS steels come within that range.

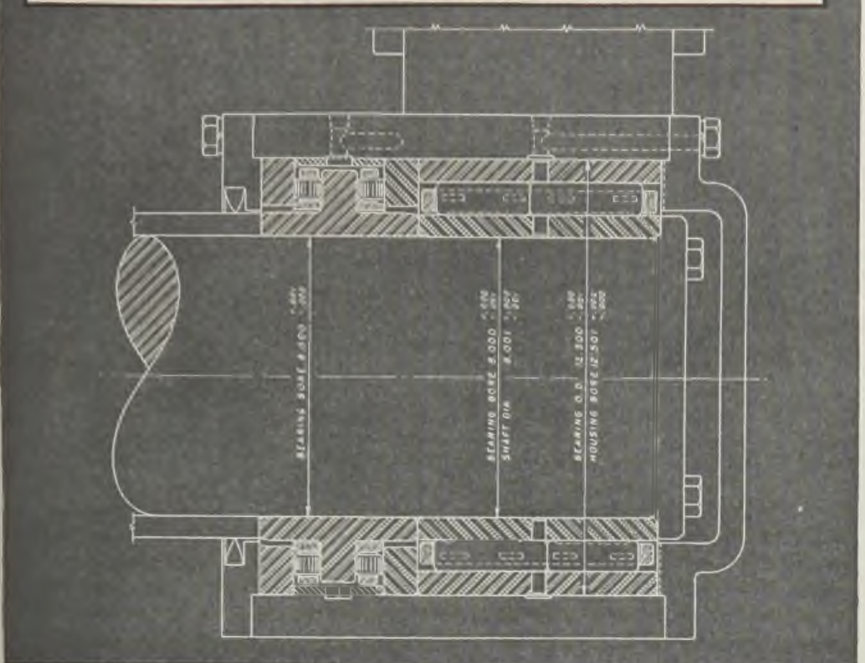
(*Please turn to Page* 150)



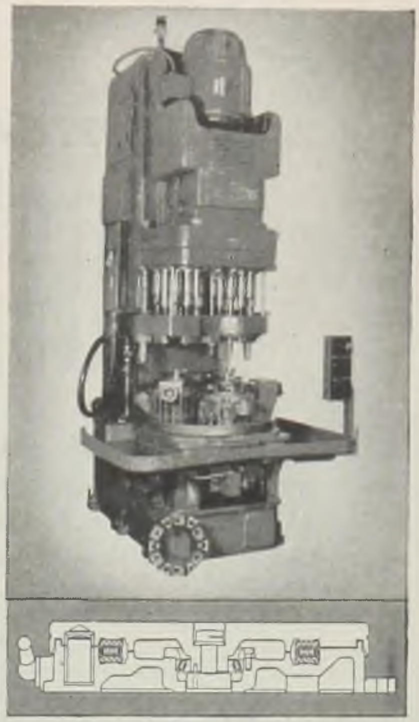
Test bars used to determine physical properties

IN THE NEWS

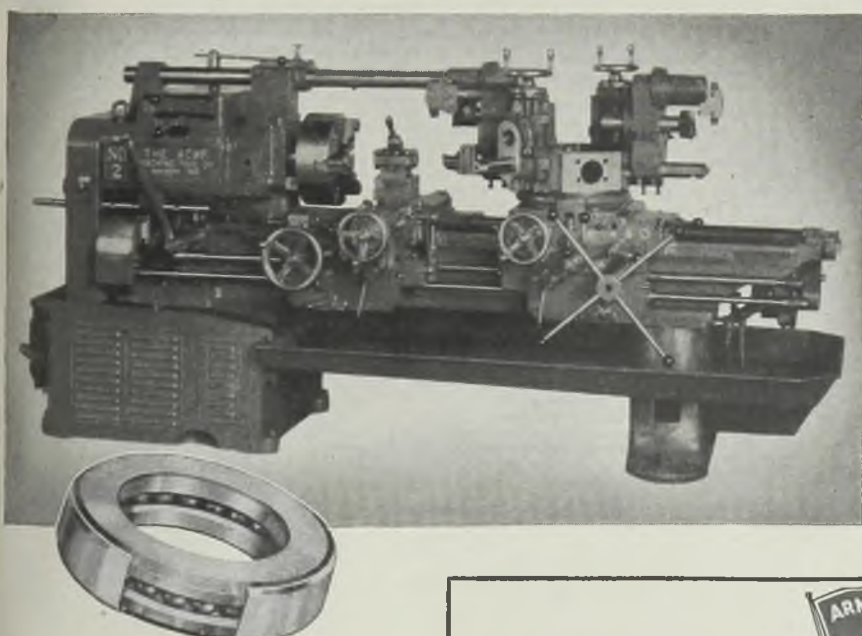
WITH TORRINGTON BEARINGS



270,000 POUNDS RADIAL LOAD and 168,000 pounds thrust load is the capacity of this compact, 12.5″ O.D. Torrington Mill Type Bearing designed by the Company's Bantam Bearings Division to carry the work rolls of a new design axle-type rolling mill in the steel industry. This is another interesting example of the ability of Torrington engineers to design and build anti-friction bearings to meet new and specialized requirements.



MULTIPLE STATION DRILL PRESS, built by Snyder Tool & Engineering Company, uses large Torrington Roller Thrust Bearings to provide anti-friction operation for the rotary table and insure sturdy support to the "work." Bearing, as shown in cross-section, is supplied in three sizes to meet the requirements for both hand and power indexed tables.



FOR ANTI-FRICTION OPERATION on the long and cross feed shafts of this Universal "Cincinnati Acme" Turret Lathe, built by The Acme Machine Tool Company, four Torrington banded Ball Thrust Bearings are employed in each apron. This type of Ball Thrust Bearing as shown in inset is supplied by Torrington's Bantam Bearings Division in a standard range of sizes from ½″ to 3½″ I.D.

THE COMPLETE TORRINGTON-BANTAM LINE includes every major type of anti-friction bearing—straight roller, tapered roller, Needle and Ball. You will find the experienced assistance of Torrington engineers helpful in selecting the *right* bearing for any anti-friction bearing problem. For today's requirements or assistance in laying out your postwar designs—TURN TO TORRINGTON!

ARMY E NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

By G. M. CHUTE
Application Engineer
General Electric Co.
Detroit

Fundamentals of INDUSTRIAL ELECTRONICS

Electronic control of heat applied by resistance welders is covered in the fifth article by Mr. Chute. Phase-shift circuit makes it possible to change quickly and accurately the amount of weld current through the primary of transformer

PREVIOUS articles in this series have shown how the vacuum tube can gradually change the amount of its anode current in response to a gradual change in the signal voltage applied to the grids. We have also seen that very large currents (compared to currents carried by vacuum tubes) can be turned on and off by using thyratrons or ignitrons. At the same time, we have had to realize that the amount of current flowing through such gaseous tubes is limited only by the load circuit, just as the amount of amperes flowing through the tips of a magnetic contactor depends on the load supplied by the contactor. With a magnetic contactor, the coil can close the contact tips, but cannot control the amount of current flowing through the tips. In the same way, the thyratron grid and ignitron ignitor can turn on or fire these tubes when desired, but cannot control or limit the amount of anode current flowing once tubes have fired.

Varying Power Through Gas-filled Tubes

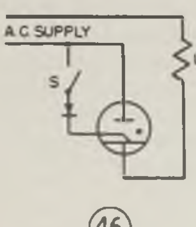
Fortunately, there are methods whereby we can control thyratrons and ignitrons so they will change or limit the average current flowing through them. Such methods are usually known as phase-shift controls. A phase-shift circuit is used in a heat-control unit (Fig. 62) designed for use with an ignitron contactor, to control the amount of current through the primary of a welding transformer. The secondary of this welding transformer supplies current to the welder electrodes and in turn produces heat at the junction of the metals being welded. By means of this heat control, it is possible to change quickly and accurately the amount of weld current and thereby control the weld heat.

Fig. 46—*Closing a switch to start an ignitron*
Fig. 47 — *Thyratron starts an ignitron*
Fig. 48—*Critical-grid-voltage curve of a typical thyratron*
Fig. 49—*Thyratron controlled by grid-voltage transformer*
Fig. 50—*Alternating current grid voltage in phase. Thyratron may conduct entire half cycle*
Fig. 51—*Grid voltage 180 degrees out of phase. Thyratron does not conduct*
Fig. 52—*Thyratron controlled by phase-shifted alternating-current grid voltage*
Fig. 53 — *Grid voltage leading. Thyratron conducts half cycle*

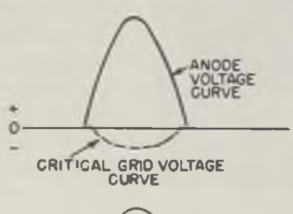
Before introducing the heat control circuit, let us proceed through several intermediate fundamental steps: (1) see how a thyratron tube is often used to control an ignitron; (2) apply an alternating current grid voltage to control the thyratron; (3) study methods for changing the phase of this alternating current grid voltage; and (4) observe the resulting wave shapes when two such thyratrons are connected to an inductive load.

Ignitrons Controlled by Thyratrons

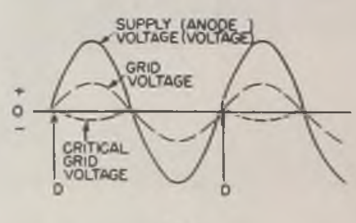
In Fig. 46, we close a single-pole switch (S) to connect the anode potential to the starter of an ignitron, so that as much as 40 amperes can flow into the ignitor to fire this big tube. (A rectifier is in series with the ignitron to prevent the flow of reverse current which would ruin the ignitor.) In place of this switch, a thyratron tube is often used, as shown in Fig. 47. Since the thyratron is connected in series with the ignitor or starter, the ignitron cannot fire until the thyratron first passes a "slug" of current into the ignitor. Therefore, whatever grid potential controls the thyratron (turns it on or off in an alternating current circuit) this



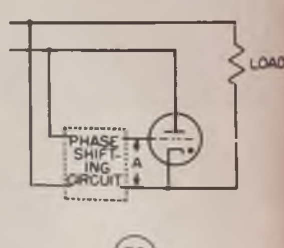
(46)



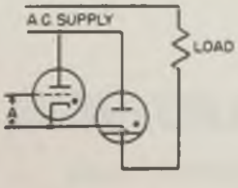
(48)



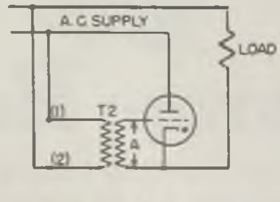
(50)



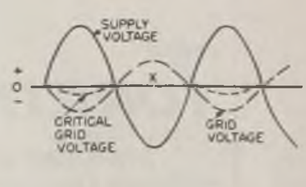
(52)



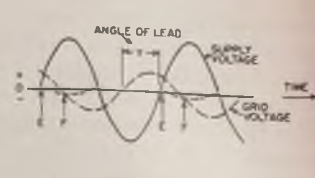
(47)



(49)



(51)



(53)

Goodness knows, we wouldn't for a moment suggest that you go in for the Sunday supplement type of post war planning.

Never-the-less, the most successful post war plans will be the nicely balanced combinations of "pretty bubbles in the air" and "how firm a foundation".

And if you can produce that happy combination, yours will be a truly bright new world.

HEAD IN THE CLOUDS
FEET ON THE GROUND

And when you plan your motor drives, we would like to sit in with you, because we can really help.

Take the machines below for instance. They are powered by Master units, which are a combination of an integrally built motor, a mechanical variable speed drive, a gear reduction unit . . . all supplied in an explosion proof construction.

These could be supplied for single phase, polyphase, or direct current . . . in open, splash proof, enclosed and fan-cooled construction, with or without the gear unit, with or without the variable speed drive . . . with an integrally mounted electric brake, if required . . . and its construction can be modified mechanically so that its method of mounting is practically unlimited.

Such wide flexibility can aid you materially in adding to the economy, safety, compactness and appearance of your motor driven products or plant equipment.

THE MASTER ELECTRIC COMPANY
Dayton 1, Ohio

MASTER

"Raising Our Sights"

THE sale of 112,500 shares of new stock at $30 per share, as authorized by the Board of Directors of this bank, has now resulted in the addition of $3,375,000 to capital funds.

Our Statement of Condition below shows capital of $9,000,000, surplus of $9,000,000, undivided profits and reserves of $4,626,688.

This increase in capital has placed the bank in a better position to serve the financial needs of business now and after the war.

STATEMENT OF CONDITION • APRIL 19, 1944

ASSETS

Cash and Due from Banks		$108,303,822.95
United States Government Obligations		220,713,351.71
Other Securities		8,644,808.12
Loans and Discounts		76,354,098.16
Investment in Banking Premises		1,650,000.00
Customers' Liability on Acceptances and Letters of Credit		908,307.36
Accrued Interest		952,732.71
Other Assets		247,902.62
		$417,775,023.63

LIABILITIES

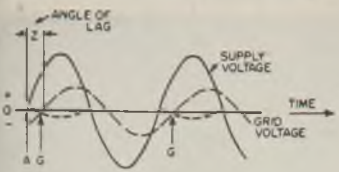
Capital Stock	$ 9,000.000.00	
Surplus	9,000,000.00	
Undivided Profits	1,815,599.95	$ 19,815,599.95
Reserves		2,811,088.34
Dividend on Capital Stock Payable May 1, 1944		157,500.00
Acceptances and Letters of Credit		908,307.36
Accrued Interest and Expenses		667,096.10
Deferred Credits and Other Liabilities		568,677.59
Corporation, Individual and Bank Deposits	$285,542,870.45	
Savings Deposits	37,131,417.98	
Trust and Public Deposits	12,336,301.80	
U. S. Government War Loan Account	57,836,164.06	392,846,754.29
		$417,775,023.63
Contingent liability on unused loan commitments to customers	$29,934,471.06	

NOTE: United States Government obligations carried at $72,015,369.02 are pledged to secure trust and public deposits, U. S. Government War Loan account, and for other purposes as required or permitted by law.

