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STEEL

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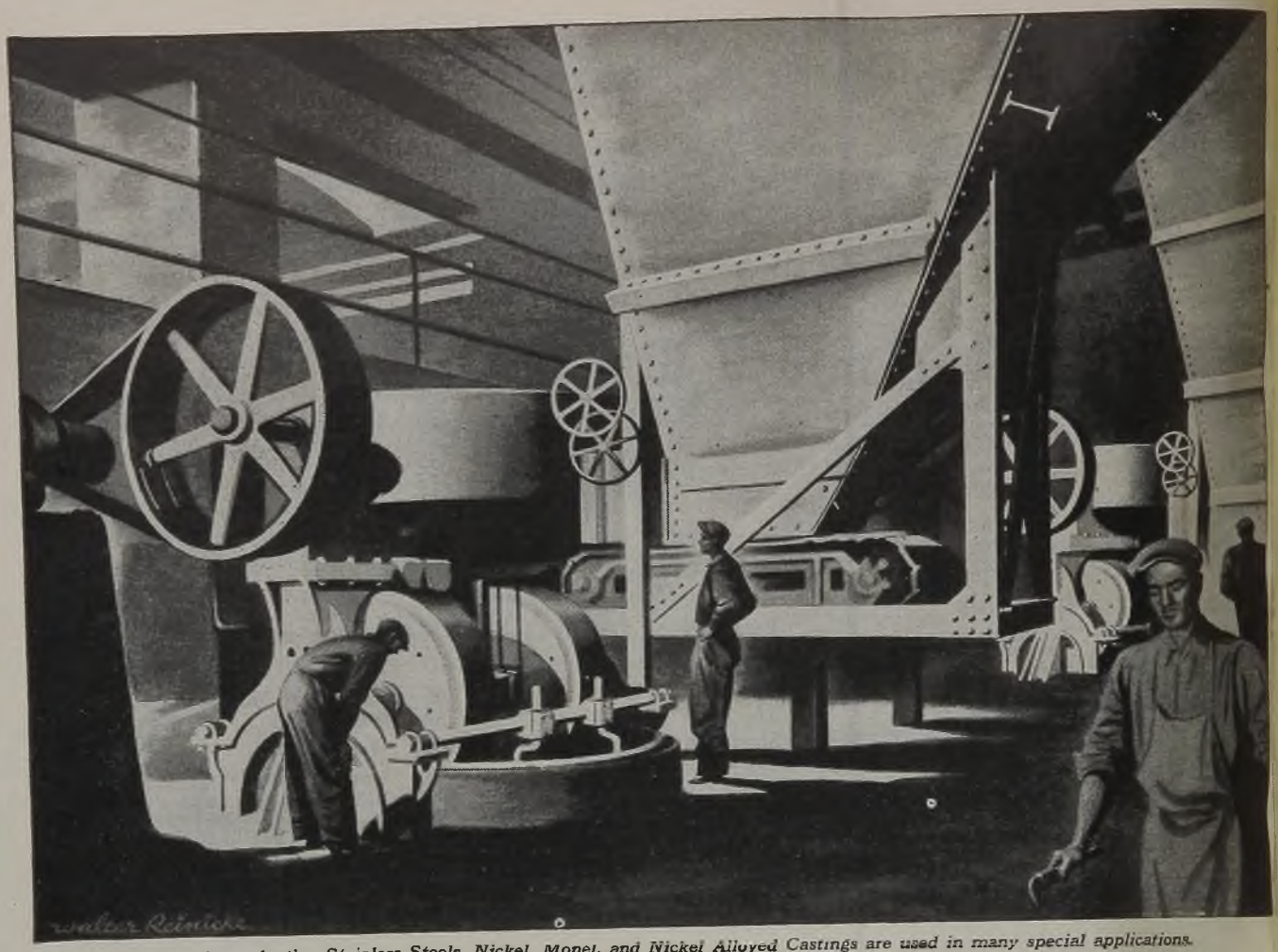
NEWS

TECHNICAL

FEATURES

MARKETS



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STEEL
August 28, 1944

Preventable Minuses

According to figures compiled by the Bureau of Labor Statistics of the Department of Labor, the productivity of labor in terms of physical production had advanced rather steadily from 1909 until the beginning of the present war at a rate of about 3½ per cent per year. The consistent manner in which this improvement has been maintained over a period of more than three decades is impressive. Assuming that this figure of 3½ per cent per year is reasonably accurate, it must be accepted as one of the most significant bits of basic information bearing upon our economic progress.

