Horizontal layer machine showing strands being closed into wire rope. Page 104

EDITORIAL STAFF

E. L. SHANER
Editor-in-Chief

E. C. KREUTZBERG
Editor

WM. M. ROONEY, *News Editor*
IRWIN H. SUCH, *Engineering Editor*
J. D. KNOX, *Steel Plant Editor*
GUY HUBBARD, *Machine Tool Editor*

ARTHUR F. MACCONOCHIE
Contributing Editor

D. S. CADOT
Art Editor

Associate Editors

G. H. MANLOVE, W. J. CAMPELL
G. W. BIRDSALL, F. R. BRIGGS
New York, B. K. PRICE, L. E. BROWNE
Pittsburgh, R. L. HARTFORD *Chicago*, E. F. ROSS
Detroit, A. H. ALLEN *Washington*, L. M. LAMM
London, VINCENT DELPORT

Assistant Editors

J. C. SULLIVAN, D. B. WILKIN
R. W. SHESTAG, J. M. KURTZ

BUSINESS STAFF

G. O. HAYS
Business Manager

R. C. JAENKE
Advertising Manager

C. H. BAILEY
Advertising Service

New York, E. W. KREUTZBERG, K. A. ZOLLNER
Pittsburgh, S. H. JASPER, B. C. SNELL
Chicago, L. C. PELOTT, V. W. VOLK
Cleveland, D. C. KIEFER, C. H. CROSS
Los Angeles, F. J. FULLER

J. W. ZUBER
Circulation Manager

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.

Copyright 1944 by the Penton Publishing Co.

STEEL

The Magazine of Metalworking and Metalproducing

MAY 22, 1944

Volume 114—Number 21

NEWS

TECHNICAL

FEATURES

MARKETS

HOW A CHANGE BELOW DECKS *via* GRAYBAR

kept the P.T.'s *Coming Fast*

A boat builder with an important Navy contract was in a quandary. His production schedules were moving ahead fast . . . except for the electrical wiring. Specifications for circuits below decks called for a special woven, flexible, shielded conduit. His stocks were exhausted, and no woven conduit was quickly available.

Then he called the Graybar Man. To meet the emergency this alert procurement advisor suggested use of a new flexible, shielded conduit, made of plastic. The boat builder asked that samples be rushed to the job.

After inspecting the cable, the builder accepted it, subject to approval by the U. S. Bureau of Ships . . . *IF* a suitable grounding connector could be found for the shield, and a method devised for making a watertight joint.

The joint was comparatively simple, but no proper grounding connector for the shield existed. Working with the boat-builder's engineers, the GRAYBAR Man helped perfect a new design, and secured approval for it from the Bureau of Ships. One of GRAYBAR'S 200 manufacturers was able to start immediate production of this new connector. Completion of P.T. Boats was quickly resumed.

WAR PLANTS, as well as the armed services, get fast, intelligent action from Graybar when emergencies arise. From its nation-wide network of warehouses, because of the close contact it maintains with its more than 200 leading suppliers, Graybar serves as Procurement Advisor on electrical needs. Are you taking full advantage of Graybar Procurement Advisors?

MOBILIZED MATERIALS
No. 18 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and in war facilities.

GraybaR

IN OVER 80 PRINCIPAL CITIES

Executive Offices: Graybar Bldg., New York 17, N.Y.

Graybar 75 YEARS OF *Electrical Distribution*

STEEL
May 22, 1944

Why They Work for Hitler

Somewhere on your street or mine is a home with a star displayed in the window. That star indicates that a son of the family is in the service. Perhaps he is in the air force, operating from England or Italy, and possibly his job in recent weeks has been to bomb German airplane plants and to put them out of commission.

We are willing to risk the lives of our best young men in this work in order that the fighting power of the enemy may be weakened, thus increasing the chance for success in our pending invasion of Europe. We risk lives to save lives.

Doubtless the enemy once wished it could bomb our airplane plants and thus cut the flight of bombers and fighters to the war zones. But now Hitler does not need even to wish to bomb our plants. This nation, in its utter failure to evolve an equitable policy of labor relations, has so encouraged irresponsible labor to ignore the needs of war that men and women in our workshops—by the tens of thousands—heedlessly do more to curtail production than Hitler and all of his resources could possibly do.

Last week, as a result of the action of a foremen's union, production of 250 Mustang long-range fighting planes was lost just as effectively and completely as if enemy bombers had bombed the plants where they are manufactured. Similarly, production of bombers, guns, tanks, etc. was lost in numerous other plants.

Why?

The immediate apparent causes were trivial. A man delivering cold drinks belonged to the wrong union. An official refused to grant permission for a 5-minute wash-up period. Men were sent home for deliberately violating a "no-smoking" rule. Workmen refused to do the allotted amount of work and were sent home. Nearly 4000 workers walked out in protest of a WLB ruling. These and other provocations, mostly minor, were the surface reasons for lost time.

But behind these immediate causes is a record of government bungling, coupled with political considerations of serious import, which makes it almost impossible to expect workers to behave as they should behave. The administration accepted their money for political purposes, it promised them almost unlimited power and license and—when unions or their members misbehaved—the corrective employed by the government was not to punish the culprits but to take the plant from its owners.

Is it any wonder heedless workers are doing Hitler's work?

QUENCHING CAST STEEL: Sometimes a basically good idea is kicked around for decades before the world recognizes its worth. This seems to have been true of the practice of water-quenching commercial steel castings.

Records show that the Taylor-Wharton Co. was water-quenching dredge bucket castings as early as 1908. In 1914 three Pennsylvania railroad men presented a paper on the beneficial results of heat treating castings. Since then technical literature has contained many references to water-quenching.

Nevertheless, for various reasons, water-quenching has had an uphill fight. As recently as 1940, only 5000 tons, or less than one per cent of the total output of commercial steel castings, were quenched and tempered. But in 1943, according to authoritative estimates, 250,000 tons, or 8 per cent of total output, received the quench and temper

(OVER)

treatment. This contrast in three years shows an upsurge in interest in this 35-year old practice.

Believing that this interest has roots deeper than the impetus of war, the editors of this publication have arranged for a symposium on water-quenching and tempering to appear in this and the two following issues. It deals with a subject which has great potentialities for producers and consumers of steel castings. —p. 82

° ° °

LABOR FORCE SHRINKS: Although there is enough work scheduled for West Coast industries to keep everybody busy for many months, it is doubtful whether enough workers can be found to maintain projected schedules.

In the Pacific Northwest, shipbuilding and repair contracts are sufficient to keep yards going at capacity for a year or more, yet labor shortages are encountered almost everywhere. In California, where airplane manufacturing and shipbuilding activities are at a peak, the labor force is shrinking alarmingly. In March, wage earners in aircraft plants declined 8900 and in shipyards 5600.

The shrinkage, which is particularly pronounced in the southern part of the state, is attributed to war weariness, lack of adequate transportation and housing facilities, diversion of men into the armed services, etc. One politician even blames Southern California's difficulties upon the machinations of eastern manufacturers who wish to "flatten California's economic bulge" after the war. —p. 56

° ° °

EMPLOYER HAS RIGHTS: United States Circuit Court of Appeals in Philadelphia has ruled that the Wagner act "does not purport to authorize a restraint upon freedom of speech in any circumstances." This was the unanimous decision of the court in turning down a petition by NLRB to hold an employer in contempt for circulating a letter to his 15,000 employes.

Concurrently WLB, reversing a ruling by one of its regional boards, upheld the right of an employer to discipline employes who strike in violation of a contract.

It is noteworthy that in both cases the decisions were against government agencies which had tried to stretch the already badly distended Wagner act far beyond its original intent. These rare rulings to the effect that employers still retain some rights guaranteed them under the Constitution are refreshing. Some day, we will wonder why this nation ever permitted biased personal interpretations to have the effect of laws. —p. 51

USE SURPLUSES NOW: W. L. Clayton, administrator of the Surplus War Property Administration, makes an observation which deserves prompt and effective attention. He declares that the major problem of surplus disposal will come after the war ends, but . . . . (and here is his pertinent point):

"It would seem that one of the most effective ways of preparing for it is to locate and dispose of as much surplus property as possible during the current phase when there is a useful demand and an opportunity to sell with beneficial effect on the domestic economy. Every article sold now is one which will not overhang the market after the war. . . ."

This is practical common sense. No time should be lost in making sure that every bit of surplus now available is diverted to war or important civilian use promptly. —p. 58

° ° °

FLYING CONESTOGAS: A significant departure from orthodox airplane design and construction is reflected in the announcement that the Edward G. Budd Mfg. Co. has begun full scale production of a new military cargo plane of welded stainless steel. The planes, designed by Budd engineers and developed under the sponsorship of the Bureau of Aeronautics of the Navy Department, are being built in a new plant near Philadelphia under Navy contract.

Effective use of welded stainless steel in the design of these carriers is indicated by the fact that although the weight of plane and full load is 38,800 pounds, 10,400 pounds represents the weight of cargo. This is a good ratio of payload to gross weight. A plane can lift its full load off the ground after a run of only 920 feet.

Naming the stainless steel plane "Conestoga" was a happy thought. Conestoga wagons were the popular cargo carriers of the early settlers. They were first made in Conestoga in Lancaster county less than 80 miles west of the new plant where the flying Conestogas are being built.

As a final nostalgic touch, how many steel men who are stogie addicts know that their favorite smokes—Pittsburgh or Wheeling brand—originally were developed to satisfy the discriminating taste of Conestoga wagon teamsters? —p. 68

E. L. Shaner

EDITOR-IN-CHIEF

DO YOU DARE CUT INVENTORIES?

. . . here is a safe method that works!

Out of the maze of talk and conflicting statements regarding war contract cancellations and cutbacks—it seems reasonable to conclude that no large-scale production curtailment is expected until after the successful invasion of Europe is an accomplished fact. However, ordnance schedules are constantly being adjusted on account of changing needs and improved designs. This has resulted in recent cutbacks for many metal-working plants. Also, reserve stocks of certain war material have already reached a point where it has been found advisable to cancel further deliveries.

Due to this situation, many manufacturers may overnight be confronted with the task of disposing of steel overstocks. Too often these stocks are not easily converted to other production uses. A valued inventory can quickly become a white elephant.

We urge you to try to avoid this loss. Keep your inventory at a practical working level without excessive reserves. We believe this is entirely safe and practical today—and can be done without incurring undue risk to continuous production. There was a time when warehouse stocks were in rather bad shape and manufacturers, in self-defense, built up high steel inventories. But the WPB has seen the folly of each company carrying big inventories to meet all eventualities, and has permitted a reasonable build-up of general warehouse stocks, which serve everyone. Thus the overall tonnage of idle steel may be reduced, and the cutback and cancellation blows are cushioned.

Stocks of most steel distributors are in good shape to meet all reasonable demands. Reliable trade sources report that these warehouse stocks are now more than 100% over the low of 1942. Ryerson, in particular, has large and complete stocks of bars, shapes, plates, sheets, stainless steel, alloys, tubing and other vital steel products—ready for immediate shipment. Call any one of the eleven conveniently-located Ryerson steel-service plants for your day-to-day or emergency steel requirements.

Prompt, personal service is assured.

JOSEPH T. RYERSON & SON, INC.

Steel-Service Plants at Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Pittsburgh, Philadelphia, Jersey City

A TON OF FINISHED STEEL REQUIRES

ORE—2,800 LBS.

COAL—1,600 LBS.

LIMESTONE—825 LBS.

AIR—16,000 LBS.

WATER—480,000 LBS.

Some job to make a ton of steel

But America Makes Millions of Tons a Year

Have at hand—2,800 pounds of iron ore; 16,000 pounds of air; 480,000 pounds of water; 87,000 cubic feet of gas; 1,600 pounds of coal; 825 pounds of limestone; 4,300 pounds of steam; 1,500 pounds of steel scrap—also fluxes, alloys, refractories, electric power, sulphuric acid, muriatic acid, fuel oil, pitch . . . and furnaces capable of developing 27,000,000 B. t. u. for each ton of steel to be shipped.

Making a ton of steel is complex in method and equipment, as well as in the number, and quality of ingredients, supplies and utilities.

At Inland these complex processes are controlled by a large staff of metallurgists working in laboratories and in the plants, and by specially trained engineers who constantly investigate and design new mechanical methods and equipment. Basic ingredients—ore, limestone, coal and fluorspar—come from Inland owned mines and quarries—selected and blended to meet the needs of critical steelmakers. All other supplies are obtained under rigid specifications.

The Inland "know how" for making each ton of steel is giving America quality steels for Victory—later it will help supply the quality steels for America at peace.

INLAND STEEL COMPANY

38 S. Dearborn St., Chicago 3, Illinois

Cincinnati • Detroit • Kansas City • Milwaukee • New York • St. Louis • St. Paul

Invasion-Eve Strikes Slow War Output

Military leaders warn that stoppages cripple munitions production and endanger lives of fighting men. Striking foremen vote to return to work

By A. H. ALLEN
Detroit Editor, STEEL

"The issue now is: Can union leaders unionize management and take over control of war production? Are their organizing drives for this purpose to be allowed to interfere with the efficiency and effectiveness of this production? Will they be allowed to disrupt American mass production industry, one of the greatest assets of our country in both war and peace, by using it to experiment with a new and untried form of union-controlled management?"—Alvan Macauley, president, Automotive Council for War Production.

DETROIT

IT BEGINS to look like the Foremen's Association of America and its 3300 striking members in a half dozen Detroit war plants are going to be made the goats in the current wave of labor unrest which is sweeping the motor capital. Army and Navy officials decided to get tough last week and, with the backing of the War Labor Board, gave out the blunt statement, "this strike is holding up delivery of guns and planes, crippling the production of munitions that should be on the way to troops on the fighting fronts and endangering the lives of American soldiers and sailors . . . . the public is not aware of the seriousness of the situation."

This appeared to have Lttle effect on leaders of the foremen's union who on Wednesday in Washington were importuned by William H. Davis, chairman of the WLB, to call off their 21-day strike or face government seizure of affected plants and criminal proceedings against the striking foremen. In the midst of the hearing, Gen. H. H. Arnold of the AAF made a surprise appearance and in no uncertain terms told the foremen representatives that the strikes were holding up vital aircraft production, particularly engines for the P-51 Mustang long-range fighter plane, for which Packard is the sole source.

Upshot was, after some bickering by the foremen's association legal counsel, the strike was called off and foremen ordered back to work.

There is more than a suspicion around industrial circles in Detroit that the foremen's association has the tacit if not active support of the UAW-CIO, despite the fact the CIO was threatening last week to order its men back to work at Packard, even though the plant was closed down by orders of the Air Forces on the grounds the quality of engines built during the period while foremen were absent had deteriorated to the point where they were not acceptable.

Here indeed was a novel situation—the UAW-CIO acting in reverse by threatening to force open a plant closed on orders of the management and the only customer!

Even if the striking foremen go back to work and normal production procedures are re-established in a few days, the labor picture around Detroit remains a sorry mess. Here was the score at midweek in other plants:

At Chrysler Highland Park plant 3000 were idle as a result of a jurisdictional argument over nothing more than what union was going to be allowed to deliver pepsi-cola to the plant. An AFL truck driver was bounced out of the plant by CIO men, who were promptly discharged, but this led to a melee in which several plant supervisory officials and labor relations men were pushed around and finally the entire plant closed, along with four other Chrysler units, whose employes quit in sympathy.

At the Graham-Paige plant, 3800 on three shifts quit their jobs in protest over a WLB ruling on the rights of a small group of metal polishers.

Wash Period Causes Strike

At Clayton & Lambert Mfg. Co., producing 40-millimeter steel shell cases for the Navy, 800 day shift employes walked off the job when the company refused to allow a 5-minute wash period before quitting time. The company's refusal was based on unfavorable experience with previous wash-up time allowances. This flareup ended after one day.

At Federal-Mogul Corp., 200 staged a sitdown strike, protesting against the company's failure to set up a time study. The company capitulated and the trouble ended.

At Great Lakes Steel Corp., 200 walked out of the strip finishing department, griping over the disciplining of two workmen. They came back the following day.

At Plymouth, 92 janitresses waddled out in a huff because supervisors had asked them to remove steel chips from machine tools.

At the Buick aluminum foundry in Flint, metal pourers decided they were going to pour only 18 pots of aluminum per shift, and nine of them said they would not work until the company agreed to the plan. The company did not, and the men were sent home. Then 18 more on the next shift made similar demands and were sent home, after which the plant closed and 1400 more were idle.

At the Chevrolet transmission plant in Saginaw, 200 in the aluminum forging department were sent home for deliberate violation of a no-smoking rule, while 200 others were idle in a dispute over working hours. Employes demanded a six-day 48-hour week instead of the present five-day 45-hour week.

At Campbell, Wyant & Cannon Foundry Co. in Muskegon, 250 men walked out of the gray iron division in a dispute over wages, leaving 2000 others in danger of being thrown out of work for lack of material.

At the big Stroh brewery in Detroit 370 CIO beermakers went home because a truck driver refused to deliver beer to a store which also sold soft drinks delivered by AFL union men.

At the Aluminum Co. of America plant here, employes have been grumbling and participating in short-lived strikes over a reduction in working schedules, necessitating a change in starting and quitting hours. Before the trouble started, an Air Forces official is reported to have asked the plant management whether it "could stand a strike." The management replied that it was now working on July business in order to maintain its working force.

Reaching down into the bottom of the bag for an explanation of the current labor nausea, Philip Weiss, chairman of the Michigan Labor Board, declared it was the result of "invasion jitters" and added that workmen are pentup over the coming invasion and "the slightest incident will touch off a wave of labor disputes." This appears a ridiculous conclusion, for any men who are worrying about invasion activity are going to keep on the job, pitching for all they are worth, rather than trump up some excuse to go home and work in their victory gardens or spend the afternoon in the neighborhood beer parlor.

Meanwhile, the Automotive Council for War Production made clear the position of its 550 member plants on the question of organizing foremen. (Embarrassing was the fact that ACWP member Ford, on May 9, signed a contract with the foremen's union). The statement, reproduced as a paid advertisement in many of the metropolitan newspapers, declared that:

"At this most critical moment in history, on the eve of the great invasion of Europe which may settle the issue of human freedom for years to come, the public is entitled to know of a situation which threatens the success of that great effort.

"The council has given careful consideration to the adverse effect on war production of the strike of foremen in the twelve plants of major war producers in the Detroit area and the still greater threat inherent in the organized drive to unionize management, beginning with foremen.

"This is a long step toward putting industrial management in the hands of union leaders.

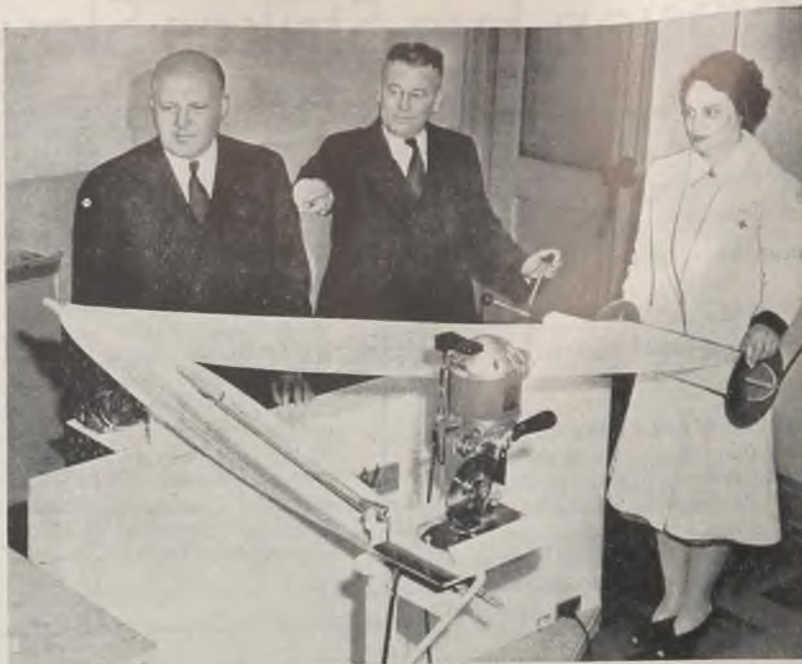
"Successful business undertakings and great achievements depend upon an organization responsive to the decision of those in charge. The commanding officers of production, like those of the Army, must have their captains and lieutenants, their sergeants and corporals. Foremen, supervisors, and managers are officers in the production army. The division of their obligations and responsibility to management, between management and any outside organization, will be just as disastrous to our war production front as outside organization of the Army's officers to bargain and debate with their superiors would be at the battle front.

"The issue now is: Can union leaders unionize management and take over control of war production? Are their organizing drives for this purpose to be allowed to interfere with the efficiency and effectiveness of this production? Will they be allowed to disrupt American mass production industry, one of the greatest assets of our country in both war and peace, by using it to experiment with a new and untried form of union-controlled management?

"What kind of collective bargaining is it when union leaders sit on both sides of the table?

"If management is to be unionized, where is union control to stop?

"This issue results directly from the fact that the federal laws and their administration are vague and confused in respect to the status of management. In the interest of the war effort, we urge Congress to make it clear that it does not intend to permit labor leaders to take over the management of our war production plants. This can and should be done immediately by clarifying and amending the necessary laws, particularly the War Labor Disputes act."



BANDAGE MACHINE: Wean Engineering Co., Warren, O., designer and builder of steel mill machinery, designed and presented to the Greater Cleveland Chapter of the American Red Cross, this electrically-driven machine which unrolls 100-yard bolts of gauze onto a flat board for subsequent cutting into 80-inch lengths for bandages. Time for this operation is thereby reduced from up to one hour to about three minutes. R. J. Wean, left above, president of the Wean company, is shown witnessing initial operation of the machine by J. R. Paisley, secretary and assistant treasurer of the Broden Construction Co., Cleveland, subsidiary of Wean Engineering, and Mrs. Walter E. Seeley, head of the Red Cross surgical dressing department

Tugmen's Strike Threatens Blast Furnace Operations at Cleveland

CLEVELAND

SERIOUS threat to blast furnace operations in the Cleveland district is seen in the strike of harbor tugmen which has been on since May 12. Stockpiles of ore and limestone at some blast furnaces are reported shrinking rapidly with at least one stack forced to resort to rail transport of ore from another plant to keep going.

Ingot operations at Cleveland are off two points from a week ago to 86 per cent of capacity but this decline is not attributable to the tugmen's strike. Expectations are, however, that if the tug strike is prolonged steel output in the area will be cut by the shortage of iron resulting from inadequate supplies of ore and limestone at blast furnace plants.

Inability of lake freighters to reach the river's ore docks through the partly dredged channel without help of towing tugs has left the steel plants without deliveries of ore and limestone since the tugmen left their jobs May 12.

An estimated 120,000 gross tons of iron ore along with a large tonnage of limestone have been lost since the tie-up occured.

Most seriously affected by the tug tie-up is the Republic Steel Corp. Close to 100,000 tons of iron ore consigned to the company's two docks in the upper river have had to be consigned elsewhere. Other plants affected are the Otis Steel plant of the Jones & Laughlin Steel Corp. and the Central Furnace plant of the American Steel & Wire Co.

The working contract between two unions of tugmen and the tug operating company expired April 1.

War production in the Cleveland district faces another threat in the decision of the local street car men's union to walk out on strike Saturday night, May 20. The car men, demanding increased pay from the municipally owned transit line, threatened to tie up operations unless their demands are met. Hundreds of thousands of workers in this vitally important war production center are dependent upon the transit system for transportation.

Company's Right To Comment on Unions Upheld

Circuit Court denies NLRB contempt suit against Budd company for letter sent to employes

SIGNIFICANT ruling involving management-labor relations was handed down in the third United States Circuit Court of Appeals at Philadelphia last week, when the court ruled the Wagner act "does not purport to authorize a restraint upon freedom of speech in any circumstances", unanimously turning down a petition by the National Labor Relations Board to hold Edward G. Budd and the Edward G. Budd Mfg. Co. in contempt for circulating a letter to the company's 15,000 employes.

The Circuit court ruled that free speech is equally the privilege of employer and employe. It held that Mr. Budd's letter, dated Feb. 29, while an undisguised and unmistakable effort to argue the merits of an independent union, principally sought to explain to Budd workers that they are not "bound" to choose an organized labor union, that they could form one of their own —or, if they chose, could form none at all.

The NLRB had asked the court to adjudge Mr. Budd and his company in contempt of a Circuit court ruling of Sept. 7, 1943. That ruling upheld an NLRB order to the company of June 10, 1942, to disband the 10-year old Budd Employes Representation Association. Also upheld at that time was the board's order that the company cease interfering with attempts to organize the workers by the United Automobile, Aircraft and Agricultural Workers of America, CIO. Also it ordered the company to reinstate with back pay two employes who allegedly were discharged for CIO activities. These decisions of the court later were upheld by the United States Supreme Court.

The Budd letter, the cause for the most recent action, was circulated after this decision with which the company had complied.

In his decision last week, Judge Charles Alvin Jones said there was nothing in the Circuit court's original ruling forbidding company comment on unions. "Nor could the decree validly contain such a prohibition," he said. "It can hardly be questioned that the constitutional guaranty (free speech) protects the employer and employe alike. Thus, to make known the facts of a labor dispute has been recognized as a constitutionally protected right of a member of a union."

Present, Past and Pending

■ U. S. SEEKS TO BUY UP SWEDISH BEARINGS

WASHINGTON—Stanton Griffis, special representative in Sweden of the Foreign Economic Administration, has been authorized to purchase all ball bearings produced by the Swedish SKF works in a move to cut off shipments to Germany. It is said Griffis has authority to spend up to $30,000,000 to achieve that objective.

■ PEN MANUFACTURERS STILL LACK STEEL

WASHINGTON—Although WPB orders covering use of stainless steel have been relaxed to permit use in the manufacture of pen nibs, the fountain pen and pencil industry advisory committee states manufacturers are unable to fill orders because deliveries of stainless steel are not expected for another ninety days.

■ WILLYS' SHELL OUTPUT PASSES 2,000,000-MARK

TOLEDO, O.—Trainload of ammunition 25 miles long has left the Willys-Overland plant here since first shipment of 155 millimeter shells by the company less than three years ago. Now over the 2,000,000 mark the company's production of the 95-pound projectiles is at present divided among the high explosive, chemical and smoke type.

■ REPUBLIC'S DPC BLAST FURNACE DAMAGED

CLEVELAND—An unexplained explosion in one of the stoves of the new No. 5 DPC stack operated by Republic Steel Corp. here toppled the 175-foot chimney last week. No one was injured. The 1300-ton stack is undergoing a comprehensive study to determine how present operating technique can be improved to better operating efficiency through controlled top pressures ranging from 5 to 10 pounds above atmosphere.

■ MORE VESSEL CONTRACTS AWARDED

WASHINGTON—Contracts for construction of 51 cargo vessels of the C1-M-AV1 type were announced by the Maritime Commission last week as follows: Consolidated Steel Corp. Ltd., Wilmington, Calif., 13; J. A. Jones Construction Co., Brunswick, Ga., 11; Southeastern Shipbuilding Corp., Savannah, Ga., 20; Leathem D. Smith Shipbuilding Co., Sturgeon Bay, Wis., 4; Kaiser Cargo, Inc., Richmond, Calif., 3.

■ TO INVESTIGATE STEEL EXPANSION PROGRAM

WASHINGTON—With the steel expansion program nearing completion reports are heard the Steel Division of the Department of Commerce will study the entire undertaking with respect to capacity, utilization, etc. At the same time it is said the Department of Justice will look into the matter of final disposal of the properties by the Defense Plant Corp.

■ GENEVA STEEL GETS PRICE CONCESSION ON PLATES

WASHINGTON—Office of Price Administration has granted the Geneva Steel Co., Provo, Utah, a competitive price with the Kaiser Co. Inc.'s plant by allowing them $3.20 per 100 pounds on plates.

WLB Upholds Firm's Right To Discipline Strikers

The War Labor Board last week in a decision involving the Norge Products division, Borg-Warner Corp., Muskegon, Mich., upheld management's right to discipline employes who strike in violation of a contract. In its action last week the WLB reversed the ruling of its Detroit regional board which had ordered the company to reinstate 41 former employes with seniority rights, but without back pay.

Commenting on the case, George W. Taylor, vice chairman of WLB, said, "When the employes in this case struck in violation of the agreement they subjected themselves to discipline by management. To say that management has no right to impose discipline in such a case would impose an insuperable obstacle in the way of management's performance of its essential function."

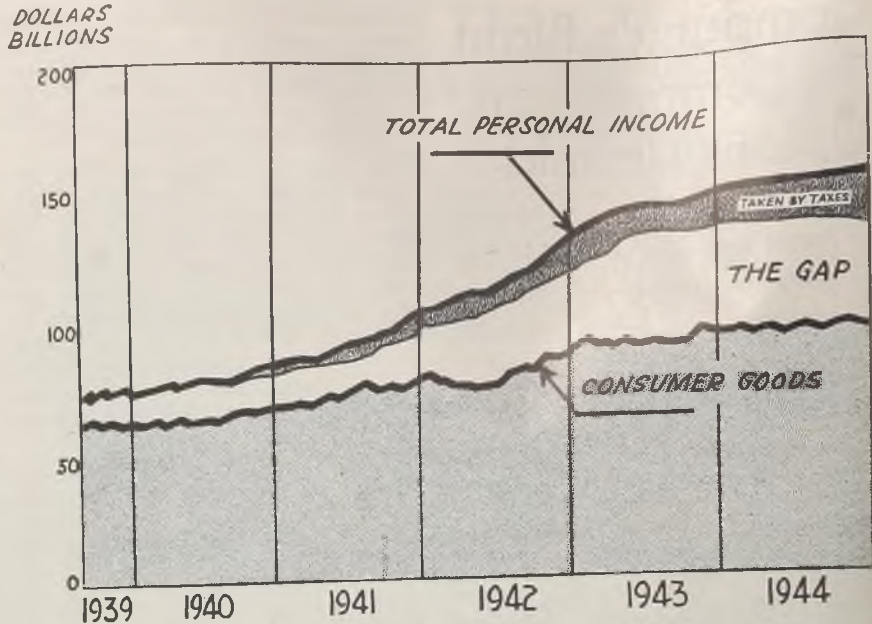
Would Permit Challenge of Unions' Majority Status

Proposed change in National Labor Relations Board procedure which includes a proposal that would allow employers to challenge the majority status of a union after the NLRB had taken jurisdiction of a dispute was cause for considerable speculation in labor circles last week.

Representatives of labor and industry were invited to a hearing at which the proposed change in procedure will be discussed. Industry spokesmen have endorsed the proposal but union leaders are expected to register opposition.

Union Claims Countered By Industry

Economist tells War Labor Board panel granting of increase would amount to "confiscation" of industry's "tools of production"



This chart, originally presented by OPA Chief Chester Bowles, was introduced at the steel wage hearing by Dr. Jules Backman to illustrate the inflationary pressure caused by wage increases at a time when the supply of available consumer goods is limited

STRONG counter attack on the claims of the United Steelworkers of America, who are seeking a 17-cent hourly wage increase, a guaranteed minimum wage, and other concessions from the steel industry, was launched by representatives of the industry last week when hearings on the case were resumed before a panel of the War Labor Board in Washington.

Appearing as the first witness at the hearings, Dr. Jules Backman, New York University economist, characterized as "devious and obscure" the argument of the union that federal tax laws impose undue burdens, amounting to "wage cuts" on wage earners, "while continuing special privileges to high income groups."

Pointing out that in these days federal income taxes serve two purposes: (1) To raise money to help pay for the war; and (2) to siphon off excess consumer buying power and thus relieve the upward pressure on prices, Dr. Backman said:

"Both of those purposes would be defeated if wage increases were granted to workers commensurate with increases in taxes upon their incomes. In the first place, wage increases to workers engaged in the production of war materials would increase the cost of those materials to the government, and so, to a large extent, would offset the increases in taxes. In the second place, such wage increases would replace the excess consumer buying power which the increased taxes were intended to reduce. There cannot, therefore, be any sound basis for the proposition that the steelworkers are entitled to increases in their wages in order to compensate for increases in taxes upon their income.

"Furthermore, it is clearly not the function of the War Labor Board to readjust the incidence of federal taxes. It is for the Congress to determine how the burdens of federal taxation shall be distributed and the board cannot presume to place its judgment above that of the Congress in that regard."

Dr. Backman presented official figures from the Bureau of Labor Statistics and other sources to demonstrate that the increases in taxes upon the income of steelworkers have not resulted in any deterioration in their economic position since the beginning of the war. He also presented additional official figures showing sharp wartime increases in the taxes of all income groups with steadily increasing percentages above the five thousand dollar a year income group.

Dr. Backman said these figures demonstrated "that there is no basis for the claim that the steelworker has had to bear an undue increase in federal taxes upon his income since the beginning of the war as compared with other groups."

"Taxes Up for All Groups"

"The truth is that taxes have been increased sharply for all groups," he said, adding:

"It is indeed a strange concept to describe as an increased burden the higher taxes which must be paid when incomes increase. It is an even stranger concept that such increases in taxes should be compensated for by higher wages."

Dr. Backman told the panel that in its presentation the union also implied that regular savings in the form of purchases of war savings bonds through payroll deductions are "to be considered as expenditures which reduce the standard of living."

"The union has implied that spendable earnings, that is, earnings after the deduction of taxes and bond purchases, should be used to measure changes in labor's economic well-being. Any such suggestion is entirely without merit.

"If any group is guaranteed that its earnings after the deduction of taxes must increase as much as living costs, then its living standards would be preserved at the expense of other groups. If bond purchases as well as taxes are deducted from earnings and the remaining earnings still increase sufficiently to compensate for increases in living costs, the groups finding themselves in that fortunate position will have improved their economic status to the extent of their war bond purchases. Such groups will be able to command the same volume of goods and services as before the war and at the same time to add to their accumulated savings.

"Moreover, if earnings after the deduction of taxes and bond purchases increase even more than the increase of living costs, as in the case of steelworkers, then it is clear that groups in that position have not only been able to add to their savings but are also in a position to increase their command over goods and services and, therefore, to improve their living standards over their prewar level.

"Moreover, acceptance of the union's argument would mean that a further increase in wage rates would become necessary in order to compensate labor for further savings made in the form of bond purchases. Similarly, if increases in wage rates shall be granted to compensate for increased taxes, one of the primary purposes of the tax program will be defeated, but that purpose being to drain off excess purchasing power.

"It is clear that deductions for taxes and war bond purchases should not be considered in determining the adequacy of labor's income to meet changes in living cost. But even after allowing for such deductions, the position of the steelworker is better than it was in the prewar period."

Breaking down the financial operations of the steel industry in an unusual manner, David S. Roswell, business consultant, told the panel the real result of granting a 17 cents an hour wage increase demanded by the union might be the "confiscation" of the industry's "tools of production," with no one gaining.

Mr. Roswell presented an analysis of 31 corporations, which make 87 per cent of the nation's steel, and to get "the same base and the same units for comparisons" reduced their receipts and expenditures into terms "per man, per hour."

Mr. Roswell described a corporation as an "intermediary" among the customers who buy the goods, the owners who provide the tools of production, the workers who use the tools of production and the government, which collects taxes from customers through the corporation.

He found the sales of the 31 companies for 1943, which totaled $6,297,000,000, to be $3.087 per hour per worker. In the disbursements, he said the sums set aside for "wearing out of tools" and "additional war costs and contingencies" amounted to 17.1 cents an hour per worker, or, coincidentally, virtually the same as the union's wage demands.

Refutes Union's Claims

The consultant said the union had named three possible sources from which the cost of the wage increase could be met: Money now going into taxes, payments to owners for the use of tools, and amounts set aside for the wearing out of tools and for additional war costs and contingencies.

"The union contends that the increases in the payments to steelworkers which it demands should be taken from the payments to the owners for the use of tools (profits)," said Mr. Roswell. "In 1943, however, for the 31 corporations, those payments amounted to only 9.7 cents per hour per worker. Furthermore, if the owners of the tools should be deprived of all payments for the use of tools, that would amount to confiscation of the tools and would not be to the interest of the workers or owners.

"The union also contends such increases can be paid from the amounts set aside for the wearing out of tools and for additional war costs and contingencies (depreciation, depletion and amortization). By coincidence, the aggregate of the amounts so set aside in 1943 were 17.1 cents per hour per worker. But if the government should order that all of that amount be applied to increased payments to steelworkers, the result would in the end be the confiscation of the tools, because, since nothing would be provided with which to replace the tools as they wear out, the owners of the tools would be deprived of their property without compensation and workers would have no tools to use.

"If the union contends that the increased payments to steelworkers which it demands will result in decreased taxes, that will simply mean that the government must collect more taxes from others or borrow more to pay for the cost of war, and the ultimate burden must be borne by the taxpayers, who in reality are the workers.

"In the end, therefore, the union's demand comes down to a demand that the government increase the prices which the steel companies shall receive from their customers, the most important of whom is the government itself, and apply the increased receipts from customers to increase the payments to steelworkers."

Roswell said the "gross amount of tools of production" (generally termed assets) of the 31 corporations involved, amounted to seven billion dollars.

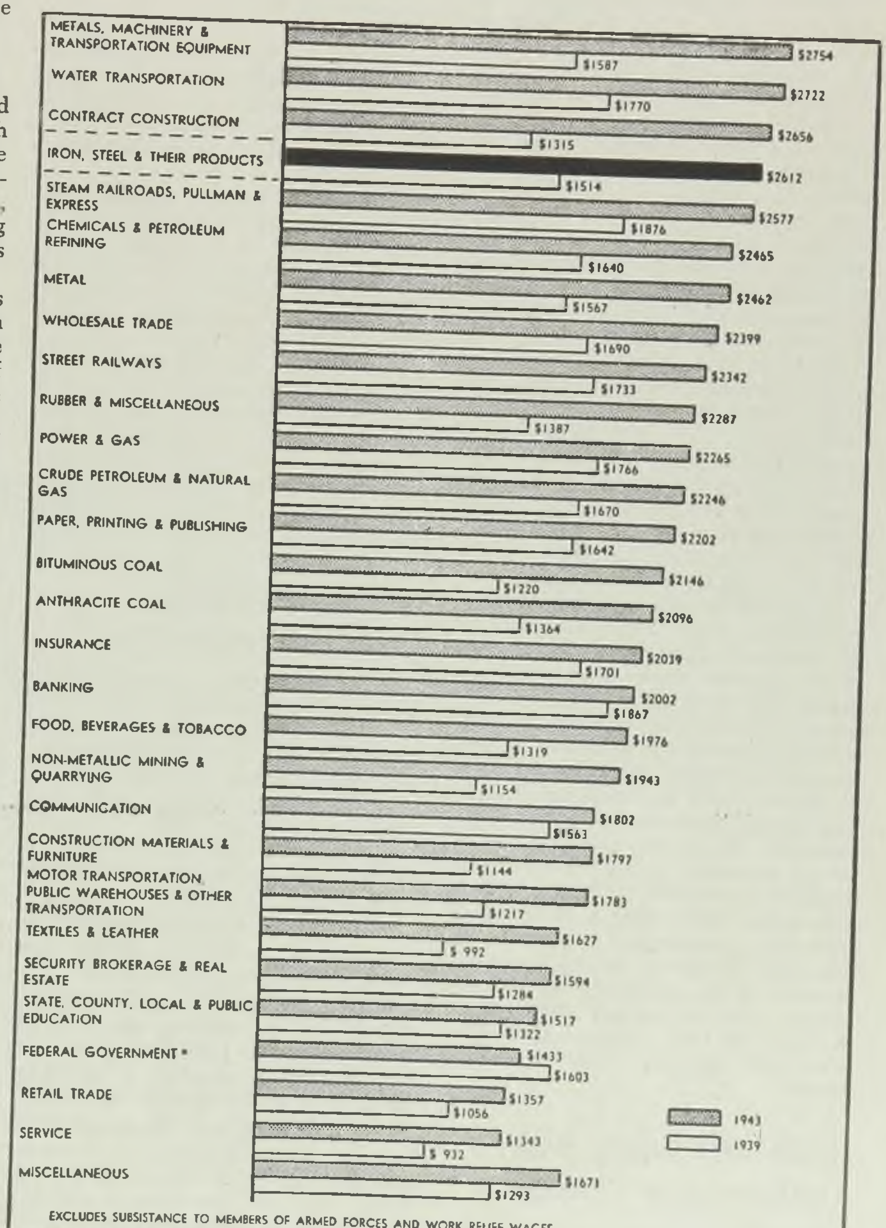
This table of the 1943 disbursements for the corporations was given by the consultant, the sum balancing with the $3.087 per man per hour receipts:

Additional war costs and contingencies	.029
Wearing out of tools	.142
Goods and services purchased from others	1.306
Payments to workers	1.241
Taxes	.272
Use of Tools (dividends)	.097
Total	3.087

F. R. Brugler, assistant to the comptroller of the Bethlehem Steel Corp., testified that "even if the entire amount of the increase in net corporate profits after taxes from 1941 to 1943 had been distributed to individual stockholders, it would have added to consumer buying power only about 1½ per cent of the amount that was added to that buying power by the increase over the same period in compensation of employes."

Mr. Brugler said 31 steel companies producing 87 per cent of the country's steel showed a decrease of $106,000,000 in net income during that period while wages and salaries jumped $970,000,000.

Annual Salaries and Wages, 1939-1943



EXCLUDES SUBSISTANCE TO MEMBERS OF ARMED FORCES AND WORK RELIEF WAGES

SOURCE: U. S. Department of Commerce

Purchasing Agents Convention To Concentrate on War Problems

Plans being completed for twenty-ninth annual meeting of association at New York May 29-31. Program streamlined to discuss current and reconversion buying policies. Attendance expected to top 2000 mark

DONALD M. NELSON, War Production Board chairman, J. F. Brownlee, deputy administrator of the Office of Price Administration, and Brig. Gen. Alfred J. Browning, director, purchases division, Army Service Forces, will be among the speakers at the twenty-ninth annual international convention of the National Association of Purchasing Agents to be held May 29-31 at the Waldorf-Astoria, New York.

General theme of this year's convention will be "Purchasing for Victory." All entertainment features have been eliminated and the program streamlined in order to discuss problems confronting purchasing agents now and during the reconversion period. An attendance of 2000 is expected.

Mr. Nelson will speak on "Problems Ahead in War Production." General Browning will talk on "Problems Faced in Purchasing for War Production," and Mr. Brownlee will speak on "What Are We Facing in Price Controls?"