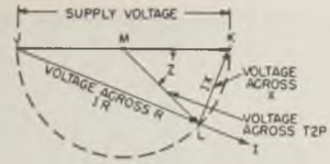
THE NATIONAL CITY BANK
OF CLEVELAND

Euclid at East 6th — THE NATIONAL CITY BANK 1845 CLEVELAND'S OLDEST BANK — *Terminal Tower*

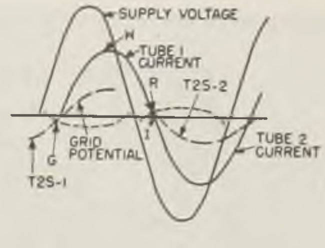
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION



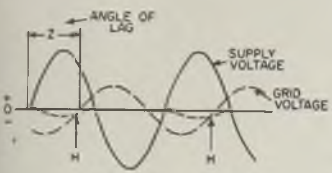
54



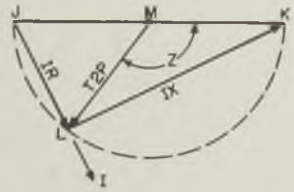
57



60

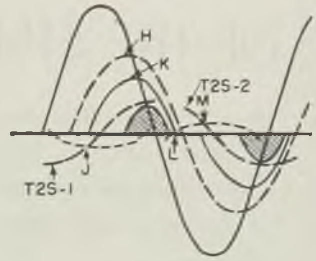


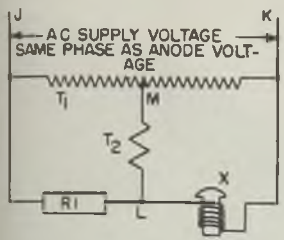
55



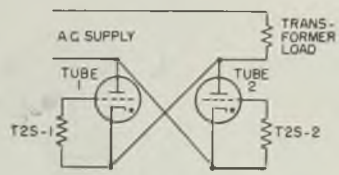
58

61





56



59

Fig. 54—Grid voltage slightly lagging. Thyratron conducts most of half cycle

Fig. 55—Grid voltage greatly lagging. Thyratron conducts small part of half cycle

Fig. 56—Circuit for phase-shifting the voltage of transformer T2

Fig. 57—Voltage relationships — small amount of phase shift

Fig. 58—Voltage relationships — large amount of phase shift

Fig. 59—Two thyratrons as an alternating-current switch, each tube having alternating-current grid control

Fig. 60—Thyratrons passing alternating-current to inductive load, at full wave

Fig. 61—Thyratrons passing less than full-wave alternating-current to inductive load

same grid potential in turn controls the firing of the ignitron. With this combination of a thyratron and an ignitron, a large amount of current (perhaps thousands of amperes) can be controlled by small changes in the grid voltage supplied at "A" (measured between grid and cathode of the thyratron). This shows that an ignitron is easily controlled by a thyratron; we may now center our attention on the thyratron alone.

The Thyratron Characteristics

Let us briefly review a characteristic of the thyratron—its critical-grid-voltage curve (previously described in Fig. 30). We know that if we apply some direct current voltage between the anode and the cathode (with the anode positive), the tube fires (permits anode current to flow) unless we also apply a voltage to the grid so that the grid is more negative than the cathode. The grid voltage that just barely prevents the tube from firing (at that certain anode voltage) is called the critical grid voltage; at a greater anode voltage the critical grid voltage is more negative.

Operating on alternating current, the thyratron anode voltage rises from zero to a maximum, and returns to zero during the positive half cycle (when the anode is more positive than the cathode). For every value of anode voltage during this half cycle, there is a corresponding value of critical grid voltage; the resulting critical-grid-voltage curve is shown in Fig. 48, and appears also in the diagrams following.

The Thyratron Grid Circuit

Coming now to Fig. 49, we find a single thyratron whose grid circuit includes a transformer (T2) which supplies a 60-cycle sine wave of grid voltage at "A". By changing transformer connections, we can make this alternating current voltage be exactly in phase with the alternating current anode voltage of the thyratron, or be 180 degrees out of phase. As we will explain later, it is possible to get any intermediate phase relation desired, by means of an auxiliary circuit.

If transformer T2 is so connected that the tube grid becomes more positive at the same instant that the anode becomes positive, the tube will fire at the beginning of every positive half cycle. As shown in Fig. 50, the grid is never negative at the right time to keep the tube from firing; that is, the grid and anode voltages are in phase. (In all such diagrams, remember that the cathode potential is represented by the zero line.) At the very beginning of the half cycle, the grid potential is more positive than the cathode, and the tube fires at point D where the grid potential crosses the critical-grid-voltage curve. The tube passes current during the entire half cycle.

Let us now interchange terminals 1 and 2 of transformer T2, shown in Fig. 49. The grid potential now becomes more negative while the anode potential is increasing in a positive direction, as shown in Fig. 51. In other words, the grid voltage is 180 degrees out of phase with the anode voltage. It is assumed that the grid voltage is much greater (more negative) than the critical grid voltage required to keep the tube from firing. In Fig. 51 it is seen that while the anode is positive the grid is always more negative than the values of the critical-grid-voltage curve, and so the tube never fires. (Although the grid potential becomes positive during the intervening half cycle X, the tube anode is then more negative than the cathode and the tube cannot fire.)

Shifting the Thyratron-Grid Phase

We must learn what happens in the tube when the grid voltage is at some other phase angle than the two cases mentioned. Fig. 52 shows the same circuit as Fig. 49, except that the dotted rectangle contains a "phase-shifting circuit". As described later, this circuit can make the alternating current grid-voltage curve either lag or lead the curve of anode voltage. By "lag" we mean that the grid-voltage curve does not cross the zero line and become positive until after the anode voltage has become positive. The term "lead" means just the opposite; that is, the grid voltage becomes positive before the anode voltage. If the grid crosses the zero line (in positive direction) one-fourth cycle than the anode voltage, we say

FLAME THROWERS OF THE STEEL FRONT

Bessemer converters are the flame throwers of production on the steel front. They spear the skies over the busy steel plants of America with fiery warnings to our enemies.

The Bessemer process first made steel available in commercial quantities. In recent years progress in the operation of converters has been outstanding, with "flame control" — a product of J&L research — the first major scientific contribution to uniformity of quality.

Easy to work and machine, this new steel now supplying urgent war needs, promises abundant contribution to better living in peace time.

JONES & LAUGHLIN STEEL CORPORATION J&L STEEL

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

STEEL CORPORATION

TONES BY ORISON MACPHERSON, AT J&L ALIQUIPPA WORKS

THE BESSEMERS

"Blow air through molten iron and expect to improve its quality? or make steel? Ridiculous idea!" exclaimed British iron workers back in the 50's when an Englishman first proposed it. "A crazy notion! It will just cool the iron!" scoffed iron workers in this country when an American began toying with the same idea at about the same time. But the inventors persisted with their experiments in oxidation of molten metal and secured such results that the world experienced an industrial evolution which gave it the superior metal, steel, in commercial quantities, at prices that enabled its wide application in commerce, construction and transportation. (In the 50's steel was made in small lots, sold for $250 to $300 a ton).

42-year-old Henry Bessemer, prolific British inventor, not then a steel man, conceived the converter for transforming iron into steel by blowing air through the molten metal, and patented it in 1855. (He formed own steel company in 1858). Bessemer was knighted at 66, not for inventing steel converter, but for suggestion he made when only 20 years old for an improvement preventing re-use and counterfeiting of seals and stamps on official documents.

"Kelly's air boiling process" was the name William Kelly, an ironmaster of Eddyville, Ky. and a native of Pittsburgh, gave to his experiments in a crude little brick furnace pot in which, a few years before Bessemer's invention, he explored his "crazy notion." Kelly's converter, by his own admission, never "converted," i.e. changed iron into steel, but did yield a more highly refined iron.

Bessemers are spectacular, especially at night, as their pulsating flames and sparks fan high in the heavens, constantly changing colors from ruddy red through burnt orange and pale yellow to blinding white. Converters situated on banks of rivers or lakes put on a show that is doubly thrilling by reflection of the fiery scene upon the black night waters. Travelers to Pittsburgh often watch the stirring technicolor picture of the Bessemers at work for Victory in the big J&L Pittsburgh Works along the Monongahela River, and gaze fascinated at the fiery scene when passing the great 4-mile long J&L Aliquippa Works on the Ohio River.

25 tons of steel every 15 minutes are made in the big pear-shaped Bessemer vessels. Demands for war steel keep the Bessemers of America working night and day, seven days a week, month in, month out.

The unwinking eye of the Bessemer flame control device, an invention of Jones & Laughlin (patented in 1940), is the first basic improvement made in the process since Sir Henry's day. It is an arrangement of photoelectric cells, filters and relays which indicates the precise moment the analysis of the steel is right.

grid voltage lags the anode voltage by 98 degrees. (One complete cycle is 360 degrees, including one positive half cycle and one negative half cycle.)

Grid Voltage Leads Anode Voltage

If we now adjust the "phase-shifting circuit" of Fig. 52 so that the grid voltage leads the anode voltage by some angle Y, the resulting conditions are shown in Fig. 53. When the anode becomes positive, the grid is already positive, so the tube fires at E. Even though the grid potential becomes more negative than the critical value as shown at F, it has no effect on this gaseous tube, since it is already passing anode current. The tube passes current during the entire half cycle, and all the following half cycles when the anode is positive.

Grid Voltage Lags Anode Voltage

Now let us make the grid voltage lag the anode voltage and see what happens. As shown in Fig. 54, the grid-voltage curve now lags the anode voltage by a small angle Z. As the anode becomes positive, the grid is still negative, as shown at A; the tube does not pass current. However, the grid voltage does not stay negative, but increases in a positive direction. Just as soon as the grid voltage rises above the negative critical grid voltage, as shown at G, the tube fires. Once the tube has fired it makes no difference what the grid potential is during the rest of the half cycle. We have here been able to make the tube pass current for less than a half cycle; in Fig. 54 the tube conducts for approximately 80 per cent of its entire half-cycle period.

In Fig. 55 are shown the same conditions as in Fig. 54, except that the grid voltage is made to lag by a much greater angle, so that the tube fires much later in the half cycle (as shown at H) and passes current for a smaller portion of each half cycle. A little later we will describe how this delayed firing provides means for gradually controlling the average amount of current flow through the tube.

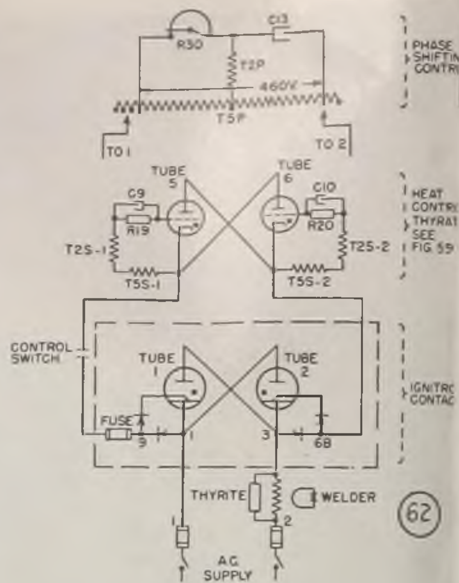
Reactor-Resistance Phase-Shift Circuit

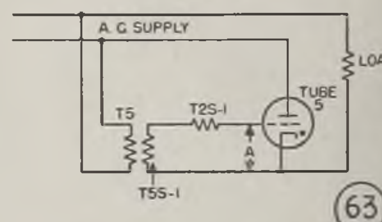
There are several kinds of phase-shifting circuits available; one commonly used is shown in Fig. 56. Here we have a transformer (T1) across an alternating current supply, of the same phase as the tube anode voltage. One reason for using this transformer is to obtain a convenient mid-tap connection at M for one primary lead of transformer T2. Also across the alternating current supply is a reactor X and a resistor R1 in series with it. Their common point L is connected to the remaining primary lead of T2. The secondary voltage of T2 is applied between the grid and cathode of the tube whose current we wish to control.

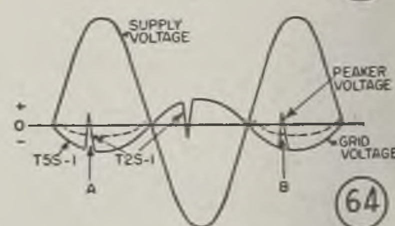
A reactor (such as X) usually consists of a large number of turns of wire wound around an iron core. Fig. 56 shows a reactor with a movable iron core (like a solenoid). Withdrawing the core decreases the amount of effective iron. With less iron, the reactor has less inductance; that is, it is less able to prevent the flow of alternating current through its windings. If the core of the reactor X in the circuit shown in Fig. 56 is removed we obtain the condition already explained in Fig. 54, a small amount of "phase shift". When we insert the iron core and thereby increase the inductance of X, we increase the amount of "phase shift" as shown in Fig. 55, and as we will explain later.