For instance, if it is true that normally the productivity of employes in all manufacturing industries increases at an average rate of 3½ per cent per year, then the pluses of efficiency more than offset the minuses of inefficiency by 100 per cent about every 29 years. In other words, the average industrial employe doubles his hourly output every 29 years.

This is so important to the nation that more study should be given to the pluses and minuses. What makes for greater productivity and what detracts from it?

On the plus side are the contributions which promote efficiency. Money saved and then invested in research and in plant and equipment multiplies the effectiveness of the workers' effort. Improvements in organization, in training, in health and in techniques increase the productivity of the individual. Machines relieve him of exhaustive physical labor and enable him to do more accurate work.

Opposing these and other pluses are numerous minuses. Among them are the restrictive practices of labor unions—featherbedding, ceilings on output, "make-work" specifications, etc. Equally restrictive in effect are monopolistic practices which persist in some areas of manufacturing. Also high up in the list of minuses are practices existing in every step of production, manufacture and distribution which are wasteful and inefficient and tend to lower the individual's output.

That productivity increases 3½ per cent annually in spite of these minuses is definitely encouraging, but this nation cannot afford to assume that this trend will continue automatically.

The normal urge for progress will always stimulate the plus factors. Our real concern should be centered upon the minuses. As we approach the postwar period, we should make a more vigorous attempt to eliminate preventable waste. Particularly we need a new determination to discourage intentional restrictive practices and a rebirth of confidence in the economic soundness of efficiency.

INSTRUMENTS IN WAR: One factor which is contributing to Allied successes on all battle fronts is the excellence of American-made precision instruments. The role of these aids in this war is assuming an importance never before experienced in military combat.

Behind the scenes is a dramatic story of revolutionary achievement. Early in the present emergency it became obvious that the demands for instruments would far exceed any production which could be achieved through the orthodox toolmakers' individual handcraft methods. To turn out the millions of spurs, helicals, worms, worm wheels, straight and circular racks, straight and spiral bevels and cluster gears required for the numerous assemblies essential to modern instruments would seriously over-tax the facilities available through existing craftmanship. To succeed, the job had to be converted from one of manual skill to one of mass production.

(OVER)

This conversion has been accomplished successfully. Not only has the output of fine pitched gears been placed upon a mass production basis but also the standards of accuracy have been raised by a noticeable margin. The overall result has been a refinement in the control of military equipment which has confounded the enemy in every theater of war—on sea, on the land and in the air.

—p. 80

* * *

DEFINE JOB RIGHTS: At a meeting of the National Industrial Conference Board representatives of a government agency and of CIO expressed sharply divergent views on the job rights of returning servicemen.

Col. Paul H. Griffith, chief of the Veterans Personnel Division, Selective Service System, declared that war veterans should be reinstated in their former jobs even though this policy displaces men with greater seniority. Victor G. Reuther, assistant director, War Policy Division, UAW, a CIO affiliate, contended that it is not the intent of Congress that veterans shall have job priority over everyone else. He predicted plenty of trouble if the seniority of civilian workers is disregarded.

We believe that differences of opinion as to job rights after the armistice are widespread. Policy should be clarified now, before misunderstandings attain dangerous proportions: The Yanks will not stand much "pushing around" when they return home. —p. 55

* * *

TIN PLATE DEMAND: End of the war in Europe will usher in interesting developments in the container industry. Persons who have studied the matter anticipate an expanding demand for containers, interrupted only by a relatively short lag.

Much depends upon the food pack, because it accounts for about 60 per cent of tin plate output in normal times. If the war in Europe should end soon, then the lag would come almost immediately thereafter, because there would be several months before production for the next season's pack would start. After this interval, demand would increase sharply. The decision of the government as to the disposal of canned goods would have a marked influence on the timing and volume of this demand.

Wrapped up in the future of the container industry is the status of the new electrolytic tin plate lines. These installations will have their first test under normal competitive conditions. —p. 50

DOING IT HARD WAY: A survey of leading industrial centers shows that only a few manufacturers have asked permission to resume the production of civilian goods under the relaxation orders recently issued. The small number of requests is not surprising because most government and industrial leaders feel that material and manpower shortages are too widespread to permit of reconversion on other than an extremely limited scale.