Walter C. Skuce, director of the Controlled Materials Division, WPB, will discuss "What Are We Facing in CMP Material Controls?" Robert R. Wason, president, Manning, Maxwell & Moore, New York, and chairman of the Economic Principles Commission of the National Association of Manufacturers, will talk on "How Long Should We Be Faced with Government Controls?"

Others on the program include: Stuart F. Heinritz, editor, *Purchasing;* Col D. N. Hauseman, director of the readjustment division, Army Service Forces; Lieut. Col. J. P. Woodlock, executive officer, Surplus War Property Administration; Clifton E. Mack, director of procurement, Treasury Department; Col. C. R. Baxter, WPB Redistribution Branch; Col. George Stuart Brady, Ordnance Department; Dr. Lewis H. Haney, professor of economics, New York University; Herbert N. McGill, president, McGill Commodity Service Inc.; A. W. Zelomek, president, International Statistical Bureau Inc.; George A. Renard, secretary-treasurer of the purchasing agents' association. Banquet speaker will be Prof. J. Anton de Haas, Harvard University, who will talk on "This Scrambled World."

Triple Mill Supply War Conference at Chicago

The 1944 wartime conference of the mill and industrial machinery industry will be held at the Palmer House, Chicago, May 22-24, with talks on such subjects as termination of war contracts, industrial relations, and postwar planning.

The three groups participating in the meeting are the Southern Supply and Machinery Distributors' Association Inc., National Supply and Machinery Distributors' Association, and the American Supply and Machinery Manufacturers' Association Inc.

On May 22, L. D. Deal, assistant treasurer in charge of war contract terminations, Lyon Metal Products Inc., will speak on a manufacturer's successful plan for termination of war contracts. Alfred Bryant, Bryant Machine & Engineering Co., will speak on successful terminations by a distributor. The afternoon session will be devoted to talks on industrial relations by J. A. Stevens, vice president in charge of industrial relations, United States Steel Corp., and John P. Roche, assistant to president, Oliver Iron & Steel Corp.

Main topic on May 23 will be a talk on export and its postwar possibility by G. W. Wolf, president, United States Steel Export Co. On May 24 there will be a sales and distribution symposium with talks by R. D. Black, Black & Decker Mfg. Co., and K. R. Beardslee, vice president, Carboloy Co. Inc.

Industrial Relations Topic at Western Forum

Industrial relations experts, counselors and personnel directors from almost every section of the nation were among speakers at the National Manufacturers' Association institute on industrial relations held at the Biltmore hotel, Santa Barbara, Calif., May 9-12.

The opening address was made by Alden G. Roach, president, Consolidated Steel Corp., Los Angeles.

J. A. Hartley, president, Braun Corp., Los Angeles, pleaded for sensible postwar, labor-management relations.

H. O. Roberts, personnel director, Servel Inc., declared that after the war there will be a period when industry will abandon its practice of permitting government to interfere in its disputes.

Fred C. Crawford, Thompson Products Inc., Cleveland, rapped bureaucracy and made a plea for the freeing of enterprise. He cited four reasons why new business is not being developed:

1—A federal tax system making it impossible for capital to risk new ventures. Earnings are taken away by the mounting tax demands. 2—The labor policy of the government makes every new employe a liability. Each new man hired becomes the threat of a WLB suit. 3—A complete and stifling system of bureaucracy regulates everything, discouraging new enterprise. 4—Unrealism in social security. Fantastic promises of social security are destroying impetus for private initiative.

Record Attendance Assured For Gear Makers Meeting

American Gear Manufacturers Association has made reservations for record attendance at its twenty-eighth annual meeting, to be held at Westchester Country Club, Rye, N. Y., May 22-24.

Among the speakers at this meeting will be William E. Robinson, vice president, *New York Herald Tribune;* John O. Almen, research specialist, General Motors Corp.; Michael Maletz, analytical engineer, Kearney & Trecker Corp.; H. W. Kayser, development engineer, Falk Corp., and F. D. Newbury, vice president, Westinghouse Electric & Mfg. Co.

Institute Steel Output Figures on New Basis

After a lapse of three months the American Iron and Steel Institute has resumed compilation of statistics on finished steel made for sale. The presentation has been revised somewhat and figures for the first three months of this year are shown on the facing page. Companies represented in the tabulation represented 98.7 per cent of total output of finished rolled steel products in 1943.

Products have been regrouped to fit current conditions better. Among changes from the old form, hot-rolled and cold-finished bars are totaled separately, tonnages of tin and terne plate show figures for hot-dipped and electrolytic, black plate is divided into ordinary and chemically treated and other refinements are introduced.

MEETINGS . . .

American Supply and Machinery Manufacturers' Association Inc., National Supply and Machinery Distributors' Association, and Southern Supply and Machinery Distributors' Association Inc.; Triple mill supply wartime conference, Palmer House, Chicago, May 22-24.

American Gear Manufacturers Association: Twenty-eighth annual meeting, Westchester Country Club, Rye, N. Y., May 22-24.

American Iron and Steel Institute: Fifty-third general meeting, Waldorf-Astoria hotel, New York, May 25.

American Machine Tool Distributors Association: French Lick Springs hotel, French Lick, Ind., May 25-26.

National Association of Purchasing Agents: Twenty-ninth annual international convention Waldorf-Astoria hotel, New York, May 29-31.

Machinery Dealers' National Association: Second wartime conference, Hotel Pennsylvania, New York, June 5-6.

Society of Automotive Engineers Inc.: National war materiel meeting, Book-Cadillac hotel, Detroit, June 5-7.

First Quarter Steel Capacity, Production and Shipments

Steel Products	Number of companies	Items	Maximum Annual Capacity Net Tons	MARCH 1944 Production Net Tons	MARCH 1944 Production Per cent of capacity	MARCH 1944 Shipments (Net Tons) Total	MARCH 1944 Shipments (Net Tons) To members of the industry for conversion into further finished products	To Date This Year Production Net Tons	To Date This Year Production Per cent of capacity	To Date This Year Shipments (Net Tons) Total	To Date This Year Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	45	1	x x x x	x x x x	x x x	717,393	225,277	x x x x	x x x	2,129,905	649,50
Structural shapes (heavy)	10	2	8,977,450	362,630	48.3	357,484	x x x x	1,074,436	48.6	1,047,552	x x x x
Steel piling	4	3		4,873		3,750	x x x x	9,405		9,276	x x x x
Plates (sheared and universal)	25	4	15,990,020	1,235,756	91.2	1,204,368	40,019	3,557,742	89.5	3,457,871	123,64
Skelp	6	5	x x x x	x x x x	x x x	77,542	60,617	x x x x	x x x	219,216	170,090
Rails—Standard (over 60 lbs.)	4	6	3,625,000	205,472	66.9	211,223	x x x x	596,214	66.1	592,975	x x x x
—All other	6	7	518,600	15,782	35.9	15,208	x x x x	42,347	32.8	45,514	x x x x
Splice bars and tie plates	13	8	1,703,700	73,248	50.7	72,927	x x x x	204,577	48.3	206,944	x x x x
Track spikes	10	9	373,200	13,116	41.5	14,359	x x x x	36,176	39.0	37,562	x x x x
Hot Rolled Bars—Carbon	36	10	x x x x	772,773	x x x	634,752	81,089	2,243,264	x x x	1,888,152	244,256
—Reinforcing—New billet	13	11	x x x x	44,907	x x x	46,430	x x x x	110,249	x x x	112,751	x x x x
—Rerolled	14	12	x x x x	10,776	x x x	11,237	x x x x	25,286	x x x	28,896	x x x x
—Alloy	22	13	x x x x	285,542	x x x	207,598	41,174	838,416	x x x	610,737	110,64
—Total	44	14	21,207,210	1,113,998	62.0	900,017	122,263	3,217,215	61.0	2,640,536	354,896
Cold Finished Bars—Carbon	25	15	x x x x	162,177	x x x	162,380	x x x x	464,363	x x x	461,177	x x x x
—Alloy	22	16	x x x x	34,864	x x x	32,927	x x x x	109,967	x x x	97,774	x x x x
—Total	31	17	2,694,110	197,041	86.3	195,307	x x x x	574,330	85.7	558,951	x x x x
Tool steel bars	18	18	214,970	13,135	72.1	12,211	x x x x	37,542	70.2	35,319	x x x x
Pipe and Tubes—Butt weld	16	19	2,289,130	124,159	64.0	121,710	x x x x	367,859	64.6	347,555	x x x x
—Lap weld	8	20	967,900	56,290	68.6	52,548	x x x x	155,308	64.5	148,434	x x x x
—Electric weld	9	21	1,225,170	53,630	51.7	54,133	x x x x	164,971	54.2	164,262	x x x x
—Seamless	15	22	2,659,250	212,120	94.1	205,482	x x x x	604,365	91.4	589,932	x x x x
—Conduit	7	23	184,500	4,973	31.8	4,362	x x x x	12,109	26.4	11,825	x x x x
—Mechanical tubing	11	24	1,004,450	74,176	87.1	76,446	x x x x	214,513	85.9	219,475	x x x x
Wire rods	25	25	6,840,210	396,116	68.3	111,376	32,623	1,116,800	65.7	310,252	85,612
Wire—Drawn	40	26	5,468,830	318,040	68.6	181,132	4,802	906,243	66.6	505,491	12,54
—Nails and staples	18	27	1,224,880	62,169	59.9	61,087	x x x x	183,747	60.3	179,103	x x x x
—Barbed and twisted	15	28	551,720	22,467	48.1	21,563	x x x x	64,545	47.0	63,565	x x x x
—Woven wire fence	15	29	1,101,090	33,984	36.4	34,627	x x x x	97,088	35.5	97,321	x x x x
—Bale ties	12	30	150,660	7,312	57.3	6,889	x x x x	21,094	56.3	19,242	x x x x
Black Plate—Ordinary	9	31	x x x x	x x x x	x x x	39,512	95	x x x x	x x x	103,945	561
—Chemically treated	8	32	464,000	14,765	37.6	14,055	x x x x	44,368	38.5	42,253	x x x x
Tin and Terne Plate—Hot dipped	9	33	3,452,400	148,983	50.9	166,592	x x x x	400,161	46.6	445,026	x x x x
—Electrolytic	10	34	1,780,450	53,980	35.8	56,545	x x x x	158,624	31.3	128,507	x x x x
Sheets—Hot rolled	28	35	19,611,270	1,104,013	66.4	558,724	22,365	3,119,493	64.0	1,615,737	63,228
—Cold rolled	14	36	7,318,780	317,239	51.2	175,352	x x x x	884,097	48.6	493,586	x x x x
—Galvanized	15	37	2,686,410	112,284	49.3	118,962	x x x x	306,745	45.9	303,204	x x x x
Strip—Hot rolled	22	38	7,307,280	236,598	38.2	155,600	22,778	655,051	36.1	432,407	65,197
—Cold rolled	34	39	3,236,940	99,394	36.2	98,091	x x x x	282,073	35.0	268,009	x x x x
Wheels (car, rolled steel)	5	40	348,800	27,209	92.1	26,118	x x x x	75,107	86.6	74,686	x x x x
Axles	6	41	416,170	19,609	55.6	19,873	x x x x	53,969	52.2	54,156	x x x x
All other	6	42	150,270	3,932	30.9	6,027	x x x x	9,355	25.0	15,361	x x x x
Total steel products	154	43	x x x x	x x x x	x x x	6,146,395	530,839	x x x x	x x x	17,614,955	1,525,276
Effective steel finishing capacity	154	44	64,722,000	x x x x	x x x	x x x x	x x x x	x x x x	x x x	x x x x	x x x x
Percent of shipments to effective finishing capacity	154	45	x x x x	x x x x	x x x	102.4 %	x x x x	x x x x	x x x	100.0 %	x x x x

Steel Products	Number of companies	Items	Maximum Annual Capacity Net Tons	JANUARY-1944 Production Net Tons	JANUARY-1944 Production Per cent of capacity	JANUARY-1944 Shipments (Net Tons) Total	JANUARY-1944 Shipments (Net Tons) To members of the industry for conversion into further finished products	FEBRUARY 1944 Production Net Tons	FEBRUARY 1944 Production Per cent of capacity	FEBRUARY 1944 Shipments (Net Tons) Total	FEBRUARY 1944 Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	45	1	x x x x	x x x x	x x x	700,027	213,837	x x x x	x x x	712,485	210,393
Structural shapes (heavy)	10	2	8,977,450	352,636	50.0	336,910	x x x x	359,170	47.5	353,158	x x x x
Steel piling	4	3		2,654		2,849	x x x x	1,878		2,677	x x x x
Plates (sheared and universal)	25	4	15,990,020	1,152,377	91.0	1,116,513	42,385	1,169,609	86.3	1,136,990	41,241
Skelp	6	5	x x x x	x x x x	x x x	71,013	52,898	x x x x	x x x	70,661	56,575
Rails—Standard (over 60 lbs.)	4	6	3,625,000	204,959	71.4	202,051	x x x x	185,783	60.5	179,701	x x x x
—All other	6	7	518,600	13,049	31.8	13,703	x x x x	13,516	30.8	16,603	x x x x
Splice bars and tie plates	13	8	1,703,700	64,300	47.7	61,075	x x x x	67,029	46.4	72,942	x x x x
Track spikes	10	9	373,200	11,772	59.8	11,626	x x x x	11,288	35.7	11,577	x x x x
Hot Rolled Bars—Carbon	36	10	x x x x	709,015	x x x	607,632	77,168	761,476	x x x	645,768	85,999
—Reinforcing—New billet	13	11	x x x x	31,087	x x x	34,206	x x x x	34,255	x x x	32,115	x x x x
—Rerolled	13	12	x x x x	8,004	x x x	7,643	x x x x	6,506	x x x	10,016	x x x x
—Alloy	21	13	x x x x	271,336	x x x	198,675	34,344	281,538	x x x	204,464	35,122
—Total	44	14	21,207,210	1,019,442	60.7	848,156	111,512	1,083,775	60.3	892,363	121,121
Cold Finished Bars—Carbon	25	15	x x x x	146,423	x x x	142,894	x x x x	155,763	x x x	155,903	x x x x
—Alloy	22	16	x x x x	35,674	x x x	31,225	x x x x	39,429	x x x	33,622	x x x x
—Total	31	17	2,694,110	182,097	85.4	174,119	x x x x	195,192	85.5	189,525	x x x x
Tool steel bars	18	18	214,970	12,796	75.2	12,075	x x x x	11,611	63.7	11,033	x x x x
Pipe and Tubes—Butt weld	16	19	2,289,130	125,163	69.1	116,215	x x x x	118,537	61.1	109,630	x x x x
—Lap weld	8	20	967,900	49,337	64.4	47,671	x x x x	49,681	60.6	48,215	x x x x
—Electric weld	9	21	1,225,170	51,269	52.8	51,110	x x x x	60,072	57.9	59,019	x x x x
—Seamless	15	22	2,659,250	195,195	92.7	191,865	x x x x	197,050	87.4	192,585	x x x x
—Conduit	7	23	184,500	3,534	24.2	3,968	x x x x	3,602	23.0	3,495	x x x x
—Mechanical tubing	11	24	1,004,450	71,432	89.8	72,210	x x x x	68,905	81.0	70,819	x x x x
Wire rods	25	25	6,840,210	361,421	66.7	100,043	28,322	359,263	62.0	98,833	24,667
Wire—Drawn	40	26	5,468,830	293,417	67.8	163,966	4,015	294,786	63.6	160,393	3,723
—Nails and staples	18	27	1,224,880	59,266	61.1	57,831	x x x x	62,312	60.0	60,185	x x x x
—Barbed and twisted	15	28	551,720	20,795	47.6	20,757	x x x x	21,283	45.5	21,245	x x x x
—Woven wire fence	15	29	1,101,090	31,420	36.0	31,981	x x x x	31,684	34.0	30,713	x x x x
—Bale ties	12	30	150,660	6,841	57.3	6,275	x x x x	6,941	54.4	6,078	x x x x
Black Plate—Ordinary	9	31	x x x x	x x x x	x x x	34,720	436	x x x x	x x x	29,713	30
—Chemically treated	8	32	464,000	15,158	41.3	14,794	x x x x	14,445	36.7	13,404	x x x x
Tin and Terne Plate—Hot dipped	9	33	3,452,400	131,694	48.2	154,895	x x x x	119,484	40.8	123,539	x x x x
—Electrolytic	10	34	1,780,450	45,466	32.3	39,544	x x x x	39,178	26.0	32,418	x x x x
Sheets—Hot rolled	28	35	19,611,270	999,806	64.4	518,149	17,356	1,015,674	61.1	533,864	23,507
—Cold rolled	14	36	7,318,780	299,501	51.7	158,961	x x x x	267,357	43.1	159,273	x x x x
—Galvanized	15	37	2,686,410	102,818	48.3	94,584	x x x x	91,643	40.3	89,658	x x x x
Strip—Hot rolled	22	38	7,307,280	209,241	36.2	137,312	21,432	209,212	33.8	139,495	20,987
—Cold rolled	34	39	3,236,940	91,071	35.5	86,006	x x x x	91,608	33.4	85,912	x x x x
Wheels (car, rolled steel)	5	40	348,800	25,032	90.6	25,578	x x x x	22,866	77.4	22,990	x x x x
Axles	6	41	416,170	17,803	54.0	17,049	x x x x	16,557	46.9	17,234	x x x x
All other	6	42	150,270	3,142	26.4	5,072	x x x x	2,281	17.9	4,262	x x x x
Total steel products	154	43	x x x x	x x x x	x x x	5,700,673	402,193	x x x x	x x x	5,767,687	502,244
Effective steel finishing capacity	154	44	64,722,000	x x x x	x x x	x x x x	x x x x	x x x x	x x x	x x x x	x x x x
Percent of shipments to effective finishing capacity	154	45	x x x x	x x x x	x x x	101.6 %	x x x x	x x x x	x x x	96.0 %	x x x x

Capacity Shipbuilding Operations For Year Assured on the Coast

Current backlogs at all major yards in Pacific Northwest unusually heavy. Labor shortage in California industries continues unabated with total employment in state down 11,400 from year ago. Inadequate housing is a major cause

SEATTLE

MAJOR shipyards in this area have current backlogs that insure maximum operations for at least a year. Kaiser's Swan Island plant has a contract for 38 additional T-2-type tankers and the Vancouver, Wash., yard has been commissioned to build twenty C-4 troop transports. Oregon Shipbuilding Corp. holds contracts for Victory ships and AP-5 transports to keep 30,000 workmen on the job until June next year.

R. J. Lamont, president, Seattle-Tacoma Shipbuilding Corp., reports current destroyer contracts sufficient to keep the Seattle plant busy until the middle of next year while the Tacoma yard has work on hand that will not be completed until the end of 1945.

Everett Pacific Shipbuilding & Drydock Co., Everett, Wash., which has been building navy drydocks, is undergoing expansion preparatory to enlarged operations to include heavy repair work.

At Portland, Oreg., several yards have been converted for naval repairs, 10,000 men reportedly engaged in this work. One Puget Sound yard is reported to be prefabricating ship assemblies being brought overland from a southern plant.

Lake Washington Shipyards, Seattle, has a backlog of navy construction while the Associated Shipbuilders, Seattle, has a program calling for delivery of 32 naval units this year. This firm will continue construction and repair work at the Harbor Island plant under name of the Puget Sound Bridge & Dredging Co., while future operations of the Lake Union plant, merged with Associated, will be devoted to repair work.

Albina Engine & Machine Works is moving most of its ship repair facilities from Portland to Longview, Wash., where a large modern plant will be developed, according to L. R. Hussa, vice president.

At Aberdeen, Wash., officers of Grays Harbor Shipbuilding Co. announce an agreement with new interests whereby facilities of the plant not required for wooden construction will be converted to steel, plans involving repairs of large steel vessels.

Buckler-Chapman Co., Portland ship joiners, has a subcontract for 27 troop transports under construction at Kaiser's Vancouver yard and 36 units at the Oregon Shipbuilding plant, Willamette Iron & Steel Works, Portland, has expanded facilities by construction of a $50,000 pier.

Local steel rolling mills are crippled by lack of manpower. The main handicap is the wage scale which cannot compete with the shipyards and other industries.

Labor shortages are in evidence in all the major industries, including machine shops and fabricating plants. Shipyard turnover is excessive. Boeing Aircraft is still recruiting workers.

Local industrial leaders hail the WPB order premitting small plants in critical labor areas to resume war contracts.

Alcoa's Troutdale, Oreg., plant is threatened with reduced operations due to labor shortage. One line may be shut down as 150 temporary workers are due to leave.

California Labor Force Is Still Reported Shrinking

LOS ANGELES

CALIFORNIA Division of Labor Statistics reports total employment in the state during March was 11,400 less than in the like month of 1943.

Shrinking totals in aircraft and shipbuilding pose a major problem coming at the peak of the war's demand in these industries. In aircraft, wage earners decreased 8900 in March; shipbuilding workers decreased 5600.

The decline in shipbuilding employment has been in progress since September, 1943, while the falling off in aircraft plants has been in evidence for a year.

Forty-two per cent of the decline in industrial wage earners in the state is in the Los Angeles district.

Reasons attributed for the decline are difficulties of finding adequate housing for workers, widespread feeling that the war is almost over, and weariness.

Morris B. Pendleton, chairman, Los Angeles Citizens Manpower Committee, states the 1,500,000-man labor force in the Los Angeles area roughly is short 30,000 persons, and that 75 per cent of this shortage exists in the harbor area due to lack of transportation and inadequate housing. He advocates two ten-hour shifts in war plants instead of the present three eight-hour shifts as part solution to the problem. This change would increase productivity 31 per cent in his estimation.

According to Congressman Harry R. Sheppard, designation of Los Angeles as a critical labor shortage area is move on the part of eastern manufacturers to flatten southern California's economic bulge after the war. Sheppard said the problems arising from labor shortage designation have already cost California industries $350,000,000 to $500,000,000 in business.

Contracts for war goods totaled $68,297,192 in the Los Angeles area during April. This is in addition to the quarter of a billion dollars already earmarked for military installations.

AIRCRAFT STEEL: This section of the Ducommun Metals & Supply Co.'s warehouse in Los Angeles was built under a War Production Board directive to carry alloy steel tubing for aircraft construction. It is one of 26 in the United States that stock steel especially earmarked for aircraft

Excess Aircraft Steel Disposal Plan Promoted

Redistributing committee to meet with Metals Reserve on program for moving stocks through warehouses

AIRCRAFT Steel Redistributing Committee will meet with representatives of the Metals Reserve Co., subsidiary of the Reconstruction Finance Corp., this week to develop a program for the handling by commercial steel warehouses of thousands of tons of excess aircraft steel which has been piling up in manufacturing plants throughout the country.

This meeting follows announcement last week by Jesse Jones, secretary of commerce, that Metals Reserve has reached an understanding with the Aircraft Scheduling Unit, the Army Air Forces, and Navy Bureau of Aeronautics providing new methods for redistribution of usable surplus aircraft material.

Recently this aircraft steel surplus has been accumulating as a result of changes in plans. Just how large a tonnage is involved is not clear but Lieut. Col. A. E. R. Peterka, Aircraft Scheduling Unit, at the recent convention of the American Steel Warehouse Association in Chicago said it was not as large as many think.

Colonel Peterka has been wrestling with the aircraft steel surplus for some time past. About two months ago at his instigation the Aircraft Steel Redistributing Committee was formed to help solve the problem. This committee, headed by Walter S. Doxsey, president, American Steel Warehouse Association, has been actively promoting disposal efforts, and a substantial number of warehouses throughout the country have indicated willingness to handle the material. Considerable detail has yet to be worked out, however, before warehouse operators can actively engage in the sale of these excess stocks. Title to the steel remains with the Metals Reserve Co., participating warehouses simply stocking and disposing of tonnages on a consignment basis. What the fee for this service will be remains to be determined.

Report to Inland Workers Shows Sharp Rise in Costs

With steel prices essentially the same in 1938 and with material and production costs, including wages and taxes, up, the Inland Steel Co.'s net profit per ton of steel has fallen during the past few years until in 1943 it was 31 per cent less than the yearly average for the last ten years, Wilfred Sykes, Inland president, disclosed in a report to employes last week.

From data of the U. S. Department of Labor and Commerce, the report showed the index of average weekly wages in blast furnaces, steelworks and rolling mills to be up 100.6 compared with the 1939 base, and iron and steel prices up 0.8 compared with the 1926 base.

Typical examples of mounting material costs were listed as follows:

	1939	1943	Rise
Heavy melting scrap (per gross ton)	$14.00	$18.75	34%
Coal (per ton)	4.40	6.10	39%
Ferro manganese (per gross ton)	100.00	135.00	35%
Zinc for galv. sheets (per pound)	.05½	.08¼	50%

Foundry and Forge Shop Labor Situation Studied

Officials of the War Production Board conferred last week with representatives of six unions concerning steps to relieve the critical manpower shortages in the foundry and forge industries, which is expected to meet 20 per cent higher war-equipment schedules by fall.

The key plants in the foundry and forge industry number about 300, all of which are doing at least 75 per cent critical war work. These vital plants, employing 200,000 men, have already lost five per cent of their labor force through the draft during the last two months, and will lose at least another five per cent in the immediate future, WPB said. Coupled with the draft losses is an abnormally high rate of labor turnover. WPB estimates show at least 20,000 additional workers must be obtained immediately.

WPB officials late last week conferred with Economic Stabilizer Vinson on a broad program to enable the approximately 300 critical plants in the foundry and forging industries to adjust wage rates and prices so as to be able to obtain sufficient manpower to meet the 20 per cent higher war equipment schedules.

At the Vinson meeting it was decided to form a task force consisting of representatives of the War Production Board, the War Manpower Commission and the Procurement Agencies which will study the wage and manpower needs of the foundry and forge industries. This committee will appoint area committees to make studies in the field. At the same time union representatives agreed to importation of Mexican labor in event higher wages are not sufficient inducement to American workers to fill the gap in foundry and forge labor ranks.

POSTWAR PREVIEWS

SURPLUS PROPERTY— Eight disposal agencies have been named by Surplus War Property Administration to sell excess war materials. First regulation of agency directed primarily to Army and Navy which currently have greatest surplus problem. See page 58.

RUBBER— Goodyear president sees bright future ahead for rubber industry. Expects synthetic material eventually can be produced for 14 cents a pound. See page 65.

DIRIGIBLES— Important possibilities for dirigible-type aircraft for commercial transport runs of 2000 miles and more seen in postwar era. Nine-cent a ton-mile freight rate likely. See page 65.

STAINLESS STEEL AIRCRAFT— New cargo carrier built of welded stainless steel put into full production by Edward G. Budd Mfg. Co. for Navy. Is expected to exercise strong influence on character of air transports of the future. See page 68.

SMALL BUSINESS— Concentration of war production in larger plants poses problem for small plants when peace comes. See page 61.

WATER-QUENCHED CASTINGS— As the first World War brought about permanent advancement in normalizing treatment for foundry products, so the present conflict, accompanied by growing demand for higher mechanical properties, stimulates interest in water-quenching of steel castings. See page 82.

TAPER ROLLING MILL— Automatic equipment for rolling pitch and controlling metal distribution in irregular shapes to exact dimensions embodies principles employed in taper rolling disk wheels and other components of peacetime products. See page 90.

SPONGE IRON— Bureau head says postwar use of sponge iron for manufacture of special-grade carbon and alloy steels is a "must" due to alloy dilution of scrap. See page 94.

Clayton names eight United States selling agencies to dispose of surplus war materials. Forms and procedures to be followed outlined. First regulation directed primarily to Army, Navy and Maritime Commission, which have greatest current problems

REGULATION No. 1, governing the declaration of surplus war property by the Army, Navy and Maritime Commission has been issued by W. L. Clayton, administrator of the Surplus War Property Administration.

Included in the regulation is a list of eight disposal agencies that will dispose of surplus property, the locations of their regional offices, the personnel in charge, and the classification of property, broken down in detail to show the types to be disposed of by each agency.

Surplus property to be declared by owning agencies to disposal agencies includes every type of property in government possession or control, including plants, facilities, equipment, machines, accessories, parts, assemblies, products, commodities, materials and supplies.

Forms and procedures to be followed by both the owning and disposal agencies are outlined in the regulation. The regulation does not deal with the methods and policies to be followed by the disposal agencies, either in redistributing the property to other federal agencies or in disposing of it elsewhere. It does not go into the matter of financial and accounting responsibilities of the disposal agencies.

During the current phase of the war, owning agencies are urged to seek out and declare surpluses promptly for disposal, holding only such property as may be essential for the prosecution of their programs. At a later phase and at the end of the war, owning agencies will turn over to disposal agencies large quantities of surpluses in conformity with the authority granted to SWPA under Executive Order 9425. Meanwhile, surpluses arising out of terminated contracts are to be disposed of by or under the authority of the owning agency in line with Mr. Clayton's statement of policy dated April 21, 1944.

The regulation provides that sale or other disposal of surpluses in active theaters of operation may be made by the military or naval commanders. Pending further regulations, owning agencies are authorized to sell surplus property in those areas abroad where the Foreign Economic Administration, a disposal agency, has no local representative, and in any of the territories and possessions of the United States where the appropriate disposal agency has no representative.

The list of disposal agencies has been increased to eight from the five suggested in the Baruch-Hancock report.

Disposal agencies will be responsible for selling all the property turned over to them by the owning agencies. They are to determine the methods of sale, the identity of the purchasers and price, the execution of all necessary documents in connection with disposal, including necessary documents of title, the collection and proper treatment of all proceeds. The disposal agencies and the broad general categories of surplus properties assigned to each are listed below:

Treasury Department, Procurement Division: Consumer goods.

Reconstruction Finance Corp. (which may act directly or through any of its subsidiary corporations): Capital and producer goods. Industrial real properties of every character, buildings and fixtures, except such real property as is assigned to the Maritime Commission, National Housing Agency and Federal Works Agency. Personal property, machinery and other equipment, materials, and products, finished or in process, reported by owning agencies as an integral whole in conjunction with the plant or other real property which can be disposed of as a unit. If not so disposed of, such personal property is assigned to the appropriate disposal agency.

Maritime Commission: Maritime property. Real property that can be utilized for building, repair or operation of ships such as ship yards, repair yards, marine terminals and similar marine real property, including buildings and fixtures. If such real property cannot be disposed of for the purposes named, it is to be turned over to the Reconstruction Finance Corp. for disposal. Such personal property as machinery and other equipment, materials and products finished or in process, reported by owning agencies as an integral whole in conjunction with maritime real property which can be disposed of as a unit. If not so disposed of, such personal property is assigned to the appropriate disposal agency. Ships of commercial design, or those which can be put into commercial usage.

Navy Department: Combat ships or naval auxiliaries.

War Food Administration: All surplus food.

National Housing Agency: Surplus housing property (including such community facilities financed through Federal Works Agency as are located on the sites of housing projects) other than those under the control and jurisdiction of the War Department or the Navy Department.

Federal Works Agency: Surplus war property of the class of facilities financed through FWA other than those located on the sites of housing projects.

Foreign Economic Administration: All surplus war property of any nature located outside the continental United States, its territories and possessions.

Subsequent regulations will be issued to cover property not embraced in Regulation No. 1, particularly real property other than those types of real property now assigned to RFC, Maritime, National Housing, and FWA. Meanwhile, owning agencies will continue to follow established procedures on such unassigned property, keeping the Surplus War Property Administration advised of plans, policies and procedures.

W. L. Clayton Expresses Views on Disposal of Surplus War Materials

CALLED upon by a Senate Military Affairs Subcommittee to recommend legislation to govern surplus government property disposal, W. L. Clayton, Surplus War Property Administrator, said it is too early to submit definite proposals. The problem is complicated, there is no precedent, and lessons will have to be learned from experience. Legislation will be necessary, said Mr. Clayton, and in the meantime, he felt, Congress may feel satisfied that the situation, governed as it is by an executive order, is under control.

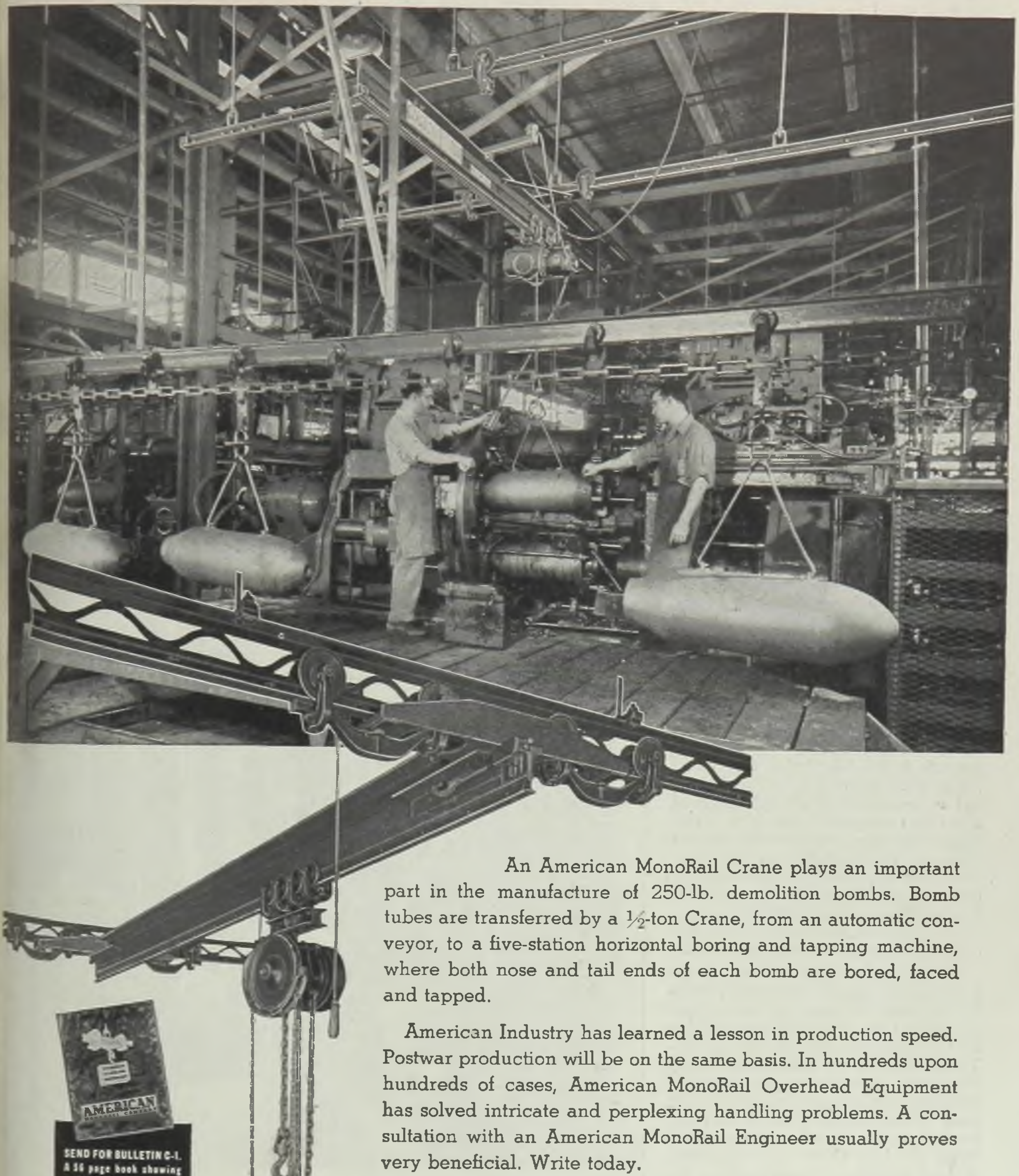
Mr. Clayton, however, expressed some ideas of a preliminary character which are interesting in view of opinions previously advanced by many business spokesmen and by members of Congress. Contrary to a widespread demand, said Mr. Clayton, it will not be advisable under all circumstances to dispose of government-owned surpluses through established trade channels.

"When we sold surplus wool in the amount of 300,000,000 pounds," he said, "we did not use established trade channels. We felt that the best way to sell this wool was at auction sales in Boston and we proceeded accordingly. There will be more such cases."

Mr. Clayton recommended that all preference provisions in connection with the disposition of property be embodied in one law. Some current proposals stipulate that preferences be given to veterans, others that preference be given to present holders of inventories or operators of plants, others that preference be given to former owners of property. This is confusing, said Mr. Clayton, and Congress should enact a single law under which the administrator will know who is to have preference No. 1 and who is to have preference No. 2.

The present operators of government-owned plants should not have any preference when it comes to disposing of these plants, declared Mr. Clayton, despite the fact that their contracts, in

American MonoRail CRANE AIDS BOMB PRODUCTION LINE



An American MonoRail Crane plays an important part in the manufacture of 250-lb. demolition bombs. Bomb tubes are transferred by a ½-ton Crane, from an automatic conveyor, to a five-station horizontal boring and tapping machine, where both nose and tail ends of each bomb are bored, faced and tapped.

American Industry has learned a lesson in production speed. Postwar production will be on the same basis. In hundreds upon hundreds of cases, American MonoRail Overhead Equipment has solved intricate and perplexing handling problems. A consultation with an American MonoRail Engineer usually proves very beneficial. Write today.

SEND FOR BULLETIN C-1. A 56 page book showing successful applications of American MonoRail Systems.

THE AMERICAN MONORAIL CO.

13102 ATHENS AVE.,
CLEVELAND 7, OHIO

many cases, provide for options. Operators should be forced to pay for these plants on the basis of competition, he said. He also said that such plants would have to be sold on a basis of negotiation and that the price in many instances would be less than stipulated in the option provisions of the contracts.

The opinion has been held widely in Congress that when government-owned plants are sold the buyer should agree that if he does not maintain operations at a certain level the government should have the power to regain possession of the plant. This provision was incorporated in S. 1730, the war contracts termination bill approved by the Senate. Mr. Clayton said he did not favor any such mandatory provision. There will be special conditions surrounding each case, he said, and these should be considered on their merits. In any event, he said, a buyer is not going to pay nearly as much for a plant if he is forced to guarantee that it will be operated at a certain minimum level when he has no way of knowing to what an extent the economy can absorb the output of that plant over a period of three years.

"Surpluses Will Be Large"

While the war is on there will be a comparatively small supply of surplus goods and a good demand for them, said Mr. Clayton. With the complete cessation of hostilities, however, surpluses will be large. "The great questions then will be whether to sell or not to sell, whether to sell rapidly or slowly, and whether to sell at home or abroad, with all the implications which these decisions carry with respect to foreign and domestic social and economic policies.

"It would seem that one of the most effective ways of preparing for it is to locate and dispose of as much surplus property as possible during the current phase when there is a useful demand and an opportunity to sell with beneficial effect on the domestic economy. Every article sold now is one which will not overhang the market after the war. This must never be lost sight of in the effort to organize so as to be able to handle the postwar problems."

Mr. Clayton summarized the activities of his administration to date as follows:

1—Formulation and issuance to the procurement agencies of prime policies for the sale by them or under their authority of property becoming available as the result of contract terminations. These, he said, are short-term policies designed to promote the prompt sale of termination inventories directly from the plant of the contractor where they are located, so as to reduce the quantity which will have to be removed, stored, declared surplus, and finally sold by the disposal agencies.

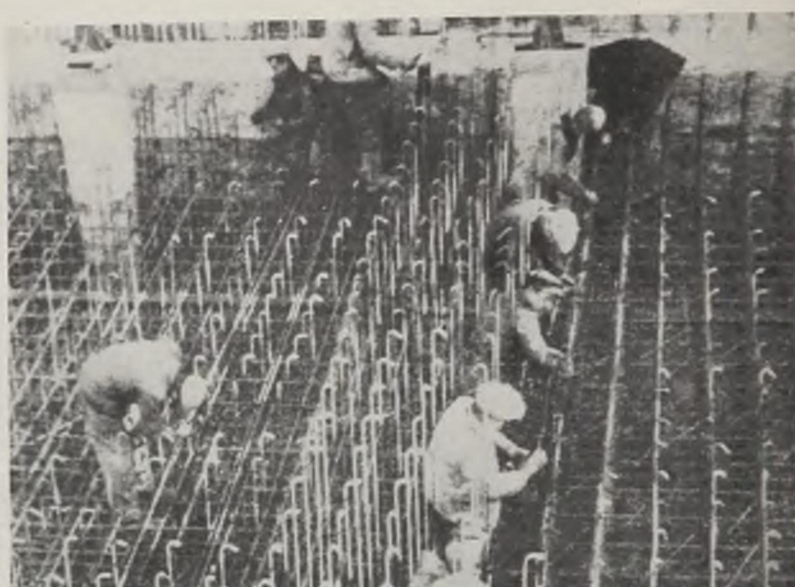
2—Segregating the various types of property, on the basis of the standard commodity classification, and assignment of specific classes of property to specific disposal agencies for sale. "This is the first step for the co-ordination contemplated by the executive order," he said.

3—Organization of the disposal agencies on a regional basis in such a manner that they can receive reports of surplus, record them on a uniform basis, exchange information as to the property available in different regions and advise prospective purchasers of what is for sale. Surpluses in major categories arising in the interim are being declared to the central office of the appropriate disposal agency in Washington.

4—Development of an appropriate form for use in reporting surpluses, together with instructions for its use.

5—Preparation of an initial regulation, just issued, instructing the agencies as to forms and procedures for the reporting of surpluses and as to their relative responsibilities with respect to surpluses so reported.

6—Study through committees and otherwise of such longer-term problems as price and disposal policies in connection with specialized classes of property, such as aircraft, organization and procedures for disposal of property located abroad, co-ordination with appropriate agencies of foreign governments, effective organization of large prospective classes of buyers, such as tax-supported institutions, price control existing legal impediments to effective disposition and many others.



ATLANTIC WALL: Somewhere along the French coast these workers are working against time to strengthen the Nazis' defenses by building a massive steel and concrete wall. This photo, which was obtained through neutral sources, is one of the many propaganda pictures published by the Germans to give the German people confidence. NEA photo

Maverick Says Concentration of Production Has Grown Since 1939

Chairman of Smaller War Plants Corp. tells Senate committee shipments from metalworking plants employing fewer than 500 dropped from 46.4 per cent in 1939 to 23.1 per cent in 1943. Holds little business' share halved

CONCENTRATION of production in the hands of big business has grown by leaps and bounds since 1939, Maury Maverick, vice chairman, War Production Board, and chairman, Smaller War Plants Corp., recently told the Senate Small Business Committee.