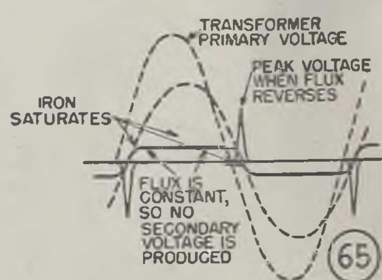
Vectors and Phase Relations

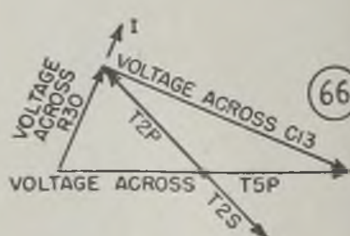
Let us briefly see how we obtain phase shift with the circuit in Fig. 56. Circuits involving phase angles are most easily explained by means of vector diagrams. You recall that a vector represents a quantity which has both size and direction. The line from which we measure the direction and size of phase-shifted voltages is called the base line. In this case, the supply voltage is used as the base line, and is represented by vector JMK in Fig. 57. By other vectors, we wish to show the voltages caused by the current flowing through R1 and X. The voltages across these circuit parts are shown vectorially in Fig. 57. We must remember that when a reactor is connected alone across a voltage, the current in that reactor lags the applied voltage. In contrast, a resistor passes current which is in phase with the applied voltage. When a reactor (X) and a resistor (R1) are connected in series as in Fig. 56, and are connected across an alternating current supply, the same current flows through both R1 and X, so the voltage across R1 always lags 90 degrees behind the voltage across X. In Fig. 57 we see that the voltage across R1 (represented by vector JL) and the voltage across X (represented by vector LK) are at right angles to each other; vectorially added together they equal vector JK (which is the supply volta e). Between the mid-point M and the 90-degree-angle junction L is a voltage (ML) which is at some angle Z with respect to the supply source JK. This voltage ML is applied to the primary of transformer T2; the secondary winding of T2 furnishes voltage at this angle Z, to the grid of the tube to be controlled. For











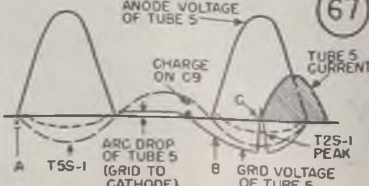


Fig. 62—Basic circuit of a commercial heat control, added to ignitron contactor

Fig. 63—A thyratron controlled by two transformer voltages in its grid circuit

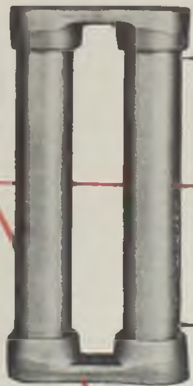
Fig. 64—Voltage waves of two transformers combining to fire thyratrons at the desired point in each half cycle

Fig. 65—Producing the voltage peak in a peaking transformer

Fig. 66—Voltage relationships in phase-shifting circuit of heat control of Fig. 62

Fig. 67—Combined grid-circuit voltages, firing thyratrons at partial heat

Illustration:



This tank track part is fabricated by brazing together precision machined alloy tubing and forgings.

Hydrogen Copper Brazed, cooled, reheated and quenched by Burgess-Norton in one continuous furnace operation.

of the completeness of Burgess-Norton's facilities for post-war production of precision parts which will be available to manufacturers when Victory Day draws nearer.

Burgess Norton
MANUFACTURING COMPANY
40 years in GENEVA, ILLINOIS

Precision Finishing as performed by Burgess-Norton is exemplified by the production of piston pins with finishes as fine as 2 micro inches.

A Part is Never Made Right unless it is Satisfactory to Our Customers the conditions shown in Fig. 57, where IX is smaller than IR, the tube-grid voltage (supplied by T2) lags by only the small angle Z behind the supply or tube-anode voltage; the result appears in Fig. 54.

Effect of Inductance Change

If the iron core previously removed is now reinserted in reactor X, its inductance increases, causing a decrease of current I flowing through X and R1. Since inductance X has increased while R1 remains unchanged, the vector voltage across X has increased as shown by the vector LK in Fig. 58. Again at a right angle to LK, we show JL, the voltage drop across resistor R1. This voltage across R1 has decreased. As a result, of these changes, vector ML (voltage across T2P) has swung clockwise so that the tube-grid voltage now lags by a much greater angle Z. The resulting relationship between the tube-anode and tube-grid voltage is shown in Fig. 55. Since the tube is kept from firing until point H, and passes current for only a small portion of each half cycle, the average current is much less than before. We see that by increasing the inductance of X we have caused a corresponding decrease in current.

Circuit to Conduct Alternating Current Through an Inductive Load

Thus far we have studied a single thyratron tube and the phase-shift control of its grid circuit. Let us now connect two tubes back to back to act as an alternating current switch, and watch them as they supply current to an inductive load. (Later we can extend this circuit to handle a large welding-transformer load, merely by letting each thyratron fire an ignitron somewhat as in Fig. 47.) In such a circuit (Fig. 59) each of these tubes is controlled by its own separate grid circuit—T2S-1 supplies the alternating current grid voltage to tube 1. However, since the current flowing through the transformer load is alternating current, we show the voltage and current wave as in Fig. 60. Here we see that the grid voltage (T2S-1) lags the anode voltage so that tube 1 starts to pass current at point G, yet the resulting current wave of Fig. 60 appears to be a continuous sine wave. When tube 1 is fired at point G, the current through the inductive

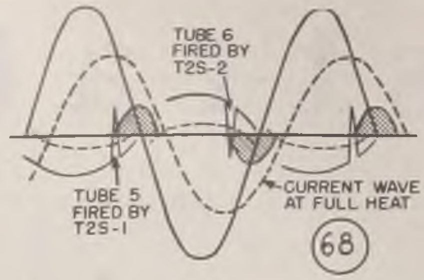


Fig. 68 — Combined grid-circuit voltages, firing thyratrons at low heat

load cannot increase abruptly, but increases gradually to its maximum at H, and continues to flow until I. However, I is the same as point R where tube 2 is fired by its own grid voltage from T2S-2, so the current now starts to flow through tube 2. This is merely a detailed way of saying that this inductive load draws current at a lagging power factor—the current wave lags about 45 degrees behind the supply voltage wave. Since we fire tubes 1 and 2 at this same 45 degree angle (the normal power-factor angle of this load), a complete sine wave of current flows through the transformer load.

Power Control by Grid-Phase Shift

If we now retard or phase-shift the alternating current curves of grid voltage so as to delay the firing of thyratron tubes 1 and 2 until a point is reached about 90 degrees behind the supply-voltage curve, Fig. 61 shows that the current starts to flow through tube 1 at point J. The inductance of the load permits the current to increase at the same rate (as before in Fig. 60), but the current has risen only as high as K before the alternating current voltage decreases at the end of the half cycle, letting the current die out at L. There is no further current flow until tube 2 is fired by T2S-2 at point M.

We notice that the height of the curve at K is lower than at H, but we now realize that this decreased current is not due to any grid control of the instantaneous current flow, but it is due to the combined effect of the inductive type of load and the delayed firing of tube 1. If the firing of the thyratrons is further delayed until a point about 135 degrees behind the supply voltage is reached, current then flows as shown by the shaded portions in Fig. 61. This method of decreasing the amount of current flow is just as effective as though the current were reduced by an auto-transformer or a series resistor. When used to control the current flow through tubes to a welding transformer, this method is called phase-shift heat control.

While the phase-shifting circuits just described are quite satisfactory in the Thy-mo-trol (thyratron motor control) and most other power applications, we need more accurate means for phase-shifting tubes used for the heat control of resistance welders (such as spot or seam welders). Let us see how this greater accuracy is provided by the circuit used in a typical heat control. This panel may be added to a standard ignitron contactor so as to phase-shift the ignitron tubes and provide variation of the welding current or "heat".

Circuit for Welder Heat Control

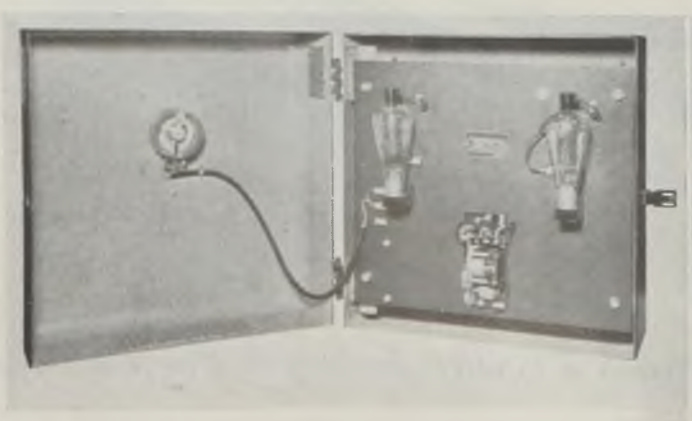
Fig. 62 shows the basic circuit of the heat control. Notice that the thyratron tubes 5 and 6 are connected as an alternating current switch in series with the control switch of the ignitron contactor. With the control switch closed, ignitron tube 1 can pass current to energize the welding transformer, only when thyratron 5 fires; tube 6 similarly controls ignitron 2.

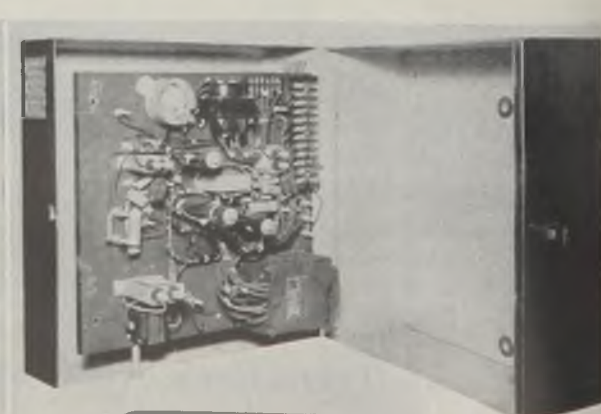
In Fig. 62, the grid circuit of thyratron 5 includes two transformers instead of the single one previously described. So, before proceeding with Fig. 62, let's refer to Fig. 63 where we show a single tube whose grid circuit includes the secondary windings of two separate transformers. Obviously, the voltage "A" which controls this tube consists of the combined voltages of T5S-1 and T2S-1. Here T5 is an ordinary transformer, connected the same as the one shown in Fig. 49; its secondary-voltage curve is 180

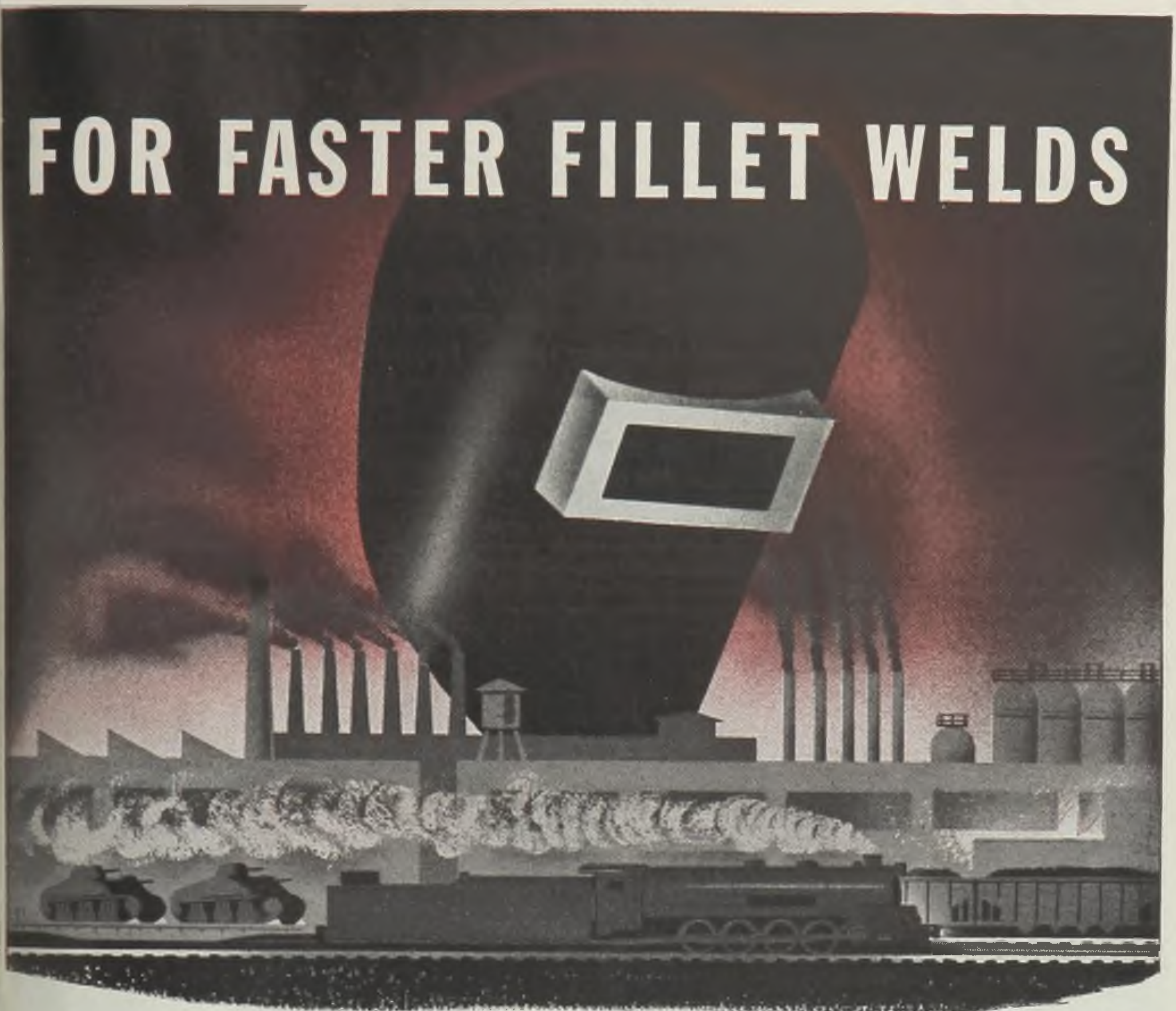
(*Please turn to Page* 152)

Left, below, thyratron phase-shift heat control for resistance welders weighs 50 pounds and measures 25 inches high, 22 inches wide and 14 inches deep

Right, a view of the thyratron phase-shift heat control unit with the hinged back panel swung out







Use Raco 20 Shielded-Arc Electrodes

High-quality deep penetration single-pass fillet welds, and more of them per hour, are assured when you use Raco 20 Shielded-Arc Electrodes. And with these electrodes you can obtain the same top-grade production whether you employ direct current straight polarity or reverse, or alternating current.