Another factor in the paucity of requests may be the confusion that has attended Donald Nelson's efforts to encourage a gradual changeover. This confusion, first generated by the strong opposition to Mr. Nelson's views in certain government circles, was not allayed by the furore arising from the White House announcement that the WPB chief was going to China for an extended trip. It remains to be seen how the resignation of Vice Chairman Wilson will affect the situation.

It is too bad that the nation's approach to the complex problem of reconversion is being made much more difficult than need be. Somebody in Washington ought to speak out clearly. —p. 47

* * *

TOO OPTIMISTIC? Questions have been raised in some responsible quarters as to whether or not some of the publicized statements about reconversion have been pitched on a too-optimistic note. It is argued that the men who talk most openly about shifting production from wartime to peacetime products are top executives who may be prone to minimize the importance of numerous details which have to be worked out by subordinates.

A case in point is the shift to civilian automobiles. Some rather optimistic predictions have been made as to the time required to reconvert facilities. Yet a very rough check of the major components of a passenger vehicle indicates that there are items such as electrical accessories, exterior trim and plating and steel for gears, engine parts and transmissions on which production is bound to be delayed for various reasons.

It is too early to speak confidently about quick reconversion for any manufactured article as complex as an automobile. There are too many question marks ahead to permit of dogmatic predictions at this time. —p. 65

E. C. Shane

EDITOR-IN-CHIEF

NEW

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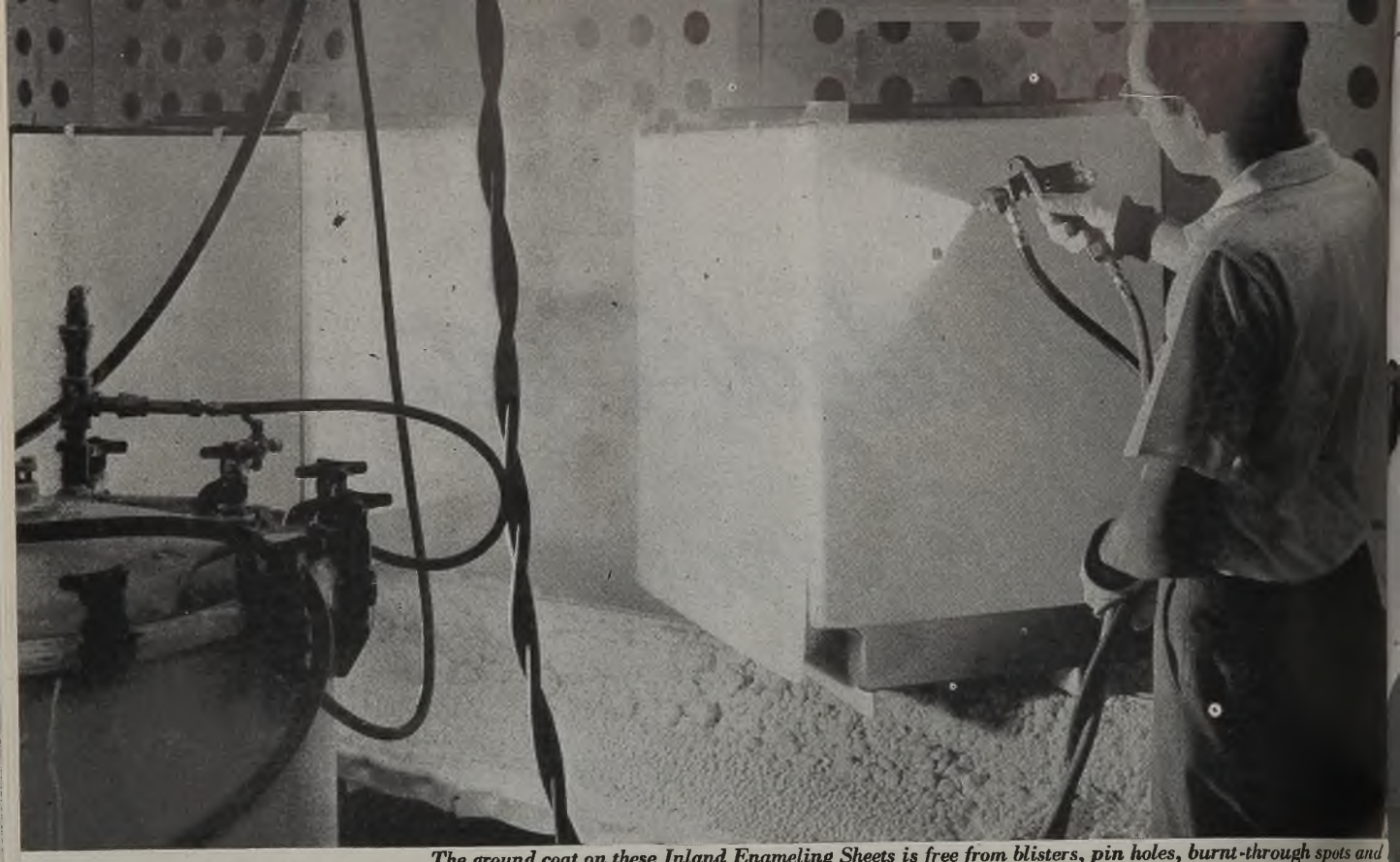