"The value of shipments of plants in metalworking industries employing less than 500 employes has dropped from 46.4 per cent in 1939 to 23.1 per cent in 1943," he said. "In other words, since the war started, the proportionate share of little business in metal products industries has roughly been cut in half."

He presented a pie chart showing the change in the relative distribution of metal products from plants of varying size between 1939 and 1943 as follows:

Number of Workers per Plant	Value of Shipments—Per cent of Total 1939— average quarter	1943— fourth quarter
Under 100	18.6	10.9
100—500	27.8	12.2
500—2500	31.3	21.4
2500 and over	22.3	55.5
	100.0	100.0

Information from Quarterly Report

The source of his information, said Mr. Maverick, is the quarterly report of the War Production Board known as "PB-732, Plant Report of Operations." These reports, he said, are received by the WPB quarterly from about 9400 plants in the metal products industries. Industries covered include all metal fabrication, excepting the primary producers such as steel mills. Mr. Maverick emphasized that the reported shipments include subcontract work as well as shipments of end-products on government prime contracts.

"The reporting plants," he said, "include practically all the large plants in these industries and account for nine-tenths of all production in these industries. This one-tenth of all production of metal products which is not reported on this form is accounted for largely by small producers. However, full adjustments have been made for this in the charts for total production by the Bureau of Planning and Statistics of the War Production Board. In transmitting these figures to me, Dr. Stacy May, director of the Bureau of Planning and Statistics, states that the figures represent the best estimate of the current distribution of plants and value of shipments from the metal products industries by size of plants."

In the manufacture of combat material little plants are now a mere drop in the bucket, said Mr. Maverick. Plants employing over 2500 get 76.8 per cent of the business. "This concentration," he said, "is far greater than we had been led to believe; it is amazing. The statements heretofore issued on concentration of war production are understatements to say the least."

Another chart presented by Mr. Maverick showed that plants employing less than 500 wage earners shipped only 7.3 per cent of the communications and electronic equipment on the basis of dollar value; those employing more than 500 shipped 92.7 and of this larger group the very big plants, those employing over 2500, shipped 68.0 per cent of the grand total. Another chart covering intermediate parts and components such as bolts, nuts, metal tanks, power boilers, bearings, valves and fittings, batteries and similar items showed that plants employing fewer than 500 made only 21 per cent of the total value of shipments while those employing more than 500 made 79 per cent of the shipments.

The comparison of plants employing less than 500 wage earners to those employing more than that number for the remaining industry groups was presented as follows by Mr. Maverick:

Industry Group	Proportion of Value of Shipments Under 500 Wage Earners	Over 500 Wage Earners
Transportation equipment	15.5%	84.5%
Industrial machinery and equipment	35.1	64.9
Plumbing and heating equipment	70.7	29.3
Consumer and service industry machinery (refrigeration and air conditioning equipment, electrical appliances, water purification systems, business machines)	34.5	65.5
Safety and technical equipment (surgical and medical equipment, industrial control and indicating instruments, photographic apparatus and materials, safety equipment)	25.9	74.1
Miscellaneous metal products (containers, metal caps, closures, hand tools, hardware, cutlery, metal building materials, jewelry and related products, lighting fixtures equipment)	60.6	39.4

"All these figures," said Mr. Maverick, "indicate a growing super-concentration of industry never dreamed of a dozen years ago."

Urges Reconversion Opportunity

Viewing the immediate future, Mr. Maverick said his most important single conclusion is that small business should be given every opportunity to convert to civilian production first. Because the small metalworking plants account for a very small percentage of the total war production, it is quite likely that many of them could be released from war production as soon as war production levels off; a drop of only a few per cent would make it possible to release these small plants. It is apparent, said Mr. Maverick, from recent disclosures by the armed services, that many small metalworking companies could be released from war work in the fourth quarter of 1944.

To give proper and adequate attention to the welfare of small business, said Mr. Maverick, it is necessary to obtain co-ordinated action by a number of governmental agencies who have a voice in establishing controls of one kind or another. The best way in which to do this is by giving SWPC representation on committees that formulate these controls.

SWPC, he said, now has representation on the following: Joint Contract Termination Board, War Production Board, Surplus War Property Policy Board, Procurement Policy Board, United States Conservation Co-ordinating Committee, Log and Lumber Policy Committee, Critical Labor Area Appeals Board and the Co-ordinating Area Production Urgency Committee. In addition, SWPC is represented in the field on various Manpower Priorities Committees and Area Urgency Committees.

Mr. Maverick said he felt hopeful that SWPC will have representation on the WPB Requirements and Production Executive Committees.

SURPLUS DISPOSAL

Jesse Jones, Secretary of Commerce, announced last week that Defense Plant Corp. had sold 6429 surplus used machine tools to the approximate aggregate value of $30,000,000. Such sales constitute about three-fourths of all machine tools that have been declared surplus by the different agencies. Of the total number disposed of, 1695 were sold to private purchasers in 936 individual sales at approximately 85 per cent of their original cost; 4734 were disposed of within the government, and are still being used in production for war. As the several government agencies declare plants, equipment, facilities or supplies to be surplus, so far as the particular agency is concerned, their disposition then becomes the responsibility of the disposal agency designated by the Surplus War Property Administrator.

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

ALUMINUM: Aluminum ingot may be delivered to fill authorized controlled material orders that are: Placed by the War Department, bearing the symbol "W" or "O"; for export under a program of the Foreign Economic Administration, bearing allotment numbers in the "E" or "L" series; identified by CMP allotment numbers of which the first four digits follow in the series of S-2950 through S-2975, applications for which should be made on form WPB-2360; identified by the CMP allotment symbols MRO-P-43 or V-9, used by persons purchasing ingot for experimental purposes under P-43; for use in casting patterns for foundries that do not have AM authorization numbers, orders for which should be designated "MRO patterns."

Ingot may be delivered to fill orders bearing "AM" numbers in the following series: AM-0100 through AM-0499, usable by producers and smelters of aluminum ingot; AM-0500 through AM-0599, usable by aluminum powder manufacturers; AM-1000 through AM-1099, usable by producers of aluminum rolled rod and bar; AM-1100 through AM-1199, usable by producers of aluminum rolled structural shapes; and AM-3000 through AM-3999, usable by aluminum forge shops.

In making reports of aluminum ingot shipments on form WPB-2593, shippers should show the full CMP allotment number if it falls in the S-2950 through S-2975 series. Only the abbreviated CMP allotment numbers need be shown for shipments on allotment numbers of the E, L, O, or W series. In reporting AM shipments, the full AM authorization number should be shown.

WAR DEPARTMENT ORDERS: War Department has combined its two programs that formerly were identified by the major program numbers W-2 and W-4. Formerly, W-2 identified the program of the office of the Chief of Engineers of the Construction Division, War Department, while W-4 identified the program of the office of the Chief of Engineers, Supply Division. These two now have been consolidated into the program of the Corps of Engineers, identified by the major program number W-4.

Consumers of controlled materials forms and shapes of aluminum, copper and steel, are permitted to combine allotments identified by the two numbers in a single allotment account. Orders charged against this account must be identified by the allotment number W-4. However, orders already placed with the number W-2 need not be changed to W-4.

GAS TANKS: Liquified petroleum gas tank manufacturers now must report monthly to the Petroleum Administration for War information concerning purchase orders accepted during the preceding month. First report is due June 10.

E ORDERS

SERVICE TOOLS: Use of higher alloy steels in manufacture of mechanics' hand service tools is permitted. Order E-6 provides that no producer shall manufacture any mechanics' hand service tools out of any alloy steel except those which are in the series specified in exhibit B of the order or except pursuant to specific permission of WPB. The following National Emergency series steels have been added to the list contained in exhibit B: 1000 with or without boron or vanadium addition agents; 8600 and 8700. Use of steels in the NE 8000 and 9600 series has been discontinued since these were never popularly used by the mechanics' hand service tool industry.

The amended exhibit B now reads as follows: "NE 1000 series with or without boron or vanadium addition agents; NE 1300 series; NE 8600 series; NE 8700 series; NE 9200 series; NE 9400 series." (E-6)

L ORDERS

METAL CLOSURES: Six food products, formerly not permitted the use of glass containers and metal closures, now may be packed in that manner. An unlimited quota of glass containers and their metal closures is allowed for the packing of supplies used exclusively in the practice of dentistry. Basis for calculating the number of metal closures permitted for use in the packing of hand soaps and shaving creams has been shifted from base year to current glass container quota. Packer's inventory of closures for malt and nonalcoholic beverages is now 30 per cent of the 1944 closure quota. (L-103-b)

INDEX OF ORDER REVISIONS

Subject	Designations
Closures, Metal	L-103-b
Electrification, Rural	U-1-c
Scrap, Tinned and Detinned	M-325
Tools, Service	E-6
Price Regulations	
Iron and Steel Products	No. 49
Pig Iron	No. 10
Tin Cans, Packers'	No. 350

M ORDERS

TINNED, DETINNED SCRAP: Smelters engaged in the recovery of tin now are included in the list of plants that may accept delivery of used tin cans, permitting the government-owned smelter in Texas City, Tex., to obtain used tin cans for tin recovery. No person is permitted to deliver or accept delivery of used tin cans except where delivery is made to or for the account of a municipal department or agency, an official salvage committee, a shredding or detinning plant, a plant engaged in the precipitation of copper, a smelter engaged in the recovery of tin, or a person regularly engaged in the collection of rubbish or trash. Other persons may apply on form WPB-2825 for permission to acquire used tin cans.

All authorizations to employ used tin cans or tin scrap for the making of bottle crowns is canceled as of June 1, 1944. Holders of such authorizations should apply for new authorizations under order M-325.

The provision has been eliminated that provided that, except as specifically permitted by WPB, no person producing detinned scrap at a plant situated in any of the states listed in schedule C could deliver such scrap except to or for the account of a plant engaged in the precipitation of copper. (M-325)

U ORDERS

RURAL ELECTRIFICATION: Farmers who had undertaken preliminary work, such as farm wiring or the purchase of electrically driven machinery, prior to April 6, may now qualify for service. (U-1-c)

PRICE REGULATIONS

PIG IRON: All persons now are prohibited from selling pig iron at prices higher than the maximum prices established in price schedule No. 10. Although the general maximum price regulation applies to the sales of pig iron by resellers, its formulae for determining maximum prices cannot be used readily because no comparable sales were made in March, 1942, the regulation's base date for pricing. (No. 10)

IRON AND STEEL PRODUCTS: Specific ceiling prices have been established for transfers of excess stocks of iron and steel products, effective June 1, 1944. Transfers of material from contractors or subcontractors to the United States government or its agencies, due to cancellation of government contracts, are exempted from all price control. Ceiling prices for other transfers are provided as follows:

(1) In sales of iron and steel products by a war equipment manufacturing plant or other similar holder, maximum prices are established as the basic mill ceiling price to a consumer, plus freight from the governing mill basing point to the holder's location of material, plus actual transportation costs to the buyer's destination, adjusted for quantity and quality differentials. However, exempt from price control are sales by a war equipment manufacturing plant or similar holder to a distributor for resale if the seller has not received a firm bid from a civilian goods producer or other similar buyer offering to pay the full maximum price for the material for use. The reseller may not resell any excess stock purchased by him at more than the ceiling prices already established for warehouse and jobber sales of iron and steel products.

(2) In resales of excess stocks of iron and steel products by distributors, the following ceilings are provided: (a) Ceiling prices shall be the basic mill price plus the customary warehouse or jobber markups provided that the material has been purchased for resale in substantially the same form as received and has been removed after the purchase from the holder's location; that it has been delivered, before receipt of any order, to the warehouseman's or jobber's established premises; and that the material has been put through recognized warehousing operations; (b) for unwarehoused material, the ceiling price is the mill base price plus rail freight from the governing basing point to the place where the buyer requires the material for use, adjusted for quantity and quality differentials.

Every seller of excess stock of iron and steel products must state clearly on the invoice that the material is excess stock. Every holder must mark on the invoice whether the material is being sold for resale. The seller's records as well as the invoice must describe adequately the material sold, so that the buyer can ascertain whether he is paying a legal price. (No. 49)

PACKERS' TIN CANS: Ceiling prices covering sales of cans for evaporated milk in the 6 and 14½ ounce sizes have been increased 8 and 6 per cent, respectively. Price ceilings on all cans in which food is packed have been brought under one regulation. (No. 350)

Appointments-Resignations

Edward R. Gay, former director of the General Commodities Division, Office of Civilian Requirements, has been appointed assistant vice chairman for Civilian Requirements.

• • •

Clarence W. Slocum, director, Industrial Manufacturing and Industrial Materials price divisions, Office of Price Administration, has resigned. Mr. Slocum had been on leave of absence as president of Beckwith-Chandler Co., Newark, N. J., manufacturers of industrial finishes.

• • •

Frederick M. Eaton, solicitor of WPB, has been appointed deputy member of the Combined Production and Resources Board. H. C. L. Miller, formerly associated with the Lend-Lease Administration, has been appointed United States executive officer of the board, and Allen Peyser, formerly director of the Foreign Division of WPB, has been named executive director of the board.

* * *

Mason Britton has been appointed United States member and chairman of the Machine Tools committee of the Combined Production and Resources Board, succeeding Ralph E. Flanders.

* * *

Frederick L. Hall of Los Angeles, Calif., has been appointed special assistant to E. A. Peyser, executive director, Combined Production and Resources Board, WPB.

* * *

Edward C. Welsh, OPA price executive at Cleveland, has been transferred to the national office in Washington to serve as special assistant to James F. Brownlee, deputy administrator for price.

Carbon Steel Needs for Direct Military Use Continue To Decline

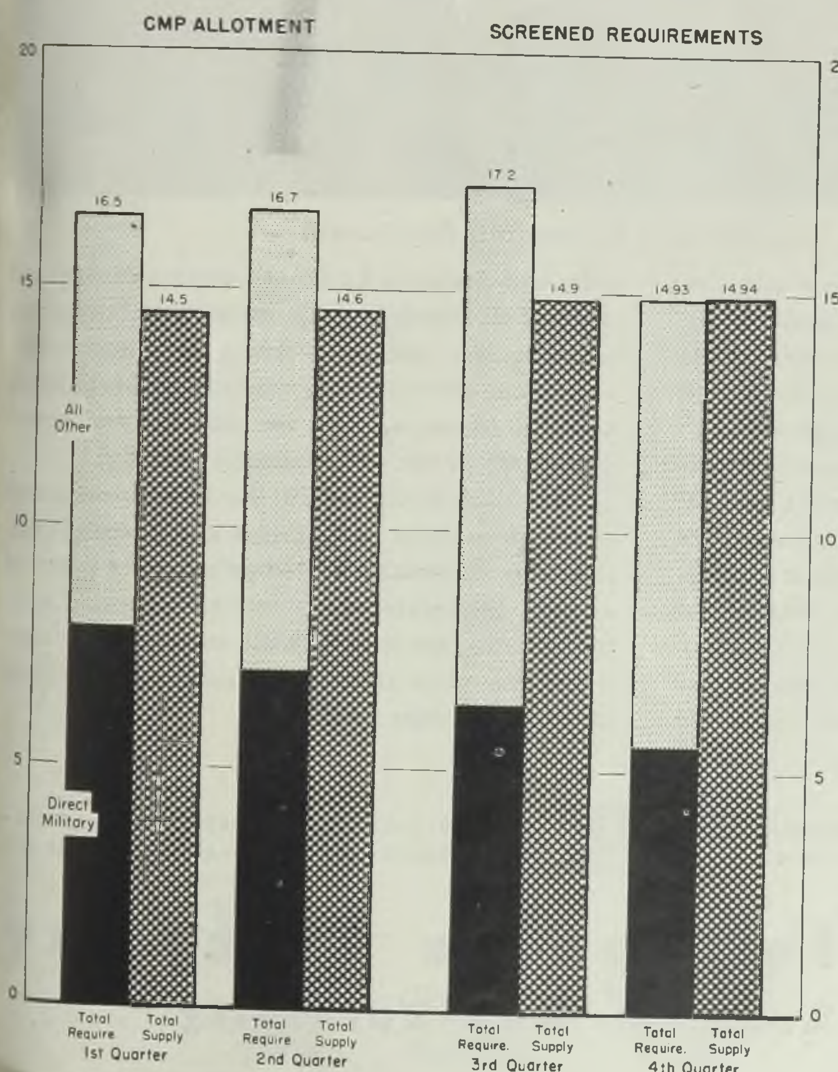
Requirements expected to drop from about 8 million tons in first quarter to only about 5.5 million tons in the fourth. Total new supply is rising gradually from 14.5 million tons in first to about 14.94 million in the fourth quarter

DIRECT military requirements for carbon steel will continue to decline over the balance of this year while total supply is expected to rise slightly. This was revealed in the accompanying chart prepared by the Construction Research Section, Bureau of Planning and Statistics, War Production Board, showing CMP allotments for the first two quarters, screened requirements for the last two quarters, and quarterly total supply.

Quantities of carbon steel allotted to claimant agencies for the direct military use dropped from about 8 million tons in the first quarter to 7 million tons in the second quarter while requirements originally submitted by the several agencies for the same use dropped further (after review, screening and changes caused thereby) to about 6.2 million tons in the third quarter and to only 5.53 in the fourth quarter. Allocations for all other uses rose from about 8.5 million tons in the first quarter to 9.7 million in the second while screened requirements increased to 11 million in the third quarter and then eased slightly to 9.4 million in the final quarter, making a total of 16.5 million in the first, 16.7 in the second, 17.2 in the third and 14.93 in the fourth quarter.

Carbon Steel Requirements, Supply for CMP

1944 quarterly totals estimated in millions of tons



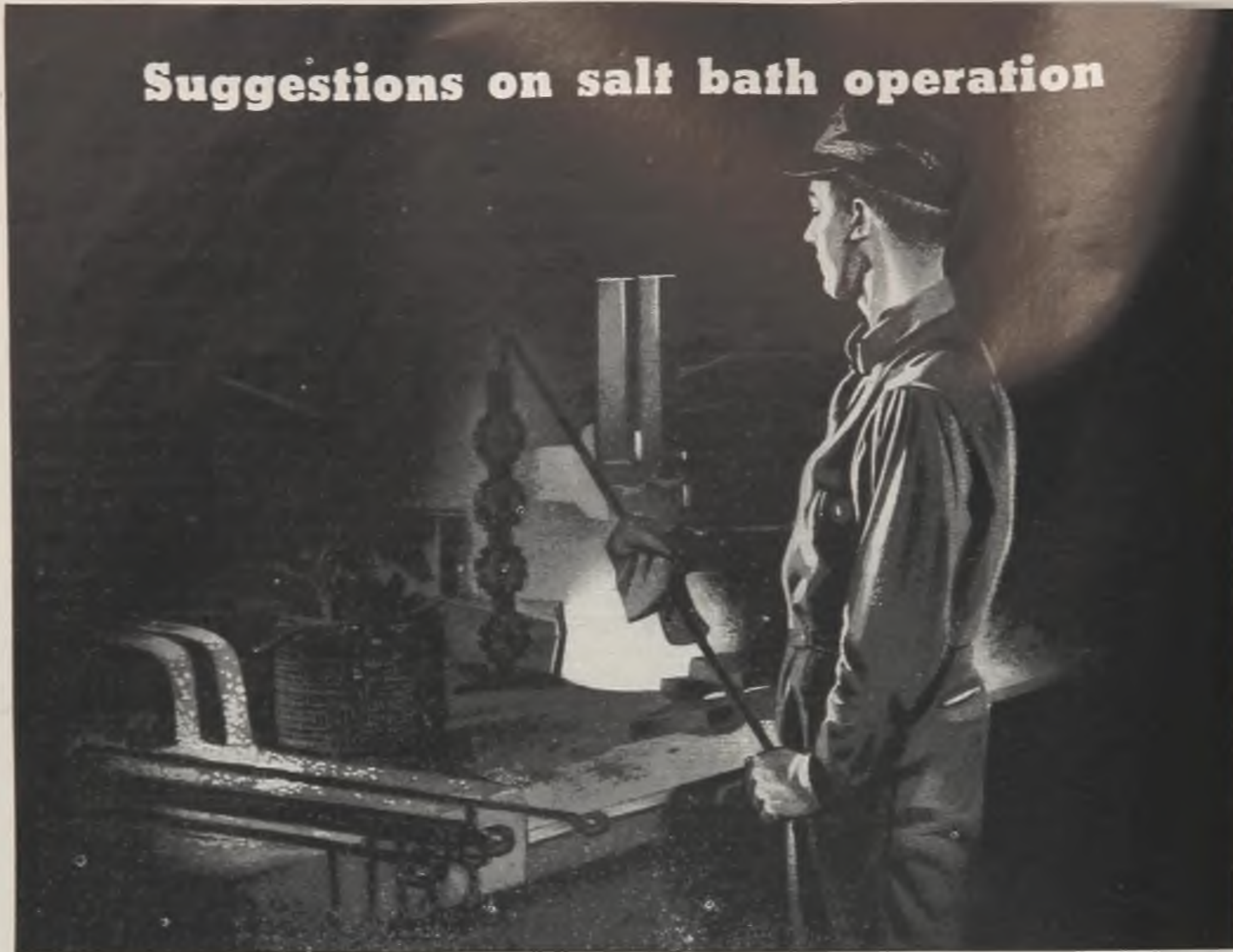
Fourth Quarter Balance Expected

Total supply, representing the estimated supply without taking into consideration inventory from preceding quarters, is rising slightly from 14.5 million tons in the first quarter, to 14.6 million in the second, to 14.9 in the third and 14.94 in the final quarter when total requirements and supply are expected to be about in balance.

The excess of allotments over supply (as shown in the chart for the first three quarters) is necessary, the War Production Board said, to allow for production schedule adjustments, attrition, and emergency reserve holdbacks, all of which tend to keep orders placed on the mills below the total allotments authorized in a given quarter.

Civilian Goods Resumption Hinges on Labor Supply

While the War Production Board recently announced a policy for resumption or increase of civilian production by small plants in cases where it would not interfere with war output, Lewis S. Greenleaf Jr., New York regional director of WPB, indicated in that city recently that no substantial increase in such output would be authorized for some time. He pointed out that the statement of policy "does not take the manufacturers out from under limitation or conservation orders or provide materials for them." However, he added, should a manufacturer have the necessary facilities and labor to make 1,800,000 flatirons, or some other civilian product deemed essential, "he could probably get the materials."



Information supplied by an Industrial Publication

Properly used, the salt bath is a very effective means of preventing decarburization of high speed, carbon, and alloy steels during heat treatment. The following suggestions are offered as an aid to effective high speed tool steel heat treatment.

1. Clean work thoroughly. 2. Immerse in a preheat salt at 1500-1650° F. 3. Transfer to high heat bath at 2150-2250° F. 4. Immerse in quench bath at 1100-1200° F. After cooling to room temperature, wash in a hot alkaline cleaner, then reheat in salt to 1100° F.

To secure maximum pot life, (up to 3 years) use salts that are chemically neutral with refractory pots, and desludge bath periodically. Molten salt seals off all atmosphere, therefore decarburization, carburization, pitting, etching, or other surface defects can be avoided by using a suitable chloride salt and adding an acid rectifier. Several preparations are available containing rectifiers.

Adequate circulation in the bath is necessary to insure uniform temperature and prevent overshooting. Externally heated pots are not practical at high temperatures, so internally heated electrode baths, preferably with automatic, or electromotive, circulation are regarded as the most effective for mass production.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

MOLY

Climax Molybdenum Company

500 Fifth Avenue • New York City

Litchfield, president, Goodyear Tire & Rubber, says postwar outlook is clouded but the rubber industry sees bright opportunities ahead. Goodyear's production in aircraft and parts exceeds the value of its rubber output

THREE basic freedoms which have contributed mightily to the world eminence of the United States until recent years are these: Freedom from the necessity of supporting a large military force on land and sea; freedom from the onerous tax load involved in supporting an excessive national debt; and freedom from restraints on the will to work and progress, and on the ability of a man to rise to the heights from a small beginning.

These cardinal principles were reiterated by Paul W. Litchfield, president and chairman of the Goodyear Tire & Rubber Co., Akron, O., at a recent private meeting with a dozen press representatives here, including this writer. The veteran Goodyear executive cautioned that, as of the present, we have lost the first two of these freedoms, doubtless for a long time to come, and we are in danger of losing the third, because of the strangling effect of unionism on the right of an individual to exert the limit of his capabilities.

In this light, the postwar outlook for industry is considerably clouded, but when put to the task, business men are inveterate optimists; and the rubber industry, for one, sees bright opportunities ahead. It is ahead of other industries in reconversion to peacetime pursuits, Goodyear for example having converted several of its former armament plants back to tire production. The industry expects to be ahead of the automotive industry as far as supplying tires for postwar cars is concerned, for by the end of the year it will have supplied an estimated 20,000,000 or more replacement tires of synthetic rubber for passenger cars, and by the time the motor industry begins to specify new equipment for cars, the rubber manufacturers hope to have a sufficient backlog to fill the demand.

Mr. Litchfield said he hoped the government would consider its vast investment in synthetic rubber production facilities in the same light as its investment in battleships or in other military equipment, maintaining them in standby condition when it becomes possible to purchase natural rubber again, both as a stabilizing influence on price and as insurance against any future cutoff in natural rubber supply.

All synthetic rubber now produced is allocated to fabricators by the government, the price being 18½ cents a pound, against a pegged price for natural rubber of 22 cents a pound. Efforts to promote South American production of natural rubber have proved a failure, principally because of the scattered location of the rubber-bearing trees and the difficulties in labor and transport. The government is now paying Brazil 60-80 cents a pound for this rubber, but shipments are disappointing. While costs of producing synthetic rubber are well above the stabilized price, it is believed that eventually it may be possible to produce the material for something like 14 cents a pound.

Aircraft Tops Rubber Business

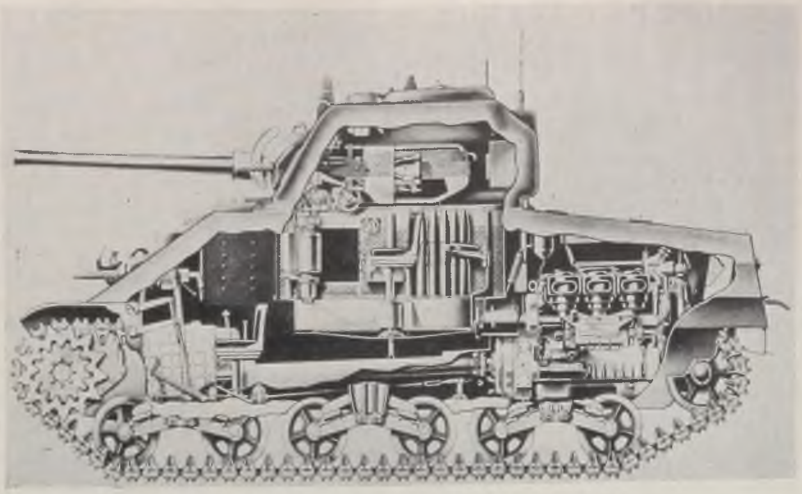
Surprising as it may seem, the value of Goodyear production in aircraft and aircraft parts now exceeds the value of its rubber production. The company has better than 26,000 employes at work on aircraft projects, including the complete Vought-Corsair fighter plane for the Navy, and parts and subassemblies for the P-38 and P-61 fighters, and the B-29 and PBM Army and Navy bombers.

Looking to the future, Goodyear officials believe there are important possibilities in the dirigible-type airship for commercial transport runs of 2000 miles and better. Although the initial cost of such ships is high, they are less expensive to operate on long hops than heavier-than-air craft; in fact a 9-cent cargo ton-mile rate appears entirely likely. Goodyear would like to see a 10,000,000-cubic foot ship built for transoceanic airtravel. The ill-fated Akron and Macon were 6,500,000-cubic foot ships, and many believe the loss of both of them might have been avoided, although fate ruled otherwise.

Safety of this type of aircraft is attested by the remarkable record hung up by the Goodyear blimp fleet of a dozen or so nonrigid ships which in the 22 years before their transfer to the Navy for war patrol work flew more than 4,000,000 miles in all kinds of weather, carrying 400,000 passengers, without injury to a single passenger. Two crew

POWDERED METAL: Typical of the progress in the art of manufacturing from metal powders is the self-lubricating bronze gun bearing, above, made by Amplex division of Chrysler Corp., Detroit. Production has been started on parts made from metal powders approaching 100 pounds in weight. Developments in this field also embrace new-type alloys of blended powders, making of tool steel from iron waste and progress in the production of self-lubricating iron bearings capable of carrying weight loads greater than 100,000 pounds per square inch

(Material in this department is protected by copyright and its use in any form without permission is prohibited)



CUTAWAY VIEW: Interior mechanism and structure of an M-4 medium tank is shown above. Driver's compartment is at the lower left just behind the drive sprocket; gunner sits at upper center, flanked by shells for the 75-millimeter cannon; at the rear is the diesel engine with driveshaft connecting to transmission forward. Fisher Body Division of General Motors alone has turned out more than 11,000 of the M-4 and its equally famous combat mate, the M-10 tank destroyer

members were lost through accidents in this period.

Production of "investment" castings is getting under way in what is believed to be the first commercial plant for this type of work in carbon and alloy steel, installed by the Michigan Steel Casting Co. here. The company is in position to accept orders for mass quantities in weights from a fraction of an ounce up to about 1 pound, and in sizes up to 4 inches maximum dimension. Michigan Steel Casting, a licensee of the Austenal Laboratories Inc., has been experimenting with this type of casting for seven years and is convinced there are interesting market possibilities in the automotive and other fields.

Essentially, an investment casting is produced by squirting molten wax into a split die in which has been formed the impression of the part to be cast; then embedding the wax pattern in an "investment" material, a fine, gelatinous substance which can be dried out and baked to form a highly refractory mold. The wax is melted out of the mold and the latter then clamped to a carbon arc furnace in which an accurately weighed charge has been placed. Furnace and mold are inverted and air pressure applied behind the molten metal to drive it solidly into the mold. Subsequently the mold is broken open and the casting shaken out. Dimensional precision on the order of a few thousandths of an inch, and a finish which requires little or no further attention are possible, as well as the casting of a wide variety of intricate small shapes otherwise impossible to cast.

Employment in Chrysler Corp. plants is now 50 per cent higher than it was during normal peacetime automobile manufacture, and more war materiel was delivered in the first quarter of this year than last year. Nevertheless, net profit declined from the equivalent of $1.46 a share last year to $1.28 per share this year for the first three months.

Welding engineers in this area listened with interest at a recent conference to details of a new type of photoelectric control for steering cutting torches used in outlining flat parts from a template. Instead of a template, a drawing of the shape is used, the outline being traced in a ⅛-inch wide black line on white paper. A scanning head is mounted over the drawing, with a small spot of light centered half on the line and half off the line. Photoelectric tubes absorb reflected light from the spot and if it veers off the line actuate a ⅛-horsepower steering motor to move the head and torches in one direction; if it swerves too far onto the line, the motor is actuated in the reverse direction. With this type of control, designed and built by General Electric, the completely automatic guiding of the torches around a specified outline is possible.

Midland Steel Products Co. has begun surveys of six suitable locations for postwar expansion of its manufacturing facilities here for the manufacture of automobile and truck frames, axle housings and other heavy stampings. Arthur G. McKee & Co. is consulting engineer for the project.

They Say:

"Parity is a necessary fundamental to any successful postwar plan, but none of the published blueprints to date appear to embody this basic principle. Refusal to adopt this principle in our economic planning will deny us a balanced national life and inevitably lead to depression."—**J. Carson Adkerson,** president, American Manganese Producers Association.

° ° °

"Our system of free enterprise which took quite a kicking-around from ideological critics before the war is stronger than ever. Industry's demonstrated efficiency has made it so. And if given proper encouragement by government it will demonstrate in peace that we can not only produce enough for all our wants but that we can create jobs enough to maintain our economic order on even keel."—**H. H. Kerr,** president, Boston Gear Works, Boston, Mass.

° ° °

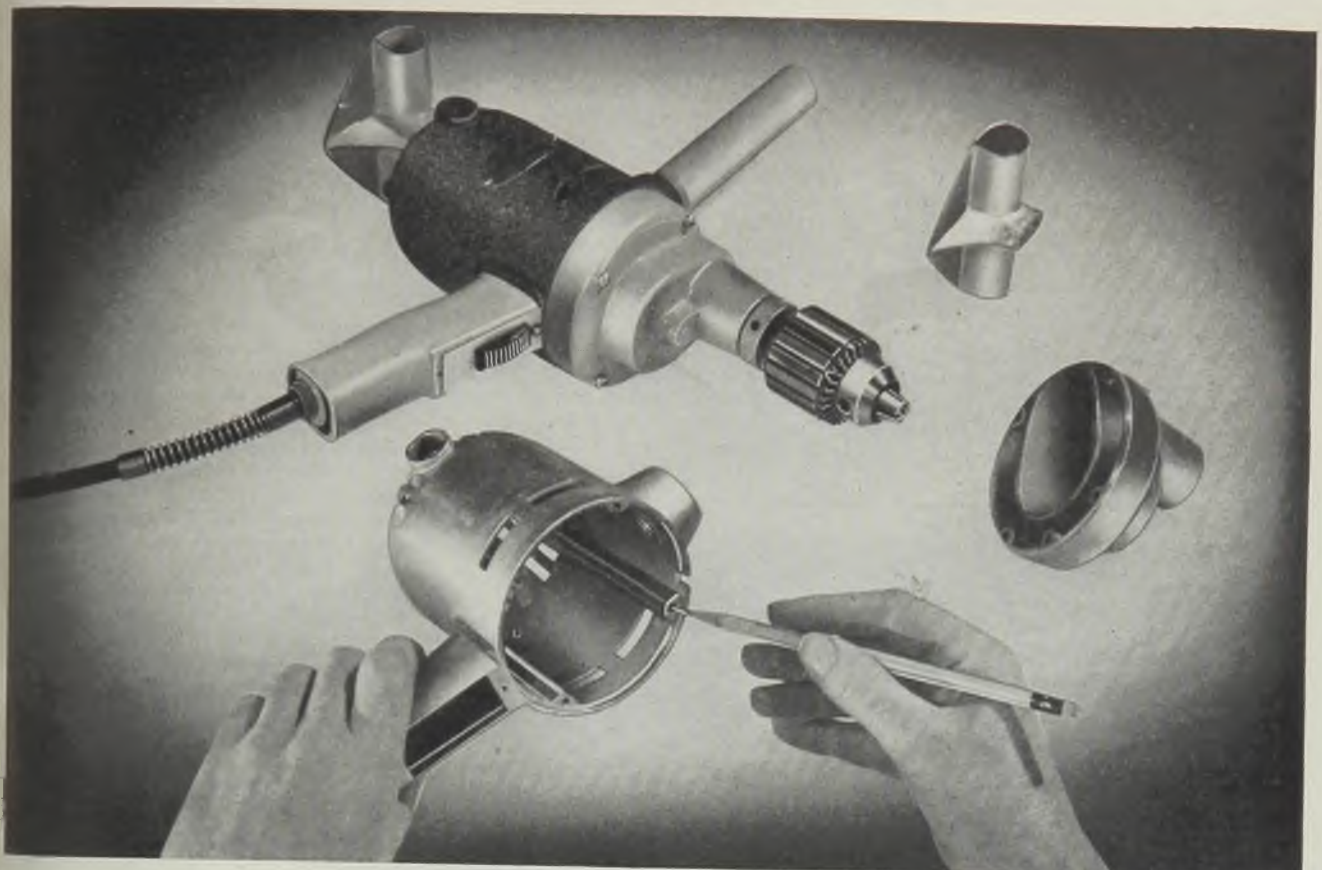
"This situation (inflation) is not likely to occur since, in the first place, the end of the war will witness a material reduction in the output of materials, accompanied by a material increase in the number of unemployed. People out of work and those whose job security is theatened do not, as a rule, indulge in spending sprees. Furthermore, it is quite certain that the controls over prices and consumption will be maintained for quite some time after the war."—**Dr. Marcus Nadler,** professor of finance, New York University.

° ° °

"A return to the status quo of sound governmental principle which existed before the last decade without perpetuating its malpractices is entirely possible. . . Business must assert itself against special privilege, regardless of who may be the beneficiary—whether it be monopolistic business, giant labor organizations, the dictatorship of the majorities, the selfish pressure of minorities, or entrenched governments who hold to the view that they are agents of destiny."—**Dr. Milton H. Fies,** president, Southern Association of Science and Industry.

COMPLEXITY!

—59% LESS LABOR REQUIRED THRU THE USE OF 3 ZINC ALLOY DIE CASTINGS IN THIS DRILL



Zinc alloy die castings are solving many of today's labor shortage problems. For example, by redesigning this electric drill to utilize 3 zinc alloy die castings, a saving of 59% in machining labor was effected over the former material and method of manufacture. In dollars and cents, the overall cost of these 3 parts was reduced 46%—a major contribution in producing the lowest priced *quality* ½" electric drill now on the market.

Complexity of design presents the opportunity for these labor and cost savings. Consider, for instance, that the assembly elements are now integrally cast in the one-piece combined motor housing and handle (foreground). Imagine the number of operations which would be required to turn out the equivalent of this part by any other method of production!

Economy of production is only one of the reasons why die castings of zinc alloy are the most widely used under normal conditions. *Every die casting company is equipped to make zinc alloy die castings,* and will be glad to tell you about their many physical advantages—or write to The New Jersey Zinc Company, 160 Front Street, New York 7, New York.

ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

New cargo plane, known as the Conestoga, is announced by Edward G. Budd Mfg. Co. Is entirely new type which utilizes welded stainless steel instead of riveted aluminum alloy sheets for first time on any considerable scale

NEW cargo plane, known as the "Conestoga," has been put into full scale production by the Edward G. Budd Mfg. Co. in its new airplane plant near Bustleton near Philadelphia.

The cargo carrier is a new type which utilizes welded stainless steel instead of riveted aluminum alloy sheets for the first time on any considerable scale in the history of the design of military and commercial aircraft. As such there is a strong possibility that the new plane will exercise a strong influence on the character of air transports in the future.

The cargo plane is the second airplane of welded stainless steel created by the Budd organization. The first—which was the first airplane ever to be fabricated of that alloy—was built by Budd in 1931, test flown successfully in 1932, and then taken to Europe for a tour of the Continent. After hundreds of hours of successful flight demonstrations, the plane eventually was brought back to Philadelphia where it has been on display in front of the Franklin Institute for the last eight years. Since that time Budd products of welded stainless steel have included streamlined railroad trains, highway truck trailers, masts, stacks and doors for the Navy, fighter plane wings and aviation exhaust systems.

The Budd cargo plane was designed by a staff of Budd engineers directed by Dr. Michael Watter. It was developed under sponsorship of the Navy Department, Bureau of Aeronautics, and is being built under a Navy Department contract.

The new airplane plant and flying field near Bustleton was built for Budd by the Defense Plant Corp. The property covers 557 acres. The assembly building is a huge structure 1800 feet long and 550 feet wide which covers 24½ acres.

The airfield adjoining the plant has two runways each 4400 feet long. Operations are directed from a control tower, equipped with the latest facilities and operated under the supervision of Civil Aeronautics Administration.

In addition to the assembly building, the plant includes an administration building, a boiler house, pump house and sewage disposal plant.

The cargo plane was brought into being at the outset to provide a type which could be used on routes in South America, where unimproved fields and short runways are common. Since its development, however, the uses to which the military services plan to put the airplane have broadened to such a degree that it is now expected it will be used on military air cargo routes in practically all theaters of the war.

The plane was designed specifically to be a cargo carrier. In creating the plane, the engineers centered their efforts on the problem of designing a "flying boxcar," which could carry freight economically on flights of moderate length, and also be capable of loading and unloading cargo with utmost ease and speed.

The plane is a two-engine transport 68 feet long, with a wing spread of 100 feet, and is capable of transporting 10,400 pounds of cargo over a range of 650 miles under C.A.A. license. Its 14-cylinder radial air-cooled engines deliver 1200 horsepower each for take off and have a normal rating of 1050 horsepower. In tests the plane demonstrated that in normal operation it could lift 10,400 pounds of payload off the landing strip in a run of only 920 feet.

Ramp Facilitates Loading

Aside from its type of construction and unique appearance the plane's most distinguishing characteristic is its provision for carrying cargo, and a ramp to facilitate its loading and discharge.

The upward sweep of the afterbody of the plane provides a large clearance below the fuselage and back of the ramp to allow trucks to be moved close to the fuselage so as to pick up or discharge shipments.

Although primarily a cargo carrier, the plane can be converted to troop transport or to aerial ambulance use.

The plane requires a crew of two, a pilot and co-pilot, whose quarters are in a roomy, comfortable, full-height operating compartment in the nose of the plane. According to the test pilots the plane is easy to fly, having exceptional stability and well co-ordinated controls.

The effective way in which stainless steel has been used in aircraft design in the Budd plane is disclosed by the fact that although the total weight of plane and full load is 33,800 pounds, 10,400 pounds represents the weight of cargo. This is an unusually high ratio of total payload to total weight.

With a full load, including equipment, fuel, and the crew, the plane at a cruising speed of 165 miles per hour will have a

SPEEDS HEATING: New induction heating arrangement to treat propeller blade hubs forged by Chevrolet at its Saginaw, Mich., plant has increased output by better handling conditions, decreased heat in the working area, and more uniform temperature in metal being worked. Formerly, blades were piled in the furnace with about 1/3 of the blade inside. To bring the blades to forging temperature, 800 degrees Fahr., required 2½ hours. In the new setup, a 5-station induction heater consisting of a 200-kilowatt motor-generator set is used. The motor-generator set is driven by a 310-horsepower, 440-volt, 60-cycle, 39 motor, and the generator is a 200-kilowatt, 3000-cycle unit with a 500-ampere rating at 400 volts. Each blade is held in a small carriage with the hub end inserted about 8 inches into a water-cooled copper coil. The heating requires 3 minutes and 10 seconds, with one blade ready for the upsetter every 47½ seconds


Speed Nuts
[PATENTED]
First in flexibility of design..
In addition to the many standard SPEED NUTS, there are hundreds of other shapes and types designed to perform multiple functions and combine several fasteners into one. These SPEED NUTS, wherever used, reduce the number of parts in an assembly and eliminate the unnecessary handling of extra parts.
The patented, self-locking SPEED NUT prongs can be incorporated into almost any shape or design to meet specific assembly requirements. No other fastener possesses such flexibility of design.
SPEED NUTS may be the answer to your assembly problem. We'll gladly review your specifications and recommend a standard or special SPEED NUT for your particular requirements.
TINNERMAN PRODUCTS, INC.
2039 FULTON ROAD • CLEVELAND 13, OHIO
In Canada . . . Wallace Barnes Co., Ltd., Hamilton, Ontario
In England . . . Simmonds Aerocessories, Ltd., London
* FASTEST THING IN FASTENERS

range of better than 600 miles. The maximum range with available fuel tankage will be about 1700 miles. This can be increased up to 3500 miles with auxiliary fuel tanks.