The advantages of Raco 20 Shielded Electrodes are of greater importance now than ever before. We shall be glad to send you samples so you may test their outstanding performance. Just write

Raco 20 Conforms with the following specifications: A.W.S.—A.S.T.M. Specification A233-42T, Type E-6020. U. S. Bureau of Ships Specification 46E3 (INT) Grade II Class 2.

The REID-AVERY COMPANY

DUNDALK BALTIMORE 22 MARYLAND

Filtered Water Prolongs Life of Charging Door

Pittsburgh district open-hearth shop reduces charging door maintenance costs 90 per cent merely by removing solids ranging from 0.001 to 0.004-inch from river water used in cooling system. By-product coke producers also making preparation to employ filters for removal of tar and light oils

By JOHN D. KNOX
Steel Plant Editor, STEEL

MANY open-hearth shops use raw river water to cool the charging doors of open-hearth furnaces. A certain amount of mud and silt is entrained in the water which find lodgement on the interior of the metal door frames. This sediment gradually reduces the cooling effect of the water flowing through the jackets until finally they burn out.

At a plant in the Pittsburgh district where the life of open-hearth charging doors was rather short, the management decided to resort to filtered water for cooling purposes. Filters were installed in April, 1943, and after ten months' operation, a reduction of 90 per cent in maintenance costs on open-hearth doors was experienced. So successful has been the operation that plans are being made to install a filtration system at its other plants for the same application.

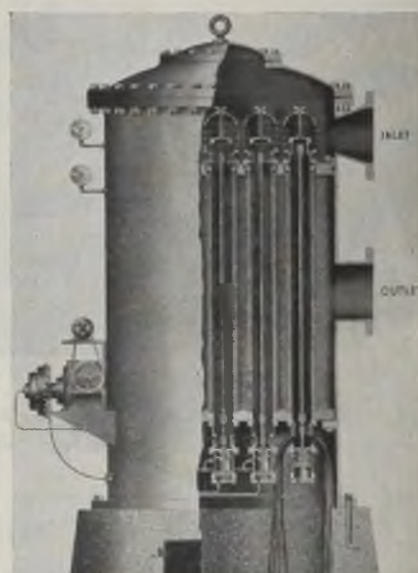
Two filters each with a capacity of 2000 gallons per minute were installed at the plant in question. They were manufactured by R. P. Adams Co., Inc., Buffalo. The main structure of the filter consists of a steel shell in which porous tubes are mounted between two rigid tube sheets. The only moving parts within the filter are the necessary valves located on either end of each tube for the purpose of segregating the tube in the cleaning cycle. Each filter tube possesses its own cleaning device.

A valving arrangement on each tube is actuated by a simple control over a predetermined time cycle. The cleaning process is automatic and continuous, one tube backwashing after another with a predetermined lapse of time between each operation. The automatic control is equipped with adjustable means for varying the cleaning cycle to suit the general characteristics of the raw water.

No moving clearances are within the filter which assures that the degree of filtration will be maintained throughout its life and that no impurities larger than the pore size of the tube will be admitted into the filter water channel. The main operating parts are installed beneath the lower tube sheet and are readily accessible for inspection or service from the pit within the foundation.

The filter will not perform on water pressure lower than 25 pounds per square inch inasmuch as automatic backwashing is dependent upon the pressure in the discharge line to effect adequate purging of the filter medium. Pressures from 25 to 100 pounds are adequate for keeping the filter medium clean with the automatic backwash feature.

A typical unit equipped with 26 tubes is controlled with an automatic cycling device for the backwashing of one tube at a time while the remainder of the 25 tubes are filtering the required flow of water. Through automatic control air is admitted to the feed line of the



Right, type of filter employed to remove solids

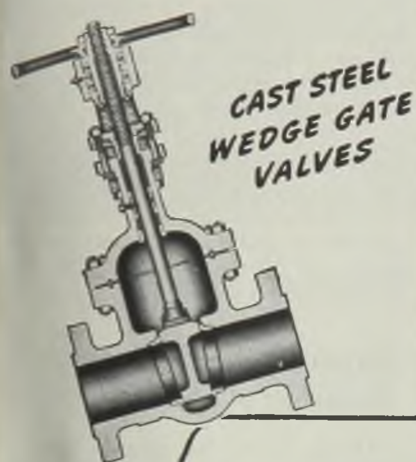
Below, water-cooled charging doors on open-hearth furnace

Power or Process Piping Systems CRANE can equip them 100%

Pipe	*Screwed Fittings*
Pipe Bends, Flanged and Welded	*Flanged Fittings*
Automatic Stop Check Valves	*Welding Fittings*
Pipe Supports	*Fabricated Piping*
Gaskets and Studs	*Separators*
Gate Valves	*Gauges*
Globe Valves	*Safety Valves*
Flanges	*Steam Traps*
Reducers	*Unions*
	Union Fittings

Steam Piping for Double-Boiler Hook-up

CAST STEEL WEDGE GATE VALVES



ONE STANDARD OF QUALITY

The whole system is more dependable because there's one high standard of quality—adequate for the need—in every part. In Crane Steel Gate Valves, for example: Straight-through ports minimize turbulence, erosion, resistance to flow. Strong tee-head disc-stem connection, ball-bearing yoke, and non-corrosive stem bearings assure smoothest operation. Adequate stem power and extra long disc guides make seating positive.

ONE SOURCE OF SUPPLY . . . ONE RESPONSIBILITY FOR ALL MATERIALS

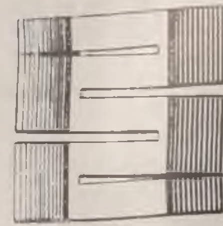
Only a source as complete as Crane can give you these advantages. For power, process, or any other piping system—not only the valves and fittings, but every part, from pipe to gaskets and studs, are regularly available from Crane. Where else, but in the world's greatest line of piping materials, could you expect a selection of equipment that always meets your needs—of quality that's always dependable? For, back of it stands Crane Co.'s 89-year leadership in the piping field. CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill.

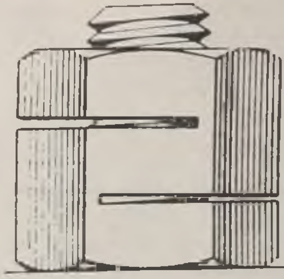
CRANE

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

Transversely slotted nut crimps on threading to provide . . . .

Shake-proof Safety Fastener





"PANTS with pleats" for a bolt might be one way of describing a new, all-metal, self-locking device produced by Beach Precision Products Co. of Harrison, N. J. Known as the Cling-Nut, the fastener is actually a hex nut with deep slots milled alternately into opposite sides at intervals.

When screwed onto a bolt and seated firmly against the engaging surface, the nut is given an extra partial turn with the wrench. Top and bottom slots close, as in Fig. 1 of accompanying diagrams, while opposed slots in center open wider than usual. Thus application of controlled pressure crimps several sections of the nut, forcing disalignment by harmlessly shoving several internal threads slightly out of phase.

The rather simple secret of the lock nut's success as a fastener is the location on the nut and depth and width of these slots, as is shown by Fig. 2 where internal threads of the nut are in normal alignment with threads of the bolt. When started on the bolt, about two whole threads can be run up easily by hand before crimping pressure begins to be exerted on the first section. As the wrench starts the next turn decided torque pressure is required to engage the nut because the bolt is forcing normal alignment of threads in the sections preceding and following it. In this manner, each section is held, depressed, then successively returned to normal position on the bolt until the nut reaches a firm base contact, where, by the additional half-turn, it is locked tight.

Depending upon the selected height of nut, two or four uniform slots are milled in the body parallel to the base surface. Slots go only as deep as the top of the thread surface beyond bolt depth; they divide the vertical height into 3, 5 or 7 equal sections. Construction is such that nut may be removed and reused repeatedly, elastic fatigue of the metal being the only limiting factor in its life span.

air cylinder beneath the tube undergoing backwashing. The air moves the piston upward, closing off the raw water from the bore of the tube and opening the lower backwash valve, exhausting the water from the bore of the tube into the backwash pit. Pressure is immediately removed from the interior of the tube and permits the surrounding filtered water to surge back through the pores and wash out the materials through the backwash valve to the sewer. The water supply for this cleaning operation comes from the general filtered water supply within the shell and does not affect the specified delivery capacity of the filter.

The unit is capable of removing solids from 0.001 to 0.004-inch depending upon the grade and type of filter tubes installed. On river water service where large volumes of solids may be present during storm periods, the degree of filtration normally is confined to the removal of solids between the range of 0.002 and 0.004-inch and above. This is accomplished by the use of a monel metal screen filter unit of great strength. Finer filtering mediums are employed for lake and reservoir service where the character of the raw water is more or less constant and the tubes are not called upon to handle large volumes of solids. This is accomplished by the use of a porous stone filter unit.

Considerable interest in filtered water for open-hearth doors is being shown by steelmakers and plans are being made for installing filters for this purpose in various districts. An Adams-type filter also has been installed at a by-product coke plant in the Pittsburgh district for removing tar and light oils from ammonia liquor. This has been so effective that five additional installations will be made in the next few weeks at by-product plants in Utah, Texas, Indiana and Ohio.

Principles of Design In Various Materials

Handbook on Designing for Quantity Production, by Herbert Chase; cloth, 517 pages, 5¼ x 8¼ inches; published by McGraw-Hill Book Co. Inc., New York, for $5.

Purpose of this book, many chapters of which are by engineers whose activities center in various materials, is to provide engineers, engineering students and others interested in design with as much practical information on designing for quantity production as can be compressed within a volume of this size.

The first section is devoted to descriptions of methods of production in each available material, each by a specialist. The second portion is entirely by Mr. Chase and makes comparison of the several materials for a specific purpose, pointing out the advantages of each in numerous applications.

Subjects treated are die castings, sand castings, screw machine products, stampings, die forgings, hot heading, cold heading and plastics.

The book is intended not only as a reference by engineers engaged in design but also for students of engineering who must understand practical considerations relating to production before they can apply the theory of design for satisfactory results.

Forum To Study Postwar Materials Handling

On the theory that planned materials handling is an essential element of planned production, Clark Tructractor Division of Clark Equipment Co., Battle Creek, Mich., is seeking to stimulate a more analytical study of moving materials, beginning with their raw state through to delivery of finished products.

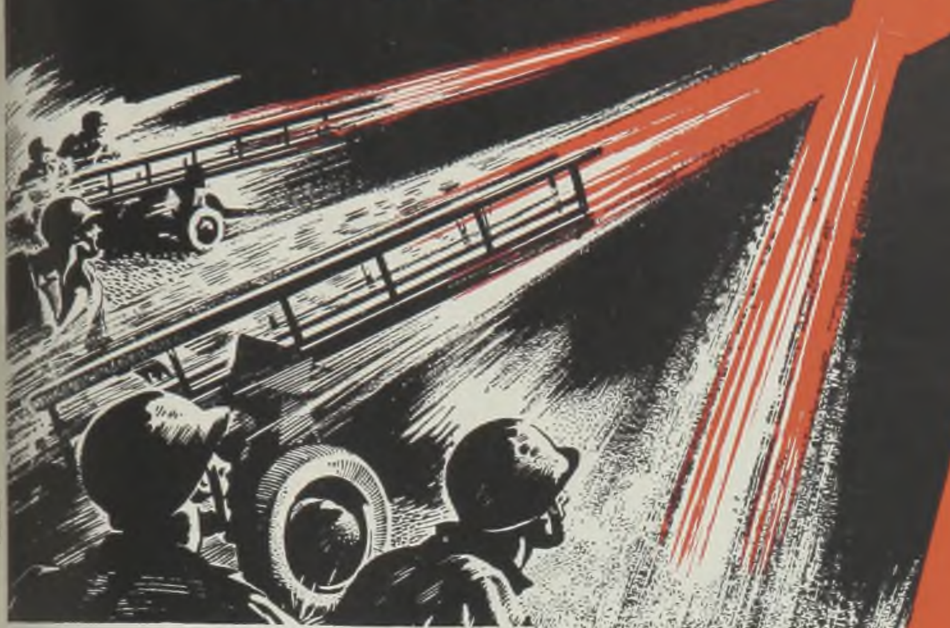
According to E. W. Clark, vice president and general manager, company has set up a Forum To Study Postwar Materials Handling which should contribute economic information valuable in formulating sound plans for industry's peacetime program.

Questionnaire forms have been mailed to executives in every industry in which materials handling is a problem. These facts, assembled and compiled, will be used as a "blueprint" for designing and building materials handling equipment engineered to fit the new needs of postwar industry.

Concentrates Production

Mercury Products Co., Cleveland, has concentrated brass turnbuckle barrel production on those with class 3 fit. Output is running 600,000 units per month.

"IN THE ROCKETS' RED GLARE..."