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DONALD M. NELSON . . . . . Goes to China

C. E. WILSON . . . . . Quits WPB

Few Apply for Permits To Resume Civilian Goods Production

Manpower shortage and scarcity of components, machinery and packaging materials preclude substantial reconversion before European war ends. Nelson's mission to China interpreted in some quarters as slowing preparations for changeover

"FOUR cornerstones with little in between" is how most metalworking companies regard the four recently issued "relaxation orders" leading to resumption of civilian goods production.

A survey by STEEL's editors of War Production Board field offices last week revealed that only a handful of manufacturers had applied for authorizations to resume civilian production. The paucity of requests was not surprising, as neither WPB nor the manufacturers expected the manpower and materials shortages would permit any large-scale resumption of civilian goods output before the end of the war in Europe.

The four orders which were intended to prepare industry for reconversion to peacetime production were: 1. Lifting of restrictions on the use of aluminum and magnesium; 2. Permission to manufacture experimental or working models of postwar products; 3. Authorization for the placement of forward machine tool orders for postwar manufacture; 4. Permission to WPB field offices to approve production of civilian goods by manufacturers who could show they have plant capacity, materials and labor not needed in the war effort.

The sending of WPB Chairman Donald M. Nelson to China on a Presidential mission aroused a flood of rumors that preparedness for a reconversion was to be delayed. Mr. Nelson long has been known to be a proponent of preparedness for peace while at the same time insisting on all-out war production. It is a fact that he often has been in conflict with high military officials on when to start preparations for peacetime production.

His chief deputy in WPB, Charles E. Wilson, former president of General Electric Co., has been reported as siding with the military chieftains. When Mr. Nelson was dispatched to China for "several months" and Mr. Wilson was placed in charge of WPB, accusations quickly were made that Mr. Nelson was "exiled" because of his reconversion policies.

The protests against the action, within and without WPB, caused Mr. Wilson to resign late last week. He is expected to return to GE.

However, for the sake of the record, it should be pointed out that the idea of the China mission is not new, that it first received consideration several months

ago, and if not actually conceived by Mr. Nelson, received his enthusiastic support. As head of war production in this country, he believed that he should visit China, a large recipient of American lend-lease benefits, as he did Russia. He also believes it is necessary to stimulate China to industrialize herself, in order that that country might become a more powerful factor in the war and a greater potential market for American products in the postwar period.

Many difficulties stand in the way of reconversion to civilian goods, even on a limited scale. Chief of these is the manpower shortage. Even in areas where no critical shortage exists, manpower officials are reluctant to approve reconversion programs for fear that labor needed in war production be attracted to peacetime work. Another limiting factor is the shortage of components, machinery and packaging materials.

A long and tedious path of paperwork appears involved in obtaining the spot authorizations for civilian goods production. First, copies in triplicate of Form WPB-4000 must be filled out and filed, along with copies in quintuplicate of an accompanying Form WPB-3820 (revised). The first attests primarily to material needs, the second to manpower requirements. When the WPB field office has reviewed the statements, it may dispatch field officers to the applicant's plant for further investigation. Meanwhile, the War Manpower Commission must review the case and perhaps send out its investigators for a check. By this time doubtless the war will be over.

A summary of the reactions to the orders in various districts follows:

CHICAGO: Only two applications for reconversion have been received at the Chicago WPB office and only one of these has a chance for approval. The manpower shortage in this area is too critical to permit authorization of resumption of civilian goods. War Manpower Commission estimates there are 40,000 jobs to be filled, of which almost half are on must contracts for the armed forces.