The cruising speed is around 165 miles per hour. At this speed the two engines each will deliver only 710 horsepower, thus providing an exceptionally economical consumption of fuel.

The Navy accepted the Budd design early in 1942 and in May of that year construction of the Budd Field plant and airfield began. The formal contract was granted in August, 1942. The static test plane was finished Aug. 12, 1943, and the static tests completed Oct. 27, 1943. The initial test flight was made Oct. 31, 1943.

Hudson Building Folding Wings for New Helldiver

Hudson Motor Car Co. is making the complicated folding wings for an improved and more powerful Curtiss Helldiver dive bomber just revealed by the Navy.

The new Helldiver, which is designated as the SB2C-3, has many improvements over its predecessor, the SB2C-1, which was rated as "tops" in its class after it made its debut at Rabaul last Nov. 11. Helldiver production is now more than double what it was six months ago.

The new Helldiver has a more powerful Wright Cyclone engine, for which Hudson also makes the pistons and other component parts.

New Boeing Wind Tunnel Creates Gales in 700 Miles-an-Hour Range

A LARGE and fast wind tunnel, an aeronautical "test-tube" capable of generating super-hurricanes in which will be born and nurtured many of the planes of the future, was dedicated at Seattle recently by the Boeing Aircraft Co.

The new experimental laboratory can produce gales in the 700 mile-an-hour range, approximating the speed of sound, through its 12-foot wide test section.

The new tunnel is a self-contained research unit, complete with model design and construction facilities and computing laboratories, as well as actual testing quarters. It has numerous experimentation conveniences and refinements never before built into any single tunnel, and is streamlined for efficiency of operation.

Discussing the far-reaching aviation developments which promise to come as a result of wind tunnel experimentation, Wellwood E. Beall, Boeing vice president-engineering, said the speed of sound is the barrier which today confronts aviation engineers in their quest for greater and greater speeds for aircraft. "Until we can solve the riddle of this mysterious barrier," Beall said, "the tantalizing possibilities of such developments as jet propulsion, insofar as speed is concerned, will be governed by and limited to the speed of sound. We need to conduct an indeterminate amount of research at speeds approaching the speed of sound to find the answers."

Model planes with wingspreads up to 11 feet, or full-scale airplane sections of the same size, can be tested in the new Boeing tunnel. An outstanding feature is that all tunnel controls are centralized in the panel board before the test section, at the same place where model observations are made.

The tunnel's flow of air is created by a propeller-like fan 24 feet in diameter. It is mounted on the end of a 37-foot solid steel drive-shaft, 16 inches in diameter, which connects the fan with the motor and clutch.

The synchronous Westinghouse electric motor has a rating of 18,000 horsepower and maintains a constant speed of 514 revolutions per minute.

An intricate Boeing-designed system of balances, capable of measuring with great accuracy lifts from one-tenth of a pound up to 8000 pounds, records all the forces acting on the model being tested: Lift, drag, yaw, pitch, roll and side force. An ingenious automatic printer, which is part of an impressive array of instruments and dials on the main control board outside the test section, will, at the touch of a button, record and print on a tape all the forces acting on the model at that instant.

Test section or "throat" of the new Boeing wind tunnel with a model plane installed for testing. It is here that the high wind velocities are attained. The movements of the model and the forces operating on it are indicated by delicate instruments in the adjacent operations from where engineers study them

Operated at High Speed

The tunnel bore is a complete, continuous-return structure which follows an approximately rectangular course 450 feet in length. It varies in size from 8 feet by 12 feet in the "throat" or test section to 27½ x 27½ feet at the largest part.

When operated at high speed, the air completes the 450-foot circuit in less than two seconds. Inasmuch as 11 per cent of the air in the wind tunnel is expelled and replaced with fresh air at every "round trip" for cooling purposes, under high speed operation the air in the tunnel is completely replaced with fresh air three times per minute. A pagoda-like structure, known as an interchanger tower, is located atop the tunnel building and is used for the intake exhaust of this air.

An aerodynamics laboratory adjoins the wind tunnel, with a reception lobby and model building shops on the first floor and engineering offices and tunnel operations on the second. This arrangement permits Boeing engineers to design, build and test models in the same building.

A prime consideration throughout the construction of the tunnel was that of convenience to those who were to operate it. For instance, an overhead monorail system is used to transport models.

Whether at the jobs of war or in war production, American Cable TRU-LAY Preformed Wire Rope ranks as the preferred line. That's because it handles easier, reeves faster, lasts longer.

It is the preforming process that endows TRU-LAY with high fatigue resistance. Being more flexible than non-preformed, TRU-LAY bends easily, resists kinking and whipping, spools better. The preforming process sets new and higher standards for wire rope service, and TRU-LAY is the original preformed wire rope. Be sure your next line is TRU-LAY Preformed made by American Cable.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

ESSENTIAL PRODUCTS... TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, MANLEY Auto Service Equipment, MARYLAND Bolts and Nuts, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Steel Castings, WRIGHT Hoists, Cranes . . . *In Business for Your Safety*

MEN of INDUSTRY

CARL G. STRANDLUND

THOMAS BACKUS

Carl G. Strandlund, vice president, Chicago Vitreous Enamel Product Co., Cicero, Ill., received the *Chicago Tribune* War Workers Awards for March for devising an improved method of heat treating tank armor plate.

—o—

P. E. Fluor has been elected president, Fluor Corp. Ltd., Los Angeles, succeeding **J. S. Fluor Sr.,** who now serves as board chairman. **J. S. Fluor Jr.** takes over the duties of executive vice president and general manager, and **Milton Lewis,** vice president since 1938, becomes assistant general manager. **Hugh R. Lamberth** has been named sales manager. The newly-established Manufacturing division is headed by **Earle S. Marsh.**

—o—

Harvey McKenney, previously manager of alloy steel sales, Follansbee Steel Corp., Pittsburgh, has been placed in charge of the alloy steel sales department of A. M. Byers Co., Pittsburgh.

—o—

Andrew Liston has been appointed sales manager for marine products, Baldwin Southwark division, Baldwin Locomotive Works, Eddystone, Pa.

—o—

Paul Goetcheus, for the past seven years sales and service engineer for Steel Sales Co., Detroit, is now associated with Michigan Steel Casting Co., Detroit, as engineering consultant on production, service and application of heat and corrosion-resistant steel castings.

—o—

E. V. Ivanso, formerly metallurgist with Wyandotte Chemicals Co., Wyandotte, Mich., has been named sales and service engineer, Steel Sales Co., Detroit.

—o—

Dr. Robert B. Sosman and **Dr. James B. Austin** have been appointed assistant directors of United States Steel Corp.'s research laboratory in Kearny, N. J., and **Dr. Robert H. Aborn** has been appointed supervisor of physical metallurgy.

—o—

Paul F. Mumma has been named general superintendent of the Ellwood City, Pa., works of National Tube Co., Pittsburgh, subsidiary of United States Steel Corp., succeeding **L. J. Mason,** newly-elected vice president of Tubular Alloy Steel Corp., Gary, Ind., another United States Steel Corp. subsidiary.

—o—

Thomas Backus, formerly chief engineer, Fuller Mfg. Co., Kalamazoo, Mich., has been named chief engineer of R. G. Le Tourneau Inc., Peoria, Ill.

—o—

D. D. Ault, for a number of years resident sales engineer in Houston, Tex., for the Bristol Co., Waterbury, Conn., has been appointed manager of the company's newly-opened branch office in Houston, Tex.

—o—

Charles R. Morrison, retired vice president, International Harvester Co., Chicago, and **R. Frank Newhall,** who retired last January as vice president and cashier, First National Bank of Chicago, have been appointed members of the Price Adjustment Section Board of the Chicago Ordnance District, succeeding **George W. Rossetter,** of the accounting firm of George Rossetter & Co., Chicago, and **John W. Leslie,** president, Signode Steel Strapping Co., Chicago.

—o—

Lewis A. Dibble, president, Eastern Malleable Iron Co., of Cleveland, Wilmington, Del., and Naugatuck, Conn., has been named chairman of the National Association of Manufacturers' "government spending" committee. **Chester C. Oberly,** president, Tokheim Oil Tank & Pump Co., Fort Wayne, Ind., is vice chairman of the committee.

—o—

Dr. S. A. Moss, consulting engineer with General Electric Co., Schenectady, N. Y., has received the New England Award, given annually by the Engineering Societies of New England Inc., to a resident New England engineer. Dr. Moss holds 46 patents on superchargers, compressors and other mechanical devices.

—o—

Charles M. Munns has been appointed division manager in charge of the newly-opened Indianapolis branch office for the Indiana territories, Detrex Corp., Detroit. **R. W. Pflug** has been named manager of the company's Central Region territory, which includes the states of Michigan, Ohio, Indiana, Kentucky and West Virginia, and **P. W. Moehle,** as divisional manager, will co-ordinate activities in the southern section of that region, operating from the Dayton, O., branch office.

—o—

Harold R. LeBlond, president, LeBlond Engineering Co., Cincinnati, has been elected president and director, Cleveland Automatic Machine Tool Co., Cleveland, and **Col. James Hammond** has been elected board chairman. **Edward G. Schultz,** treasurer, R. K. LeBlond Machine Tool Co., Cincinnati, is the newly-elected vice president and treasurer, and **Ralph Tyler Jr.** is assistant secretary, while **C. Blake McDowell** and **E. F. Suchy** have been re-elected secretary and assistant treasurer, respectively. New directors are **James J. Laughlin Jr.** and **Carl M. Jacobs.**

—o—

R. D. Wyly has been appointed advertising and sales promotion manager, Sterling Tool Products Co., Chicago, and **William L. O'Byrne** has been placed in charge of correspondence for the company's sales service.

—o—

Sir James Lithgow, Bt., M. C., has been elected president of the newly-formed British Iron and Steel Research Association, and **Dr. Andrew McCance,** F.R.S., has been elected chairman. Immediate steps are being taken to appoint a director of research and a principal administrative officer of the association.

—o—

At the thirty-sixth annual general meeting of the Institute of Metals held March 15 in London, **Dr. W. T. Griffiths,** Mond Nickel Co. Ltd., London, was elected president, succeeding **Lieut. Col. Sir John Greenly,** K.C.M.G. **G. L. Bailey,** of the British Non Ferrous Metals Research Association, was elected vice president. **G. Shaw Scott,** who

WILLIAM GILLETT

Who has been elected chairman of the technical committee of the Steel Roof Deck Industry, noted in STEEL, May 15, p. 63.

has served the Institute as secretary since its foundation in 1908, and as editor for 30 years, will retire June 30, and will be succeded by **K. Headlam-Morley,** secretary of the British Iron and Steel Institute. The Institute of Metals Platinum Medal for 1944 was presented to **Lieut. Col. R. M. Preston,** past president of the Institute and managing director of the Rio Tinto Copper Co.

—o—

Sidney J. Newman, president, Newman Bros. Inc., Cincinnati, has been reelected president of the National Association of Ornamental Metal Manufacturers, for the seventh consecutive year.

—o—

William E. Goldsmith, since 1940 associated with the traffic department, R. G. Le Tourneau Inc., Peoria, Ill., has been appointed traffic manager.

—o—

M. F. Dunne, president, Pyott Foundry & Machine Co., Chicago, has been appointed chairman of a newly created committee of the Illinois Manufacturers' Association to formulate plans for reemployment of war veterans. **D. P. Sommer,** vice president, Keystone Steel & Wire Co., Peoria, Ill., is a member of the committee.

—o—

Lyle C. Harvey, president, Bryant Heater Co., Cleveland, has been elected president of the Association of Gas Appliance & Equipment Manufacturers. Mr. Harvey, who will be installed as president in October, succeeds **W. F. Rockwell,** president, Pittsburgh Equitable Meter Co., and chairman, Timken Detroit Axle Co., Detroit.

—o—

L. C. Hatch has been named manager of the Winch and Crane division of Gar Wood Industries Inc., Detroit, succeeding **G. E. Robinson,** retired.

—o—

J. B. Ward, formerly Chicago sales agent for Addressograph - Multigraph Corp., Cleveland, has been made vice president in charge of distribution in United States and Canada, succeeding **D. E. White,** vice president, who is thus freed to devote more time to forming of company policies and plans, particularly in regard to reorganization of foreign markets.

V. J. RODDY

Who has been named vice president, American Screw Co., Providence, R. I., as announced in STEEL, May 8, p. 92.

EARL R. SAYRE

WILLARD V. MERRIHUE

EDWARD T. NAHILL

—o—

Earle R. Sayre has been appointed application engineer, P. R. Mallory & Co. Inc., Indianapolis, Ind. He formerly was affiliated with Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

—o—

Willard V. Merrihue has been named manager of the advertising and sales promotion divisions, Apparatus department, General Electric Co., Schenectady, N. Y.

—o—

A. S. Hamilton has been made Cincinnati district sales manager, Wheeling Steel Corp., Wheeling, W. Va., succeeding **Henry E. Smith,** resigned. **Joseph S. Borland** succeeds Mr. Hamilton as manager of the company's Buffalo office.

—o—

John P. Dods, director of research and advertising manager, Summerill Tubing Co., Bridgeport, Pa., has been appointed director of advertising and sales promotion for the closely affiliated interests of Columbia Steel & Shafting Co., Edgar T. Ward's Sons Co., and Summerill Tubing Co., with headquarters in Norristown, Pa.

—o—

B. F. DeFord has been elected assistant secretary, and **John R. Reuling** has been elected assistant treasurer, Pemco Corp., Baltimore.

—o—

L. F. A. Mitchell, a former executive of the Canadian Westinghouse Co. Ltd., who has been with the Industrial department of the East Pittsburgh, Pa., works of Westinghouse Electric & Mfg. Co., since 1937, has returned to the Canadian company as assistant to Vice President H. A. Cooch.

—o—

Ernest G. Brown has been named general manager of mechanical goods, general products and "Lastex" yarn and rubber thread divisions, United States Rubber Co., New York, succeeding **Willard H. Cobb,** recently elected vice president and member of the executive committee.

—o—

Edward T. Nahill, formerly associated with General Electric Co., Schenectady, N. Y., has been appointed sales manager, Ace Mfg. Corp., Philadelphia.

—o—

George A. Lamb, formerly chief of the Economics and Statistics Division, Solid Fuels Administration for War, has been appointed to the newly-created post of assistant director of the Bureau of Mines. Almost all activities of the Economics and Statistics Division of the SFA have been transferred to the Bureau of Mines.

—o—

P. L. Palmerton has been appointed assistant manager, Radio division, Western Electric Co. Inc., New York, and **D. C. Hickson** has been named staff assistant at New York headquarters.

—o—

Edward A. Egan has been appointed director of industrial relations, General American Transportation Corp., Chicago.

—o—

Edward J. O'Donnell has been appointed manager, railroad department, Graybar Electric Co. Inc., New York, making his headquarters in Chicago. **S. W. Scott** has become Los Angeles district commercial manager, succeeding **W. E. Guy,** new district commercial manager at Chicago.

—o—

Gilbert H. Corbin has been named Minneapolis district sales manager, Pennsylvania Salt Mfg. Co., Philadelphia, succeeding **Thomas M. Gillespie,** who is leaving the company to establish his own business.

—o—

Robert J. Ritchey has been appointed manager, Market Development division, Carnegie-Illinois Steel Corp., Pittsburgh.

—o—

Charles J. Koch has been appointed managing engineer of the Induction Motor Engineering division, General Electric Co., Schenectady, N. Y., and **Frank**

J. RALPH PATTERSON

C. HOWARD PAUL

Who have been appointed to the board of directors, Mackintosh-Hemphill Co., Pittsburgh, as reported in STEEL, May 8, p. 90.

D. Phillips has been named assistant engineer. Mr. Koch and Mr. Phillips succeed **Howard Maxwell**, manager of the division, and **Milton H. Wells**, designing engineer, who are retiring after serving with the company 42 and 43 years, respectively.

—o—

George S. Eveleth, assistant to the president, International General Electric Co. Inc., New York, has been elected a vice president of the company.

—o—

Julian A. Pollak has been elected president of Pollak Steel Co., Cincinnati, **Albert C. Weihl** has been elected vice president and general manager, **Virgil W. Prather** is secretary, and **Charles M. Grimm** is treasurer.

—o—

Max Sklovsky, chief engineer, Deere & Co., Moline, Ill., will retire June 1 after 42 years with the company. Mr. Sklovsky was active in munitions research during World War I and until recently devoted his time to current problems of munitions production.

—o—

Ralph N. DuBois, Packard Motor Car Co., Detroit, has been elected chairman of the Detroit Section, Society of Automotive Engineers, for the 1944-45 season. Others elected were: Vice chairman, **Ronald J. Waterbury**, Chevrolet Motor division, General Motors Corp.; secretary, **E. M. Schultheis**, Clark Equipment Co.; treasurer, **F. W. Marschner**, New Departure division, General Motors Corp.

—o—

Arleigh W. Anderson has been appointed sales representative for southern California, Ross Heater & Mfg. Co. Inc., Buffalo, with offices at 164 South Central avenue, Los Angeles 12.

—o—

John C. Vander Pyl, previously vice president, American Machine & Metals Inc., East Moline, Ill., has been named executive vice president, and **Wayne Mendell**, former general sales manager, has been made vice president in charge of sales.

—o—

Leonard S. Smith, previously purchasing agent, Mayhew Steel Products Inc., Shelburne Falls, Mass., has been appointed sales manager.

—o—

L. P. Philp, formerly assistant to the president, American Car & Foundry Co., New York, has been appointed assistant to the chairman.

—o—

Jack E. Gould has been named general superintendent of the Tubular Alloy Steel Corp., Gary, Ind.

—o—

J. Russell Gnau, for 25 years assistant to **Charles E. Sorensen**, recently resigned production chief of Ford Motor Co., Dearborn, Mich., is now associated with **John W. Thompson** in supervision of the Ford company's public relations department.

OBITUARIES . . .

Elmer G. Johnson, plant superintendent, Clark Bros. Co., Olean, N. Y., subsidiary of Dresser Mfg. Co., until 18 months ago when he transferred to another Dresser company subsidiary, the Bovaird & Seyfang Co., Bradford, Pa., died recently.

—o—

Adolph Mueller, 78, chairman of Mueller Mfg. Co., Decatur, Ill., died May 14 in Miami Beach, Fla.

—o—

Harvey B. Bower, 51, vice president, Chicago-Latrobe Twist Drill Works, Chicago, died May 10 in Milwaukee.

—o—

Eugene H. Baum, 43, vice president and general manager, Montague Castings Co., Muskegon, Mich., died May 11 in that city following an operation. Prior to becoming affiliated with that company about a year ago, he had been with Michigan Foundry Supply Co. for many years.

—o—

John A. Longacre, for many years resident vice president, American Equipment division, Pittsburgh Screw & Bolt Corp., Norristown, Pa., died April 25. Mr. Longacre, who had recently retired from the company, was one of the founders of American Equipment Corp., and served as president until the corporation was absorbed by Pittsburgh Screw & Bolt Corp.

—o—

Alfred J. Gutzler, 81, retired oil appliance manufacturer, died May 1 in South Pasadena, Calif.

—o—

Charles A. Fellows, 81, for more than half a century builder of bridges and stations for the Santa Fe railway, died recently in Los Angeles.

—o—

William R. Poland, 62, owner of the W. R. Poland Mfg. Co., Indianapolis, Ind., and president of Spraker Mfg. Co., also of that city, died May 10 in Indianapolis.

—o—

Charles L. Taylor, president and treasurer of the Taylor & Fenn Co., Hartford, Conn., died recently. Mr. Taylor had been associated with the company 48 years.

—o—

George G. Raymond, 76, a vice president of Todd Shipyards Corp., Brooklyn, N. Y., and for many years identified with the metalworking field, died recently in Jersey City, N. J. He was one of the original developers of the torpedo and had been associated at one time with E. W. Bliss & Co., Brooklyn, Pratt & Whitney, Hartford, Conn., and Yale & Towne Mfg. Co., Philadelphia.

—o—

Frederick E. Gage, 71, retired superintendent of American Steel & Wire Co. plants in Cleveland, died recently in Pittsburgh. He had retired in 1938 after 46 years with the company.

—o—

Albert Haberer, 42, assistant chief engineer of Fisher Body division, General Motors Corp., Detroit, died there May 14. He had been associated with Fisher Body for 27 years.

—o—

Robert C. Whiting, 66, vice president in charge of labor relations since 1924 for George A. Fuller Co., New York, building contractors, died recently in New Rochelle, N. Y.

—o—

Vernon Edler, 47, vice president and general manager, Peerless Pump division of Food Machinery Corp., died May 1 in Los Angeles.

—o—

Clement H. Graeff, 50, founder and president of the Cleveland Mica Co., Cleveland, died May 14 in Ann Arbor, Mich.

Western Electric Co. Takes Over DPC Plant

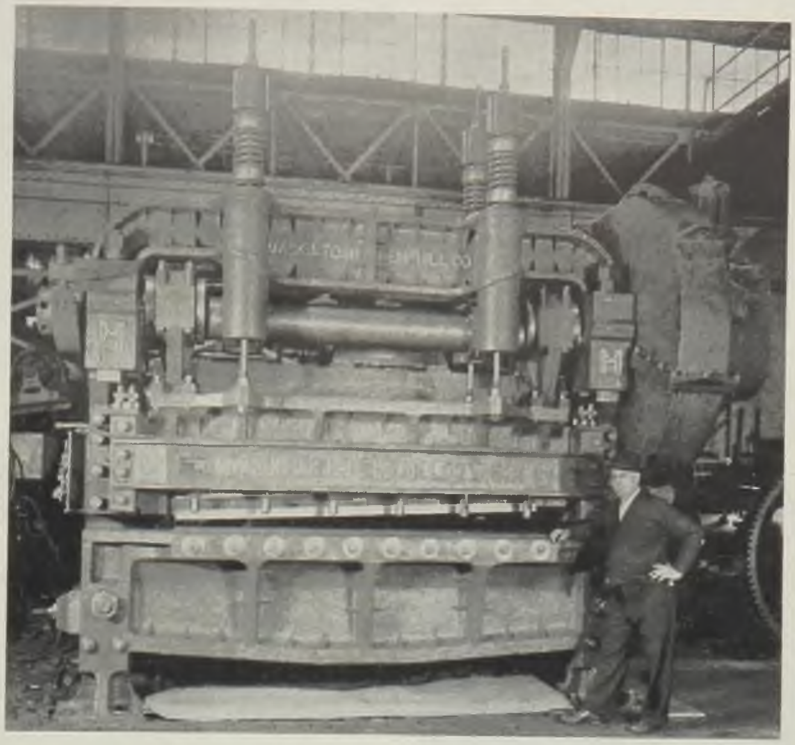
Company to transfer wire and wire-products operations from Baltimore Works to DPC plant located at Scranton, Pa.

UNDER an agreement reached recently, the Western Electric Co., New York, will take possession of the Defense Plant Corp.'s factory at Scranton, Pa.

This expansion of the company's war production was arranged through the Signal Corps. It will enable Western Electric to transfer a portion of its wire and wire-products operations from its works in Baltimore, where additional production for the armed forces will then be undertaken.

The Scranton plant becomes a "satellite" of the Baltimore Works which is under the direction of J. R. Shea, works manager.

The Scranton plant adds approximately 87,000 square feet of manufacturing space to the company's facilities. Training of employes at the new location will begin as soon as equipment formerly used in the production of aircraft piston rings can be removed. Finishing operations on wire, cords and cable will give employment to about 1000 persons.



BUILT FOR INDIA: This 100-inch shear, which weighs 55 tons and cuts plates up to 1-inch thickness, is ready for shipment to a steel mill in India. The shipment was arranged by the British Supply Mission. The shear has six pneumatically controlled hold-downs, first of such type to be designed by Mackintosh-Hemphill Co., Pittsburgh. Previous models used springs or hydraulic pressure for clamps

Rheem Mfg. Co. Has $64,000,000 Backlog

A backlog of more than $64,000,000 in business on May 1 was the largest in the history of Rheem Mfg. Co., Washington, according to the annual report to stockholders by R. S. Rheem, president.

The company, operating 13 plants throughout the country and three in Australia, is making steel drums, fiber shipping containers, automatic water heaters, artillery cartridge cases, etc.

Earnings for 1943 amounted to $1,310,836, equivalent after preferred dividend requirements, to $1.82 per common share. Net sales for 1943 reached a new high of $54,864,829, an increase of 66 per cent over 1942. During the past year the company sold a total of 230,000 shares of its common stock to Bethlehem Steel Corp.

Sam Tour & Co. Adds Foundry Research Unit

Sam Tour & Co. Inc., New York, announces addition of a foundry research unit and an increase in staff.

The foundry research unit is in charge of an experimental foundry associated with a production foundry in New Jersey, operating on gray iron, brass, bronze, and aluminum sand castings, permanent mold castings, centrifugal and precision castings in bronze, aluminum and steel.

Among the recent additions to the staff are: Fred J. Tobias, production engineer; Theodore Rubin, metallurgist; Robert Rogolsky, assistant metallurgist; Lewis W. Gleekman, assistant metallurgist, and Irving Olshever, laboratory assistant.

Salkover Company Moves to New and Larger Plant

The Salkover Metal Processing Co. has moved its Chicago plant from 3249 West Ohio street to larger and more modern quarters at 4209 West Lake street. The company also has a plant in Long Island City, N. Y., and specializes in commercial controlled atmosphere electric furnace brazing and bright annealing.

A company official envisages a tremendous postwar future for electric furnace brazing. "Business success will be dependent upon ability of industry to make better things at lower cost," he said. "It is our belief that electric furnace brazing, properly applied, can produce innumerable parts or assemblies superior in physical properties and lower in cost."

Wm. Powell Co. Elects New Officers at Meeting

At the annual meeting of the Wm. Powell Co., Cincinnati, which was held recently, the following were re-elected to office: H. H. Coombe, chairman of the board and treasurer; James Coombe, president and general manager; Geo. E. Weitkamp, first vice president and secretary; David Forker, vice president; Oliver E. Gang, vice president; Wm. Heilig, vice president, and Elmer R. Noll, vice president.

Board of directors of the company elected the following additional vice presidents: William R. Kraus, William E. Minor, Harry C. Morine, E. K. Pierce, and E. W. Voss. Wilton Husing was elected assistant to the president.

BRIEFS . . .

Roots-Connersville Blower Corp., Connersville, Ind., has issued a new bulletin devoted to its rotary pumps.

—o—

California Shipbuilding Corp., Los Angeles, launched its 353rd ship at its Wilmington yard on May 11.

—o—

Department of Interior, Washington, has available for distribution a geologic map of the Arkansas bauxite district.

Damaged War Vehicles

Thousands of trucks, tanks and other military equipment reconditioned and sent back to battlefronts. Many restored to 95 to 100 per cent of their original efficiency. Reclamation program adds substantially to output of new materiel

CASUALTIES in vehicles and other equipment in this highly mechanized war are high, but shattered steel and machinery are not left on the battlefield to rust. Much of it is rebuilt and put back in action.

At the United States Army's Mt. Rainier ordnance depot at Ft. Lewis, Wash., one of many such depots in various sections, damaged vehicles from battlefronts all over the world are collected. As they roll into the depot on flatcars, they are classified as to the amount of damage they have suffered and the extent to which they can be repaired.

Thousands of reconditioned Army vehicles, top of page, from 95 to 100 per cent as efficient as when they were new, are parked at the Mt. Rainier depot, awaiting shipment to battle zones

Left, tank tracks, stripped from tanks on the battlefield, are reclaimed at Ft. Lewis, will see action again

Left below, back from the war zones, these engines will be completely rebuilt. Blocks will be reground and each part will receive individual attention

Rebuilt at Ft. Lewis

Those machines which can be restored to 95 to 100 per cent of their original efficiency are rebuilt and returned overseas. Those which can be repaired but cannot be restored to approximately their original efficiency are shipped to training centers. Those which are beyond repair are dismantled for salvageable parts and the remainder is returned to the war effort in the form of scrap.

Thousands of trucks, tanks, bulldozers, "ducks" and other vehicles already have been reconditioned and sent back to the battlefronts. Many will play an important part in the coming invasion of Europe.

The Army's reclamation program is adding substantially to the output of new materiel from the country's war plants and is helping to give the Allies a substantial superiority in equipment. It is a military adage that materiel superiority not only increases chance for victory but also decreases losses in men.

This series of photos, taken at the Mt. Rainier depot, shows how damaged vehicles are given new life.

Center below, parts of vehicles which are beyond repair are sold as scrap. A considerable tonnage of such battlefield scrap, although less than expected, is flowing back to the steel mills

Right below, engines are rebuilt on an assembly line at the depot. Most of the assembly work is done by women ordnance workers

Right, amphibious tanks, damaged in beach landings, await reclamation. Many will be returned to the battlefronts. United States Signal Corps photos from NEA

Further Tightening in War Output Schedules Noted

UNEXPECTED military demands have created a number of tight spots in war output schedules, but the program as a whole is up to expectations. Explaining the size of the job still to be done, War Production Board officials state total 1944 output must be raised about 10 per cent and that two-thirds of the program—consisting of critical equipment—must be increased 25 per cent.

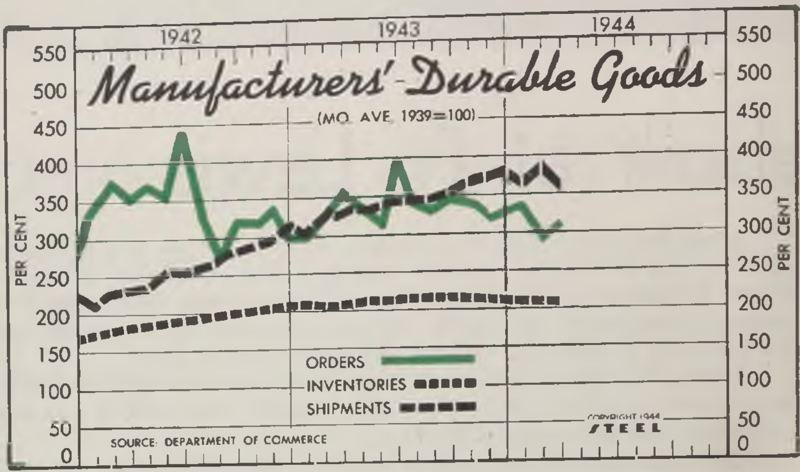
The steel industry's expanded ingot production and finishing facilities are at practical capacity, yet order backlogs are increasing. Machine tool interests now expect 1944 shipments will have to exceed $500 million, against an earlier estimated $350 million. Antifriction bearings remain the most critical war component, and although some headway has recently been made against order backlogs production of certain types has not been stepped up sufficiently to meet current essential needs.

Many new production tasks have developed lately, including: Air cargo carriers; rocket guns; sharply expanded shell program (estimated to require an additional 200,000 tons of shell steel monthly); large guns of novel design; new types of pursuit planes; radar equipment, new types of invasion landing craft, heavy trucks, large steel shell containers, and land mines.

New selective service regulations temporarily deferring induction of those 26 through 29 and indefinitely deferring those 30 or over may materially aid industrialists to meet projected production schedules. However, output of a number of critical war components is already falling behind, due chiefly to the manpower shortage.

RAILROADS—Revenue freight moved by Class I railroads continues to tend upward, reflecting intensive efforts to complete invasion plans. Latest monthly data compiled by the Association of American Railroads show March freight movement equivalent to 62.5 billion ton-miles, or 2 per cent over the comparable 1943 month. Carloadings during April and to date this month are at a somewhat higher level, according to weekly reports.

SHIPMENTS, INVENTORIES, ORDERS — Durable goods manufacturers' shipments and inventories receded moderately during March, while new orders increased. The most notable declines in shipments were recorded in the automobile and other transportation equipment group. Of the major durable goods industries the electrical machinery group recorded the only increase.



U. S. War Expenditures, Industrial Production, Manufacturers' Shipments, and Employment

	1943 September	October	November	December	1944 January	February	March
Government war expenditures (millions of dollars)	7,212	7,105	7,794	6,951	7,416	7,808	7,948†
Industrial production (adjusted, 1935-39 = 100)	244	247	247	241	242	244	242†
Durable manufacturing	370	375	377	365	368	368	366†
Nondurable manufacturing	179	179	180	174	174	177	175†
Manufacturers' shipments (Ave. month 1939 = 100)	261	270	270	276	264	279	273†
Durable	356	371	373	380	365	384	369†
Nondurable	186	191	189	194	186	197	198†
Employment (millions)	52.8	52.1	51.7	51.0	50.4	50.2	...
Male	35.2	34.8	34.6	34.2	34.0	34.0	...
Female	17.6	17.3	17.1	16.8	16.4	16.2	...
Wage earners in manufacturing (thousands)	13,935	13,965	14,007	13,876	13,659	13,576	...
Durable goods	8,319	8,389	8,456	8,403	8,288	8,224	...
Iron and steel and their products	1,721	1,731	1,744	1,736	1,721	1,713	...
Nondurable goods	5,616	5,576	5,551	5,473	5,371	5,352	...

Sources: U. S. Treasury Department; Board of Governors of the Federal Reserve System; Department of Commerce; Department of Labor. †Preliminary.

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	99.0	99.0	98.5	98.5
Electric Power Distributed (million kilowatt hours)	4,238	4,234	4,307	3,969
Bituminous Coal Production (daily av.—1000 tons)	2,020	2,060	2,030	1,655
Petroleum Production (daily av.—1000 bbls.)	4,512	4,519	4,432	3,984
Construction Volume (ENR—unit $1,000,000)	$42.2	$41.9	$32.9	$91.0
Automobile and Truck Output (Ward's—number units)	15,680	15,635	17,330	19,675

*Dates on request.

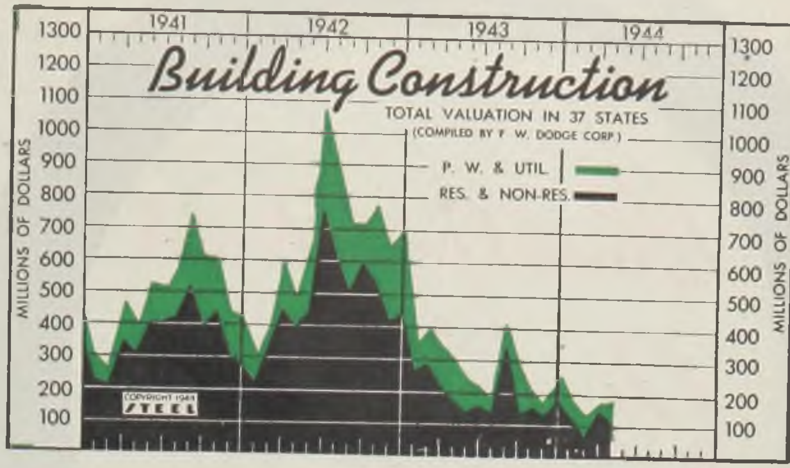
TRADE	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars)	850†	837	800	817
Business Failures (Dun & Bradstreet, number)	32	42	33	77
Money in Circulation (in millions of dollars)‡	$21,725	$21,614	$21,295	$16,741
Department Store Sales (change from like week a year ago)‡	+17%	−11%	+32%	−5%

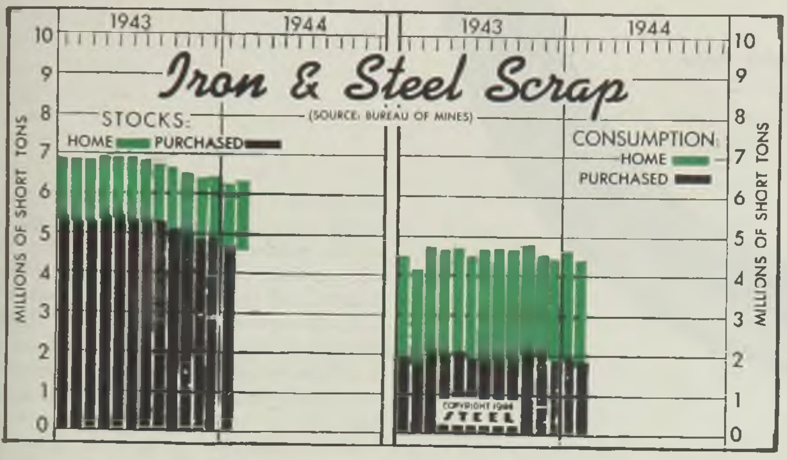
†Preliminary. ‡Federal Reserve Board.

Construction Valuation In 37 States

(Unit—$1,000,000)

		Public Works-Utilities		Residential-Non.-Res.	
	Total	1944	1943	1944	1943
Jan.	159.2	50.3	85.8	108.9	264.3
Feb.	137.2	55.1	112.9	82.1	280.5
Mar.	176.4	61.3	123.0	115.1	216.7
April	179.3	72.0	127.7	107.3	175.6
May	.....	.....	95.8	.....	138.6
June	.....	.....	73.3	.....	156.3
July	.....	.....	50.0	.....	133.7
Aug.	.....	.....	73.4	.....	340.3
Sept.	.....	.....	175.1	.....	125.0
Oct.	.....	.....	63.5	.....	150.0
Nov.	.....	.....	59.0	.....	125.4
Dec.	.....	.....	67.4	.....	184.9
Total	.....	.....	1,106.9	.....	2,106.4





Iron and Steel Scrap Bureau of Mines

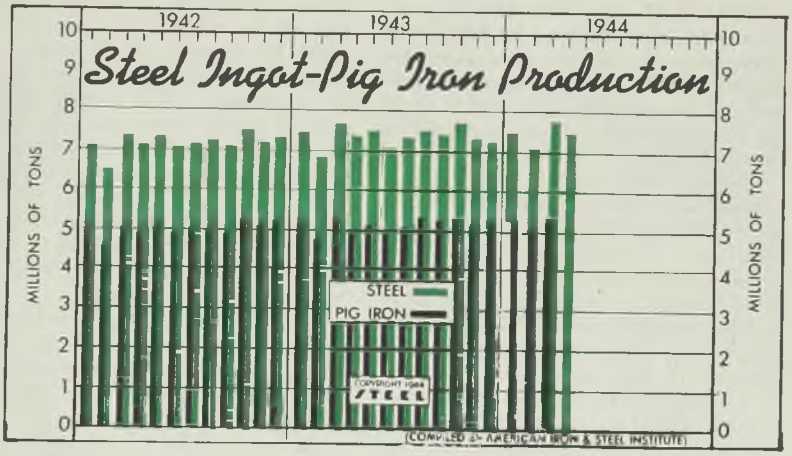
(Gross Tons—000 omitted)

	Consumers' Stocks		Total Consumption	
	1944	1943	1944	1943
Jan.	6,214	6,877	4,616	4,492
Feb.	6,134	6,871	4,414	4,178
Mar.	....	6,850	....	4,787
Apr.	....	6,918	....	4,642
May	....	6,905	....	4,723
June	....	6,916	....	4,493
July	....	6,860	....	4,670
Aug.	....	6,778	....	4,686
Sept.	....	6,613	....	4,657
Oct.	....	6,456	....	4,830
Nov.	....	6,391	....	4,581
Dec.	....	6,448	....	4,449
Mo. Av.	....	6,740	....	4,599

Iron, Steel Production

(Net tons—000 omitted)

	Steel Ingots		Pig Iron	
	1944	1943	1944	1943
Jan.	7,587	7,425	5,276	5,194
Feb.	7,189	6,825	5,026	4,766
Mar.	7,820	7,675	5,434	5,314
Apr.	7,569	7,374	....	5,035
May	....	7,545	....	5,173
June	....	7,027	....	4,836
July	....	7,376	....	5,023
Aug.	....	7,562	....	5,316
Sept.	....	7,489	....	5,226
Oct.	....	7,786	....	5,324
Nov.	....	7,374	....	5,096
Dec.	....	7,266	....	5,213
Total	....	88,873	....	61,777



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$8,235	$9,319	$8,125	$9,210
Federal Gross Debt (billions)	$187.1	$187.4	$187.0	$138.2
Bond Volume, NYSE (millions)	$39.1	$42.0	$52.7	$78.9
Stocks Sales, NYSE (thousands)	3,438	3,398	3,395	9,033
Loans and Investments (millions)†	$50,674	$51,064	$51,633	$46,108
United States Government Obligations Held (millions)†	$37,603	$37,834	$37,961	$30,496

†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)†	249.5	249.6	249.7	243.7
Industrial Raw Materials (Bureau of Labor index)‡	113.3	113.2	113.6	113.2
Manufactured Products (Bureau of Labor index)‡	101.0	101.0	100.9	101.0

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

Black Oxide Finish for Stainless Steel

may be quickly applied with new sodium dichromate process

By IRVINE C. CLINGAN
Research Chemist
Rustless Iron & Steel Corp.
Baltimore

CHEMICAL and electrochemical processes commonly employed for blackening steels have not proved satisfactory for stainless steel[1]. Solutions used are generally of the oxidizing type, and in them the stainless steels are passive, resisting chemical change.

Black or dark colored finishes have assumed a position of importance in the use of stainless steel parts for some applications. This is particularly true where reflective or bright surfaces may be undesirable or even prohibitive, as in certain armament parts. Commercially, this need is being met through the application of pigments, enamels, japans, electroplated coatings, by tempering, and other similar methods. These coatings have not proved adequate in service either because of brittleness, poor adhesion, low resistance to wear and abrasion, or because of poor corrosion resistance.

Normally, stainless steels resist mechanical adhesion of coatings that are foreign to the alloy. The medium of resistance is a thin, invisible oxide film on the surface of the metal, and the stability of this film is a measure of the corrosion resistance of the alloy. These protective films can be destroyed by chemical, electrochemical, and mechanical means, but they rapidly form again on exposure to air or other oxidizing media. It is this phenomenon that makes surface preparation for application of coatings on stainless steels so difficult.

In promoting a color change in the surface appearance of stainless steels, a method by which this protective film could be ignored would appear to be the simplest and most practical approach to attainment. This would limit the method to electrochemical or chemical means. The protective film would probably exert some influence over the reaction rate in the beginning, but under properly controlled conditions the chemical change could be directed to completion or be made to proceed until stifled by the reaction product.