TARGET ROCKET TUBING

Anti-Aircaft Gunners Boost Their Batting Average

MANY soldiers now learning how to knock enemy planes from the sky with anti-aircraft guns are getting far more realistic training in this difficult art than those who practiced it in the early part of the war. In actual combat they're registering more "kills" with less battle experience. For today, instead of firing at a relatively slow-moving cloth target pulled by a tow plane, anti-aircraft trainees are schooled to set their sights on speedy rocket targets which flash across the sky from unknown and varied angles, at the pace of fast fighter planes.

Rocket targets are unique projectiles, but they are housed in a familiar material—WELDED STEEL TUBING—and it's part of our war job, as fabricators of this versatile type of tubing, to make casings for rocket targets. Thousands of "Standard" tubes for this purpose have already gone forth—and thousands more are on the way.

Despite its size, this war assignment does not employ all our capacity. We are in position to take on additional orders for WELDED STEEL TUBING in various shapes and sizes . . . and we also have equipment available to handle more contracts for Upset Steel Forgings, both tubes and solids. We will be glad to consult with you on any problem you may have in either of these classifications. Write, wire or telephone for information.

★ ★ BUY WAR BONDS ★ ★

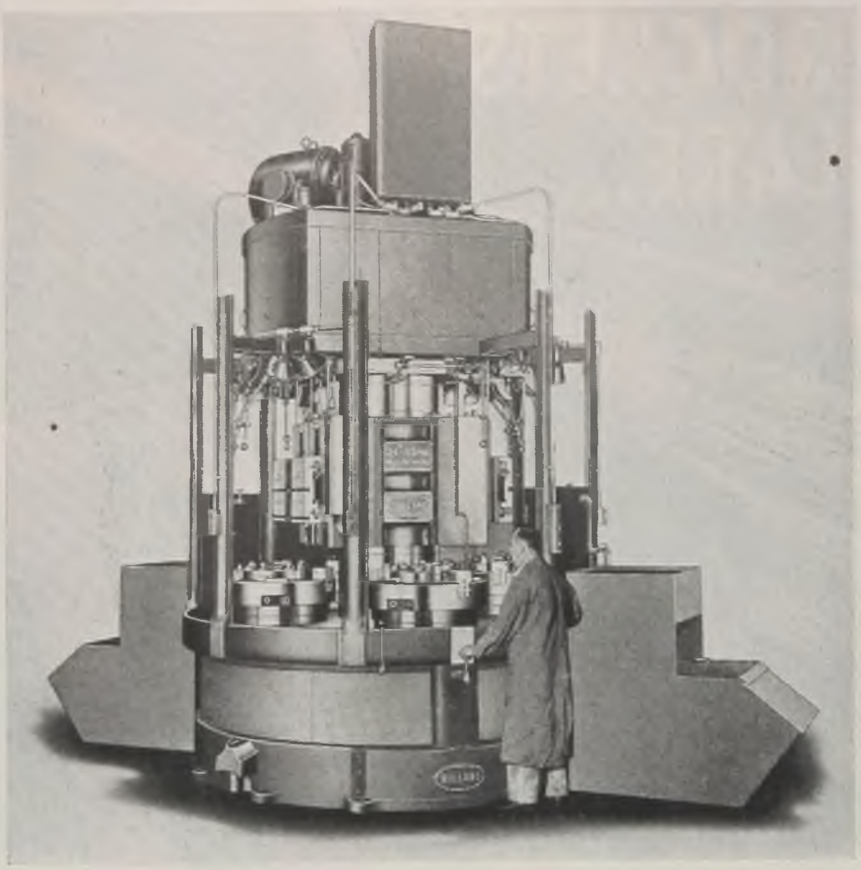
THE STANDARD TUBE CO.

Detroit STANDARD Michigan

Welded Tubing Steel Forgings

★ *Complete Tube Stocks Maintained by* ★

STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N. Y.
LAPHAM-HICKEY COMPANY, 3333 West 47th Place, Chicago, Ill.
UNION HARDWARE & METAL CO., 411 East First Street, Los Angeles, Calif.



New Bullard Mult-Au-Matic Capable of Handling Larger Size Components

TO SPEED machining of component parts of airplane engines, marine power units, tanks, transmissions, etc., a larger size Mult-Au-Matic than heretofore made by Bullard Co., Bridgeport, Conn., has been introduced. The new 34-inch Mult-Au-Matic incorporates new principles which are necessary for the production of these larger parts. The machine—entirely new and very massive—is provided with a number of labor saving features, such as power-operated chucks and push-button controls for tool slides. It will accommodate work up to 34 inches in diameter and up to 23 inches in height.

Six heads—two at each working station, each with independent feed works, and each providing vertical, horizontal, or angular motion, make it possible to accomplish with three working stations what formerly required six working stations. All heads are counterweighted hydraulically with an adjustment to give more and less weighting. A specially designed indexing and locking mechanism gives smooth indexing and provides rigid positioning and locking of the carrier at the completion of the index. Push button controls for actuation of the tool slides simplifies tooling operations. Forward or backward motions are obtainable. Hydraulic feed "kick-out" at each feed works prevents carbide tool breakage when the machine is stopped in uncompleted cuts.

An adjustable column, carrying the tool heads permits moving up and down of all six heads as a unit. Being able to adjust the heads closer to the work eliminates excessive head and tool overhand, thereby increasing tool rigidity. Change-over from low to high work is quickly accomplished on the same machine. Flexibility of speed ranges has been stressed and a dual speed range gives low speed with more power for slow, heavy cuts, or high speed for the smaller diameters. This is so designed that one or two spindles may be in low speed while the others are in high range or vice versa. At the loading station is located a fluid motor drive used to jog the spindle for targeting and indicating purposes.

Milling Cutter Bodies

To facilitate the application of the correct milling cutter to a particular piece of work, Farrel-Birmingham Co. Inc., Ansonia, Conn., has developed milling cutter bodies of Meehanite which can be machined with allowance for carbide or cast alloy tips within a broad range of rake and spiral angles.

The user faces, bores and slots the hub to suit his requirements, mills the tooth seats and brazes on the desired tips. Carbide tips may be applied where a high grade finish is required or cast alloy tips may be used for heavy roughing operations.

Because the bodies are made of Meehanite, which has great damping capacity, usual operating speeds can then be higher, chatter is reduced and tip life prolonged. This type of metal has a coefficient of expansion that is closer than steel to that of carbide. This helps to make possible a superior bond between body and tip.

Metal Cutting Saw

Peerless Machine Co., Racine, Wis., announces improved metal cutting power saws. A hydraulic micro-set length gage is mounted on the conveyor to accurately gage the length of cut. Feed pressure is adjusted by vernier finger-tip screw control and can be selected to the accuracy of ounces. The oil capacity of the feed unit has been increased 75 per cent. Other features are the four sided saw frame which completely surrounds the blade and the work and the backing plate support. This plate backs-up the blade to permit the application of maximum feed pressure with minimum strain on the blade. The eight bearings on which the saw frame and guide travel have beeen enlarged. Bearings have ground and renewable inserts. The frame is balanced in its reciprocating travel by dual hydraulic cylinders and the driving rod is connected in line with the center of the saw frame. Driving force is centrally applied and by increasing the chip capacity 60 per cent fewe

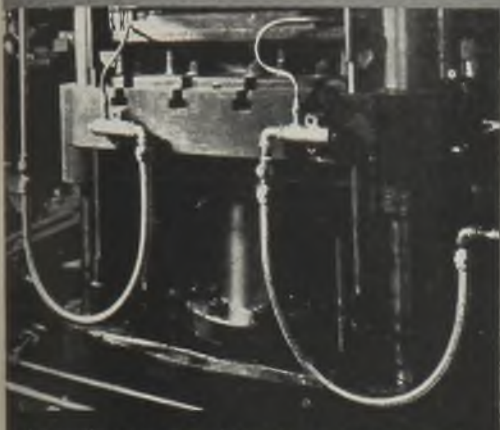
clean-up periods are required. All parts are readily accessible for easy cleaning and adjustment. The 7 and 11-inch models can be converted in any shop for handling a single bar or a nest of bars or tubes and are availabble in a variety of models and sizes.

Spike Type Box Grab

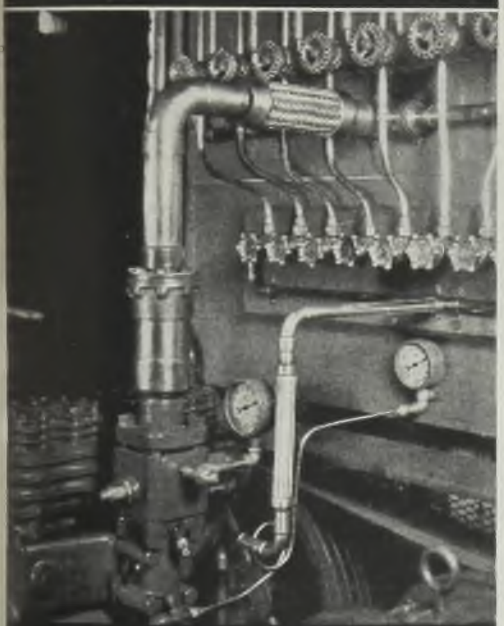
A new spike type box grab has been developed by Palmer-Shile Co., 796 South Harrington avenue, Detroit 17

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

SEAMLESS METAL TUBING
. . . flexible as a blacksnake whip



Conveying steam and connecting moving parts



Conveying gas and liquid, connecting misaligned parts, absorbing vibration

meets a thousand exacting requirements

The tubing is American Seamless Flexible Metal Tubing—the most reliable type of flexible metal conveyor obtainable where *absolute tightness is essential.* Because it is jointless it is, in effect, a flexible pipe.

Applications are practical in literally thousands of places in industry. Typical functions are illustrated on this page:

1. *For conveying steam.*
2. *For conveying liquids and gases.*
3. *For absorbing vibration.*
4. *For connecting misaligned or moving parts.*
5. *For protecting electrical wiring.*

Our technical department is experienced in designing flexible metal assemblies for specific applications. If you have a particular problem, maybe we can be of assistance to you. 44102

AMERICAN METAL HOSE BRANCH
OF THE AMERICAN BRASS COMPANY

ANACONDA *Subsidiary of Anaconda Copper Mining Company*
General Offices: Waterbury 88, Connecticut
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

American Metal Hose

Conveying gas and connecting moving parts

Use in product design and protection of electrical conduit which is recommended for use in grabbing, holding and lifting large export boxes, heavy boxed machinery or any similar boxed merchandise on which spike grips may be used. The gripper plates are fitted with replaceable cone headed spike bolts.

Four models are available in capacities of 1000, 2000, 3000 and 4000 pounds respectively. The grab may be used on boxes up to 5 feet wide and the heavier the load the tighter the hold. Chain length is adjustable.

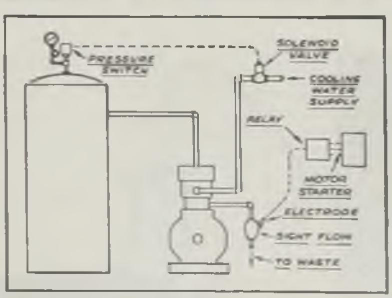
Signal Switch

Mosebach Electric and Supply Co., 1170 Arlington avenue, Pittsburgh 3, now offers a heavy-duty signal switch for

safe and efficient underground haulage. The switch is wired in series with the signal lights so that if one light fails the entire system fails. It is designed for roof or rib mounting and can be conveniently operated without leaving either motor or trip. The extra heavy contact jaws and switch blades will stand rough usage.

Compressor Control Unit

To protect water-cooled compressors against the damaging overheating that results if operated without cooling water and at the same time to prevent unnecessary and costly waste of water in those many installations where cooling water is left running all the time, the Johnson Corp., Three Rivers, Mich., has developed a new compressor control, Type M. It operates only when water is actually flowing through it, thereby

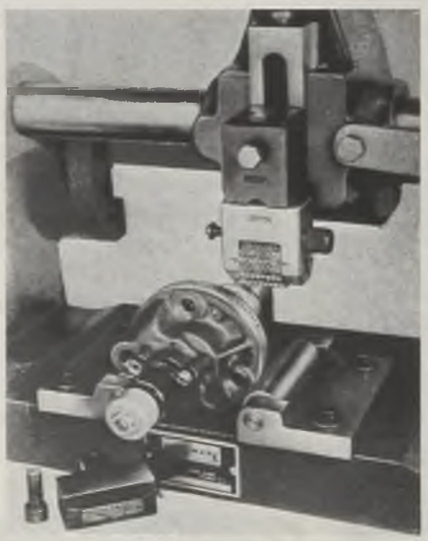


guarding against failure of water supply from any cause whatsoever and permits safe use of automatic water cut-off valves. The control consists of a sight flow fitting, mounted in the water discharge pipe of the compressor which serves as a holder for a metal electrode. When pressure in the receiver falls below the predetermined level, the pressure switch on receiver opens a solenoid controlled valve to admit cooling water to compressor which is not started until water flows through it and into the sight flow, completing circuit with the electrode. If for any reason water supply fails, compressor will not be started, or if operating, will be stopped immediately. It is also available as Type U for use on unloading compressors which insures that cooling water is flowing before compressor starts. It stops compressor or sounds a warning alarm if water supply fails.

Marking Machine for Curved Surfaces

By installing a set of standard nonadjustable cradle rolls and a socket-type mandrel fixture to support and locate the part in the proper marking position, the marking of curved surfaces is accomplished as the last operation after the unit is completely assembled and inspected.

When a numbering machine with a sight index control is placed in the marking head of the machine and adjusted to



proper marking depth, a part is marked easily at every forward and every return stroke of the machine.