Only one application has been received here for permission to produce experimental models.

Component Parts Lacking

CINCINNATI: A score or so of inquiries as to procedure were received at this office. Late last week no actual application had been received, in fact the application forms were not immediately available.

DETROIT: Regional WPB office here reports only a handful of requests for the WPB-4000 authorization form and no manufacturers have filed for action. WPB officials point to a recent survey of 185 war plants in the area indicating a labor shortage of about 11,000 as proof that there will be no spot authorizations for some time to come.

Principal value of the recent WPB authorizations is seen in the fact they will provide an accurate gage of military production programs which are behind schedule and at the same time provide the means for taking up the slack in employment should it develop.

Many problems confront the manufacturer seeking to produce some of the items on the list of products now given the green light. First, the matter of critical components such as electric motors, wiring, bearings, etc. Next, even more critical items, cartons, packaging material, crating, have been pre-empted for war materials shipment. Finally, there is the matter of pricing products which have not been made for some time.

Few Reconversion Inquiries

PITTSBURGH: Reconversion problems do not weigh as heavily here as in some other districts due to the fact that Pittsburgh produces the steel, aluminum, glass that go into the end products. Here the major reconversion problem will be to redesign distribution methods, in plants and products.

The local WPB office reports that inquiries on the reconversion orders are few. Added to the fact that there are few companies that manufacture any of the products named in the WPB list of authorized civilian items is the manpower shortage and probability that no company could get approval from the WMC to use workers on civilian goods at this time.

BUFFALO: Both WPB and WMC agree there is little or no chance of any Buffalo-Niagara frontier plants resuming civilian production in the immediate future. This view prevails despite the fact that approximately 100 plants are ready to swing into civilian production when materials and manpower are made available.

BIRMINGHAM: District manufacturers are making application under Priorities Order No. 25 in small volume. Most of the applications come from small shops and foundries not participating in the war effort and which for that reason have been inactive.

Birmingham has few manufacturers turning out finished goods; primary emphasis in this district is in the production of materials.

BOSTON: In the first week after the WPB order authorizing limited civilian goods production 322 inquiries as to procedure were received at the New England WPB office. None of these was an actual application and, as a matter of fact, applications and forms for certificates of approval were not received by the regional office until several days after the order was issued.

While inquiries have since increased and a few applications have been filed, the order is expected to release but a trickle of additional civilian goods.

Some readjustment in ceiling prices will be necessary before manufacturers can resume production. Manufacturing costs in the metalworking and allied industries have increased from 20 to 25 per cent and at 1942 price levels producers of these goods are barred economically from a return to normal production. Indications are that OPA will consider favorably requests for price increases.

CLEVELAND: Only five applications have been received here since the order authorizing limited civilian goods production was issued. All of these are from very small companies employing less than 15 people and all merely asked an increase in their production quotas which had been approved by WPB earlier this year. Items which these companies produce include inner-spring mattresses, beds, towel racks, bed-spring sofas and box springs.

WPB officials point out that while a manufacturer may be in a comparatively free labor area his suppliers may be in a critical area. Shortage of machinery, components and packaging containers are other limiting factors.

Reaction to the earlier WPB orders permitting manufacture of experimental models and authorizing placement of forward orders for machine tools has been negligible. Not a single request has been received for permission to go ahead on an experimental model.

Attracts Considerable Interest

NEW YORK: The fourth point in WPB's program for the gradual reconversion of industrial output to civilian needs, effective Aug. 15 and covering 79 groups of products, has attracted considerable interest among manufacturers, particularly in the districts where labor shortages are not critical. However, they are convinced that time is going to be required for most of them to gain the authorizations they seek under the measure to change over, or expand, on such civilian work as they may now be engaged.

Formulated primarily to prevent unemployment or labor dislocations, following cancellations or cutbacks, the latest measure, they realize, is not "a general opening of the door" to civilian production. The swing back to peacetime production under this regulation will be possible only where labor and materials are not needed for more essential purposes, with major emphasis on the labor aspect.

WPB officials, in fact, have clearly indicated there will be little chance for manufacturers in the No. 1 critical labor classification, or even in the No. 2 group, to receive authorization to change to peacetime work, or to expand existing civilian production above quotas established early in the emergency.