The characteristics of the reaction product in a chemical change of this kind would be of great importance, especially from the standpoint of corrosion resistance.

As an example of an oxide coating having inferior protection properties, consider heating a piece of stainless steel at a sufficiently elevated temperature and in the presence of oxidizing atmospheres. It would not be difficult to effect a color change in the surface appearance of the alloy, the protective oxide film would undergo a chemical change without any apparent difficulty; and, if heating were continued for a sufficient length of time, the chemical reaction would go to completion, at which time the metal would have changed completely into its oxides.

If, instead of permitting the chemical reaction to proceed to completion, the steel was heated for a predetermined length of time and then removed from its heating environment, the depth of the oxide coating and the color change could be controlled. However, the reaction product formed under these conditions has been found to be porous, brittle, and can be readily penetrated by various corrosive media. It is obvious that a coating of this type would not afford protection to the underlying metal, and in all probability would prove harmful.

If the reaction product is of such a nature that it forms a thin, continuous, adherent, and strong coating which prevents further chemical action on the metal, then it would be reasonable to expect that this coating possessed inherent protective properties. Black oxide coating formed on stainless steels in accordance with the method being presented were found to be resistant to further attack on the metal after the comparatively short period of time required for their complete development. These coatings possess considerable strength and elasticity, have good resistance to wear and abrasion, improve the corrosion resistance of the alloy in various corrosive media, and do not impart any dimensional change in the parts treated.

Method[2] and Equipment

Articles to be blackened are first cleaned of scale, grease, oil, or other foreign substances present on the surface. After drying, they are immersed for a sufficient length of time in a molten solution of dichromates, preferably sodium dichromate, at a temperature in excess of 615 degrees Fahr. The parts are removed from the solution, allowed to cool, and immersed in warm water. The salts are readily soluble, and no difficulty will be encountered in removing them.

Treatment time will depend on the temperature of the bath, and the size and number of parts being treated. It is recommended that the bath be operated between 730 and 750 degrees Fahr. and the time of immersion be from 15 to 20 minutes at temperature. See Fig. 1.

The only equipment necessary is a steel tank, a sufficient source of heating energy, and work baskets or wires for suspending the parts in the bath. Care must be used to prevent localized heating of the tank. It is recommended that a cover be used, and means be provided for slowly stirring the melt. Neither of these are essential, but they will be found to be consistent with good practice. In blackening small parts in baskets, an occasional shaking of the parts will insure a more uniform finish.

Properties of Coatings

Coatings formed by this process have properties of elasticity and strength that are exceptional. One example of this was revealed when a 50-pound coil of 18-8 wire, 0.150-inch in diameter was treated for 15 minutes in sodium dichromate at 740 degrees Fahr., then lime-coated and drawn in soap through a 10 per cent reduction in cross-sectional area.

No visible breaks developed in the black oxide coating during this operation.

Sections of the coil were then bent through a 180-degree angle flat, and abrasion was applied with a rubber eraser across the more severely bent section. The coating appeared to be sound, showing no tendency to crack or peel.

In general, the coatings show the corrosion-resisting characteristics of the surface of the metal prior to coloring. However, the various types of stainless steels after blackening show *improved* resistance to corrosion in various corrosive media. See Table I.

Since these coatings are formed at relatively high temperatures, in a non-aqueous bath, their composition is that of oxides of the metal, and not hydroxides. Consequently, the color is permanent and does not change on exposure to atmospheric conditions. Samples representing the various grades of stainless steel, some of which are shown in Fig. 2, have been in the laboratory for more than one year and their color remained unchanged.

Conclusion

Chemical processes generally employed for blackening steels have not proved satisfactory for the stainless steels. A method is presented for surface blackening stainless steels by treatment in molten dichromate at temperatures in excess of 615 degrees Fahr. The resulting black coating possesses a high degree of strength and elasticity, shows good resistance to wear and abrasion, improves the corrosion resistance of the parent metal in various corrosive media, does not produce any dimensional change in the treated part, and the color is permanent.

Fig. 1 (Right)—As substantiated by this time chart, immersion time of 15 to 20 minutes appears to be sufficient. Recommended temperature of the bath is between 730 and 750 degrees Fahr.

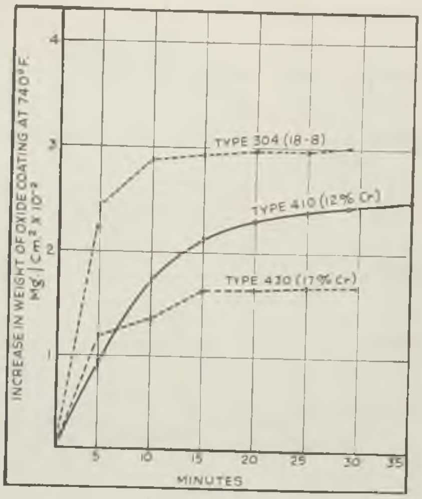


TABLE I

Comparative Corrosion Data in Weak Nitric and Hydrochloric Acids

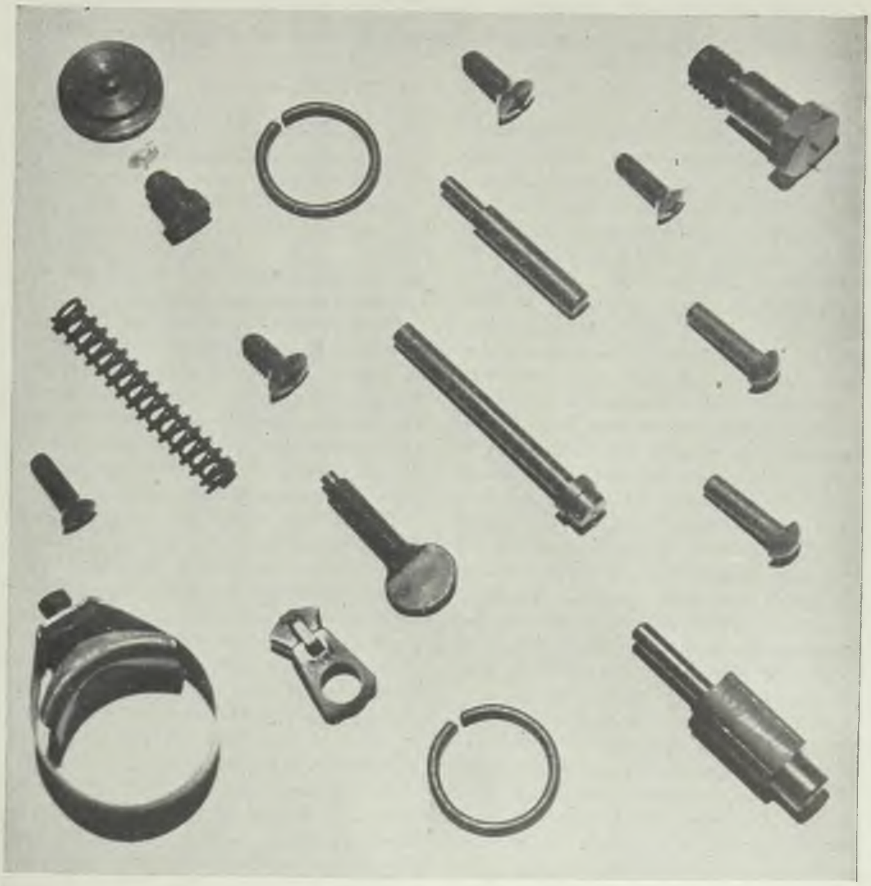
(Corrosion Rates are expressed as grams/cm²/50 hours.)

Test Specimens*	0.5% by wt. HNO_3-boiling	2.5% by wt. HNO_3-boiling	0.5% by wt. HCL-120°F.	1% by wt. HCL-120°F.
12 Cr.	0.0023	0.104	0.993	1.480
12 Cr-Blackened	0.0000	0.008	0.108	0.473
17 Cr.	0.0008	0.0004	2.72	2.940
17 Cr-Blackened	0.000	0.0000	0.0505	0.882
18-8	0.0012	0.0000	0.0193	0.0190
18-8-Blackened	0.0000	0.0000	0.0007	0.0012

*Test specimens were 2" x 1" x .050,", with a pickled finish.

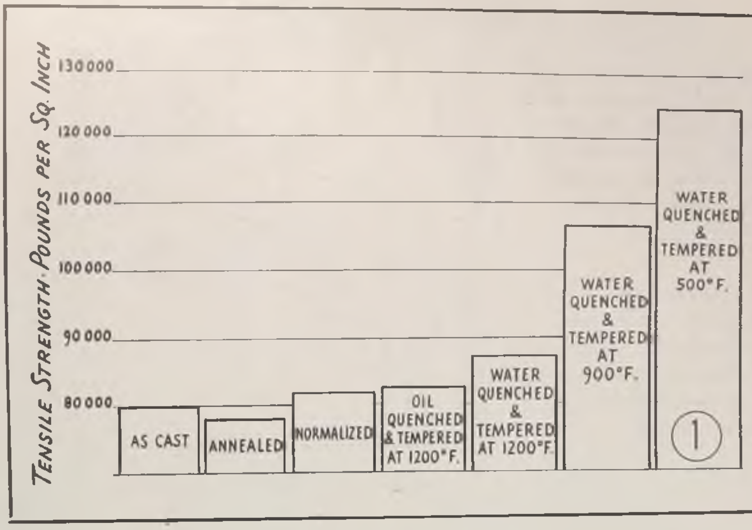
Identification	Chemical Analysis of Steels Tested: C	Mn	P	S	Si	Cr	Ni
12 Cr.	0.11	0.43	0.015	0.024	0.35	12.17	0.18
17 Cr.	0.10	0.47	0.018	0.017	0.36	17.48	0.12
18-8	0.05	0.65	0.021	0.015	0.54	18.11	9.18

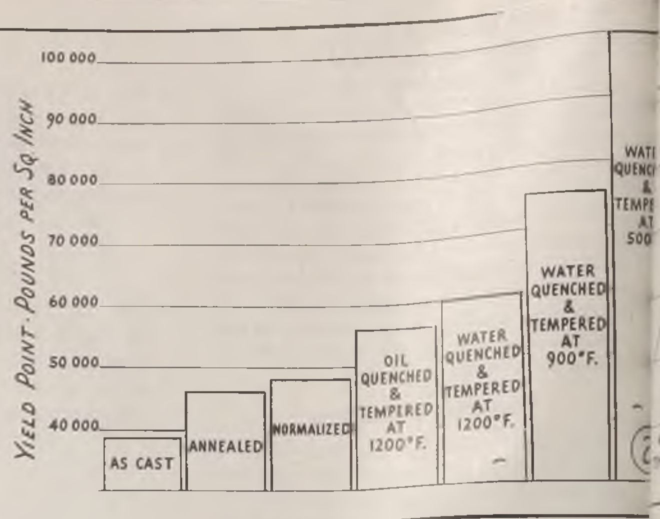
Fig. 2 (Below)—Typical stainless steel parts after black oxide finish has been applied. Coating is permanent, showing same corrosion-resisting characteristics as the base metal



[1] Blackening of Nonferrous Metals, by Walter R. Meyer, Ph.D., American Electroplaters Society Proceedings of Educational Sessions of the thirty-first annual convention, June 1943; 90-2; disc. 92-4.

[2] United States Letters Patent pending.





A Symposium on Water-Quenched Steel

Growing trend toward production and utilization of water-quenched and tempered steel castings has been accelerated by increased wartime demand for parts with higher mechanical properties. This symposium appearing in this and two succeeding issues of STEEL also was presented before the Steel Founders' Society of America. It presents background information and details on practices followed by five leading producers

By C. W. BRIGGS
Technical and Research Director
Steel Founders' Society of America
Cleveland

THE HISTORY of the water-quenching of commercial steel castings goes back about 35 years. Published information on the subject reveals that the Taylor-Wharton Co. water-quenched gold dredge buckets under the direction of John Howe Hall in 1908. The buckets were made of carbon cast steel. In 1909 this company developed a medium manganese cast steel as a water-quenching steel for different cast steel products.

In 1913, Hall presented a paper on the heat treatment of cast steel before the American Society for Testing Materials, in which he set forth the advantages of the water-quenching of cast steel. Those who discussed the paper stated that water-quenching might do very well to give fine microstructures to laboratory test bars, yet this treatment of actual castings would be out of the question on account of the danger of setting up serious stresses and cracking the castings.

Hall subsequently showed, in a paper given before the October, 1913, meeting of the American Institute of Mining and Metallurgical Engineers on shock tests of cast steel, that quenched and tempered castings were much to be preferred, and that cracked castings were not necessarily produced during the operation of water-quenching.

During 1914, a paper on the heat treatment of steel castings was presented by Young, Pease and Strand before the American Institute of Mining Engineers. The authors discussed the general improvements that could be obtained in the properties of steel castings by the water-quenching of castings.

The authors were associated with the Pennsylvania Railroad and they made their studies on bolster castings. The bolsters were given a 1600-degree Fahr. water-quench, and tempered at 900 degrees Fahr. The properties were reported on test bars cut from sections of the bolsters. This was the first time on record in this country that the purchaser of steel castings showed an interest in water-quenched steel castings.

In a discussion of the paper by Young, Pease and Strand, Hall stated that it was most gratifying to find that others had found that the danger of cracking castings by quenching them in water had been greatly exaggerated.

Taylor-Wharton continued with its practice of the water-quenching of steel castings and, in 1917 and throughout the first World War, they produced gun carriage castings from medium manganese steel quenched and tempered.

In 1920, Hall, Taylor and Nissen published an article in the *Transactions* of the American Institute of Mining and Metallurgical Engineers on the heat treatment of cast steel, in which numerous tables appear on the properties of carbon and medium manganese cast steels in the quenched and tempered condition.

Prior to the period of the first world war, the steel casting industry produced for sale most of the tonnage in the as-cast or full annealed condition. The first world war brought about an advancement in heat treating conditions for many foundries in the industry, and a large proportion of their products was given a normalize treatment or a normalize and temper treatment.

The normalizing treatment became the popular commercial heat treatment after World War I, and its use gradually increased during the period 1920 to 1940. Commercially, the annealing heat treatment was used less frequently during the period 1920 to 1940, and towards the latter part of that period the annealing heat treatment was seldom given except to meet specification requirements calling for this type of treatment.

The tonnage of quenched and tempered castings sold during the 1920's was not great, and the total tonnage was produced by less than a dozen foundries. In 1930, considerable interest was ex-

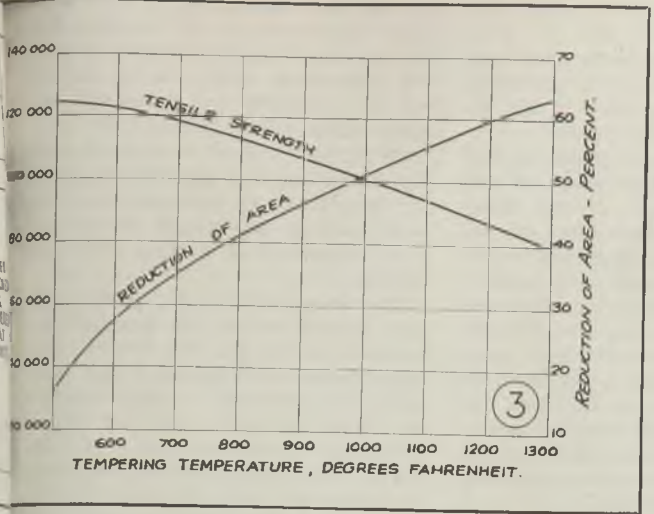


Fig. 1—Tensile strengths of a 0.30 carbon cast steel resulting from different heat treatments

Fig. 2—Yield points of a 0.30 carbon cast steel resulting from different heat treatments

Fig. 3—The effects on tensile strength and reduction of area obtained by varying the temperature at which 0.30 carbon cast steel is tempered after quenching

Castings

hibited in the quenching of steel castings, and a number of men in the industry wrote papers on the properties of quenched and tempered alloy cast steels.

Buyers of steel castings became more interested in the properties of quenched and tempered steels, and greater interest was exhibited in the operation by foundrymen and foundries.

Specifications For Steel Castings

The leading specifications on steel castigns in 1930 were the three American Society for Testing Materials Specifications: A 27-24, Steel Castings; A 87-27, Carbon-Steel Castings for Railroads; and A 95-29, Carbon-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service.

Specifications A 27 and A 95 carried the following clause: "No castings which have been quenched in any liquid medium shall be offered under these specifications." Specification A 87 required that castings be furnished only in the annealed state.

It can be seen from these specifications that at as late a date as 1930, neither buyers nor producers of steel castings generally welcomed standard specifications for high mechanical properties which required quenching and tempering heat treatments.

It was 1933 before a tentative specification was adopted by ASTM, permitting liquid quenching and tempering of steel castings. The specification adopted was A 148-33T, Alloy-Steel Castings for Structural Purposes. This specification offered three grades which permitted liquid-quenched and tempered castings.

However, during the same year Specification A 154-33T, Carbon Steel Castings for Industrial, Railroad and Marine Uses, was issued, which included a clause to the effect that quenching of castings was not permitted except by agreement between buyer and producer.

By 1939, however, practically all of the ASTM steel casting specifications carried clauses giving requirements necessary for liquid quenching. A note was included in these specifications to the effect that "Accelerated cooling by liquid contact develops properties that are advantageous for certain purposes, when the details of steel casting design, of chemical composition, and of shop practice are suitable for liquid quenching."

It will be noted from the above clause that the producers of steel castings had many reservations regarding the shape, size and composition of castings that could be successfully quenched on a commercial production basis. If castings weighed much more than 100 pounds and were not of fairly uniform sections, they were not considered as adaptable to the quenching heat treatment.

The Army and Navy Specifications have been opposed to the water-quenching of steel castings. As late as November, 1941, when Federal Specification QQ-S-681b was adopted, all steel castings were required to be furnished in the full annealed condition. The rapid cooling of castings was not permitted without specific authority from the purchaser. The 1941 revision permitted four classes to be given the quench and tempering treatment.

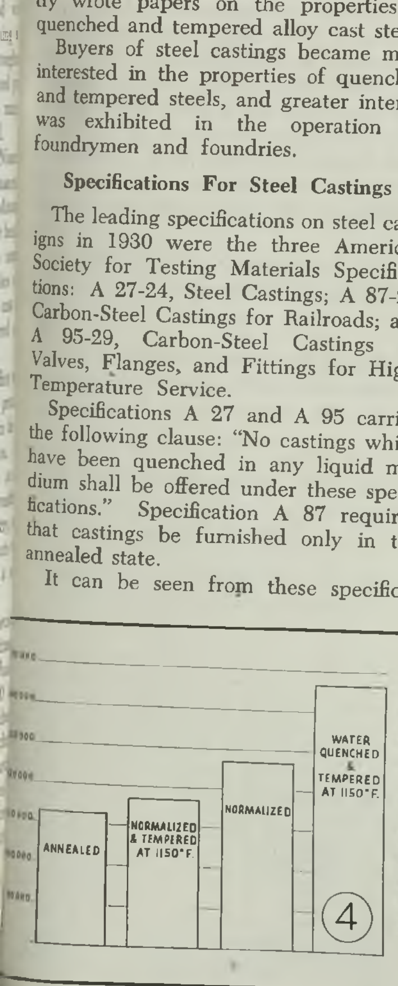
The Navy Specification 49S1, as in effect today, does not permit the liquid-quenching of steel castings without special approval of the Navy bureau concerned in the purchase of the castings.

Thus, it may be seen that specification requirements and the lack of interest on the part of both buyer and producer, in the liquid-quenching practice resulted in but a low tonnage of steel castings produced with a quench and temper heat treatment.

The 1940 production of steel castings was about 900,000 net tons. It has been estimated that of this amount 270,000 tons consisted of low alloy steel castings; and of this amount, perhaps 50 per cent of the alloy steel was produced by the electric furnace practice, even though records show that of the overall casting production, the open hearth production during 1940 accounted for approximately 65 per cent. Practically all of the alloy steel produced by the open hearth shops was given a normalizing heat treatment.

The normalizing heat treatment was, of course, the predominating heat treatment given alloy steels, and the writer assumes that at least 90 per cent of the 135,000 tons of electric furnace alloy steel was given this treatment.

It is thus believed that the commer-



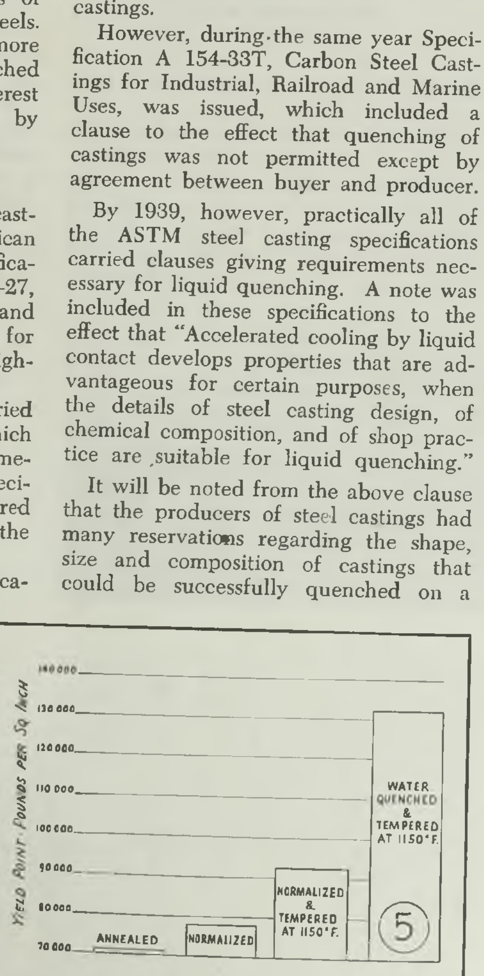


Fig. 4—Tensile strengths of an alloy cast steel (carbon 0.30 per cent, nickel 1.68 per cent, chromium 0.55 per cent, molybdenum 0.27 per cent) resulting from different heat treatments

Fig. 5—Yield points of an alloy cast steel (same as sample in Fig. 4) resulting from different heat treatments

cial quenched and tempered casting production of 1940 did not exceed 5000 tons (excluding experimental Army castings), less than 5 per cent of the electric alloy steel production—or less than a half of 1 per cent of the entire casting production.

Compare the 1940 figure with what is considered as a fair figure of production of castings receiving the quench and temper treatment for 1943. It is believed that not less than 250,000 tons of steel castings received a quench and temper treatment, or at least 8 per cent of the entire casting production, which was estimated to be about 3,000,000 net tons.

The most popular quenching medium is water. Of 31 foundries that quenched castings in 1938, 19 foundries reported to the American Foundrymen's association that water-quenching predominated. Nine foundries indicated that oil-quenching was used in most cases, and 3 indicated that oil and water were used about equally.

At the present time, water-quenching not only predominates as the quenching fluid for steel castings, but it is used almost exclusively by the foundries.

Prior to 1940, buyers generally had but little experience with quenched and tempered steel castings. In fact, many design engineers and buyers had the impression that it was impossible to obtain high tensile and yield point property values of wrought steels by using cast steels. Furthermore, they also believed that steel castings were brittle if given the quench and tempering treatment. Of course, both beliefs are far from the truth. Cast steels and wrought steels of similar chemical compositions develop comparable properties after quenching and tempering operations.

The fault for these erroneous beliefs on the part of the buyer lies somewhat with the steel casting producer, for he has not popularized information regarding the water-quenching ings. Realization of this condition has led the Steel Founders' Society to publish information widely on the properties of quenched and tempered cast steels such as shown in Figs. 1 to 5.

Of primary interest to users of castings is the fact that their knowledge of the possibilities of quenched and tempered castings was gained through the actual experience of working with these castings.

The Army learned, during the lend-lease period which just preceded our entrance into the war, that they had considerable need for high-tensile high yield-point steel castings. Castings designed for these strengths required water-quenching treatment. Also, it was found that water-quenching treatment was advisable for the obtaining of excellent ballistic properties for steel castings. Thus, War Department prime contractors and subcontractors began to see, work with and study the properties of

Water-Quenching Small Stee

By J. W. JUPPENLATZ
Chief Metallurgist
Lebanon Steel Foundry
Lebanon, Pa.

THE PROPER water quenching of steel castings is dependent upon two factors; the first being the hardenability of the steel which is a function of its analysis and the method of deoxidation used, and the second being the cooling rate from the proper quenching temperatures which must be compatible with the analysis and sections involved.

Liquid quenching of steel castings has been practiced for many years, but knowledge recently acquired, especially on the subject of hardenability, has increased the field of its application and the uniformity of results secured from such treatment.

It is assumed that selection of analysis or type of steel is carefully made with due regard to the essential heat treatment operations, thereby assuring, for example, a casting having high physical properties suitable for rigidity under high stresses. Some of the fundamental requirements of this heat treatment process may be classified as:

1—Sound metallurgical information on the steels of the type involved; such as its content of hardenable elements, grain size, methods of melting and deoxidation.

2—Uniform arrangement of castings to assure adequate circulation of hot gases upon heating for quenching. This results in complete austenization or solution of carbides in all sections of the castings

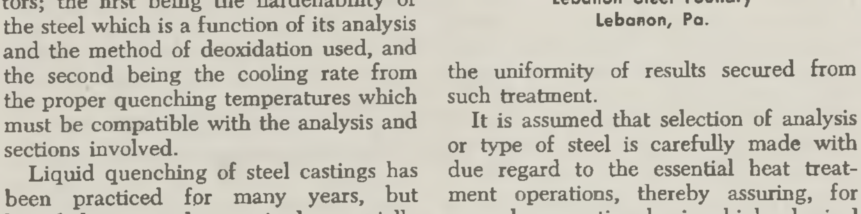
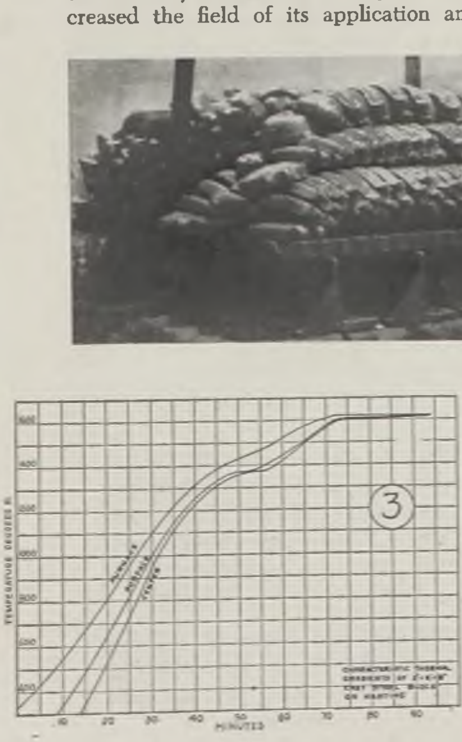


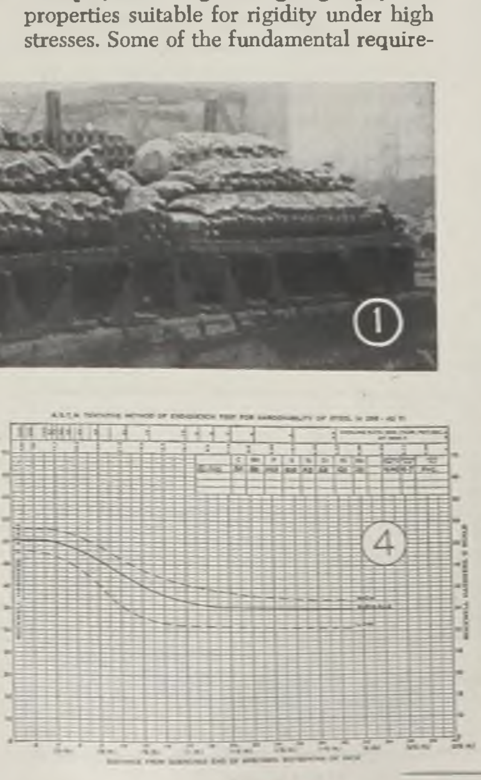
Fig. 1—Typical example of car loading for production heat treatment

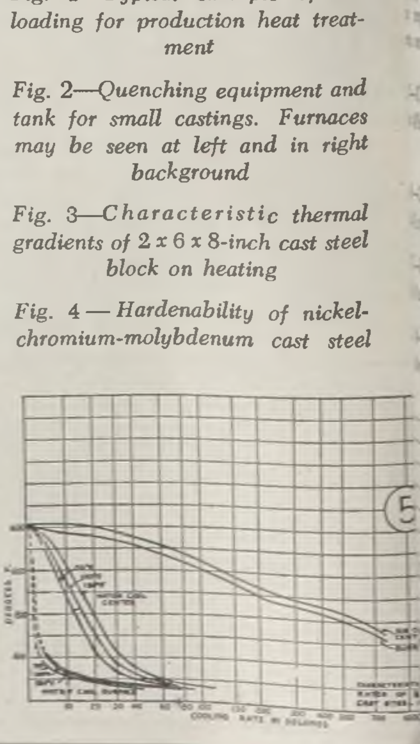
Fig. 2—Quenching equipment and tank for small castings. Furnaces may be seen at left and in right background

Fig. 3—Characteristic thermal gradients of 2 x 6 x 8-inch cast steel block on heating

Fig. 4 — Hardenability of nickel-chromium-molybdenum cast steel







quenched ad tempered steel castings which they would not have experienced under normal conditions.

The experience has proved a good one for the design engineer, the buyer of steel castings and the casting producer. The good account that these castings have given of themselves has placed confidence in the designer toward specifying the use of castings more generally. The information obtained regarding the casting properties in the water-quenched and tempered state is doing much to acquaint the buyer with the possibilities of high strength castings and castings of increased toughness for postwar commercial service. Also, the period of expanded production of quenched and tempered steel castings has contributed a great deal for the producer. He has learned much regarding the technique of water-quenching of steel castings such as, for example, the time quench, tank capacities, water velocities, quenching temperature, hardenability test control, etc. He has learned that castings of all sizes and of varying cross-sections can be water-quenched. In fact, he has learned that many of the past fears that he had of the water-quenching of steel castings were greatly exaggerated.

Also, the greater use of liquid-quenching has resulted in improvements in the mechanical handling of castings in various stages of the process, resulting in a more uniform product at a lower cost.

The future commercial use of water-quenched and tempered steel castings is bright. Casting buyers who have recently learned of the tremendous possibilities of the use of high strength castings probably will not return to the lower properties obtained by normalizing and annealing. Furthermore, it appears that buyers will insist upon specifications permitting higher strength grades, with including clauses on quenching heat treatment.

The producer of water-quenched and tempered castings will insist that specifications become more simplified as to heat treating requirements, and that there be no ban on liquid quenching. In fact, there are at present committees working on the revision of the American Society for Testing Materials casting specifications with the above points in mind.

Thus, it is possible to foresee an increased use of the water-quenching heat treatment for commercial steel castings after the war; for inasmuch as normalizing was the great improvement in the heat treatment of steel castings after the first world war, so the quenching treatment of commercial castings will be the major steel casting development resulting from this war.

Of course, it is not too wise to make predictions, but it is believed by the author that in a 10-year period following the present war, approximately 50 per cent of the alloy steel casting production will be produced for sale as liquid quenched and tempered castings.

Castings

after a predetermined soaking time in the furnace at proper temperatures.

3—Rapid removal of the castings from the furnace and quenching at known cooling rates so that the austenite (carbides in solid solution) transforms into martensite (hardening) without crack formation.

4—Properly tempering (softening) for the required period of time so that a ductile tempered—martensite structure is obtained.

5—Appropriate testing to determine that the required physical properties have been secured.

Fig. 5—Characteristic cooling rates of ½ x 4½ x 4-inch cast steel specimen

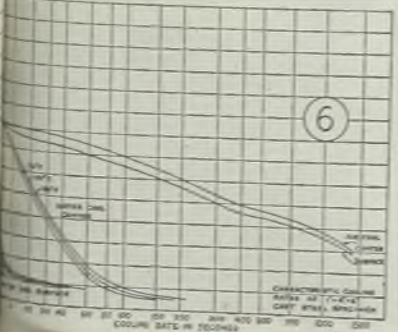
Fig. 6—Characteristic cooling rates of 1 x 4 x 6-inch cast steel specimen

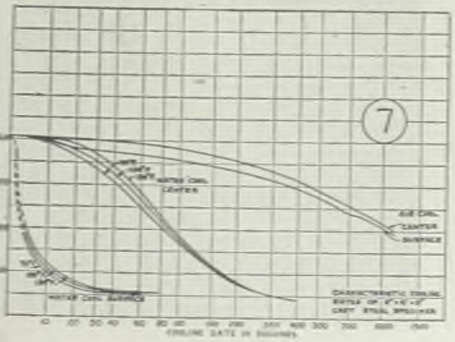
Fig. 7—Characteristic cooling rates of 2 x 6 x 8-inch cast steel specimen

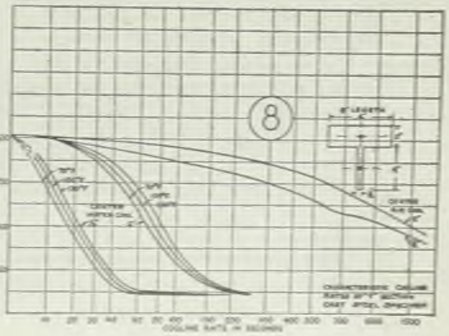
Fig. 8—Cooling rates of "T" section cast steel specimen

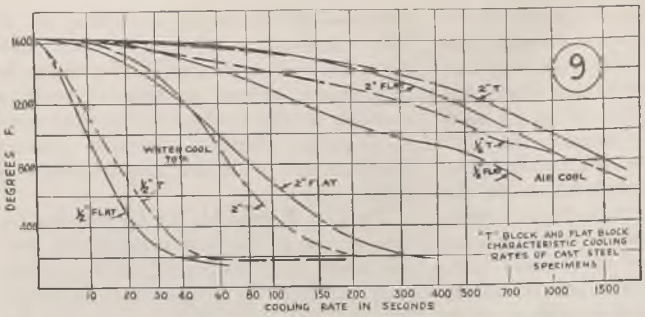
Proper loading of well cleaned castings, free of sand and excessive scale, in a furnace of suitable design, is the first requirement.

This holds regardless of the type of furnace, whether batch or continuous type. Castings should be so arranged that free circulation of gases is permitted around all sections so that uniform heat distribution is assured. Castings should follow the ambient furnace temperature with a small lag, the extent of which can be easily ascertained by thermocouples within the load and later by comparative observation. Typical thermal gradients upon heating of a 2 x 6 x 8-inch block of a nickel-chromium-molybdenum steel are shown in Fig. 3 as determined in a small









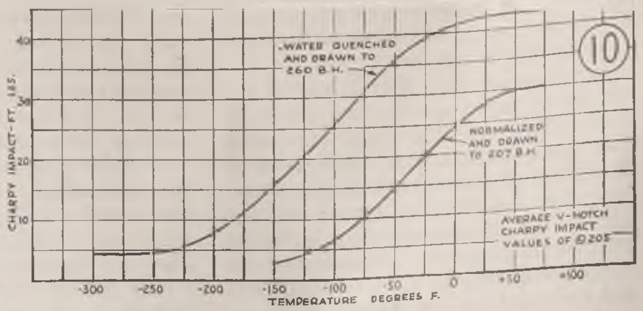


Fig. 9—T-block and flat block characteristic cooling rates of cast steel specimens

Fig. 10—Results of low temperature Charpy V-notch impact of a nickel-chromium-molybdenum cast steel

furnace at a moderately rapid heating rate.

Thermocouples were used for recording the three temperatures; i.e. first, that of the ambient furnace; second, the geometrical center of the piece; and third, 1/16-inch below the surface of the middle 6 x 8-inch face. Note the temperature lag at the critical point of 1365 degrees Fahr. Actual production furnace conditions will show similar temperature gradients within the castings, providing their placement permits ample hot gas circulation.

A typical example of production heat treatment is shown in Fig. 1. A car-type furnace is used with perforated heat resisting supports and four batch-type trays. The castings, when loaded in this manner, provide sufficient circulation of hot gases, so uniform temperatures are quickly obtained. Six thermocouples extend through the side walls into the charge, with multiple burners for adjustment and automatic oil fired control. With this type of control, uniform temperature distribution is obtained, time permitting, which closely approaches ±10 degrees Fahr., a factor of extreme importance in obtaining uniformity of product.

Austenization of Carbides First

With the proper type of furnace equipment and control, castings are heated for austenization or solution of the carbides at the selected temperature and time. (Under—or overheating leads to erratic results—and should be avoided). Water quenching is then in order, involving the transfer of castings from the furnace at temperature to the water quenching system before heat loss becomes excessive. The time involved for this transfer is an effective part of the successful hardening and should be accomplished quickly.

Fig. 2 shows the crane fixture for removing the tray loads and the immersing in a suitable quenching tank. The time involved for this transfer averages about 33 seconds, which does not result in an objectionable temperature loss.

The quenching equipment and tank, as shown in Fig. 2, are adequate to quench a complete furnace charge (16,000 pounds maximum) with a maximum temperature rise of 12 degrees Fahr. The quenching tank proper is of 7500-gallon capacity with a circulating system of 1000 gallons per minute, entering through a 6-inch pipe centered in the bottom of the tank pointing upwards, providing violent agitation of incoming water with its greatest concentration at the center bottom of the tray load of castings being quenched.

The water overflows through openings at the top of the tank to return to a 25,000-gallon reservoir, which is fed with incoming fresh water at 50 degrees Fahr. This system permits adjustment of water temperature and considerable flexibility of quenching operations.

Quenching tank water temperatures are indicated and recorded for control purposes. Water temperatures during quenching naturally increase with the hot water rising by convection and circulating forces.

Time quenching is an important factor in the successful heat treatment of steel castings.

1—Underquenching or slack-quenching results in incomplete hardening, which does not allow full development of the potential physical properties.

2—Overquenching, i.e. cooling too rapidly and/or to too low a temperature, quite often results in cracking due to the development of a brittle martensitic structure with high internal stresses. This is true of structures other than castings.

The above statements are based on the supposition that the analysis (hardenability) is appropriate for the sections involved and that the proper quenching temperature (cooling rate) consistent with that analysis is used.

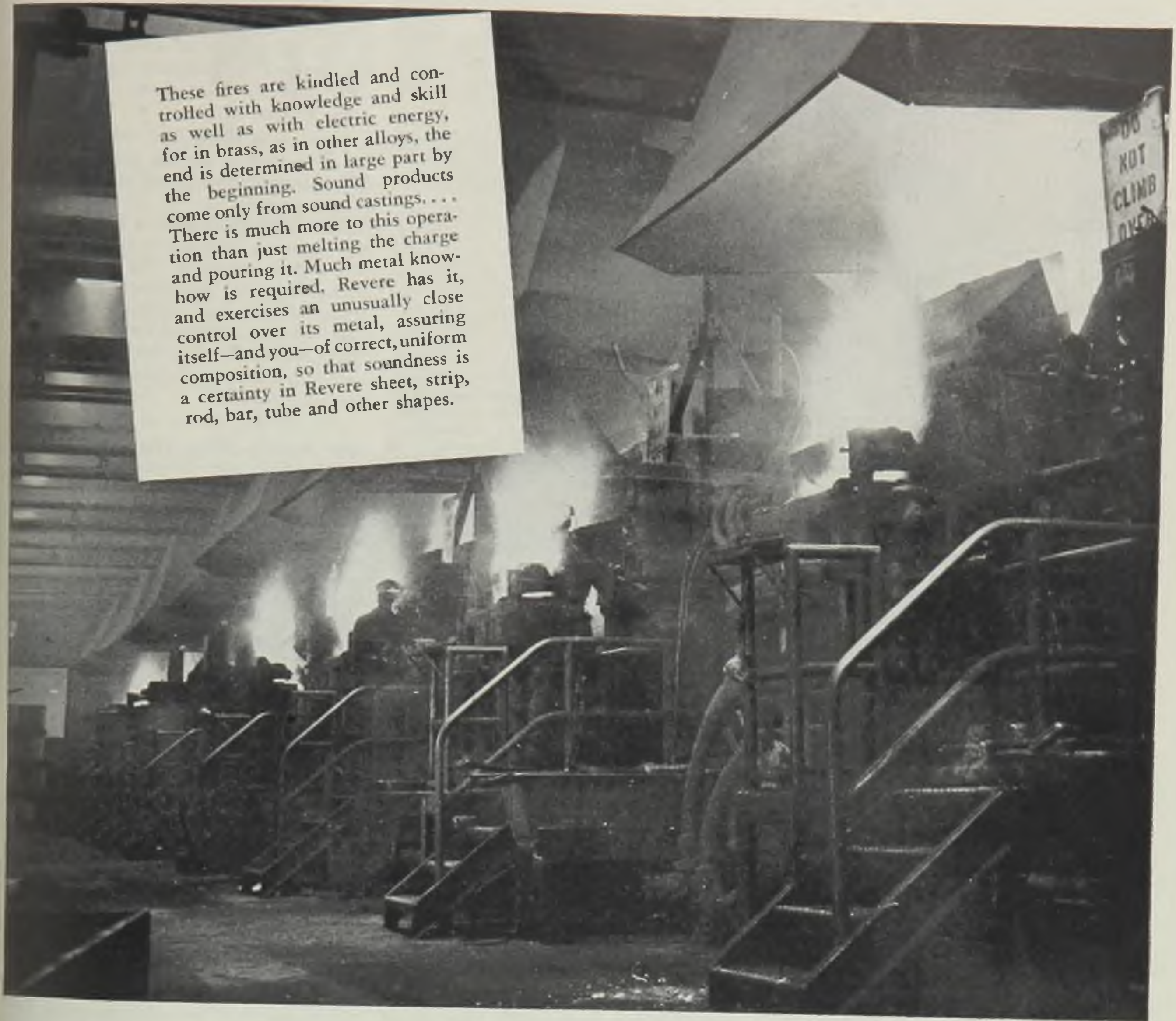
Predeterminations of hardenability by Jominy tests are helpful guides. Fig. 4 shows the hardenability of cast nickel-chromium-molybdenum steel with average analysis. The rate of cooling required can be estimated in various sections for the degree of hardness desired. For an average hardness of rockwell C 40 (Fig. 4), the cooling rate must be about 16 degrees Fahr. per second at 1300 degrees Fahr. in the center of a 1½-inch thick plate. The upper and lower dashed lines indicate the nominal hardness range with normal variables of analysis.