Characters are changed by turning the knob at the right of the numbering head and twirling the wheels to desired irregular or consecutive numbers. Interchangeable with the numbering head is a holder which carries a marking die for impressing other specifications and changes are made by the removal of a single hollow-head screw. This machine is being manufactured by Acromark Co., 9-13 Morrell street, Elizabeth, N. J.

Current Compensator

A new current-regulating compensator for resistance welding machines is announced by the electronic control section of General Electric Co., Schenectady 5, N. Y. It is designed to facilitate consistent welds by holding true heating value of weld current constant for any heat-control setting without requiring continual manual adjustment. After the predetermined heat-control setting for a particular job has been made on the

compensator no further adjustment is required. It will hold the welding current to a variation of plus or minus 2 per cent under the same conditions which would cause the unregulated welding current to vary plus or minus 20 per cent. This unit consists of an electronic control circuit which automatically retards or advances the firing point of the ignitron tubes used to control the current, thus holding it constant regardless of line voltage changes or welding conditions. Housed in a sturdy steel enclosure the compensator can be readily mounted on or near the welding machine. It can be applied to most General Electric resistance welding controls which incorporate the phase-shift method of heat control.

Current Interruptor

Dynatrol, a new device for the higl speed, arcless current interruption of inductive d-c circuits is announced by Sciaky Bros., 4915 West Sixty-seventh street, Chicago 38. It is designed to replace magnetic contactors formerly used on resistance welders of the electromagnetic stored energy type. Dynatro interrupts the charging current withou arc and thus reduces maintenance, increases the efficiency of the system anc because of shorter charging time, results in 20 per cent greater operating speed. It is essentially a high speed, single pole interruptor, the contact points of which are shunted by a bank of capacitors. Movable contacts open with a high acceleration so that at any instant they have separated sufficiently to prevent a discharge while the primary current is directed to the capacitors. It is available on all Sciaky stored energy welders up to and including 50 kilowatt.

Finger Chuck

A new Airgrip two-jaw compensating finger chuck is being offered by Anker Holth Mfg. Co., 332 South Michigan avenue, Chicago 4. These chucks, made in various sizes, are furnished for second operation work which must be concentric with the locating surface within extreme close limits.

Automatic Arc Welding

(*Continued from Page 103*)

moved by drilling with a 3-lip drill at about 100 revolutions per minute on the gang drill shown in Fig. 7.

About 6 minutes is required for the operation, which could just as well be handled on an ordinary drill press. However, this particular machine happened to be available and well suited, since the two heads can be used to drill two hubs simultaneously.

Sizing Hub: When this roller was first put into production, the end sections of the hub were expanded a few thousandths before spooling. But this was abandoned in favor of a cold sizing operation, done after spooling. Accordingly, the next operation is to size the hub to provide uniform close tolerances for pressing on the cup-and-flange subassemblies. Fig. 8 shows die setup for this job. A massive 500-ton press reduces the outside diameter of the hub a few thousandths—just enough to assure uniform final size of all the hubs.

Final Assembly: Fig. 9 shows first step in final assembly. Here a cup-and-flange subassembly is being pressed on the end of a hub in a 3-post worm-gear-drive press of 8 tons rated capacity. This type of machine is particularly well adapted to press assembly work since the entire area in front and on both sides of press is unobstructed, providing maximum ease in mounting and locating parts for assembly.

Fixture Assures Correct Position

Fixture used consists of a heavy plate with hole large enough to permit entry of hub whose lower end then rests on base of press. Now the two halves of a separable or split ring are placed around the hub, the cup-and-flange subassembly positioned on top of the hub and the press operated to force it on the hub. Fixture limits movement, automatically assuring correct final position.

The same setup is employed for pressing on the other cup-and-flange subassembly after the first has been welded, since the hole in the plate is large enough to permit passage of a cup. Only change necessary is to adjust height of plate above press base to compensate for added distance of overhanging cup then already welded in position.

Automatic Welding: Probably one of the most important factors assuring low production cost of this assembly is the well engineered automatic welding of the final assemblies. The same type of automatic welding head as in Fig. 3 is found throughout this line. In this design of head, the welding wire is notched slightly to mesh with two drive rolls which are connected through a differential gear set to two electric motors running in opposite directions. Thus when both motors run at same speed, the drive rolls stand still.

The "up" motor, that tending to drive the feed rolls in a direction that lifts the wire from the arc, is a constant

PRECISION COLD ROLLED

THINSTEEL

•precision control assures duplication of all desired physical characteristics

● Another advantage of versatile CMP Thinsteel is the wide range of tempers available. Beyond the standard tempers it is possible to provide any unusual temper between dead soft and full hard—and duplicate it in coil after coil. Perhaps your fabrication problem could be eliminated by utilizing a special temper planned for your requirements. It may mean plenty of savings, too.

Because CMP is a specialist and the pioneer in *precision* cold rolled strip steel you will find extensive "know how" and complete cooperation in helping plan your material specifications.

THE COLD METAL PRODUCTS CO.

SUBSIDIARY OF THE COLD METAL PROCESS CO.

YOUNGSTOWN, OHIO

speed motor. The "down ... nected across the arc and thus operates at a speed controlled by arc voltage. When arc tends to increase in length, arc voltage rises, "down" motor voltage increases and rod is fed into the arc to compensate. Thus it is possible to maintain automatically any arc length desired throughout quite a wide range merely by adjusting a rheostat in the "down" motor circuit.

First of these units on the final assembly line is pictured in Fig. 10, where the operator has just completed setting it up to make weld "C", Fig. 1, A 3-jaw self-centering lathe chuck affords means for rapidly mounting the work in the fixture, while a motor and speed reducer mounted below rotates the work and fixture.

Weld "C" is completed in 60 seconds, arc time, using some 350 amperes of welding current and 3/16-inch diameter welding rod. Incidentally, all the welds are made with this same size wire.

Conveyor Handling: The various welding stations in this final assembly line are interconnected by short sections of gravity roller conveyor like that in Fig. 11. These conveyors also provide a bank of work ahead of each station as in Fig. 13.

From Fig. 11, conveyor leads to an automatic welding station where weld "D" is made with 350 amperes in about 60 seconds, the setup being very similar to that shown in Fig. 13.

Weld "E" Is Next Step

With the first cup-and-flange assembled and welded, the other subassembly is pressed on other end of hub in same presses shown in Fig. 9. Then weld "E" is made as in Fig. 12. An automatic welding head is not used here because there is not sufficient room to get past the first cut to make the weld "E". Accordingly this weld is made by hand, using 250 amperes and heavily coated ⅛-inch rod, the fixture being set to make a complete rotation in about 90 seconds.

Final weld "F" is made in the automatic setup in Fig. 13. Note fixture is arranged to tilt the work so this fillet weld can be made in the most efficient position—the horizontal. Here again 350 amperes is sufficient to complete the weld in about 60 seconds, arc time.

Inspection: Making weld "F" finishes the welding sequence. After all slag remaining on the welds has been chipped off, the completed roller is inspected and dimensions checked in the setup in Fig. 14. Operator is using a go-no-go gage which checks distance between two cups and depth.

Outside dimensions of cups and amount of runout are checked by swinging two dial gages up against the outer surface of cups and rotating the roller unit in this same setup, Fig. 14. The two dial gages and frame on which they are mounted can be seen just to the right of the roller in Fig. 14.

Finish Machining: The only machining necessary on the completed roller is at points marked "f", Fig. 1. These include facing the end of each cup to establish overall length of roller, facing each end of hub to give final hub length and machining two diameters inside each end of the hub for bearing seats.

All these finishing operations are done in one setup on a double-ended machine. None of the dimensions are critical except the two bearing seat diameters which must be held to 3.190/3.188 and 3.1492/3.1482 respectively, the latter being equivalent to 3.1487 inches plus or minus 5/10,000-inch.

Sulphurized Cutting Oils

(*Continued from Page* 105)

amount of sulphur which can be dissolved or combined with mineral oil is limited. The problem of how to extend the limits aroused the interest of a number of postwar investigators who studied the effect of elevated temperature as a means of promoting the reaction between the sulphur and hydrocarbon molecules.

The extension of this research prompted the widespread interest which can conveniently be regarded as the third stage. Increase in machine tool speeds, in cutting tool loads, in toughness of metals and the necessity for greater precision all contributed to the arousing interest.

When more dependable cutting oils were required, more dependable methods of making them had to be developed. All this work considered sulphur as a fundamental component and assistant to effectual cutting tool cooling.

Sulphurized cutting oils are not a cure-all for metal-cutting difficulties. In fact, certain conditions and some metals prohibit their usage. For example, highly sulphurized oils are not suitable for machining brass or nonferrous alloys due to the active nature of the sulphur which causes the surfaces of these metals to turn black.

In other words, the nature of the cut and the type of metal are the dominating factors. Briefly, the addition of sulphur to a mineral oil enables better heat transfer, more rapid cutting and smoother surface finish on steel.

In turn, whether or not a cutting oil should be transparent depends upon the advantages pertaining to being able to observe the cutting process as the work is turned against the edge of the cutting tool. Draining of the oil from the tool is an important item in connection with visibility. Consequently, the effects of reduced viscosity upon cutting ability were investigated. Oils of this nature are especially adapted to machining of low, medium and high carbon steels as well as the several types of alloy steels so necessary in the design of precision and heavy-duty machinery.

Subsequent research in connection with sulphurized oils indicated that there was probably some relationship between the corrosive tendency and the way in which the sulphur is dispersed in the oil. It was noted that the corrosive nature of a sulphur cutting oil could ... heating the oil sufficiently to cause the free sulphur to react with the mineral oil to form products which are noncorroding.

The metal removed by a drill, planing tool or milling machine cutter varies with the process for each metal. The power in drilling is usually higher than that of turning or planing because of the friction occurring between the chips and the flutes of the drill as they are removed from the hole, and because of the action of the chisel edge of the drill. In milling the average power consumption is higher because of the removal of the chips with very small average thickness. The chart prepared by O. W. Boston of the University of Michigan and shown as Fig. 3, on page 104, is of interest in this regard.

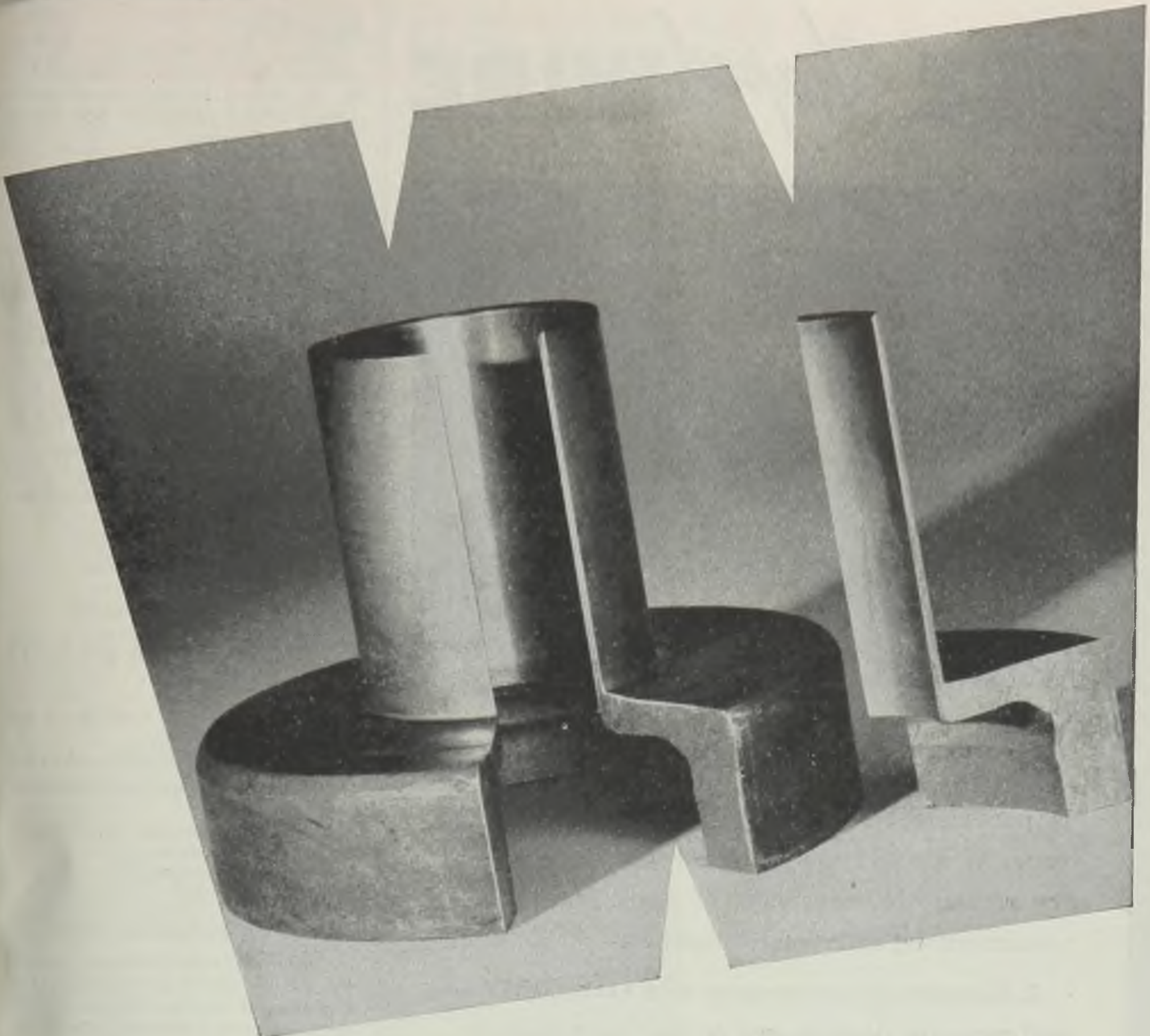
In many operations long stringy chips are objectionable as they tend to mar the work surface, cause congestion of the machine parts and are difficult to remove.