Laboratory cooling rates of cast steel plates of ½, 1 and 2-inch thicknesses were checked at 1/16-inch below the surface and at the geometrical center. Characteristic cooling rates were obtained in unagitated water with a maximum rise of 25 degrees Fahr. over the stated water quench temperature. These curves can not be compared with production operations with agitation, but they do exemplify the character of cooling rates. No attempt was made to prevent scaling during heating operations, to simulate production conditions; however, the specimens were shot blasted between quenching cycles.

Figs. 5, 6 and 7 represent tests of ½, 1

Fig. 11—Incorrect method of piling hollow cover castings for water quenching treatment

The Fires of War Burn Brightly at REVERE



THERE is something fine and genuine about brass, the major alloy of copper. By varying the proportions of its constituents, and through heat treatment, brass can be made to cover a wide range of physical characteristics, from soft to hard. Where ease of machining is a factor, Free Cutting Rod offers the advantage of less wear on tools and machines, greater output, greater accuracy, and a brilliantly smooth finished surface. When cold forming is employed, tempers can be adjusted to suit the requirements. Stamping, drawing, spinning and extrusion are some of the other manufacturing processes for which brass is ideal.

Questions arise at times concerning the selection and proper treatment of the correct alloy for a given process and product. In such cases, it is a pleasure for Revere to work closely with fabricators, furnishing technical advice and practical suggestions, without obligation.

Revere brass comes not only in the usual mill products, but also in forgings, extruded and drawn shapes. . . . Write for your complimentary copy of the 54-page manual, "Revere Copper and Copper Alloys—Technical Information for Product Designers." Contains detailed information on various brasses and other alloys, with 106 graphs, new chemical and physical properties chart, illustrated welding information, much other valuable data.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N.Y.

Revere mill products—sheet, strip, rod, bar, pipe, tube—are stocked by leading metal distributors.

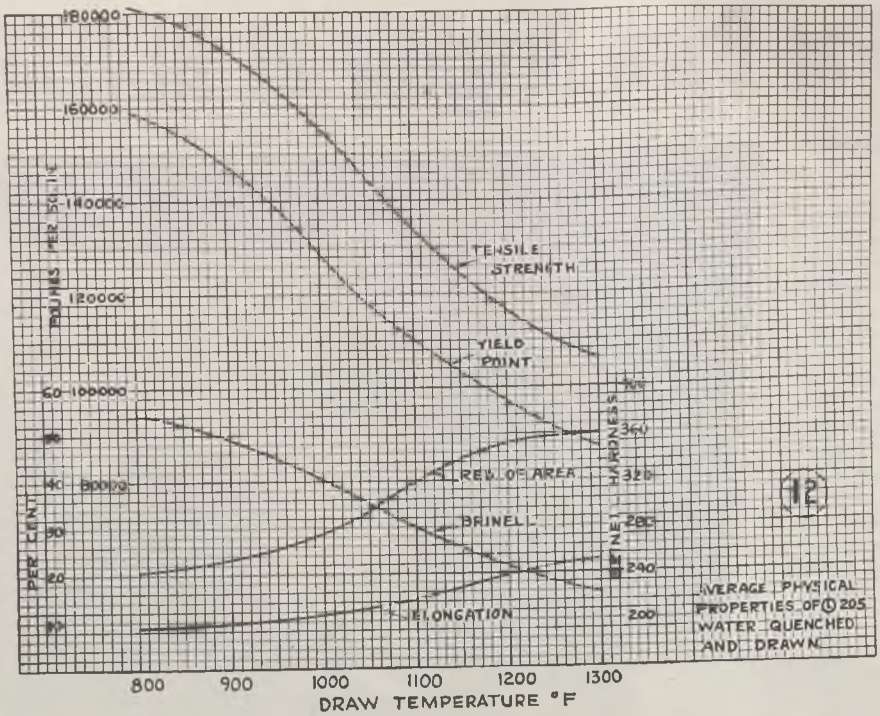


Fig. 12—Average physical properties of a nickel-chromium-molybdenum cast steel

and 2-inch thickness tests respectively, with unagitated water at 70, 100 and 130 degrees Fahr. for quenching. Also, cooling rates are included, using still air at 72 degrees Fahr.

Obviously, the cooler water resulted in more accelerated overall cooling rates through the most important temperature zones of 1300-700 degrees Fahr., for low alloy steels, due primarily to a shorter water vapor stage. The cooling rates of the three thickness blocks involved decrease in proportion to the increase of thickness in either air or water at the various temperatures. As would be expected, the lighter sections cool more rapidly with a relatively shorter vapor period.

Selection Based on Cooling Rates

With variables of mass, castings should be selected with approximately the same cooling rates for batch quenching, so that controlled time quenching may be practiced. If this is not followed, danger of underquenching or overquenching is probable. Likewise, castings are usually of nonuniform design with thin and heavy adjoining sections. These conditions add to the problems of heat treatment, since the lighter sections are often overquenched which may result in cracking.

Fig. 8 shows the relative characteristic cooling rates within a T-block with ½ and 2-inch sections. Heat conduction from the 2-inch mass through the ½-inch mass during the water quenching aids the heat treater by helping to maintain some heat in the lighter section and also increase the cooling rate of the heavier section. Fig. 9 covers comparative cooling rates of similar thickness blocks with those of the T-section.

When the quenching of nonuniform sectioned castings is required, controlled time-quenching becomes more important so that satisfactory hardening can be accomplished in the heavier sections without cracking of the lighter ones. The time can often be ascertained with the use of "tempil" sticks, by quenching the heavy sections to about 500 degrees Fahr. (depending on alloy contents) so some temperature remains in the lighter and cooler sections to prevent cracking. The designer should make an attempt to prevent large differences to exist in section thickness of castings to be liquid quenched.

After quenching for hardening, it is good practice to place the castings quickly in a suitable draw furnace. Quenched castings are in a brittle-martensitic and stressed state and lose ductility rapidly after cooling from 300 degrees Fahr. Convection or recirculation types of draw furnaces are desirable.

This furnace utilizes car-type loads of castings which have previously received quenching treatments. With this type of recirculation, draw furnace temperatures may be accurately controlled to ±5 degrees Fahr. even at 800 degrees Fahr.

Temperature Control Vital

The accurate control of low temperature draw furnaces is of extreme importance when a narrow range of physical properties is specified. Fig. 12 shows the average physical properties obtainable with a nickel-chromium-molybdenum steel, which change rapidly with draw temperature ranges from 900 to 1150 degrees Fahr. where 25 degrees Fahr. difference in temperature could easily amount to 6000 pounds per square inch in tensile values. These results are from coupons 1¼-inch square.

The advantage of water quenching of steel castings is reflected by increased physical properties. The effectiveness of the heat treatment process should be rigidly checked by physical methods such as tensile, brinell or other methods. Fig. 10 shows the average low temperature Charpy V-notch impact results. Evidence of the advantages of water quenching and drawing in increased impact resistance over the normalized and drawn states is apparent.

It has been shown that water quenching of small steel castings can be successfully accomplished. There are limitations to the process, one of which is water vapors. Castings should not be loaded for quenching so that the steam may form and become pocketed. Fig. 11 shows a wrong, however convenient, method of piling hollow cover castings which obviously results in trapped steam that effectively retards the quenching rate. Hardness inspection clearly segregates poorly hardened material.

The limiting factors in the successful application of water quenching of small steel castings may be summarized as follows:

The use of heat treatment furnaces of uniform temperature and adequate heat control. Prompt transfer from the furnace at quenching temperatures to the water. Water quench with known rates of cooling (temperature of water and velocity), to avoid vapor pockets. Time-temperature quench for mass and irregular sections involved. Draw without delay.

Standard for Oil-Fired Floor Furnaces Approved

Commercial Standard CS113-44 for oil-burning floor furnaces equipped with pot-type vaporizing burners has been promulgated by the National Bureau of Standards of the Department of Commerce at the instance of the Standards Section, Consumer Section, Office of Price Administration and approved by those manufacturers, distributors and others interested in such equipment. The standard is effective for new production from Feb. 17, 1944.

The new code applies to oil-fired, flue-connected floor furnaces equipped with vaporizing pot-type burners with or without mechanical draft or forced circulation, either manually or automatically controlled, and includes the following sections:

General requirements (safety, durability, dependability, rating, efficiency and operating instructions); design and construction; performance; laboratory test code; publication of furnace ratings; informative labeling; guarantees; general installation requirements; sizing; placement and venting.

—o—

Co-ordinated unit substations available in all standard ratings are discussed in a new 25-page booklet issued by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

DIECASTING DIGEST

Pre-Fill Injection System for Eliminating Porosity in Aluminum, Brass and Magnesium Die Castings

Porosity is caused by (a) entrapped air and gases, and (b) shrinkage voids. It can be controlled and eliminated by:

(1) Slow injection velocity, as slow as chilling of metal and thickness of casting section will permit. This gives air a chance to escape ahead of the metal.

(2) High final injection pressure on the metal as it chills.

This reduces volume of entrapped air and prevents formation of shrinkage voids. In the past, injection velocity and final pressure have been controlled and energized by air or nitrogen filled accumulator bottle systems. Such pressure vessels, containing hot oil and air or nitrogen, are dangerous; serious accidents have occurred. Their use is expensive, due to leakage and absorption of the air or nitrogen. The accumulator shoots the metal into the die at high velocity (sealing off escape of air) but has little energy left for applying pressure at the end of the stroke.

The recently developed Lester pre-fill system eliminates the necessity for accumulator bottles, provides high final injection pressures, and gives the die caster controlled injection velocity. This injection system consists of a hydraulic cylinder fitted with a large actuating piston, the hollow piston rod of which contains a passageway to a smaller inner fixed piston. Oil under 1000 psi hydraulic pressure is introduced through the hollow piston rod, displacing at high velocity the small piston opposing it, which piston also carries with it in its forward movement the piston rod and the attached main or large piston.

As the latter moves forward, oil flows by gravity from a vertical storage tank through the pre-fill check valve to occupy the space back of the large piston. When the die cavities have been filled, 2000 psi oil pressure from a booster pump is applied directly to both pistons, resulting in high sustained final pressure which packs the metal into the die. When the injection piston reverses, the oil is returned to the gravity tank.

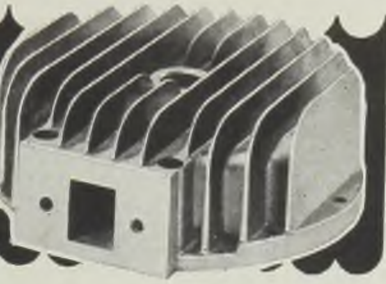
This principle has been used on hydraulic press rams for years, but its application to die casting is new.

Advantages are:

Injection speeds can be lower or higher and final injection pressure can be much higher — up to 33,000 psi or more, producing castings relatively free of porosity and capable of passing X-ray inspection. Both speed and pressure can be controlled independently, and are constant and uniform.

Lower operating costs are realized, better castings are made for less money, and the serious hazard of accumulator explosion is completely eliminated.

COOLER AIR for NAVY DIVERS



. . . because this air compressor head* was die cast on a LESTER-PHOENIX!

Here's a good example of product improvement through proper die casting procedure:

Made on a Lester-Phoenix HHP3X die casting machine with pre-fill injection system (note special cylinder on machine below), this aluminum alloy casting has thinner fins and more of them, for greater radiation area and greater cooling effect. Its smooth surface likewise improves radiation, and its solid structure provides better heat flow. Super-pressure slow-squeeze injection gives it the strength to resist rough handling and the smooth-surfaced density to resist salt corrosion.

The Lester-Phoenix machine not only makes a better casting, but produces it 10 times as fast as sand casting can make it, at 1/3 of the cost! For more information, write:

LESTER-PHOENIX, INC.
2629 Church Avenue
Cleveland 13, Ohio

**Cast by The New Products Corp., Benton Harbor, Mich. for The Defiance Alloyed Products Co., Defiance, Ohio.*

WRITE TODAY!

Send for this well illustrated 8-page book on die casting and die casting equipment.

LESTER-PHOENIX
DIE CASTING MACHINES

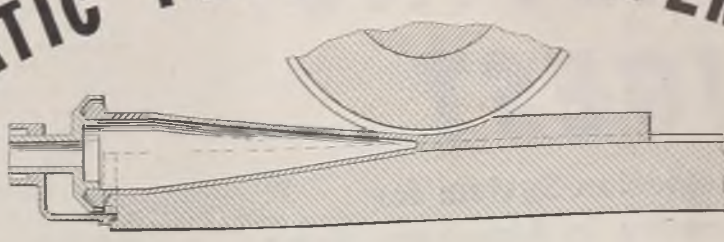
Sound Die Castings for Aircraft

If you are interested in making denser, stronger die castings which will

pass X-ray inspection, send for this article by Herbert Chase, reprinted from *Iron Age*.—Lester-Phoenix, Inc., 2629 Church Ave., Cleveland 13, Ohio.

BIBLIOTEKA POLITECHNIKI ŚLĄSKIEJ

AUTOMATIC PRECISION TAPER ROLLING



By JOHN W. SMITH

John W. Smith Laboratories
Philadelphia

AS A MEMBER of the National Advisory Committee for Aeronautics during the first world war, I saw that future progress in aeronautics would demand metal propeller blades.

It now is only a matter of history how my research engineering established the proper metal distribution in hollow steel propeller blades for the U. S. Army Air Force at McCook Field, Dayton, O. This was accomplished by machining seamless steel tubing to the required wall thickness from the root to tip and the government presented me with a citation for this achievement.

In 1920, I designed the automatic rolling mill to eliminate machining of tapered sections such as propeller blades. However, the propeller industry would not provide the investment for the equipment at the time. Therefore, from a financial standpoint, it was necessary for me to transfer my research data on blades to taper-rolling steel disks for automobile wheels.

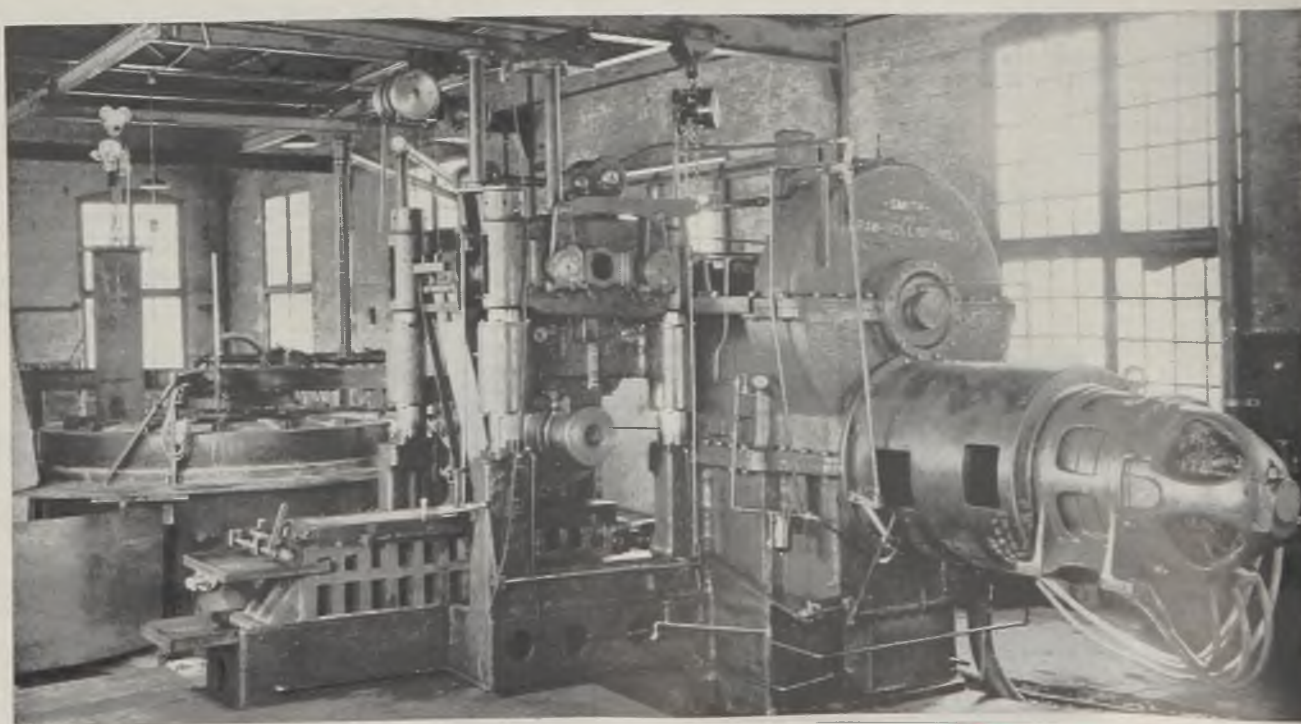
In 1923, my first automatic rolling mill was placed in operation, turning out nine taper-rolled disks per minute. Production of taper-rolled disk wheels increased from 50,000 per month to 260,000 per month in 1943. All truck wheels are made by this process as were a large percentage of passenger car wheels prior to the war.

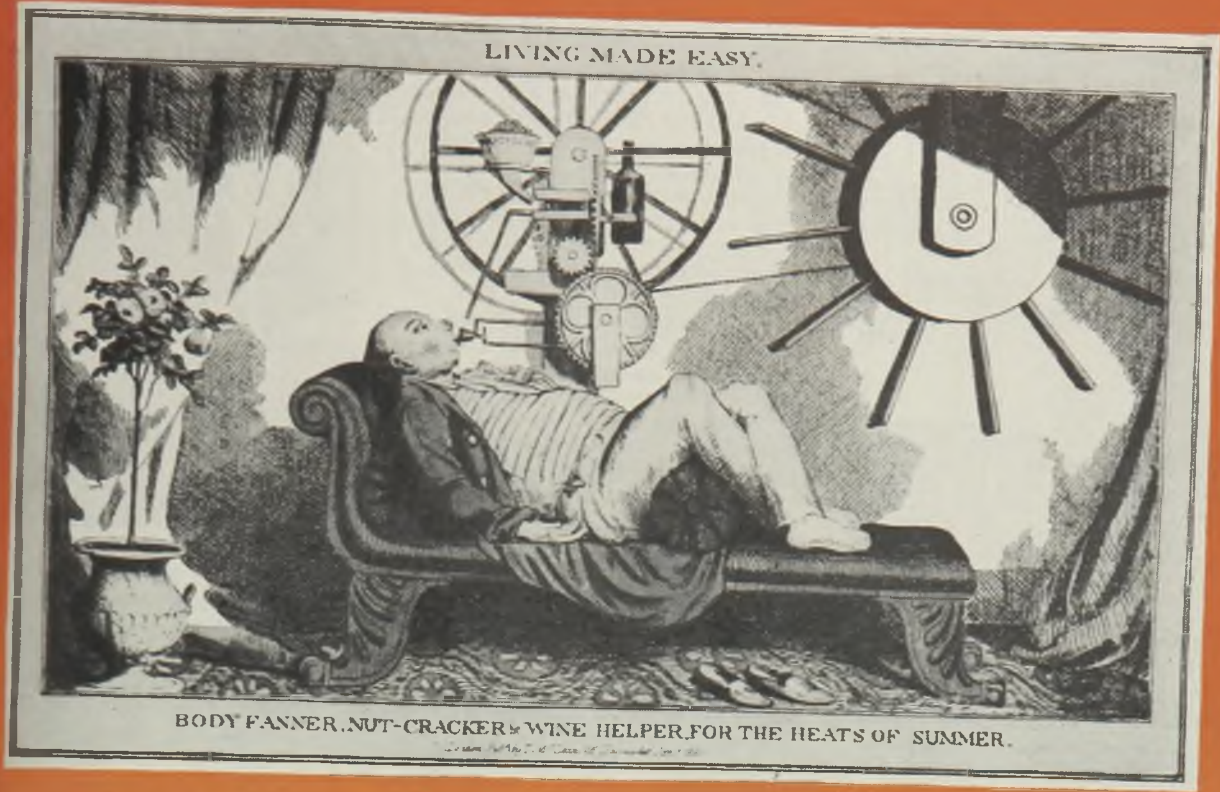
How long will it take for industry to adopt automatic precision die rolling for propeller blades and the like?

For the past 20 years, rolling mill engineers have tried out various forms of conventional 2-roll equipment in the fabrication of steel and aluminum alloy propeller blades. So far, no method has been developed with this conventional equipment whereby blades may be rolled to the exact dimensions required. For instance, one company now is taper rolling 0.6-inch plate to 0.13-inch but the difference between 0.13-inch and 0.056-inch must be machined off at the thin end. The setup employed was described recently as follows:

"The old crew had grown gray in service and the old band mill was nothing much to look at. But they hoisted it out of the bone yard, erected it where it had stood a dozen years before. Then they made the changes in the mill which the new rolling method dictated. No time had been wasted in waiting for new machinery to be built. None was needed to break in new men. The veteran hand mill crew took over. The plates are of about the same length and width as those made under the conventional method. They are 0.6 of an inch thick at one end point, but only 0.13 of an inch at the other. The total weight of the taper-rolled plate is approximately half that of the uniformly thick plate from which steel propellers used to be made. Under the old method, half the steel had to be machined

Fig. 1—Each billet to be taper rolled has a special hanger attached and is heated in the furnace at the left. The hanger engages an automatic loader which may be seen in an upright position in front of the machine. After the billet is in position, the operator presses a button and the balance of the operation is completed automatically. The loader drops the billet on a die supported by a flat-bed arrangement which is reciprocated rapidly under the single roll. Note that the motor is supported only by the machine base





THE BETTMANN ARCHIVE

MIDSUMMER DAY'S DREAM

For centuries sweating men have talked of doing something about summer weather and have dreamed of ideas for tempering its discomforts. In the early eighteen hundreds George Cruikshank, master of ridicule, took this satirical swing at the "air-conditioning" dreams of his contemporaries.

Today air conditioning is an accomplished fact. And manufacturers plan that, after the war is won, every American homeowner may be independent of climate, wherever he lives.

All progressive manufacturers are planning, but, unlike the picture making dreamers of other days, modern manufacturers can get *their* dreams into production. For today a modern machine tool industry is working with them, planning the tools that will get inventions and designs into the homes of American people . . . quickly and economically.

Jones & Lamson engineers are at your service, as they have been for more than a century, to help you turn today's plans into tomorrow's realities.

Jones & Lamson Saddle Type Universal Turret Lathe

The versatility of Jones & Lamson Universal Turret Lathes and their high precision and high production are vital to America's industries—they will be of great economic advantage to all metal working manufacturers in the competition of tomorrow.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U. S. A.

Profit-producing Machine Tools

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

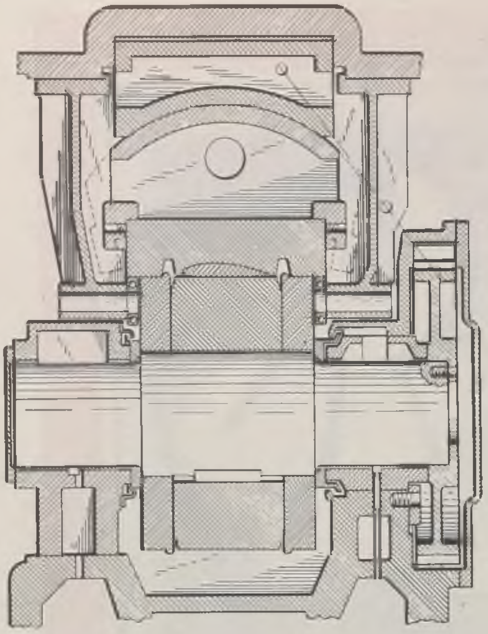


Fig. 2—This cross-sectional diagram shows the method for rolling the pitch and controlling metal distribution in irregular shapes, in this case a propeller blade. Both the die and the roller are machined to the contours required

away, sent to the scrap pile as shavings."

In the rolling of steel or aluminum to irregular shapes such as propeller blades, the rolling mill engineer has been handicapped so far by lack of the right type of precision equipment. The automatic, flying micrometer for precision rolling of sheets cannot be applied to taper or die cavity. The system of passing the metal through a succession of rolls for multiple pass production also cannot be adopted.

The automatic rolling mill employs the gaging rollers as shown in Fig. 2 and a system of automatic stops similar to the system used in hydraulic pressing. The mill exerts enough pressure to precision die roll the airfoil zone to the required unit weight. This cannot be done by forging.

In 1941, the supply of alloy steel employed in the construction of aeronautical power plants and the like was receiving serious attention. On investigation I found in one case over $200,000 worth of alloy steel per month could be saved by taper rolling. To save the steel, I introduced automatic rolling in place of machining.

The contract was signed March 5, 1942 and in April, 1942 the first taper rolled plates came off the 45-ton automatic mill, shown in Fig. 1, which has a pressure loading of up to 2,000,000 pounds. Its fluctuating horsepower in rolling is from 100 to 400 horsepower.

The rolling time was 12 seconds for three passes per plate. Fig. 1 shows in the foreground the automatic rolling mill as used in taper rolling the first 400 skelps meeting the specifications agreed to in the contract.

The loader drops the billet to a horizontal position on a die and then is given the number of passes required to obtain the tolerance specified. The mill will repeat the number of passes necessary with precision registration at a predetermined reduction with the proper distribution of metal at each station. Rolling time per pass for a standard blade is about 3 seconds and dimensions are held within plus or minus 0.002-inch. About 80 pieces may be rolled per hour. The machine rolls the pitch and controls metal distribution in the airfoil zone. The contours of the roll and the die provide the finished shape of the blade or rolled skelp without subsequent machining.

History will show how the highly developed automotive industry was remodeled into the aeronautical industry by the bureaucratic system of exploiting

Fig. 3—The automatic mill employs the principles involved in the equipment developed by the author for taper rolling disk wheels and widely used by the automotive industry. This machine turns out nine disks per minute

an industry which had been built up b industrial competition and competitiv labor.

The experience of the author in con ducting a research laboratory for a perioc of over 30 years in applied science ha taught the author we lost the struggl for industrial supremacy when we elimi nated competitive industry and competi tive labor. Industrial expansion in th postwar period cannot be expanded b the cost-plus system or the bureaucrati system. Cost-plus and the declaratio of earned capital as surplus profit hav made it virtually impossible to adop new processes.

New Catalog Lists Many Types of Speed Reducers

A 376-page catalog covering speed reducing transmissions of various types has been made available by D. O. James Mfg. Co., 1140 West Monroe street, Chicago 7, to aid customers and other firms with speed reduction problems. Catalog number is 1000R.

The following types of gear reducing transmissions are included:

—Continuous tooth herringbone gear type, with ratio range of 2/350:1 and from 0.63 to 1230 horsepower

—Planetary gear speed reducers, with ratio range of 10/1200:1 and from ¾ to 75 horsepower

—Right-angle spiral bevel gear type, with ratio range of 1/6:1 and from 0.3 to 275 horsepower

—Right-angle spiral bevel herringbone type, with ratios of 6 to 44:1 and from 1/2 to 260 horsepower

—Right-angle spiral bevel planetary type, with ratios of 8 to 1100:1 and from ¾ to 75 horsepower

—Worm gear reducers, Type "H"; ratios of 6 to 65:1 and from 1/32 to 145 horsepower

—Worm gear reducers, Type "M"; ratios of 8.5 to 240:1 and from 0.01 to 42 horsepower

—Helical worm gear type; ratios of 60 to 240:1 and horsepower from ¼ to 66

—Double worm gear type; ratios of 150 to 8100:1 and from ⅛ to 50 horsepower

—Combination vertical worm gear and spur gear type, with ratio range of 47.5 to 290:1 and from 0.15 to 9 horsepower

—Motorized worm gear type, with ratio range of 6 to 65:1; driven speeds from 310 to 25 revolutions per minute and from ⅛ to 30 horsepower

—Motorized gear speed type; ratios of 1.25 to 1200:1 and driven speeds from 1458 to 0.74 revolutions per minute and from ¾ to 75 horsepower.

Date Set for Enameled Steel Tank Standard

Effective for new production fro July 1, 1944, Commercial Standar CS115-44 for the guidance of manufac turers, distributors, retailers and use of domestic-type porcelain enamele tanks has been issued by the Departme of Commerce, National Bureau of Stan ards. Purpose is to establish standar specifications and methods of test as line of demarcation between satisfac tory and unsatisfactory porcelain enam eled tanks in sizes from 15 to 80 ga lons inclusive. Standard requires max mum hydrostatic test pressure of 30 pounds per square inch.

General requirements—such as natur and thickness of base metal, enameling storage capacity and working pressur ratings, sizes, fittings and inspection— are covered. A more elaborate sectio devoted to methods of test and certifica tion is included.

FREE BOOK tells how to be sure your extinguishers are ready!

Your fire extinguishers are *first aid* equipment. They must be ready to nip fires quickly — and that means they must be in top form *at all times*. Regular inspection is the only sure way to keep them in condition.

The booklet shown here has just been issued by Walter Kidde & Company to help you set up a fire extinguisher maintenance system. It covers all types of equipment, gives *specific* instructions. Write for your copy of this free booklet today!

Kidde

WALTER KIDDE & COMPANY, INC., 140 CEDAR STREET, NEW YORK 6, N. Y.

Sponge iron has definite place in postwar picture

Chief of metals and minerals unit says its use will be a "must" in making special grades of both carbon and alloy steels since dilution of scrap with alloying elements makes it necessary for steel producers to use more virgin materials to "get houses in order". Expects sponge iron will be made available in tonnages comparable to ferroalloys

By WALTER A. JANSSEN
Chief, Metals and Minerals Unit
Bureau of Foreign and Domestic Commerce
Washington

SPONGE IRON does have a definite place in the metallurgical scheme of things. Indeed, the puzzling problems that have beset the iron and steel industry during wartime serve to emphasize this fact.

But how large and important a place will sponge iron occupy in the postwar period? Only time, experience, and a better understanding and co-ordination of thermodynamic and economic balance sheets can determine the future tonnage-wise position of this commodity.

This declaration is neither as involved nor as all-inclusive as those made by proponents of sponge iron and direct metal processes. These enthusiasts have long argued that their adoption would eliminate the pig iron stage and the modern blast furnace, which is a unit of high thermal efficiency and productive capacity with low operating costs.

Sponge iron is produced by converting or reducing finely divided iron ore to metallic iron. In the process, most of the gangue is removed without melting either the ore or the reduced product.

As its name implies, it is a sponge-like form of metallic iron intimately mixed or combined with such impurities as silica, alumina, sulphur, and phosphorus originally present in the ore. A particle of sponge iron has the same general shape and size as the particle of ore from which it was reduced, but because of the removal of oxygen from the oxide, it is much more porous than the ore.

The particles may become agglomerated into masses which vary in size and shape according to the method of reduction used and providing the temperature is sufficient to permit the reduced iron to weld or ball together.

Finely divided ore is heated to below the fusion temperature, out of contact with air, and subjected to reducing conditions that remove oxygen from iron. In some processes, pulverized charcoal, coal or coke is mixed with finely divided ore. In others, a reducing gas, or gases, is passed through the ore.

Under suitable reducing conditions, sponge iron can be produced quite readily at 900 degrees Cent. And after cooling it can be magnetically separated from a large part of the associated impurities present in the original form.

From this brief description it is readily seen that the direct process of reducing the ore results in an iron of high purity and malleability. Nor is the sponge iron process new.

The first iron weapons were hammered out of masses of meteoric iron. But later, probably even before the period of accurate history, man had discovered how to reduce iron from its ores by heating it with charcoal.

An early reference to sponge iron is found in the writings of Siculus in the fourth century B. C., in which appears—"pieces of ironstone having been changed by the heat of the fire into lumps of iron resembling great sponges."

We know, too, that the famous blades of Damascus, Syria, and the equally famed steels of Toledo, Spain, and the Delhi iron column in India were all forged from virgin metal produced directly from certain iron ores.

As to methods, records tell us that the ancients charged finely divided ore into a crude furnace or pit hearth. They used charcoal which served a threefold purpose: (1) as the fuel, (2) as a reducing agent, and (3) as a protection to shield the reduced metal from the oxidizing influences of the air surrounding it.

The charge was brought to a sufficient temperature to soften the reduced iron. The resulting mass then either gathered as particles or coalesced to form a bloom in a pasty or liquid slag at the bottom of the furnace or pit. The bloom was removed. Then through subsequent heating and hammering it was freed of adhering slag and was formed into bars and other shapes.

In later types of these early bloomery furnaces, combustion of the charcoal and resulting endothermic reactions were accelerated and expedited by a blast of air supplied by a bellows made of skins. Progress continued and in A. D. 1640 there was invented in Italy a blast produced by a water blower or trompe, which supplied aspirated air throug

Out of these small catalan forges, furnaces of larger capacity and of the shaft type were developed. However, the blooms produced, instead of being carbon free or nearly so, were a low-carbon steel directly reduced from the ore without melting.

It was only when the height of the furnace shaft was further increased that the reduced iron fused and absorbed more and more carbon, thus lowering its fusion point, and molten iron was produced.

The production of pig iron in the blast furnace consists essentially of a progressive reduction of the iron oxide to sponge iron in the cooler planes of the shaft. This is followed without interruption by a melting and slag formation in the bosh and hearth zones of higher temperatures.

So long as charcoal and cold blast were used, the pig iron was still considered to be a superior metal, even though less pure than the carbon-free sponge iron. But when these shaft furnaces grew to be even larger, both in height and girth, hot blast was introduced and the fuel used was first anthracite and later coke. Then more and more impurities were absorbed by the pig iron.

As pig iron is the intermediate from which all ferrous products are produced, so is the blast furnace the intermediate step in the development from ancient direct to the modern indirect processes for steelmaking.

Indeed, the removal of the carbon, silicon, sulphur, and phosphorus from pig iron and steel made from pig iron and scrap has been the test extraordinary of the steel industry.

Wrought iron, bessemer, open-hearth, and electric furnace steels are examples of indirect processes that have followed the blast furnace. All are adapted to large tonnage product units.

What are the results of such progress? The "march of time" in the iron and steel industry reveals a metamorphosis from pure iron to low-carbon steel, through high-carbon pig iron, and then back to less pure wrought iron and steel. It is the price which mass production has entailed. It is measured principally by the planned introduction of carbon, which is followed by the planned elimination of it.

Therefore, it is only natural that the ease with which iron ore can be reduced and a pure, or nearly carbon-free, malleable iron produced direct from the ore should be an attractive field for investigation by inventors and metallurgists. In fact, many attempts have been made by them to design a process capable of accomplishing in a single operation the same results obtained by blast furnaces and some one or more of the steel-refining processes.

To these men, it did not seem logical, reasonable, or economical to deliberately

(*Please turn to Page* 145)

Sound the Alert!

MANAGEMENT • LABOR

—for the 5th War Loan drive during June and July. The need for the 5th War Loan is immediate, crucial. For impending events may make the 5th the supreme financial effort of the war.

The U. S. Treasury has set the overall goal at $16,000,000,000 — $6,000,000,000 from individuals alone. This is the biggest sum ever asked of the American people—*and it must be raised.*

That's why the U. S. Treasury asks Management and Labor to sit down together and organize—NOW!

For organization—good organization—has been responsible for the excellent showing of the payroll market. And its most important single superiority has been personal solicitation—desk to desk, bench to bench, machine to machine personal solicitation. 71% of all persons on payroll deductions were solicited for the 4th War Loan.

Now, to personal solicitation, add the sales incentive of a definitely established plant quota. Build your campaign around a quota plan. Set up departmental goals. Stress percentage of participation figures. Stimulate group enthusiasm.

In planning your quota campaign, work in close cooperation with the Chairman of your War Finance Committee. Everything is set to make the 5th War Loan drive a huge success—with your help!

(Note: You've read this message. If it doesn't apply to you please see that it reaches the *one* person who can put it in action!)

Here's the Quota Plan:

1. Plant quotas are to be established on the basis of an *average* $100 *cash* (not maturity value) purchase per employee.
2. Regular Payroll Savings deductions made during the drive accounting period will be credited toward the plant quota.
3. 90% of the employees are expected to contribute toward raising the cash quota by buying extra 5th War Loan Bonds: 1—Outright by cash. 2—By extra installment deductions. 3—By extra installment deductions plus cash.

Example: **JOHN DOE Mfg. Co.** — 1,000 Employees

1,000 employees x $100	=	$100,000 Cash Quota
Regular Payroll deductions during the eight weekly payroll Accounting Periods of June and July		30,000
		$70,000 (to be raised by sales of extra Bonds to at least 900 employees)

ORGANIZE • SOLICIT • DELIVER

5TH WAR LOAN

The Treasury Department acknowledges with appreciation the publication of this message by

STEEL

★ ★ *This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.* ★ ★

Use it up . . .

That's the thing to do in wartime. Eat every bite of food, save every scrap of soap, make a patriotic habit of stretching all the supplies in the house so they go further, last longer.

Wear it out . . .

This year old coats, old shoes, are a badge of honor. They show you're sensible enough to know that one way to help win the war, to keep prices down, is to wear your old things out!

Make it do . . .

Before you spend a penny in wartime, ask yourself, "Do I really need this? Or do I have something now that will do?" As you patch and darn and turn, you're keeping prices down.

or do without!

When you put your money in War Bonds, savings, taxes, insurance—you're putting your money to work fighting the war and building a sound, stable nation for the peace to come.

It's your money you're saving when you help keep prices down. For it's buying too much when there's too little to buy that sends prices up. And when prices go up—and keep going up—your savings, your future, are in danger.

How can you help keep prices down?

By never spending a thin dime you could turn into a War Stamp. By thinking twice—and thinking "No"—at every urge to open your purse.

By wearing old things out, making makeshifts do. Remember, it's the things you *don't* buy that keep prices down!

See that prices go no higher . . . Be a saver—not a Buyer!

HELP US KEEP PRICES DOWN

A United States war message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.

Fundamentals of INDUSTRIAL ELECTRONICS

The electronic heater is discussed in the eighth and final article of Mr. Chute's series. Induction long used in industry in lower frequencies but more recent applications require power above 400,000 cycles per second. Previous articles covered use of electronics in motor controls, photoelectric relays, welding equipment and the like

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

THE ELECTRONIC heater is a tube-operated industrial-heating equipment which produces results that cannot be duplicated in any other way; it converts ordinary 60-cycle power into alternating current of such high frequency (550,000 cycles per second) that this electricity can heat objects in ways not possible at lower frequencies.

Induction heating has long been known and practiced, using power at 1000 cycles or less. In recent years motor-generator sets produce up to 15,000 cycles per second for this purpose; spark gaps further increase the range to perhaps 200,000 cycles. However, many recent developments in induction heating require power at frequencies above 400,000 cycles per second; such power can be supplied only by means of electron tubes.

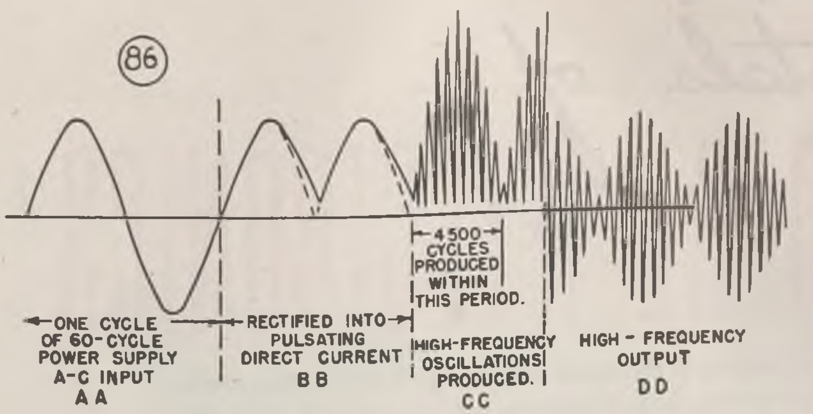
The high-frequency power output of the electronic-heater cabinet is fed by a pair of external leads to a load coil of several turns, fitted closely around the piece to be heated. The turns of this coil act as the primary of a transformer, while the workpiece of metal is the secondary of this transformer. Current from the electronic heater circuit, flowing through the turns of the load coil, causes a corresponding current to circulate within the work metal and produce heat inside the metal. Because of the high frequency, this current tends to flow mostly in the outside portions of the metal (because of "skin effect"), concentrating heat at desired portions.

Starting with the 60-cycle input, the electric power is first changed into a form of direct current before it is finally converted into high-frequency alternating current. These successive steps are shown in Fig. 86, which also indicates the point in the circuit where these various wave shapes are likely to appear.

A simplified circuit diagram of the electronic heater appears in Fig. 87. Here the 60-cycle power enters through transformer T1 which supplies about 2500 volts at AA. (This voltage may be reduced in several steps by a tapped auto-transformer, not shown.) This alternating current supply is rectified by tubes 5, 6, 7 and 8 as shown later, so that the voltage at BB is always in one direction, although still pulsating 120 times per second. At CC the oscillator tube 1 adds its high-frequency effect, producing a fluctuation or "ripple" in the BB voltage.

Notice that tube 1 oscillates so rap-

Operator is shown placing a small gear in a fixture preparatory to inductive heating for surface hardening, using a 15-kilowatt electronic heater



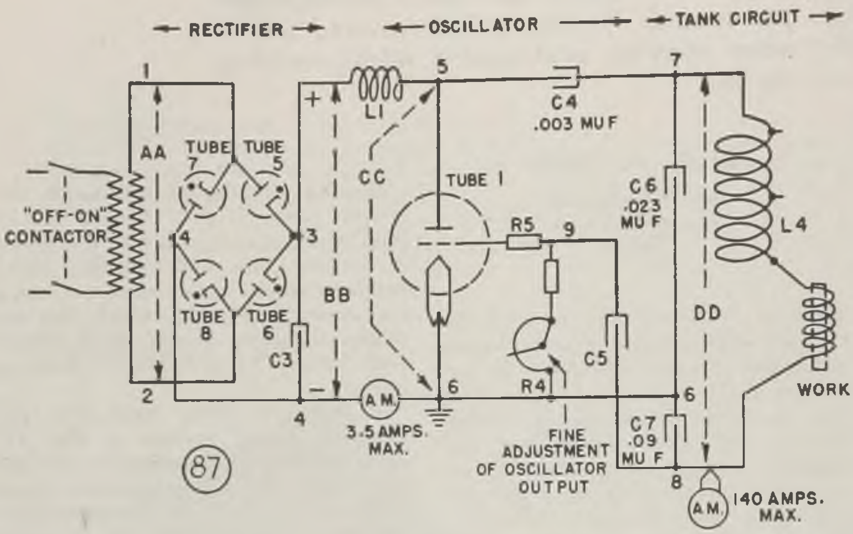


Fig. 86—Steps in converting ... cycle alternating current into high-frequency alternating current

Fig. 87—Simplified circuit diagram of the electronic heater

idly that it converts each of the BB waves into more than 4500 ripples or alternations. The resulting output DD is a voltage having 550,000 complete alternations each second. We may disregard the periodic 120-cycle variation of this voltage. Later, while we learn how the oscillator tube 1 operates, we will assume that the voltage BB is held constant at its average value of about 2250 volts; the resulting high-frequency voltage DD will therefore be considered constant in amplitude.