Hardness Reduces Cutting Speed

The hardness of steel reduces the cutting speed for a given tool life almost directly as the hardness is increased as shown by the chart (Fig. 4) also prepared by Professor Boston. Thus the cutting speed for a 50-minute tool life of mill annealed SAE-4340 steel when being machined with a feed of 0.0127-inch and depth of cut of 0.050-inch, is about 136 feet per minute. For the same steel hardened to give a brinell hardness of 492, the cutting speed for a 50-minute tool life is only 28 feet per minute. The brinell hardness increase is from 1 to 2.5 while the cutting speed is reduced from about 5 to 1. The cutting speed for any value of tool life for various values of hardness can be determined from this chart.

The cutting speed greatly influences the quality of the machined surface, even independently of the size of cut, tool shape, and other cutting conditions. In cutting a steel at low speed, the finish is usually poor. Under these conditions a high rake should be used, a light feed, and a cutting fluid consisting of an oil containing sulphur or chlorine. As the cutting speed is increased, the finish becomes better. For each structure a cutting speed is obtained at which the built-up edge disappears, the cutting edge actually scrapes the work surface and produces a keen cut or burnished surface. The speed at which this superior finish is obtained varies not only with the type of steel cut, but with the structure of the steel. This speed is lowest for the hardest metals, and highest for the softest metals.

Under normal cutting, such as when high speed steels are cutting at moderate speeds, cooling is believed to be the primary function of the cutting fluid so that aqueous solutions or emulsions are more desirable. These cutting fluids should be applied at relatively low temperature, such as from 80 to 110 de-



Close Tolerances of Presteel Stamping Cut Costs

Pressed from 0.500" steel, heavy flanged sleeve bearings similar to the one shown above are held to tolerances of ±.001" both inside and outside of the barrel and have a finish specified in micro inches (before silver plating). Previously, such bearings have been machined from tubing at a cost nearly 50% greater than the price of Presteel stampings.

Worcester Pressed Steel stampings made by carefully controlled press operations producing uniform parts to tolerances of thousandths of an inch or less have helped many manufacturers to lower costs and improve their products. Our engineering and production experience is at your disposal. Mail samples or prints to—

WORCESTER PRESSED STEEL CO.

Worcester 6, Massachusetts

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883 grees Fahr., in large quantities [illegible] high velocity.

Table I shows the speeds, feeds and rake and relief angles recommended by O. W. Boston for high speed milling cutters of the production type over 3 inches in diameter.

Long Range Research

Laboratory research procedure in the study of sulphurized cutting oils was planned with long range objectives. It was especially fortuitous that the research chemists as a whole subconsciously anticipated wartime priorities on certain of the base materials. It simplified materially the production of the sulphurized cutting oils now in such great demand by the war industries. This research procedure was planned as follows:

1. **Study of Existing Cutting Oils**
   - (a) Make-up and components
   - (b) Cutting ability on standard machine tools
2. **Study of Base Materials**
   - (a) Dependability of source
   - (b) Location of source
   - (c) Use in existing cutting oils
   - (d) Patent coverage
   - (e) Behavior in service, as to
     1. Odor
     2. Sludging
     3. Separation (stability in storage)
     4. Discoloration of work or tool
3. **Methods of Preparing Suitable Cutting Oils**
   - (a) Effect of chemical composition
   - (b) Effect of pressure
   - (c) Effect of temperature
   - (d) Effect of time

Service Performance Studied

Concurrent with laboratory research the cutting effects of various types of experimental cutting oils was observed on thread cutting machines, turret lathes, and other heavy duty tools.

In conjunction with field research, it was concluded that cutting oil performance in actual service should be studied from the several angles in which the tool operator is most interested, i.e.:

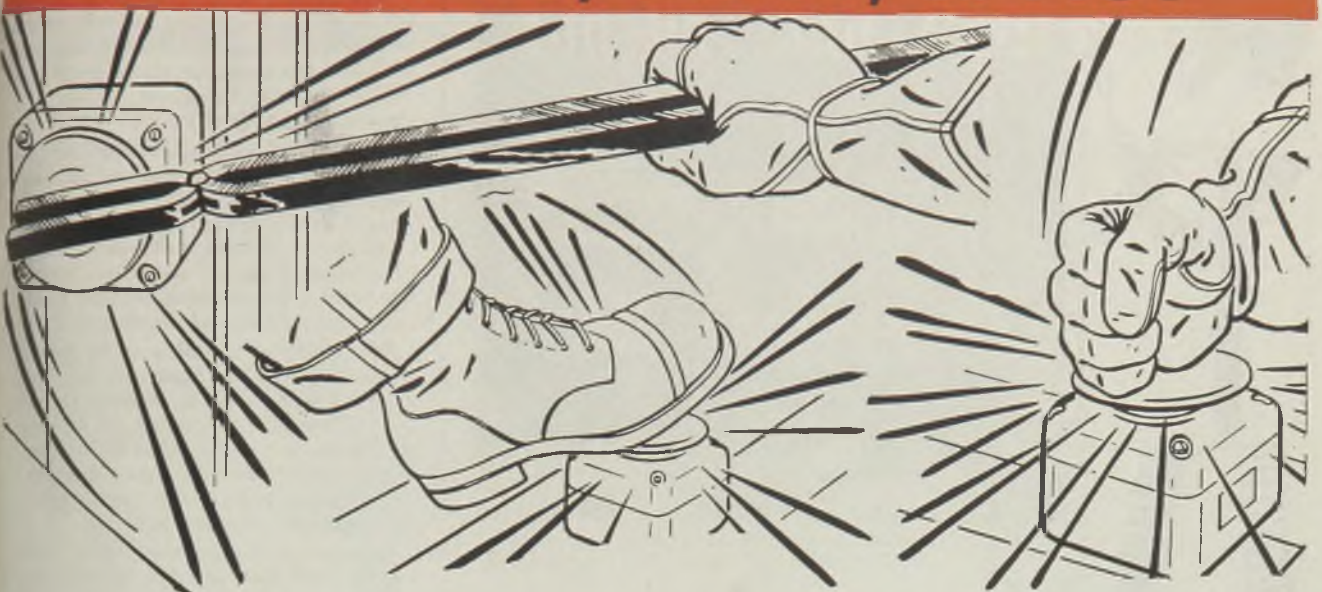
1. Cutting ability
   - (a) Tool life
   - (b) Surface finish
2. Protection against rusting
3. Ability to resist smoking or fogging

In the final analysis, a cutting oil is measured by its cutting ability, assuming that it meets the other requirements as to nonsludging, freedom from objectionable odors and freedom from sulphur precipitation.

Proof testing for cutting ability was studied in the laboratory on thread cutting machines, observing and recording
- (a) Noise or squealing
- (b) The degree of smoothness of the thread
- (c) Temperature rise during cutting

The life of a metal cutting tool is measured by the number of pieces which can be cut, threaded or shaped before the cutting edge of the tool becomes sufficiently dull to require redressing.

WITH TONGS, FOOT, OR FIST



YOU CAN OPERATE THIS "ROUGHNECK" PUSH BUTTON

TYPE "RN"
THE REAL
ROUGHNECK
OF THE "3C"
PUSH BUTTON FAMILY

The ROUGHNECK is built like "MR. FIVE BY FIVE"—low, squatty, and hugs the ground. There's plenty of bearing area, so that "off center" blows don't rock it on its base.

And if you miss the "button", those rounded sloping shoulders let the impact slide smoothly off.

Of course the ROUGHNECK immediately responds to gentle treatment, too—just enough finger pressure to make contact is enough.

FEATURES—

Silver-to-Silver Button type, Double Break Contacts.

Large electrical clearances.

Bakelite Insulating Parts.

Screwdriver removal and replacement of all parts.

TYPE "D" HEAVY DUTY
PUSH BUTTON UNIT

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, 10, OHIO

Obviously a cutting oil which will extend the tool life is most desirable.

The surface finish is affected by the rake angle of the cutting tool, the depth of cut, the friction between the chip and tool, and the plastic or elastic properties of the material being cut, along with the cutting quality of the oil.

Pipe thread cutting afforded an excellent means of observing the lubricating and cooling properties of an oil with respect to the operating conditions outlined above. In turn, it afforded a means of evaluating any oil under test according to tool life, smoking, surface finish, odor, chip sticking and discoloration.

The ability of a cutting oil to prevent rusting of a freshly machined steel surface is influenced by the wetting properties of the oil. A cutting oil of good wettability and oiliness is to be preferred to one which tends to creep from the metal surface to leave bare spots exposed to oxygen and moisture in the air.

A good cutting oil must be of sufficiently high flash and fire test to resist smoking and fogging when exposed to the increased surface temperatures developed during cutting.

The smoothness of the cut surface is generally agreed upon as being an excellent criterion as to the suitability of a cutting oil. The "lead abrasion" method afforded an interesting means of comparing cutting oils quantitatively as to their influence on surface finish and effective tool life. Some earlier investigators had studied methods of measuring

(1) power used in cutting
(2) cutting temperature
(3) tool life tests
(4) current shop practice

Surface Smoothness Tested

The "lead abrasion" method however has proved to be more dependable. It involves study of the surface finish when a pencil lead is passed over a certain linear distance of the surface, the results being recorded in terms of inches of wear of the lead. Any restriction in free flow of the chips across and away from the rake of the tool causes erratic results in the lead abrasion readings and usually produces inferior surfaces.

Reproducibility is highly important in connection with such a test. A heavy duty turret lathe was used to good advantage in developing the method of procedure by making a cut on the end of a piece of lap-welded or seamless steel pipe. The roughness of the cut surface is measured in terms of inches of lead worn off when the pencil-lead abrasion apparatus is passed over a definite linear distance of the surface. The lead abrasion apparatus provides for keeping pressure on the pencil-lead essentially constant regardless of the wear on the lead. The force necessary to exert pressure on the lead point is developed through an air cylinder and piston.

Experience with sulphurizing mineral oils has indicated that when sulphur and mineral oils are in intimate contact, there is a gradual change in their be-

havior as the temperatures are increased. Thus at low temperatures, it is mainly a question of the solubility of sulphur in the oil, while at more elevated temperatures, particularly when the ingredients are maintained at these temperatures for a considerable period, it is a question of interaction accompanied by some solution of sulphur in the oil. During the early development of sulphur cutting oils, extensive investigational work was carried out involving:

(1) Study of methods of incorporating sulphur in light viscosity mineral oils

(2) Investigation of reasons for sludge separation during storage

(3) The most effectual processing temperature

(4) The potential benefits of air blowing to reduce the corrosive tendency of the finished oil, by removal of volatile acid by-products

(5) The benefits (if any) which might accompany redistillation

During the course of the research the following factors were considered as important:

1. The performance of sulphurized oils vs. sulphurized oil bases blended with straight mineral oil.
2. The suitability of sulphurized fatty oil vs. sulphurized fatty oil base blended with sulphurized and unsulphurized mineral oil. The fatty oils included prime lard oil, cottonseed oil, No. 1 lard, rapeseed, whale and castor oils.
3. The effect of viscosity by using light vs. heavy mineral oils.
4. The merits of various deodorants in masking odor and preventing sedimentation.

It is the function of the cutting oil to interpose and maintain a suitable film between the working face of the cutting tool and work; also on the clearance side. The basic principle of lubrication holds true in that conversion of solid friction to fluid friction is absolutely necessary to prevent premature wear-out of metal parts moving with respect to one another.

Sulphur facilitates the obtaining of this objective. But sulphur cannot be added at random to a petroleum oil. Exhaustive research has proved that the manner of compounding and the nature of the materials to be compounded are the salient factors.

V-Belt Pamphlet Out

"Goodyear Engineering Data for V-Belts" is the title of an authoritative new pamphlet being distributed by Goodyear Tire & Rubber Co. to engineers and engineering departments. Reprinted from Goodyear's "Handbook of Belting", the V-belt pamphlet contains complete details on care and installation of all types of V-belt drives. One section of the 33-page pamphlet is devoted exclusively to Goodyear's new steel cable V-belts.

At Your Service . . .

46 YEARS of Steel Casting Knowledge

In the field of steel castings, experience is a great asset. But so are advanced foundry methods, engineering techniques and completely modern facilities—and PSF has them too. The war years have brought great advances in materials and practices, and PSF has been in the thick of these developments in its work for Ordnance and the Navy, and for the railroad, steel and heavy machinery industries. When the time's right, let us turn this progress to your profit.

PSF

EXPERIENCE backed by complete and modern FACILITIES

Pittsburgh

STEEL FOUNDRY CORPORATION

GLASSPORT, PA.

Sales Offices: NEW YORK • PHILADELPHIA • WASHINGTON AND CHICAGO

WAD 9379

Two NE Steels

(*Continued from Page 118*)

Taken as a whole, the balance between strength and ductility of the AMS-6320 and 6322 steels, as shown in these tensile tests, indicate that they have a high quality rating, comparable to any of the other alloy steels listed for comparison. This is true at any hardness between 28 and 48 rockwell C.

Impact Properties: Three-notch Izod impact test samples were made up from each steel, hardened as 0.430-inch square bars, ground to finished dimensions and broken in impact. Tests were made at hardnesses of 24 to 52 rockwell C in 4-point hardness increments, using three test samples at each hardness. The results of these 144 tests on 48 test bars are shown graphically in Chart No. III with Izod impact strength plotted against tempering temperature. The average values at each hardness can be found by referring to Table III, in which they are compared with other standard alloy steels at the same hardness.