Tube 1 is the only oscillator tube shown in Fig. 87. Four such tubes are included in the 5-kilowatt (output) rating of electronic heater; the 15-kilowatt unit uses two tubes of greater rating. Such tubes are connected in parallel and operate as a group; therefore we may select only one tube to represent this group in the simplified circuit.

The portion at the right in Fig. 87 is known as the "tank circuit"; it includes those capacitors (C6 and C7) and inductances (L4 and the work coil) which control and determine the output frequency of the oscillator tube. As shown later, a large alternating current circulates within this tank circuit at 550,000 cycles per second, and is quite separate from the current flowing in the oscillator and rectifier tubes.

There are many forms of oscillator circuit. That of the electronic heater, using two capacitor groups (C6, C7) and a single continuous inductance (L and work combined), is known as a Colpitts circuit.

The Rectifier

In Fig. 87, tubes 5, 6, 7 and 8 form a rectifier of the full-wave bridge type, operating from a single phase of the 60-cycle power supply. Each of these tubes is a vapor-filled half-wave rectifier; that is, it permits large current to flow, but only when its anode is more positive than its cathode; it has no grid to control or limit this current flow. It is a heated tube, requiring that its filament be heated at least five minutes before attempting to pass anode current; any time thereafter these rectifier tubes supply current to the oscillator load as soon as the "off-on" contactor closes. (Notice in Fig. 87 that the tube filaments are not shown in detail, nor the transformers which supply the low voltage for these filaments. Such details add nothing to the operation or understanding of the circuit in general.)

Now let us trace the current flow in the rectifier circuit. When point 1 is positive, current flows through tube 5 to point 3, through L1 to the oscillator circuit; current returns to point 4, and through tube 8 to point 2, the other side of the transformer. Notice that current flows from 3 toward 4 in the load circuit. Notice also that tubes 5 and 8 operate in series; each tube is subjected to only half of the high voltage AA.

Similarly, when point 2 is positive current cannot flow in the reverse di rection through the same path as be fore, for the tubes themselves preven such reverse flow. Instead, current now flows from point 2 through tube 6 t point 3, through L1 to the oscillator current returns to point 4, through tub 7 to point 1. Notice that the curren still flows from 3 towards 4, demo strating the rectifying action of the tub in this bridge circuit.

Having seen how this pulsating bu unidirectional voltage is produced a BB, we are now ready to discuss th oscillator circuit. But first let us see ho a vacuum tube, like oscillator tube will respond to the potential at its gri its anode current increases gradually its grid potential becomes more positiv

Vacuum-Tube Operation

If a vacuum tube is connected, as i Fig. 88, the amount of direct curre flowing in the tube and the primar of transformer T will depend upon th voltage V applied between the gri and cathode. The operation of such tube is shown in Fig. 89; here we se that, with 2000 volts of direct curre applied between anode and cathod more than one ampere flows if the gri voltage is zero (as if the grid is co nected to the cathode). If the grid made 100 volts more positive than th cathode, the tube permits 3 amperes flow. However, when the grid is mad more negative than the cathode, th tube current decreases; a grid voltage —100 volts can prevent all current flo

At V in Fig. 88, suppose we apply 11 volts, 60 cycles, as from a wall outle The grid of the vacuum tube no changes from positive to negative positive 60 times each second; as show in Fig. 90, this causes the tube cu rent to change in proportion. By usi the tube in this way, we convert a co stant direct current supply into a proximately a sine wave of current flo at 60 cycles. When this fluctuating cu rent flows through the primary windi of transformer T (in Fig. 88) we fi

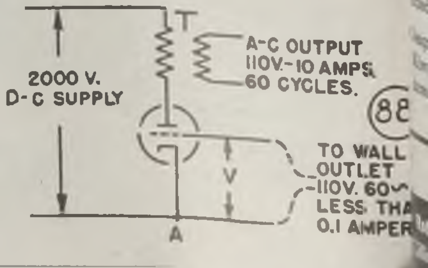
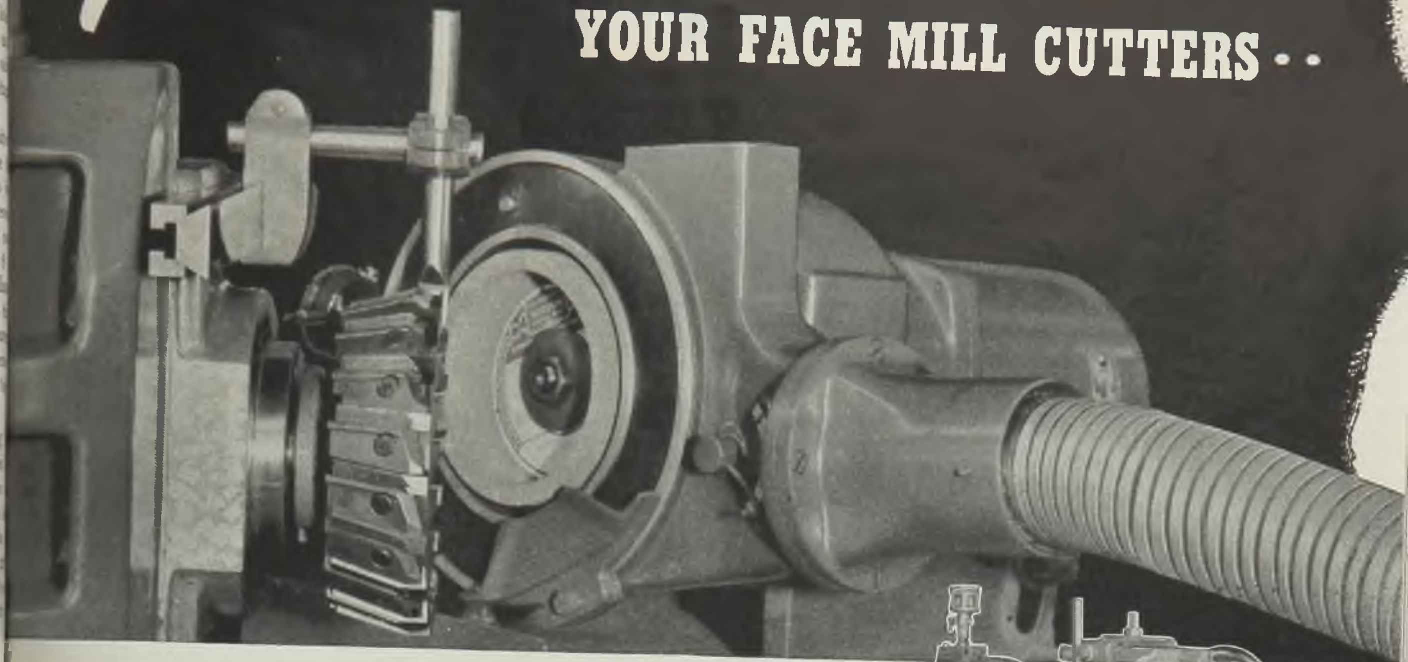
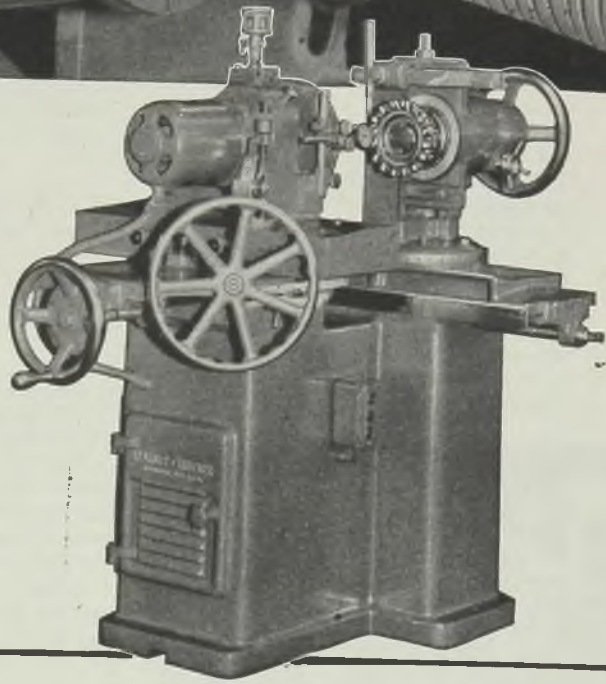


Fig 88—A vacuum tube serving as a 60-cycle amplifier

Increase PRODUCTIVE TIME BETWEEN GRINDS ON YOUR FACE MILL CUTTERS . .



. . . Assure a Greater Return From Your Milling Machine Investment

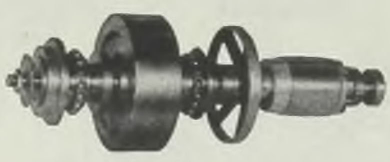


Avoid waste of valuable productive time by constant changing of face mill cutters. The Milwaukee Face Mill Grinder sharpens each tooth accurately — makes cutters last longer — require less frequent regrinding — decreases "down-time" on your milling machines.

An indispensable machine of strength, precision and capacity, the Milwaukee Grinder grinds Tungsten Carbide and other cutters, ranging from 3 inch to 16 inch diameters, to within .0002 runout — and does it fast.

MILWAUKEE FACE MILL GRINDER FEATURES:

- Unusual Rigidity
- Accuracy to within .0002 runout
- Finger-tip controls — handily located for simplified operation
- Design and performance of the Milwaukee substantially reduces sharpening time
- The three-bearing dynamically balanced grinding wheel spindle rotates at 3400 r.p.m.; heavy flywheel keeps abrasive wheel up to full grinding speed—maintains accurate uniform cutting action — each tooth perfectly ground.



- Set-ups quickly made with graduated dial, facilitating quick adjustments

For complete information write for Bulletin 41-A

Rotary Head Milling Machine

Kearney & Trecker *Products* CORPORATION
Milwaukee, Wisconsin

Milwaukee Face Mill Grinder

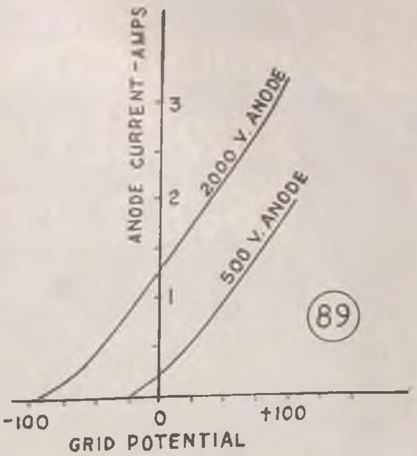
Milwaukee Midgetmill

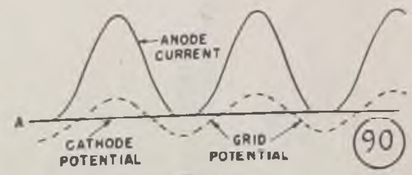
that the secondary of T can supply power to a 60-cycle alternating current load of say 10 amperes at 110 volts. Here we see the tube working as an amplifier; we apply negligible current at 110 volts to its grid, and the tube produces a useful output of 10 amperes at 110 volts, 60 cycles. So why not ask this question—"Since the grid input and the load output are both at 110 volts, 60 cycles, why not use part of the output to feed back to the grid, so that the wall plug is no longer required?" In Fig. 91, why not throw the switch from the lower to the upper position? If successful, the tube will be working as a 60-cycle oscillator, supplying its own grid excitation, quite independent of any external grid signal.

A Simple Oscillator

Such a trial will not be successful until we add a capacitor (C in Fig. 91) of just the right size so that this capacitor has 60-cycle resonance with the inductance of transformer T. (This means that $1/2\pi fC$ must be equal to $2\pi fL$, where f = 60 cycles, C is in farads, L is the transformer inductance in henries.) With C added, the circuit of Fig. 91 becomes a simple but uneconomical method of converting direct current into 60-cycle alternating current. However, if we now gradually reduce the size of capacitor C, the tube will oscillate faster so that, at this increased frequency, C and L are still in resonance.

This is the basic explanation of the vacuum-tube oscillator; by proper selection of the amounts of L and C used in its output circuit, the tube will oscillate (alternately increase and decrease its anode current) at the desired frequency. This combination of L and C not only determines the oscillating frequency, but also stores the energy necessary to supply a flow of power into the output circuit even though the tube is not passing current continuously.





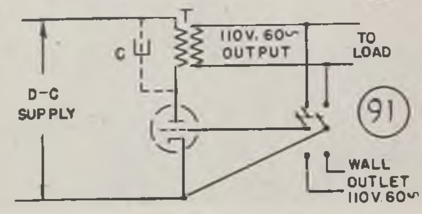


Fig. 89—Curves showing how grid potential affects anode current of a vacuum tube

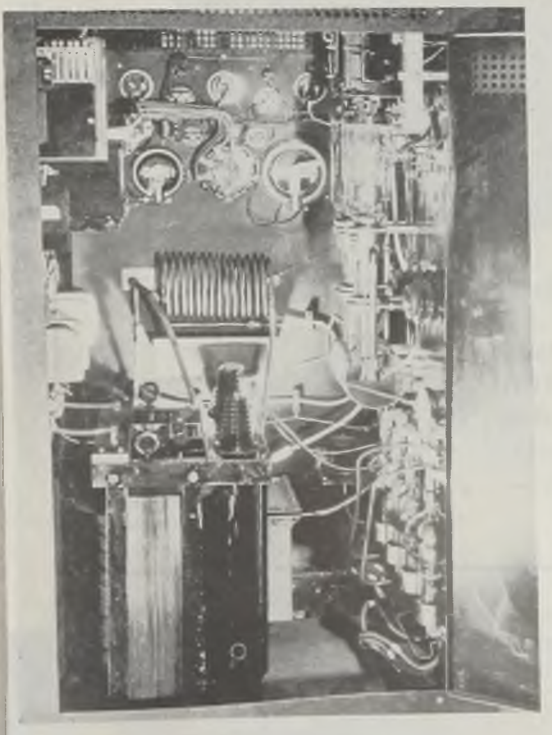
Fig. 90—Alternating grid potential causes anode current fluctuations

Fig. 91—Amplifier becomes an oscillator when switch is in upper position

A mechanical illustration of such an oscillator is the grandfather's clock; its input or driving force is the steady pressure exerted by weights or a wound spring; its output is the swinging of the pendulum; steady pressure (like direct current) is converted into oscillating motion (like alternating current). The steady pressure may not be sufficient to start the pendulum from rest, but it keeps the pendulum swinging, because the pressure supplies the losses of the clock's movement. The length of the pendulum determines the rate of oscillation or frequency. Once each swing, the pendulum receives only a short "push" from the spring; the energy stored in the pendulum carries it through its complete swing and back to receive the next push.

The Oscillator Circuit

Let us return now to the oscillator circuit of Fig. 87. As already mentioned, in the remaining discussion we assume that the supply voltage BB is a constant direct current voltage; the low-frequency ripples from the 60-cycle supply are of no direct interest and merely complicate the picture. This constant direct current supply is the driving force that keeps the oscillator working. The real oscillation or high-frequency voltage appears at DD, and forces alternating current through the work. Several waves of this DD voltage are shown in Fig. 92, together with corresponding voltages and currents in other parts of the circuit. Fig. 92 does not try to show what causes or controls the current flowing in tube 1; it shows the results when tube 1 passes current during brief intervals as shown.



Inside view of a typical 15-kilowatt electronic heater

Notice that the cathode potential of the oscillator tube 1 is used as the center line or axis of the voltage diagram in Fig. 92. The output voltage DD is shown swinging above and below this axis, causing a large alternating current (as much as 140 amperes in the 5-kw Electronic Heater) to flow in the tank circuit (C6, C7, L4 and the work). This current encounters resistance, so there are heat losses which absorb energy from the tank circuit. In order to replace these losses, oscillator tube 1 controls its flow of anode current in such a manner as to feed energy into the tank circuit; if these losses are not replaced, the voltage swing of DD decreases and soon all oscillation disappears.

Like A Rope Swing

This circuit works quite like the rope swing under the apple tree. We know that the swing continues to move back and forth for some time even after we stop pushing. While it "dies down" its number of forward movements per minute does not decrease (for its frequency remains constant, determined only by the length of the rope); however, its travel away from the center point gradually decreases until all movement finally disappears. The energy was originally pushed into the swing has also been consumed in friction losses (heat).

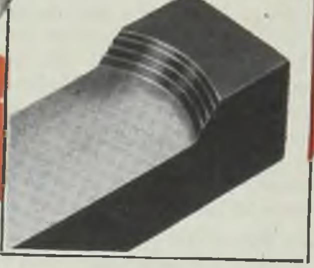
To keep the swing in motion, we know that a small push during each swinging movement is sufficient—merely enough push to overcome the losses. Also, rather than follow and push the swing gently during most of its arc of travel, we know that it is much easier (more efficient) to stand still and deliver a sudden large push at the point where the swing is near the end of the arc just starting its forward movement.

All these observations apply equally well to the oscillator. In the well-designed circuit, the oscillator tube permits anode current to flow during about one-fifth of each cycle. (We are speaking now of 550,000 cycles per second. During the remaining four-fifths of the cycle, the current and voltage in the tank circuit continue their swings, but the tubes rest.

From the direct current supply (BB in Fig. 87) current flows continually through reactor L1 with very little variation. During most of each cycle, thi

Introducing the KENNAMILL

The amazingly simplified inserted-blade step-cutter that makes high-speed carbide face-milling of steel possible in every shop!



Partially completed cut illustrating method of flycutting in steps—note bright, smooth finish obtained.

A sensational Kennametal achievement—the KENNAMILL—can give new life to your milling machines . . . adapting them for the high speed milling of steel that is inherent in modern, negative rake carbide cutters. At the same time, the Kennamill can improve the quality of your work by producing finished surfaces that are exceptionally smooth and accurate.

Kennamills are inserted-blade cutters, available in four sizes with taper shanks to fit standard spindles, as listed below. All sizes use the same ⅞" square, 10° negative back rake Kennametal-tipped blade (Cat. No. 39M40). Two sets of blades are supplied with each cutter head.

The low initial cost of Kennamills is combined with economy of blade maintenance. No expensive grinding equipment is needed—the blades are easily removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary since each blade cuts an independent path.

The use of Kennamills assures optimum machine performance. The sturdiness of the cutter body, plus distribution of the work over the keen-cutting Kennametal-tipped blades, minimizes vibration and chatter, smoothes out the load, and fully utilizes available horsepower, with feeds up to 21" per minute.

Kennamills are available for immediate delivery. They are stocked at our factory, and at Kennametal offices in Atlanta, Chicago, Detroit, Houston, Los Angeles, Philadelphia, New York, and San Francisco. Get in tune with the fast-moving tempo of carbide steel milling—order Kennamills today.

PRICES OF KENNAMILLS

(Complete, with 2 sets of No. 39M40 Kennametal-tipped blades)

Size	Fits Spindle	No. of Blades in Cutter	Price Each
2"-40	#40	3	$31.91
2"-50	#50	3	35.41
3"-40	#40	4	39.99
3"-50	#50	4	41.22
4"-50	#50	4	43.04
5"-50	#50	4	44.85

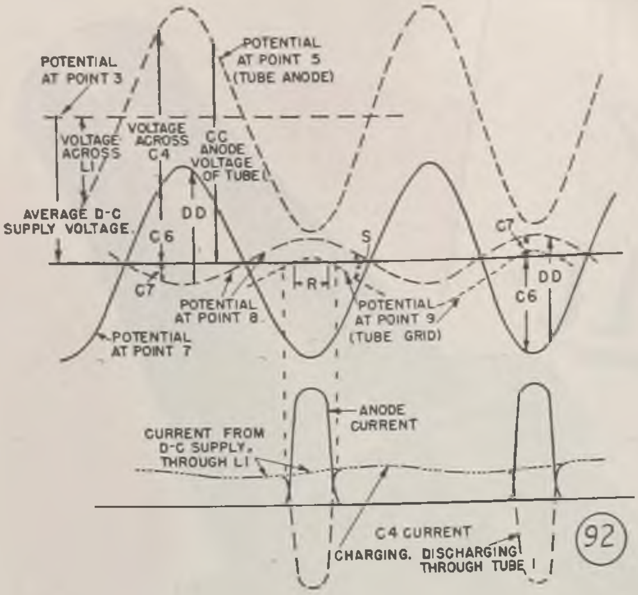
Extra Blades (No. 39M40) each $1.83

Templates—for regrinding blades—each $1 75

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, 200 LLOYD AVE., LATROBE, PA.



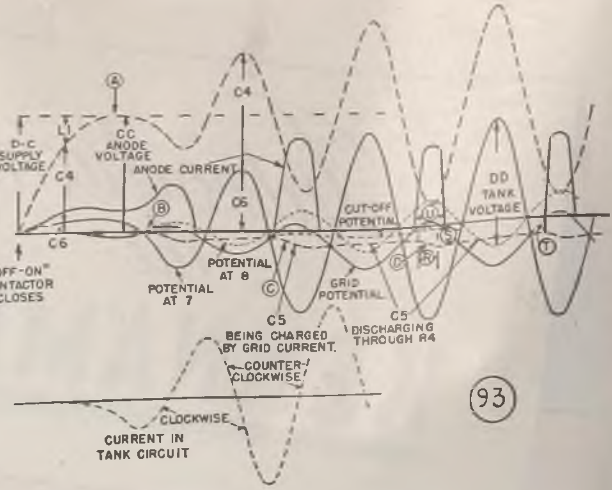


Fig. 92—High-frequency voltage and current variations in the oscillator and tank circuits

Fig. 93—Curves showing build-up of oscillation and self-bias

current flows into capacitor C4, returning through the tank circuit to point 6. This current delivers a small amount of energy into the tank circuit. When oscillator tube 1 permits anode current to flow, the steady flow through L1 now passes through the tube and back to point 4. At the same time, C4 discharges and forces a larger current to flow through the tube and the tank circuit to point 7. These currents are shown in Fig. 92. Notice that this action is properly timed so that C4 forces current through tube 1 and into tank capacitor C6 during the time when point 6 is more positive than point 7. This increases the voltage across C6 to compensate for its previous losses.

To help in the above explanation, we show that C4 alternately receives and discharges current, so that C4 seems to be a necessary part of the oscillator circuit. Actually, C4 has sufficient capacity so that it offers no barrier to the high-frequency alternating current flowing between the tank circuit and the tube anode. The tube oscillates well even if C4 is shorted; C4 merely insulates or blocks the high direct current supply voltage away from the tank circuit.

C4 Delivers Big "Push"

From the operation described above, we see that energy continually leaves the direct current supply, but enters the tank circuit in pulses; the tank receives a small "push" from the flow of current which charges C4, but it gets a larger "push" when C4 discharges through tube 1.

In Fig. 92, the upper curve shows that the tube anode voltage is swinging to values greater and less than the average direct current supply voltage. By letting current flow through tube 1 only when the anode voltage is at the lower part of its swing, the losses in the tube are decreased (since watts loss equals tube current multiplied by anode voltage).

In Fig. 92, the distance between the large alternating current curves represents the voltage across the capacitor C4. Notice that this distance remains nearly constant; the potential of points 5 and 7 (terminals of C4) are swinging in equal amounts with relation to the axis (cathode of tube 1). Although, as previously described, the direct current supply flows steadily into C4 and then discharges suddenly through tube 1, the voltage across C4 changes very little (since C4 is selected large enough to give this result).

The Grid Circuit of the Oscillator Tube

We now reach the point where we should ask why the tank capacitor is built in two units (C6 and C7 in Fig. 87) instead of being combined into one unit having equivalent size necessary to give the desired output frequency. These two capacitors split the rf. (radio-frequency or high-frequency) voltage DD into two parts. We will soon see that the voltage across C7 is used to give a signal back to tube-1 grid so that this oscillator tube will let its anode current "push" the tank circuit at the right instant to maintain oscillation.

In Fig. 92 we see that the voltage across C7 is about one-fourth as large as the voltage across C6. Of greater importance, the C7 voltage is 180 degrees out of phase with the C6, so that point 8 is above the axis (point 6) whenever point 7 is below the axis. Point 8 is connected (through C5 and R5) to the grid of tube 1, and Fig. 92 shows that the C7 voltage tends to make the tube grid more positive (thereby permitting anode current to flow) during the half cycle when there is the least tube anode voltage CC.

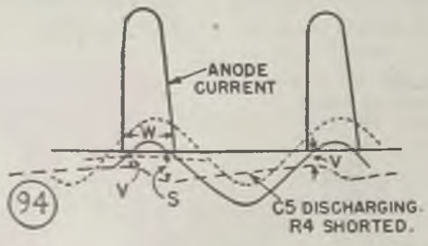


Fig. 94—Decreasing the self-bias causes greater anode current

The potential at tube 1 grid (at point 9 in Fig. 92) is seen to be a voltage wave of shape similar to that of point 8 but at a lower level, so that the grid is positive (above point 6, cathode of tube 1) only during the brief interval marked R. This downward displacement of the grid potential (shown as S in Fig. 92) is caused by the voltage across C5 in the grid circuit (in Fig. 87); this voltage S is known as the grid bias. We next need to learn how this grid bias is produced, and how it controls the power output of the electronic heater.

The Grid Bias

During any instant when the tube-1 grid is more positive than the cathode, current can flow through the tube from grid to cathode. The voltage across C7 (see Fig. 87) forces this current to flow from point 8 into capacitor C5 and from point 9 through R5, through the tube to the cathode connection at 6, and back to C7. This current tends to charge C5 to the crest or peak value of the C7 voltage. When the grid voltage next swings negative (below point 6, the cathode) this grid current stops, leaving C5 charged. During the following half cycle (when the C7 voltage has reversed, so that point 6 is more positive than point 8), the rectifying action of the tube prevents current from flowing in the cathode-to-grid direction which could discharge C5. However, a discharge path is provided through the adjustable resistor R4, so that C5 loses a small part of its charge and voltage before the start of the next cycle. (The voltages of C5 and C7 combine to cause this current to flow from point 6 through

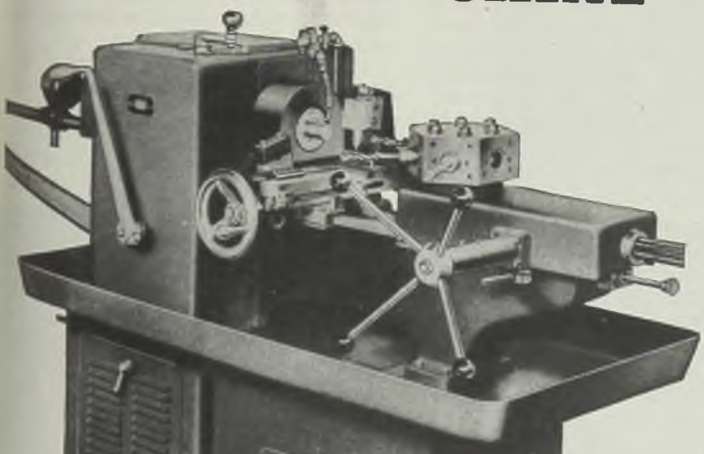
(Please turn to Page 142)

OSTER No. 601

"RAPIDUCTION"

Simplified

SCREW MACHINE



Capacity
1½"
Round Bar

"These machines have proved very satisfactory," commented the owner of a battery of Oster No. 601 *"Rapiductions"* when the above photograph was taken.

The company (name on request) uses the machines for forming, turning, and related operations on aviation valve stems and guides and also on 20 mm. H. E. shells.

Easy to Operate

Beginners learn rapidly on Oster No. 601 machines. SIMPLIFIED design is the reason. No complicated features confuse the operator of little or no previous experience.

Designed to Meet Individual Needs

Oster No. 601 *"Rapiductions"* can be furnished with automatically indexed, six-station turret or with plain saddle and single tool post, as required. Two types of drive are optional: WORM DRIVE (for making extremely heavy forming cuts) or DIRECT DRIVE (for high speeds on small diameter work and for machining non-ferrous metals.)

Your nearest Oster Distributor will supply you with Catalog No. 27-B. If you don't know his location, write:

THE OSTER MANUFACTURING COMPANY
2037 East 61st Street • Cleveland 3, Ohio, U. S. A.

OSTER *Cuts Your Costs!*

Photomicrographs showing progressive ch

Raw rod, 400-pound coil, 3280 feet long, tensile strength 100,000 p.s.i.

Patented rod, 3280 feet long, tensile strength is 115,000 p.s.i.

First hole drawing, 5000 feet long, diameter 81%, 156,000 p.s.i.

Second hole drawing, 720 feet long, diameter 67% 171,000 p.s.i.

Wire Rope...

The Steel Tendons of Modern Industry

Life of wire rope is influenced by many factors. Abuses to which it is subjected during installation create hazards. Steps involved in drawing and stranding wire and in closing strands into rope as practiced by midwestern producer are described in detail by the author

By G. ELDRIDGE STEDMAN

FEW industrial products have the diversified utilities of wire rope. In the general contracting, excavating, mining, marine, oil, structural, farming, logging, industrial, elevator, pulling, and many other fields, most useful activity would be impossible without this product.

Many factors influence the life of wire rope. These need properly to be understood or many serious circumstances can result. Danger and destruction are always on the other end of the rope which fails. Generally, there could be better rope engineering understanding among users in relation to types of construction, type of core, whether of hemp or of wire structure, and latest improvements in fabrication. Considerations such as regular and Lang lay, right lay or left lay, preformed, or ordinary fabrication are important to know.

Technical considerations should be understood; such as tread diameter of sheave, permissible radial bearing pressure of sheave, material of sheave groove, arc of contact of rope on sheave, critical and minimum diameters for proper performance, internal bending stresses. Indeed, much can be learned concerning operating conditions, relative to arrangement and condition of equipment, relative rope speed, overstressing, abrasion, corrosion, creep, field lubrication and avoidable abuses. Viewed from these angles, consideration of wire rope is an important engineering subject, deserving of considerable attention.

This is the more true when there is awareness of the many abuses to which wire rope can be subjected by lack of understanding and resultant dangers and destruction which rope failure can cause on practically every job. The hazard of such abuses appear with its installation when there can occur improper seizing, socketing, splicing, dog legs and kinks, corrosion and rust, lack of lubrication, birdcaged rope, crushed or bruised wire rope.

From the standpoint of use, such abuses as nailing and flagging through the rope, clamp slipping or "siwashing" rigid objects which "burns" or hardens the wire surfaces, improper rope speeds,

...gressive structure from the raw rod to finished wire

Third hole drawing, 10,300 *feet long, diameter* 57%, 184,000 *p.s.i.*

Fourth hole drawing, 14,570 *feet long, diameter* 47½%, 200,000 *p.s.i.*

Fifth hole drawing (overdrawn), 21,000 *feet long, diameter* 39½%, 217,000 *p.s.i.*

Sixth hole drawing (overdrawn), 29,300 *feet long, diameter* 33½%, 233,000 *p.s.i.*

crushing or grinding on the drum, improper arrangement and condition of sheaves, rust gripe from harmful fluids, pinching grooves, popped core, excessive abrasion; all are ever needful of being anticipated. A new rope should be broken in, as the strands and core are springy. For this reason particular care should be taken during installation so that fabricated relationships between strands and core are not changed.

At the plant of Union Wire Rope Corp., Kansas City, Mo. much of the wire mill equipment was specially designed by Curtis Voigtlander, wire mill superintendent, widely recognized for his inventions and his brother, Walter Voigtlander, chief engineer. A description of processes will give the reader understanding of fabrication.

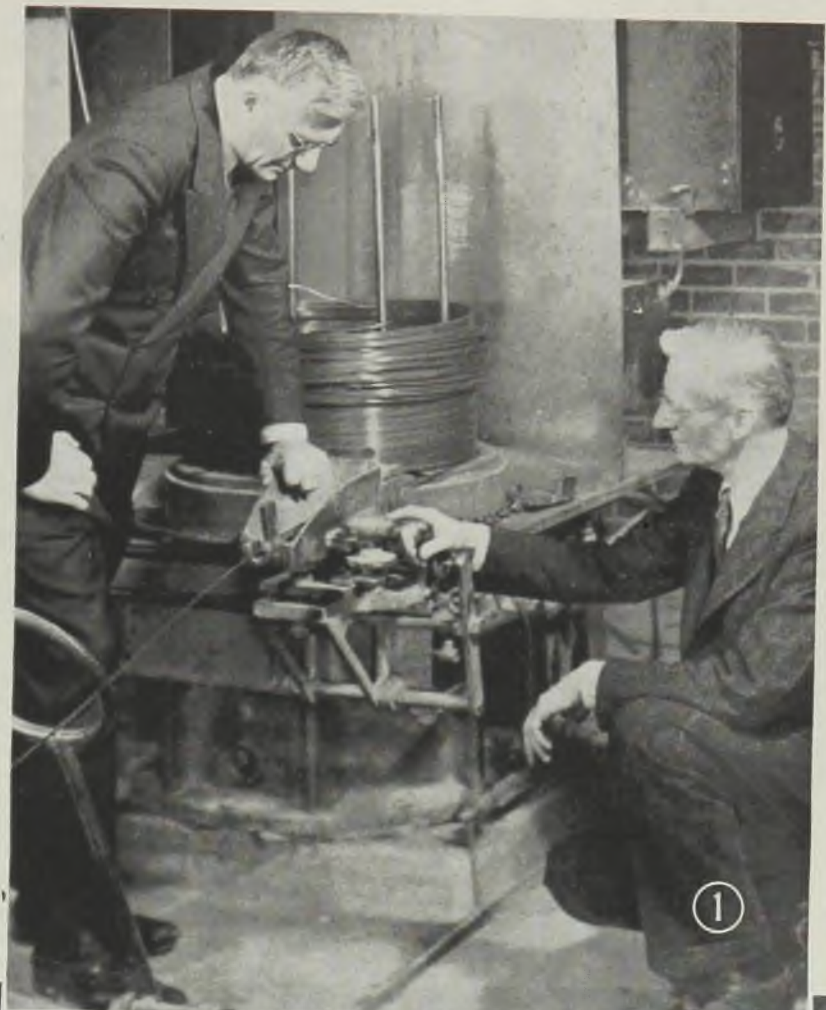
Principal steps in fabricating wire rope are: (1) Heat treating rods, called "patenting", (2) cleaning and baking,

Fig. 1—Voigtlander brothers who have designed considerable wire mill machinery

Fig. 2—Charging end of patenting furnace

Fig. 3—Discharge end of patenting furnace

Fig. 4—Bundles on hairpin hook being removed from pickling bath



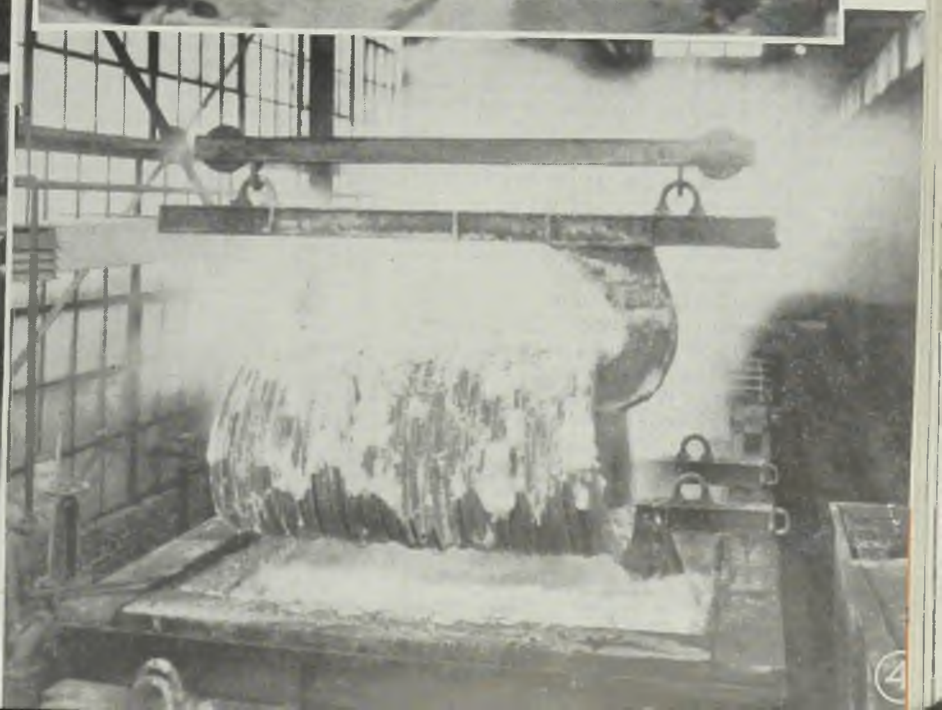


Fig. 5—Three [illegible] removed from flash oven

Fig. 6—Wire drawing operation. Pointed wire has been fed through die and is shown in jaws attached to wire drawing block

(3) cold drawing wire, (4) testing wire, (5) spooling wire, (6) stranding wire, (7) "closing" the rope. Technique starts far before fabrication in the choice of the kind of steel, selection of rods of suitable diameter with chemical specifications to yield the properties required for the service to which the finished rope is to be employed.

The smallest commercial rope-wire rods have a diameter of 0.210-inch (No. 5), and may also be of 1/4, 9/32, 5/16-inch diameter, and even larger. Coils of such rods are received from the steel mill, tagged with heat numbers and a certified analysis of each heat, in open cars, in coils weighing approximately 400 pounds. Generally, only the class of high-carbon steel rods are used for steel wire rope, the tendency being not to work beyond the eutectoid range, to get away from the pearlite constituent and yet secure properties of high strength and good ductility. Rarely is steel wire worked here lower than 0.28 per cent carbon.

The initial heat treatment of rope wire is known as patenting. This not only is done to achieve uniform grain, but as well to win the molecular crystalline structure of desired type for proper subsequent drawing of the wire.

Patenting is a term peculiar to the nomenclature of heat treatment in the wire rope industry. It comes from the fact that it was patented by James Horstall, who first drew wire from tempered rather than annealed rods. It is partly a normalizing process in that it does relieve internal strains. But patenting temperatures and rates of quench are higher than for normalizing. The purpose of patenting is to form a larger grain structure than would be secured from normalizing. The wire is cooled either in air or in a bath somewhat cooler than patent furnace temperature. Quick patenting to hold coarser grain structures is directly opposite to annealing, where slow cooling is desired.

Building wire rope is a science calling for precision equipment and skilled workmen. The vital differences of wire rope come as much from these elements of fidelity in establishing quality distinctions as from the materials themselves.

The series of operations involved in fabrication tend often to be rotational in nature, i.e., the first series draws the wire to a certain diameter. It is then rotated again, and sometimes again, through cycles to get ultimate specified wire diameter in final spooling, stranding and closing. This may cause a number of heat treats, and always causes a succession of draws.

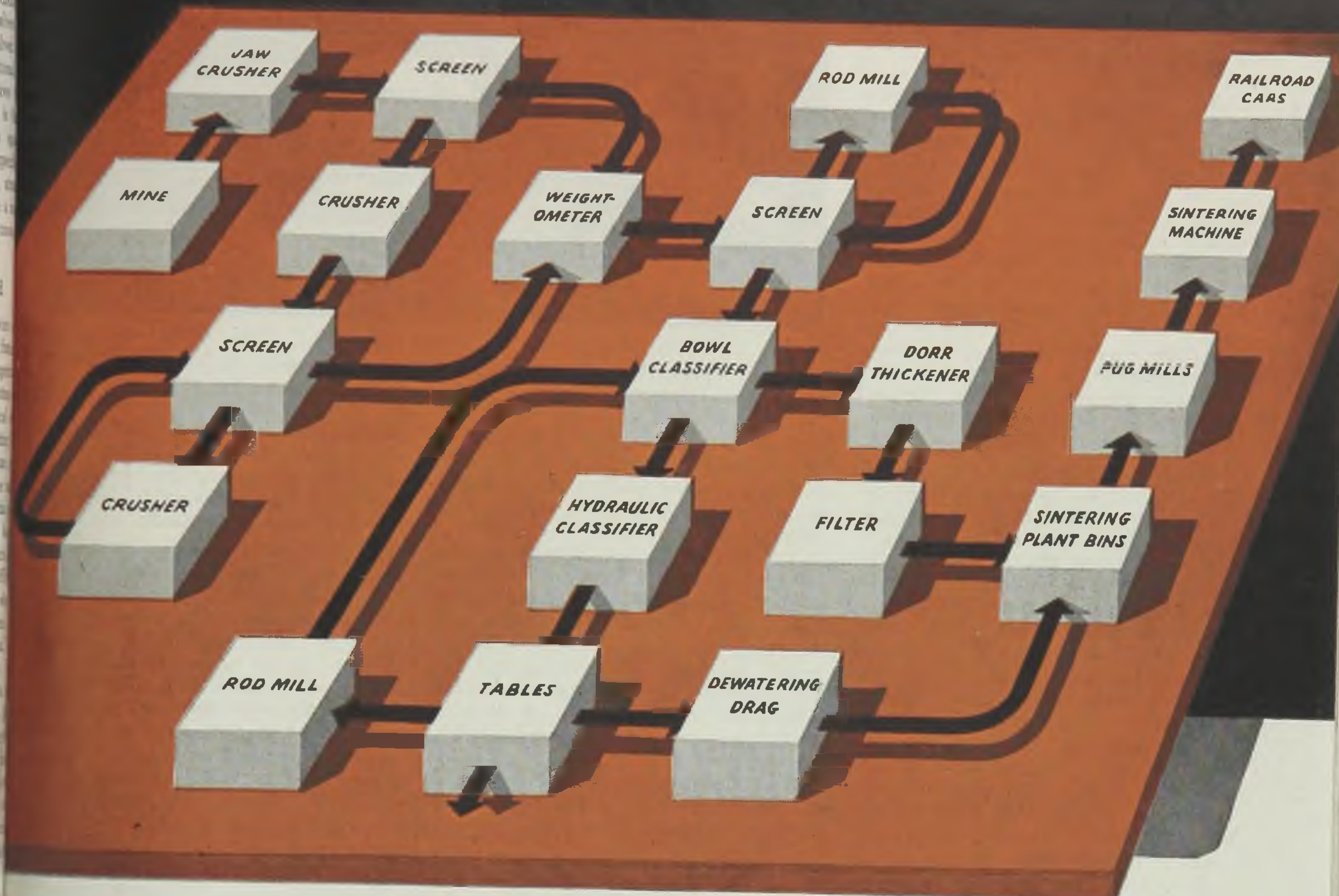
How Rods Are Patented

In the patenting treatment, wire rods are pulled slowly through a long furnace, heated well above critical temperature of the steel. Speed and temperature are dependent upon size and chemical composition of the rod. Four patenting furnaces of varying dimensions are provided. The largest rod furnace maintains a temperature control within plus or minus 5 degrees Fahr. It has 20 burners for natural gas on each side. Temperature is from 1600 to 1850 degrees Fahr., depending upon whether the season is summer or winter and whether quench is air, salt, or lead. This furnace accommodates rods only. The smallest furnace will take from No. 9 to the finest size, such as drawn to finish of 0.007-inch. A 1/64-inch diameter wire rope is manufactured, the wire of whose individual strands could hardly be seen with the naked eye. The finest wire made by Union uses a die whose conical hole is so small it is difficult to discern on close inspection.