The curves indicate that the impact strength of AMS-6320 steel is considerably higher than that of AMS-6322, at any tempering temperature, due largely to the lower hardness of the AMS-6320 steel. There is one point, 44 rockwell C, at which AMS-6322 has the higher hardness, but at all other values the AMS-6320 steel does actually have the higher Izod impact strength, although the difference is not as great as would seem to be indicated by the curves.

Good Impact Strength

The AMS-6322 steel averages as high in impact strength at all hardnesses as the other alloy steels used for comparison. The AMS-6320 steel, however, shows exceptionally high values in the hardness range between 28 and 40 rockwell C. This steel seems to be especially well adapted to parts requiring shock loading. Similar results have been noted by other investigators.

Torsion Tests: Test bars were made up from both steels, heat treated as 0.530-inch gage diameter, ground to finished size and tested in torsion. The test size used was 0.500-inch gage diameter and a 2-inch gage length. Tests were made at hardnesses of 24 to 52 rockwell C in 4-point hardness increments, using three test bars at each hardness. The results of torsional strength, yield point in torsion, and degree of twist per inch at failure are shown graphically in Chart No. IV, where torsional properties are plotted against tempering temperature. All tests were made by slow loading. These values are also shown tabulated in Table IV in comparison with three other alloy steels that had been previously tested in the same manner.

The curves showed AMS-6322 to have higher ultimate torsional strength and higher yield point in torsion, but a lower value in degrees twist at failure than the AMS-6320 steel at all tempering temperatures. The difference is less noticeable when the values are compared at the same hardness, but the AMS-6322 steel had slightly higher strength values and the AMS-6320 steel showed high ductility values at the same hardnesses. Both steels compare favorably with other steels tested in a similar manner and shown at the same hardness. The relatively high ductility of the AMS-6320 steel is easily noticed in these results.

Additional Properties: While other tests on these steels have not been completed in our laboratories, preliminary tests and results reported by others have led to the following:

The machinability of these two steels is very similar to that of other low alloy steels of the same carbon content, both as regards surface finish and cutting speed.

The fatigue properties of these two steels seem to compare favorably with other steels which they were designed to replace.

Low-Temperature Properties

The low-temperature impact properties of AMS-6320 steel have been reported to be very good, and those of AMS-6322 steel at least as good as the alloy steels that it was meant to replace. These high impact strengths at low temperatures would seem to indicate that the AMS-6320 steel would be a desirable alloy for use in airplanes at high altitude.

The welding qualities of these steels have not been thoroughly investigated, largely because a steel of lower carbon content but the same alloy content seems preferable for work of this type. NE-8630 showed good welding characteristics.

Incidentally, a review of the literature on NE steels of the same analysis confirmed many of the results listed in this report.

Conclusions: It has been concluded that the two steels listed, AMS-6320 and AMS-6322 (NE-8735 and NE-8740) have heat-treating characteristics and physical properties equal to the alloy steels they were designed to replace.

The AMS-6320 steel (NE-8735) can be used as a replacement for such steels as SAE-2330, 3135, 4135 and similar alloy steels. The AMS-6322 steel (NE-8740) can be used as a replacement for SAE-2340, 3140, 4140, 4640, 5140 and similar alloy steels, and for some uses for higher alloy steels such as SAE-4340, 3240 and 6150.

However, since, like food, the proof of the pudding is in the eating, so is the proof of the quality of the above steels dependent on the service life of actual parts made of them and the work of testing these steels is not yet completed. The evidence shown indicates that the service tests will verify the prediction that these steels will be a valuable addition to our list of alloy steels and that they will remain after the present emergency ceases to be the deciding factor on the selection of steels.

Industrial Electronics

(*Continued from Page 128*)

degrees out of phase with the supply voltage, as shown in Fig. 51. This voltage of T5S-1 prevents the tube from passing current.

In Fig. 63 the other transformer T2S-1 supplies a voltage which fires tube 5. The combined wave shape of these transformers is shown in Fig. 64. Notice that the voltage of T5S-1 is an ordinary sine wave, but T2S-1 furnishes a narrow voltage peak which is high enough to force the tube grid positive for just a small part of the half cycle; this brief voltage peak fires tube 5. If we can change the position of this peak, we also change the point in the half cycle where tube 5 fires. The natural question is—how do we produce the voltage peak of transformer T2, and how do we change or move its position?

The Peaking Transformer

Transformer T2 is a special design of transformer called a "peaker" or peaking transformer; it has very little iron in its core. When its primary winding is connected across an alternating current voltage, its magnetic flux does not follow the usual sine wave (dotted line); instead, the flux curve is flat during most of each cycle, as shown (solid line) in Fig. 65. This flat line represents the maximum flux which can be held by the small amount of iron, which becomes "saturated" at a very low value. If we now recall that the secondary or output voltage of any transformer is produced by a change of flux, we see why this transformer produces no secondary voltage during those periods when the flux is constant (flat). However, at that instant when the flux changes from above the zero line to below the zero line, the normal amount of secondary voltage is produced, but it exists for such a short time that it appears as a peak. Notice that this peak is located close behind the point where the wave of primary voltage crosses the zero line. (For those who question why the flux curve crosses the zero line so nearly in phase with the supply voltage, instead of at the usual 90-degree lag, we explain that the primary of this certain transformer operates in series with a large internal resistance, so that the magnetizing current (and flux) is influenced by this resistance, and flows more closely in phase with the supply voltage.) So, in Fig. 63, if the voltage applied to the primary of T2 is in phase with the alternating current supply, the voltage peak of T2S-1 appears very near the beginning of the half cycle. However, if we phase-shift T2 (by applying to its primary a voltage which lags the alternating current supply voltage), the peak of T2S-1 occurs later in the half cycle of supply voltage, as shown in Fig. 64.

Operation of the Complete Circuit

Returning to the complete circuit in Fig. 62, we now understand that tube 5 is fired by the voltage peak of T2S-1 in its grid circuit. Notice the primary

T2P of this peaking transformer connected in the upper part of Fig. 62, which is a phase-shifting circuit somewhat like that of Fig. 56. This new circuit (Fig. 62) uses a variable resistor R30 for adjusting the phase angle of the voltage applied to T2P; meanwhile capacitor C13 remains constant. If R30 is turned until all its resistance is shorted, then T2P is connected directly across part of T5P (connected to the alternating current supply); the voltage peak of T2S-1 then occurs near the beginning of the half cycle.

If R30 is now turned so as to insert some resistance, the corresponding vector diagram (Fig. 66) shows that the voltage applied to T2P here leads the supply voltage by perhaps 135 degrees. However, by properly connecting the secondary leads of T2S-1, we obtain the voltage peak at a position about 45 degrees behind the supply voltage. As previously shown in Fig. 60, firing at this 45-degree angle may provide approximately a complete sine wave of current flow through the tubes, or full "heat" at the welder.

When we further increase the resistance in R30, the peak of T2S moves to the right, or occurs later in the half cycle; tube 5 fires later, passes less average current and causes less "heat" at the welder. This condition is shown in Fig. 67.

Grid Capacitor Action

Notice that Fig. 67 shows the voltage of T5S-1, 180 degrees out of phase with the anode voltage of tube 5. As a further precaution to prevent tube 5 from firing at point A, we insert R19 and C9 in the grid circuit, as shown in Fig. 62. By "grid rectification" (one-way current flow from grid to cathode, as described in a previous article), T5S-1 forces current through R19, charging C9 so that it is more negative at the grid connection. The result is shown at B in Fig. 67, where the grid potential has been made so negative that tube 5 cannot fire accidentally. When tube 5 does fire, because of the T2S-1 voltage peak at C, current flows through tube 5 into the ignitor of ignitron 1, but flows only long enough to fire the ignitron. The shaded area of Fig. 67 represents the combined current flow, first in the tube 5, immediately followed by ignitron 1.

If we now turn R30 to insert all its resistance, the peak of T2S occurs very late in each half cycle, as shown in Fig. 68; the shaded area shows the decreased current flow which results in very low heat at the welder. We see that by turning resistor R30 we can gradually control the amount of tube current and the welder "heat".

Accurate Heat Obtained by Peaking Transformer

For the control of resistance welders, the greater accuracy provided by the use of peaking transformer is very important. In Fig. 62 notice that the tubes cannot pass current to the welder until the control switch is closed. Regardless of when this switch closes to start each separate weld, Fig. 64 shows the tube cannot fire at any point of the half cycle except where the voltage peak exists, as at A or B. This is a necessary feature in order to obtain consistent welding results. We see that the heat control described provides not only an accurate stepless means of varying the welder "heat", but gives more consistent welding results by starting successive welds at exactly the same point on the voltage wave.

Part 7 in this series will show how the ability of electron tubes to rectify and to gradually control or change the current flow through gaseous tubes (phase-shift) makes possible a versatile electronic motor control.

Combustion Gas Turbine

(*Continued from Page* 110)

means, such as a motor, is required. This is necessary as the air for combustion is supplied to the combustor by the compressor. When the unit is in operation the energy to drive the compressor comes from the expansion of the products of combustion in the gas turbine.

In the simple cycle operating at 1200 degrees Fahr., the products of combustion (gas) contain some 600 per cent excess air. This gas is expanded in the turbine and exhausted to the atmosphere. No intermediate fluid is used as in the steam cycle, where fuel is burned and releases chemical energy as hot products of combustion which pass through a steam boiler to generate steam for the steam turbine. The steam generator, or boiler, is the biggest single element in the steam power plant. In the gas cycle a compressor and combustor replace the boiler, resulting in a much smaller and more compact power plant. Because the simple open combustion gas cycle does not require cooling water, no steam condenser such as used in the condensing steam cycle is needed.

The closed cycle offers a method of increasing the maximum capacity of the open cycle. The volume of the working gas is inversely proportional to the absolute pressure. If the pressure is multiplied by 10, the size is divided by 10. In the closed cycle, the circulating working gas is at a relatively high pressure and reduces the physical size of compressor and turbine. To reduce the temperature of the gases before they enter the compressor, cooling water is required. The heat exchanger in which the gas is cooled before it enters the compressor is called a gas precooler. The amount of heat given up to the cooling water is equivalent to that removed in the condenser of a steam unit of equal capacity. The quantity of cooling water required will be less, as a higher water temperature rise is permissible.

A closed cycle system under development by Westinghouse uses a separate gas turbine and compressor to pump up the cycle on which the main gas turbine and compressor operate. High pressure of around 600 pounds per square inch may be used with a compressor inlet pressure of around 150 pounds per square inch. The main gas turbine and compressor would be small as they operate at high pressure. This cycle is internally fired, the products of combustion passing through the gas turbines and main compressor. Enough make up air is continually supplied to maintain pressure and support combustion. It is supplied by a compressor which is driven by a second gas turbine.

The possible applications of the gas turbine are many. Ranging from a simple open cycle for small capacities to a closed cycle for very large ratings it offers wide possibilities. For example:

Locomotives: The simple open gas cycle requires no water. It has low weight and small space requirements combined with simplicity. With an efficiency of 20 per cent at 1200 degrees Fahr. and the expected low maintenance of turbine drives, it should prove a good power plant for a locomotive. The inability of the gas turbine to operate in reverse makes either electric drive or the development of a satisfactory reversing gear necessary for this application.

Airplanes: For relatively small power outputs, such as required by the airplane industry, the gas turbine operating at high speed and high temperature to obtain maximum rating per unit weight of material, has real possibilities.

Ship Drives: The combustion gas cycle offers efficiencies equal to the best modern marine steam power plants, which have overall efficiencies of approximately 25 per cent. Weight and space requirements of equipment are a real factor in this application. The gas cycle eliminates the steam generator and steam condenser. The advantage in weight and space undoubtedly will favor the gas cycle, despite the gas compressor, the regenerator heat exchanger, and the large gas turbine. The requirement of astern operation in marine service handicaps the gas turbine, except as an electric drive.

Power: General application of the combustion gas cycle in the power generation field will probably not take place until the problems in connection with the use of coal as a fuel are solved. The successful development of the closed cycle is necessary if units of very large capacity are to be built. The maximum capacity for which units can be built in the open cycle will include the majority of industrial applications. There are many special applications in the power generation field in which the open gas cycle will possibly find early application. Examples are: Emergency standby service, and low first cost units on the ends of transmission lines.

Processing: In the industrial field where both power and process steam are required the gas turbine has possibilities. It fits well in those applications where the steam required is relatively small in relation to the power load. This is different from the extraction steam turbine where large quantities of process steam per kilowatt are necessary to attain a comparatively efficient cycle.

WHERE STEEL *Must Not Fail!*

And the steel in American warplanes won't fail. Men and methods have seen to that. Our pilots know it, too. Their skill and the dependability of their planes have made America's air arm more than a match for any adversary. Andrews is proud that its alloy and carbon steel sheets are going into the manufacture of the finest, most dependable fighting planes ever built. Andrews aircraft quality alloy and carbon steel sheets are available in a wide of range sizes and thicknesses to meet specifications AN-QQ-S-685 (X-4130). AN-QQ-S-686 (X-4135). AN-QQ-S-756 (X-4340). AN-S-11 (SAE 1020-1025). AN-S-12 (NE-8630). AN-S-22 (NE-8635). Complete information on Andrews aircraft steel will be sent on request. Write today!

THE NEWPORT ROLLING MILL CO.
NEWPORT KENTUCKY
DIVISION OF **THE ANDREWS STEEL CO.**

★ ★ ★ *The Andrews Steel Company produces a limited range of aircraft quality alloy plates*