The period of heat soak can only be estimated by the travel of the wire at

Fig. 7—Multiple wire drawing machine with six blocks in operation

McKee design assures an ore beneficiation plant to meet *your* sinter requirements



EVERY McKee-designed ore beneficiation plant is the result of careful study of *all* the facts which influence plant design and selection of equipment.

For each application of ore beneficiation all factors must be taken into consideration to determine correct plant design. Physical properties and seasonal movement of ores, required quantities and desired physical characteristics of sinter to be produced as well as blast-furnace or open-hearth operating conditions must be considered.

Experienced metallurgical and mechanical engineering, based on such a study, assures you a plant of efficient design with crushing, screening, concentrating, blending and sintering equipment properly correlated to provide maximum production and accurate control of physical properties of sinter with a minimum of supervision.

Arthur G. McKee & Company

★ *Engineers and Contractors* ★

CHESTER AVENUE · CLEVELAND, OHIO

OCKEFELLER PLAZA

COMMERCE BUILDING
HOUSTON, TEXAS

Fig. 8—Compression die employed for closing strands into rope

feet per minute through the furnace in relation to furnace length. The largest furnace is about 60 feet long. The larger sizes of wire, after patenting, are salt quenched (large diameters and high-carbon only) at a temperature of about 1000 degrees Fahr., the salt taking the temperature down below the critical temperature of 1230 degrees Fahr. where, past the transformation point, it is wound on open drums on the "take-off". These coils are kept separate as to carbon content, heat number and diameter. Its travel on "takeoff" to reach its approximate drum winding further cools it, the distance being sometimes as much as 100 feet. The larger wires are salt or lead quenched to gain more controlled structural phenomena and to inhibit oxidation that tends to increase in relation to the larger surfaces of larger diameters. Smaller diametered and low-carbon rods are air quenched in room amosphere conditions, having less oxidation hazard. After being patented, wound on drums for recoiling, the rods and wires are stripped from the drums and go to stock ultimately to processing.

Second step is its cleaning and baking. The company has recently installed the most modern equipment for this critically important operation. Five bundles of rod or wire (from 1600 to 2000 pounds) are strung on an acid-resisting bronze yoke known as a "hair pin". The material is first immersed in a bath of steam-heated dilute sulphuric acid, per cent of solution varying with size of rod or wire and temperature used, (greater for higher temperature). The purpose of this dip is to remove dirt, scale and corrosion. Exposure time is from 15 to 25 minutes. The bath is in strong agitation. The material is then removed from the acid and submitted to a needle rinse of cold water under high pressure.

Continuing the cleaning procedure, the wire is submitted to a fine water mist drizzle for from 10 to 20 minutes to form a coating of "velvet rust", called a "sull" coat by the industry. This is an oxidation. Then the material is dipped into a bath of steam-heated lime water. All such material has to be drawn through dies successively and therefore requires lubrication. This sull coat, plus the lime solution, plus powdered tallow soap applied at the draw, supplies that lubrication.

The bundles are then baked in a flash baker at about 650 degrees Fahr. maximum for seven to eight minutes. The object here is to dry the material and to drive off the occluded hydrogen which develops from pickling and becomes absorbed in the pores of the metal. This must be baked out. It then is cooled at room temperature and is ready for the draw.

The third operation is cold drawing of the wire. The coils of lime coated rods or wire are placed upon a reel, the end pointed properly to be received by the conical hole in the wire drawing die. The die shop has thousands of dies of all diameters and complete machinery for rough, finish and polish grind. Finish and polish are accomplished by diamond dust and the technique in recovering this dust is unique in itself.

In the drawing operation, a short end of the wire is pulled through the die by a powered "puller" to that length required to be fastened on top of the drum or "block" which, mounted on a vertical shaft, is set up to receive the coil, the block pulling the wire through the die, which it automatically stores upon itself. Amount of reduction, speed of draw, and number of drafts depend upon diameter, grade of steel, and desired physical properties. The drawing is a predetermined series of repointings, and draftings as the passes proceed through smaller dies to successive blocks. Interesting phenomena occur as is illustrated in photomicrographs appearing herein, which show the changes in structure, diameter, and tensile strength and elongation of a

Fig. 9 — Converging angle of stranding machine

Fig. 10—Preparing bakelite mounted specimens

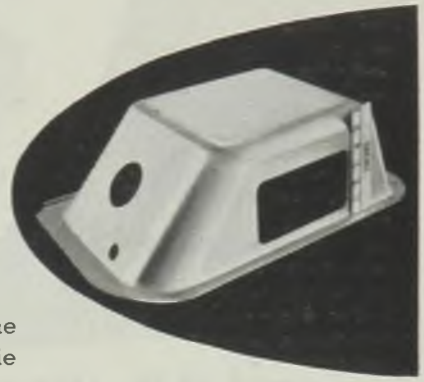
WE'VE BEEN ASKED
THIS ABOUT MAGNESIUM:

Can you form magnesium sheet?

Dowmetal Magnesium Alloys readily lend themselves to forming, bending and drawing operations. Wherever these fabrication techniques are used, in any field of manufacture where the high strength-weight ratio of the metal is a prime consideration, magnesium is peculiarly valuable.

Not only does it have excellent strength and elastic energy absorption qualities, but it is the lightest of all structural metals.

Dowmetal sheet can ordinarily be formed with the same equipment used for other metals, or with only minor die modifications. Hot forming is generally preferred in working Dowmetal as it permits deep draws in a single operation and eliminates the need of intermediate annealing; too, no allowance for springback is necessary. Cold forming is used for shallow draws and bends of reasonably generous radii.



Dow is currently producing for Bell Aircraft Corporation this weight-saving aircraf pedal-well

Those who have seen the broad scope of the research and quantity-production facilities at the Dow shops and foundry in Bay City, Michigan, know of the progress that has been made in the various methods of Dowmetal fabrication: in sand, permanent mold and die casting; extrusion; forging; sheet, plate and strip; in riveting and welding. In answering inquiries, Dow, as the pioneer and major producer of magnesium, offers the knowledge accumulated during 28 years of intensive research.

DOWMETAL *magnesium*

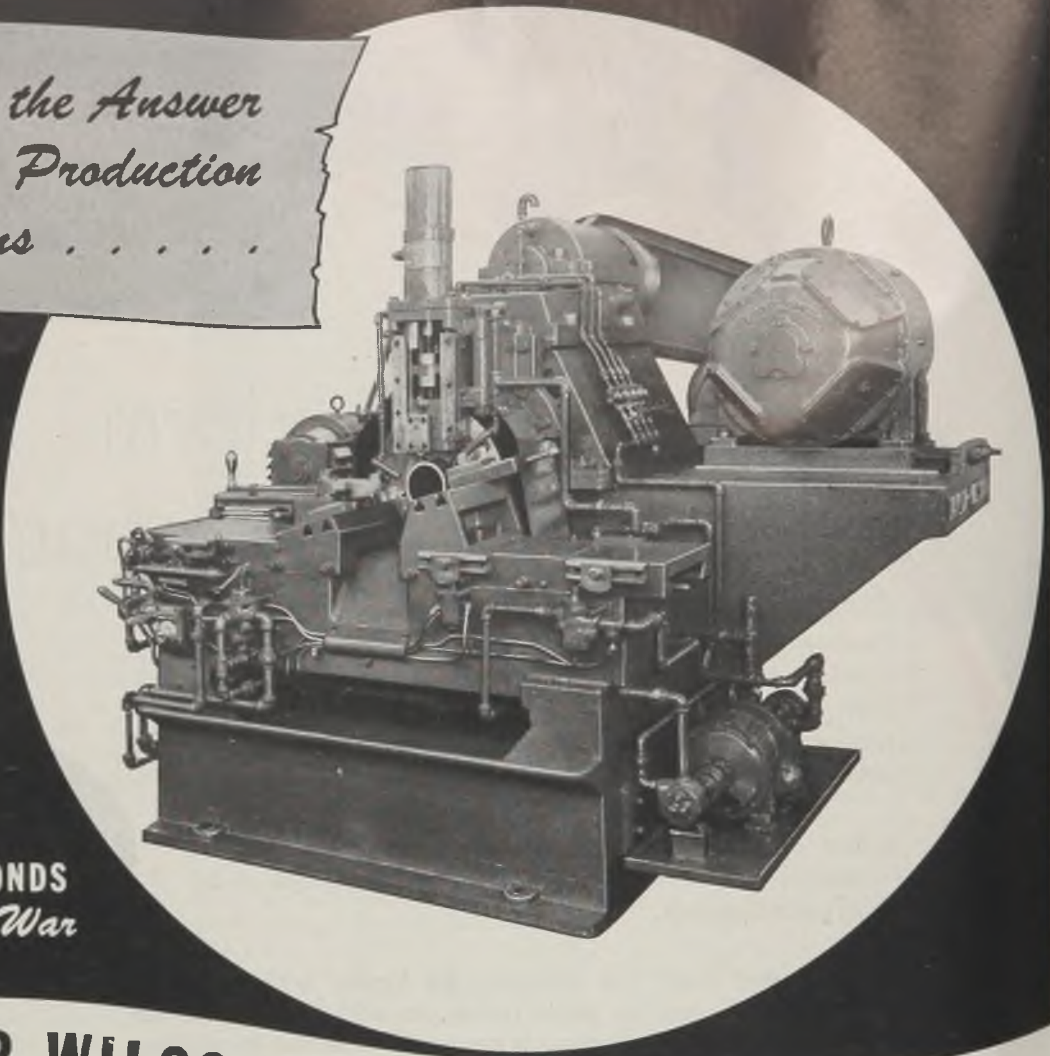
THE METAL OF MOTION

DOWMETAL

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

Here is the Answer to your Production Problems . . . . .



BUY MORE BONDS
Help Win the War

TAYLOR-WILSON CUTTING-OFF MACHINE

War necessity has uncovered the superior production capacity of Taylor-Wilson cutting-off machines and their extraordinary ability to take the punishment of continuous high speed operation. In many plants they are enabling manufacturers to meet production schedules never before thought possible. Accuracy is assured at all times and at all speeds. Now giving conspicuous service in crop ending, cutting off pipe or tubing for couplings stock, roller bearing blanks, bomb blanks and other items in set lengths.

We Also Manufacture

Straightening, Burnishing and Sizing Machines — Galvanizing Equipment for Pipe—Small Seamless Tube Mills, Butt Weld Pipe Mills, Tube Testing Machines, Test Benches, Complete line of Equipment for finishing of Pipe.

TAYLOR-WILSON MANUFACTURING CO.

THOMSON AVE., McKEES ROCKS, PA. (PITTSBURGH DISTRICT)

400-pound coil of patented rod through six draws with progressive changes from 3280 to 29,300 feet long, from 100,000 to 233,000 pounds per square inch and from an 81 per cent diameter at the first draw to reduction ultimate of 33½ per cent at the overdrawn last pass.

For fine wire, an intermediate size of wire is "ript" one or more "holes" from the original rod. This preliminary drawing is then sent back for repatenting, repeating thereafter the complete cycle of fabrication. As many as three such cycles are used before finished wire is secured in some diameters.

Temperature rises in work during the drawing operation, there being resistance and friction involved, even with the careful lubrication, in the varied drawings and reductions of diameter. The operation is also affected by humidity. One can notice perceptible increases in room temperature near the multiple drawing machines and one of the fine efficiencies of the Voigtlander design comes from its improved die and block cooling arrangement. Best room temperature for drawing is under 88 degrees Fahr.

Procedure for Testing

A routine testing is accomplished, every wire operator's production of coils being kept separate. A sample coupon is snipped from each end of each coil. Three routine tests are made on these samples: (1) Size is gaged for tolerance, (2) tensile strength is established in relation to requirements, (3) number of torsions in relation to given length, (100 times the wire diameter) and an 8-inch length is always tested. Any rejects are generally returned to the patent furnace for reprocessing in finer diameters.

The coiled wire then is wound evenly on spools or bobbins so that the wire will come away easily and without tangling in its stranding. This is called spooling.

The spools then are cradled in a stranding machine. These cradles with their spools "float" along the axis of the machine, spools always being in an upright position to prevent twist or torsion of the wire. The wires are led to the inside surface of the shell of the machine and are forwarded to the front of the machine where they are "laid" in one or more layers around the core wire. This core wire, following another course of feed, passes directly from the front spool through the hollow nose of the machine where, at the apex point to which all wires converge, outer wires are helically bent, never twisted, around it.

As they are formed and pulled out by a set of power-driven drums, these strands are measured for length. A number of such strands, customarily six, are made of equal length and are made ready to be "closed" around a core to form a finished rope.

In the stranding operation, a uniform wind is always effected on the bobbins. The relative speed of these pull-out drums will regulate the length of the lay or pitch of wires in the strand; the faster the pull-out, the longer the lay.

The "layer" or "closer" machines, some vertical and others horizontal, have the capacity to close a wire rope up to 4 inches. These units employ the same principle as the stranding machines. The strands are brought forward to the point of convergence at the front of the machine where they are helically bent around the core at the entrance to the compression die. The strands are prevented from torsion by a planetary gearing (or eccentric ring) which controls the cradle "float" from the back of the machine. The core of whatever type (hemp, wire, other center materials) is led from the back through the entire length of the hollow shaft of the machine. The finished rope is pulled through a compression die by power driven drums and then to the shipping reel where it is stored. This finishes the main fabrication steps. All shipping reels are made in company shops.

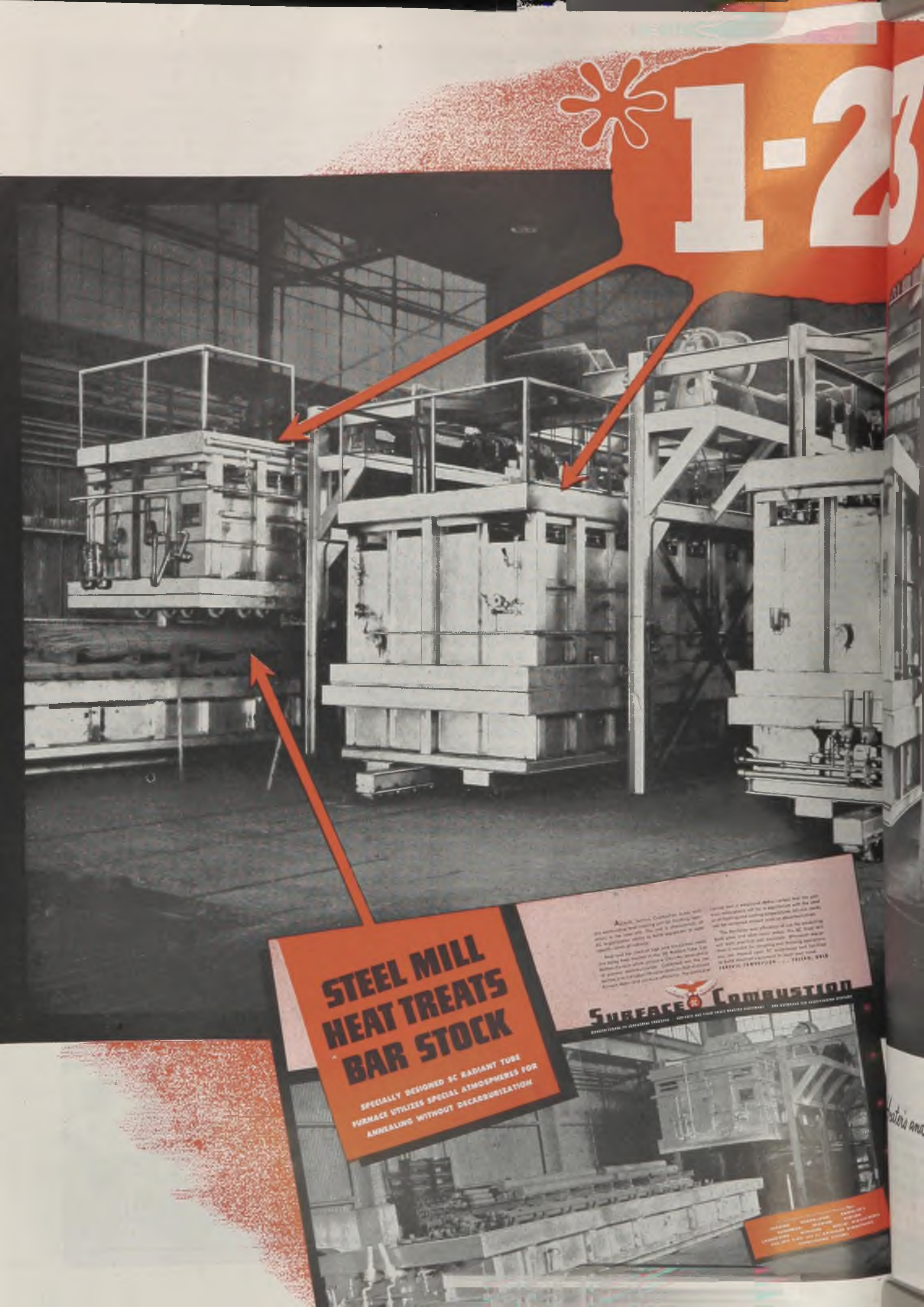
The company maintains a complete and modern metallurgical testing laboratory. Usual procedure, in preparing incoming rod samples for diagnosis, is to slice wafers of numerous rods per heat to check the physical condition. These are mounted in bakelite molds, rough ground, polished and etched. A photomicrograph, capable of 2500 diameters, is used. Usual magnification is at 125 diameters. The diagnosis is based upon analysis of edge defects, seams, rolling laps, decarburization, sulphide and heavy oxide inclusions, pipes. Samples of processed wire material are likewise diagnosed.

Details of Inspection

Finish inspection involves: (1) Break test for the finished ropes, made on a 6-foot sample cut from the master reel. (2) Tests on the wires of a composite strand, made up from a 2-foot length, taking an equal number of like positioned wires from each strand; the tests include (a) gage for wire diameter tolerance; (b) tensile break strength; (c) per cent elongation of wire in a 10-inch gage length (made simultaneously with the break test); (d) test for the number of torsions per "100 d" length; (e) hardness in brinell equivalent; (f) fatigue test.

If the wire is galvanized, then only (a) and (b) from above, plus (g) wrap test, wrapping the wire six turns around a mandrel twice the wire diameter, and then unwrapping, as a fatigue test for the wire; (h) Preece test for the galvanizing, where the samples are submitted to controlled chemical reaction, for a given number of one minute immersions, and comparing the samples with a standard of bright metallic copper deposit; (i) the strip test for galvanizing, wherein the zinc coating of a specified length of sample is chemically stripped from the wire and the weight of zinc in ounce per square foot is determined.

Fig. 11—Physical testing equipment is installed along one of the laboratory



1-2
STEEL MILL HEAT TREATS BAR STOCK
SPECIALLY DESIGNED SC RADIANT TUBE FURNACE UTILIZES SPECIAL ATMOSPHERES FOR ANNEALING WITHOUT DECARBURIZATION
SURFACE COMBUSTION

In 1942, Surface Combustion announced the installation of a special designed, radiant tube furnace, utilizing a special atmosphere for annealing of rods and bar stock of high carbon steels, without decarburization.

* Today...this installation has grown to three identical units.

This type of unit is unique as it combines features of flexibility and efficiency that makes them practical and desirable. Combined are the car-bottom and individual-lift-cover features that eliminate furnace doors for greater efficiency, and to provide ease in the handling of materials. The method of control that is employed makes certain that the gaseous atmosphere will be in equilibrium with the steel at all heating and cooling temperatures. All size stocks are annealed without scale or decarburization.

This installation is characteristic of Surface Combustion organization ability to design and build equipment to meet either roughing or finishing equipment needs.

...Heater's and Heat Treater's Helping Hand 'Surface'

SURFACE COMBUSTION • TOLEDO 1, OHIO

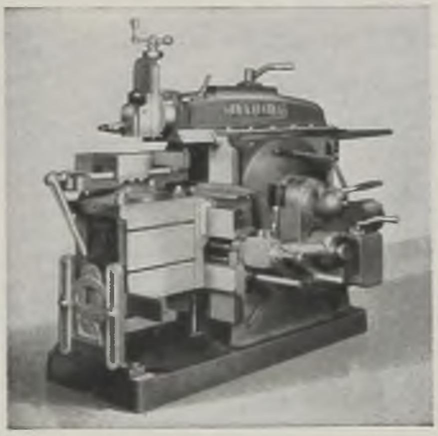
WHEREVER HEAT IS USED IN INDUSTRY
...FROM INGOT TO FINISHED PRODUCT

Shaper

Designated as the Super Twenty, a new 20-inch shaper is announced by Queen City Machine Tool Co., 254 East Second street, Cincinnati 2. It is readily adaptable to a wide variety of machine shop work and equally is suited to heavy and general toolroom work.

The ram is of the V-type of wide bearing both bottom and sides, and the column is well ribbed for sturdiness. All gears of the speed train are hardened and shaved. The main bull wheel gears and the back gear train are helical. The bull wheel is the 2-piece type. The clutch is the dry multiple disk type. Speed range is adequate. Feed range affords a fine feed of 0.008-inch for finishing and a hogging feed of 0.191-inch for the heaviest roughing. Changes of feed are made by simply turning a knob.

A high torque motor for the power rapid traverse is standard equipment. This is pushbutton controlled from the operating side of the machine and may be operated even though the feed is engaged. An electrical limit switch is incorporated into the rail. If the table should be moved too far to either side, the

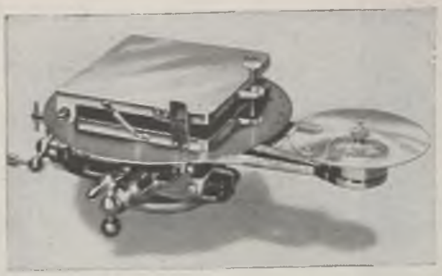


limit switch goes into operation, stopping not only the power rapid traverse motor but also the main drive motor. A heavy duty vise is furnished as standard equipment. The table support is designed to give real support to the table even when the table is moved to extreme ends. It has a full bearing on the bottom of the table and the foot extension covers the entire width of the base. Timken bearings are used throughout.

Quartz Orientation Replacement Table

A quartz orientation replacement table is announced by Robert H. Clark Co., 9330 Santa Monica boulevard, Beverly Hills, Calif., which is adaptable to any quartz cutting saw. It is used in positioning the quartz to facilitate extreme accuracy for cutting crystals used in electronics. It also is used in the manufacture of the crystal oscillators.

Correction readings may be transferred from either General Electric or Phillips X-ray machines directly to the 10½-inch degree dial on the table. The minute calibrations on the adjustments



are visible easily and large enough to allow corrections to a fraction of a second. The table can be rotated 360 degrees and provisions are made for the "X" correction with a plainly visible and conveniently located scale and pointer. The tables and mechanism are chromium-plated cast bronze. Adjustments are provided to compensate automatically for all wear.

Spring-loaded gears in the gear train eliminate back-lash, assuring setting to minute precision. The gears on the sector-arm and the gear train are meshed under constantly maintained tension to eliminate any inaccuracies due to tooth wear. The gear case is protected by a Lucite cover to prevent quartz loaded coolant from getting into the precision gear and mechanism.

Resistance Welder

A complete line of resistance welders from 1 to 75 kilovolt-amperes are now manufactured by Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5, N. Y. The machines, an exclusive design, include such features as water-cooled tips, adjustable pivot type foot pedals, 6 to 25 heat stages, automatic trip switch, precision timers and contactors, high power factor correction, mechanical timers, air

or motor-driven. Carried as standard stock are 5, 7½, 10 and 15 kilovolt-ampere machines with 6, 12 and 18-inch throat depths. Sizes 20, 30, 40 and 50 kilovolt-ampere machines are equipped with throat depths of 12, 24 and 36 inches.

The horn diameter and electrode diameter varies throughout the line. Adjustable arms are available with a 5 to 12-inch drop or a 5 to 15-inch drop standard. All models are equipped with adjustable slides and are foot operated rocker arm types unless otherwise ordered.

Collet Speed Chuck

For turning bar stock, facing off and second operation turning, Zagar Tool Inc., 23880 Lakeland boulevard, Cleveland 17, has developed a collet speed chuck. It can be used on screw machines, lathes and wherever collets are standard equipment. The collet does not move at all in Zagar fixtures and as a result, face-off and length dimensions can be held within very close limits.

It can be mounted on any lathe,

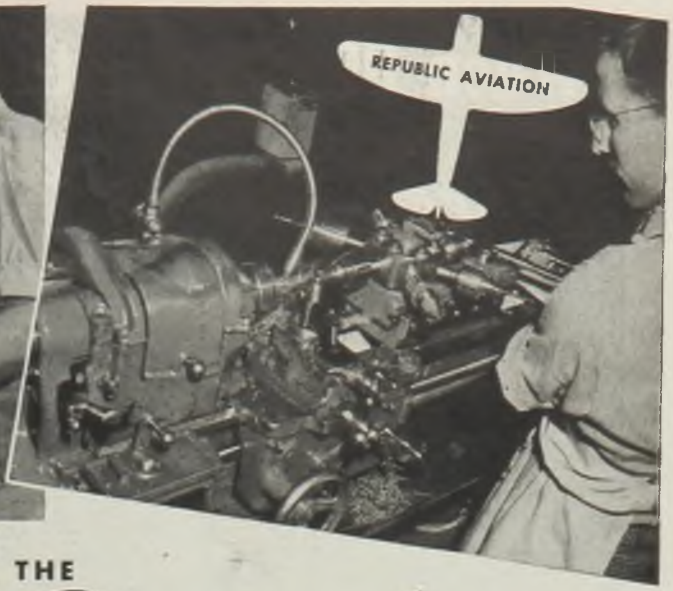
grinder or rotating spindle and can be opened and closed while the machine is running. There is no heating. Being independent of the spindle, it can be mounted on face plate and be indicated to run dead true regardless of any spindle run-out.

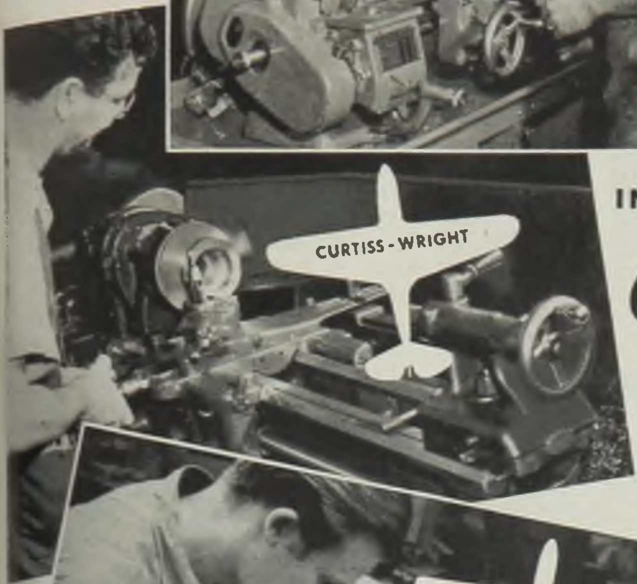
This collet speed chuck is precision made, being hardened and ground throughout. It is available in 1 and 2-inch sizes. The 1-inch size takes a standard 5-C Hardinge collet; the 2-inch size, a master collet using standard W. & S. collet pads. Maximum capacity with special collet is 2⅝-inch diameter by 1½-inch deep.

Flywheel Arbors

Practical operating conditions have shown that most carbide milling is best performed with very coarse toothed cutters. Either adequate power is lacking or the work or setup will not stand the extreme pressure of closely spaced cutters. If milling cutters with conventional tooth spacing are used, the chip load per tooth is so small that metal cutting is inefficient. Hence the use of cutters

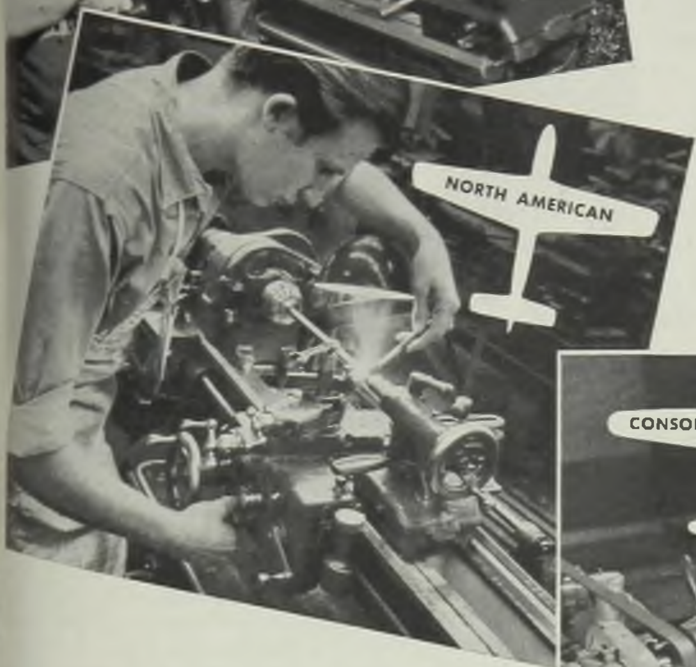
(All claims are those of the manufacturer of the equipment being described.)





IN THE *Aircraft Industries*

SOUTH BEND LATHES have long been popular for precision manufacturing operations and fine tool work in the aircraft industry. Today, in the greatest plane production schedule in history, these modern lathes are more than keeping their traditions for dependable precision and exacting tolerances. Providing lathes to most of the aircraft industry is one of our many important war assignments.



TRAINING HELPS

South Bend training helps—books, sound films, wall charts, and booklets on the care and operation of engine lathes and toolroom lathes—are available for facilitating the training of new lathe operators. Write for a copy of Bulletin 21-C.

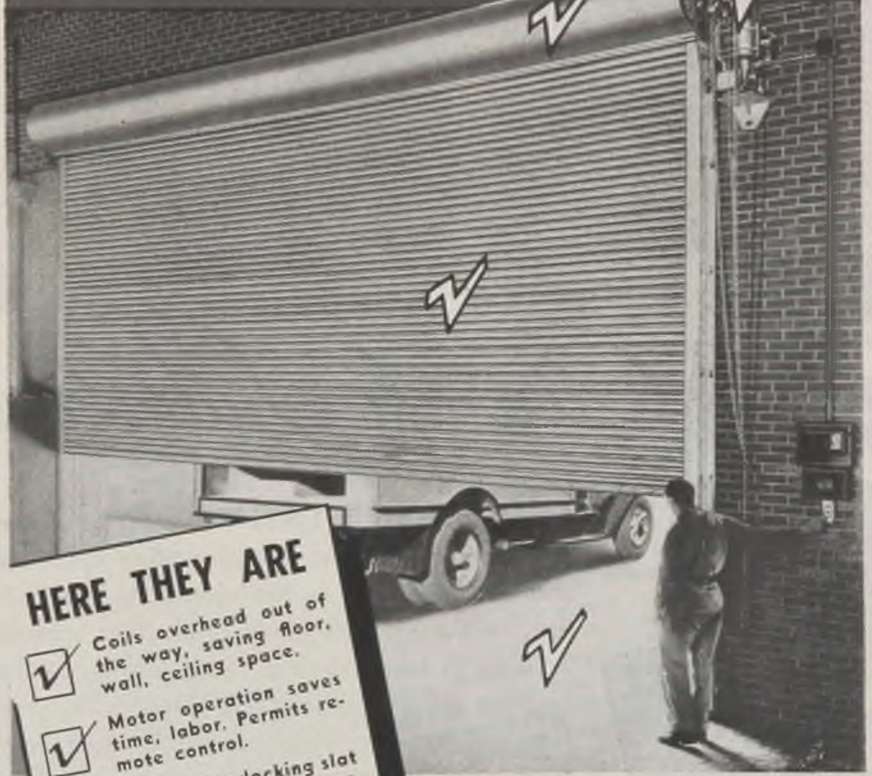
BUY WAR BONDS NOW... SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

When DOORS are the issue

Check these features



HERE THEY ARE

- Coils overhead out of the way, saving floor, wall, ceiling space.
- Motor operation saves time, labor. Permits remote control.
- Sturdy, interlocking slat construction for long, dependable service.
- Opens straight up. Ice, snow, stored materials don't hinder operation.
- Its simplicity of design harmonizes with any architectural style.

You're sure to want these

KINNEAR ADVANTAGES

Check these advantages of Kinnear Rolling Doors and you'll find that no other door offers so many outstanding features. Kinnear's sturdy, interlocking steel-slat construction is resistant to intrusion, fire, damage, wear, and weather. The Kinnear Rolling Door coils neatly overhead out of the way of damage, saving floor, wall and ceiling space — it opens straight up, over snow, ice, and stored materials — neat in appearance, it harmonizes with any architectural style. With Kinnear Rolling Doors and Motor Operation — a matchless combination — you simply press a button and the door rises smoothly and easily into a compact coil above the opening. Kinnear Motor Operation also means savings in time and labor, in heating and air-conditioning costs. If you're not already profiting from these advantages, write immediately for full details on Kinnear Rolling Doors and Motor Operation. The Kinnear Manufacturing Company, 1780-1800 Fields Avenue, Columbus 16, Ohio.

Offices and Agents in All Principal Cities

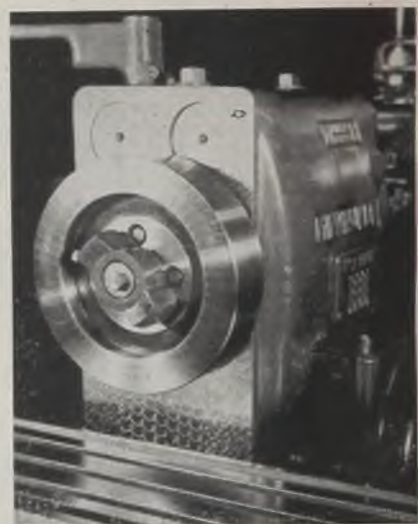
SAVING WAYS IN DOORWAYS

KINNEAR
ROLLING DOORS

with one, two, three or four teeth, cutters, has evolved. However, these coarse bladed cutters give an intermittent cutting action caused by the cutters bumping in and out of the work.

To eliminate this condition fly wheels should be incorporated in the drive. Their use tends to dampen the vibration or fluttering caused by intermittent cutting. Flywheels increase the effective power available to the cutter, particularly if the cut through the work is comparatively short. The potential energy which is stored in the heavy rim of the wheel increases considerably the force available to go through the cut. Actually power is stored up and then expended, which of course is the purpose of any flywheel. The flywheel used should be as heavy as feasible and mounted as close to the cutter as possible. By having the flywheel action right at the cutter any windup or resiliency in the drive is eliminated.

As a simple adjunct to the use of carbide or fly cutters, Weddell Tools, Inc., 1239 University avenue, Rochester 7, N. Y., has developed simple flywheel arbors or adaptors. The standard shell end mill arbor is replaced by a flywheel arbor which mounts on the spindle of



the machine. This combination arbor and flywheel has a nose, which is a replica of the nose end of the shell end mill arbor, onto which the milling or fly cutter is fastened and driven. The flywheel arbor is made with counterbored back or locating means to fit any milling machine or horizontal boring mill. The arbor nose is made in any of the standard sizes, ¾ to 2½ inches in diameter.

For the use of cutters which fit directly on the spindle, a flywheel spindle nose adaptor has been developed. On this, the back is counterbored or adapted to fit the machine spindle nose, while the front is the same as the machine spindle nose, permitting the mounting of the standard cutter. Similar adaptors are available permitting the use of taper shank cutters.

The use of flywheel arbors or adaptors allow a lighter bodied, less expensive, and more easily handled cutter to be used. They are made in standard sizes.

A new generation of industrial workers is learning about Exide dependability!

New workers are enlisting every day in America's industrial battle. Many of them have been unfamiliar with motive power batteries and the equipment powered by dependable Exides . . . but that picture is changing fast. The long-life of Exide-Ironclad Batteries is convincing these new workers of something experienced operators have always known . . . that Exide-Ironclad Batteries are leading a war of movement on the home front. Remember, only Exide can make an Ironclad.

Write us for a FREE copy of the new bulletin "UNIT LOADS," prepared by The Industrial Truck Statistical Association. Tells how to cut material handling costs up to 50% . . . covers latest developments in material handling . . . includes actual case histories.

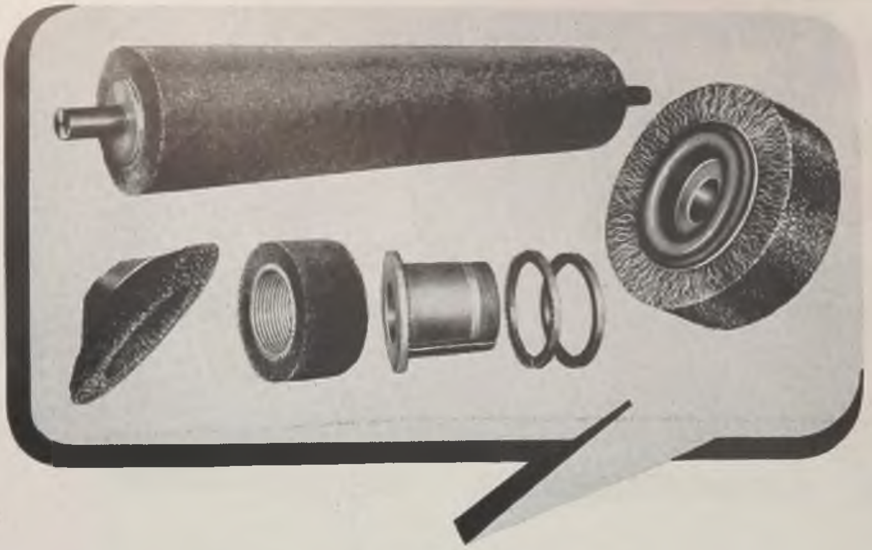
ARMY ★★ NAVY

Exide
IRONCLAD BATTERIES

1. High Power, More Production: To get the most from any battery-powered electric vehicle, its battery must deliver good voltage, hold that voltage high, and be ready for emergency demands with a giant surge when needed. Exide-Ironclads do just that.
2. Long-Life, Saves Materials: Rugged Exide-Ironclads are built to last, and save vital materials by getting maximum use from everything that goes into their making. When you buy an Exide you definitely—Buy to Last and Save to Win!
3. Easy Maintenance Saves Labor: Exides are kept charged by the simplest method ever devised. With the Exide Charge Control Unit there's nothing to do but connect the battery to the charging source and turn a knob.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto



it's SPIRAL BRUSHING TOOLS like these that will solve your BRUSHING PROBLEMS

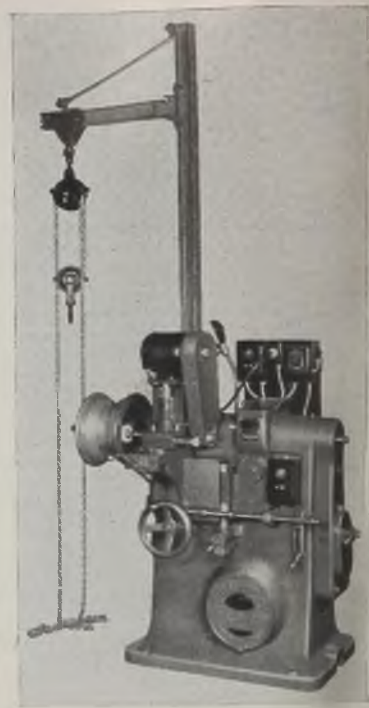
Wherever power driven brushing tools are required to do the job—Spiral Brushing tools will do that job better and longer. Whether the job is scrubbing, removing burrs, cleaning angles or other difficult areas, these job-designed Brushing Tools work faster, safer and do their job better. • Every Spiral Brushing Tool is especially designed for the work it is intended to do. Whatever your brushing problem may be, send today for a Spiral Specification sheet. Spiral engineers will promptly job-design the Brushing Tool to meet your problem.

SPIRAL BRUSHES, Inc.
3114 EAST 91ST STREET • CLEVELAND 4, OHIO
Branch Offices
WASHINGTON • CHICAGO • ST. LOUIS • PEORIA
PITTSBURGH • DETROIT

to fit standard machines, ... they ar standard end mill arbors—or amounts o made special, with special shapes t increased mass, or of special clear the work or fixture setup.

Aircraft Brake Drum Truing Machine

To meet the specific needs of militar aircraft maintenance, a special aircra brake drum truing machine has bee designed by Lempco Products Inc., 575 Dunham road, Bedford, O. A squirre cage induction-type motor eliminates th danger of sparks. By rotating the turre which contains both the turning tool ar



grinder, it takes only 30 seconds change from turning to grinding, or v versa, without altering the setup rega less of how many times changes made from turning or grinding. It available with or without crane and ho

Die Table

A new type rolling table, announc by Barrett-Cravens Co., 3250 W Thirtieth street, Chicago, is a valua aid for all kinds of shops and factor It serves as a portable work bench, set separator and a lifting table for st ing, moving and setting up dies, for su porting bars and sheets of steel for m ing and for the many other jobs p formed by lifting tables.

Incorporating a small crank-opera overhead hoist, the user can handle piece quickly and smoothly without da aging, jolting or jarring. The table simple to operate and easily moved easy turning casters.

The multiduty die table is offered two models—style B-1, which will h dle dies up to 40 inches long and a table capacity of 3000 pounds; ta height which can be set between 24 a