Even in Group 4 labor areas, such as New York City, manpower consideration may hold up conversion, as WMC officials will have to be satisfied that the supply of the particular labor required is not needed for war production. In this manner, it is pointed out, by withholding their assent in the granting of an authorization for civilian production WMC officials could encourage the movement of workers to essential jobs.

Uniform Policy for T-Loans Set

Director of Office of Contract Settlement says granting of small termination loans speeded by authorizing Federal Reserve banks to approve guarantees up to $500,000

UNIFORM procedures for Federal Reserve banks' guarantees of termination loans, T-loans, made by commercial banks to contractors whose war contracts are canceled were prescribed last week by Robert H. Hinckley, director, Office of Contract Settlement, in his first general regulation.

These T-loans enable any war contractor to convert into cash at his local bank approximately 90 per cent of the sound value of his war assets frozen by contract termination. The lending bank, in turn, is protected on its loan by Federal Reserve bank guarantee. Subcontractors, as well as prime contractors, are eligible.

The procedures promulgated as regulation No. 1 of the Office of Contract Settlement were formulated by a committee made up of representatives of the War Department, Navy Department, Maritime Commission, and the Federal Reserve Board and were approved by the Contract Settlement Advisory Board, established by the Contract Settlement act of 1944.

Mr. Hinckley said that to speed up the granting of small loans in the field, the Federal Reserve banks, as fiscal agents, have been authorized to approve T-loan guarantees totaling $500,000 or less to a single borrower.

The regulation states in part:

"The requested percentage of guarantee should not ordinarily be questioned by the Federal Reserve bank or the contracting agency if it does not exceed 90 per cent; and a contracting agency should not authorize a percentage of guarantee in excess of 90 per cent, or 95 per cent in the case of small loans, unless the circumstances clearly justify the financing institution in requesting it and other means of interim financing are not promptly available. . . .

"The borrower's certification of his investment in termination inventories and receivables and of amounts payable to subcontractors should not be questioned by the Federal Reserve bank or the contracting agency unless there is reason to believe it is substantially overstated in value."

Accompanying regulation No. 1, the Office of Contract Settlement made available the texts of its standard T-loan Guarantee Agreement, Termination Loan Agreement and Explanatory Notes with reference to these agreements.

Present, Past and Pending

■ UNVEILS CONTINUOUS MOLDING, EXTRUDING MACHINES

DETROIT—Continuous injection molding and extruding machine, one of which is now in use producing seamless plastic tubes for rocket launchers, has been unveiled by Chrysler Corp., whose 45-year-old project engineer, Walter P. Cousino, conceived the original model five years ago. Machine will mold thermoplastics, thermosetting plastics, natural and synthetic rubbers. Monroe Auto Equipment Co., Monroe, Mich., now is operating one machine under license, producing synthetic rubber link bushings, seamless plastic tubing, etc.

■ TO HOLD CONFERENCES ON TERMINATION PROCEDURES

WASHINGTON—Under the joint sponsorship of the Smaller War Plants Corp. and Army and Navy procurement officers, meetings of subcontractors and smaller prime contractors will soon be held in all parts of the country to interest contractors in making preparations for contract settlement and to convey information on contract termination procedures.

■ WICKWIRE SPENCER WIRE MILL CLOSED BY STRIKE

PALMER, MASS.—Rope and wire drawing mill at Wickwire Spencer Steel Co.'s plant closed down last week as a result of a strike of about 1100 in protest over alleged failure to make effective a WLB directive ordering checkoff and union maintenance.

■ PRICE CEILINGS ESTABLISHED ON RECONDITIONING DRUMS

WASHINGTON—OPA has recently established dollars-and-cents ceilings covering charges for the reconditioning of used steel drums of 29 to 58-gallon capacity, and selling prices for used and reconditioned containers of 7 gallons and upward capacity.

■ ST. LOUIS CAR CO. RESUMES OPERATIONS AFTER STRIKE

ST. LOUIS—Production of amphibious tanks for the Navy and power cars for Russia has been resumed by St. Louis Car Co., pending a decision by the WLB on the dispute that caused the recent 12-day strike of 1200 members of the United Steelworkers of America-CIO.

■ AMERICAN CAR & FOUNDRY REPAIRING COMBAT TANKS

NEW YORK—American Car & Foundry Co. is starting work on repairing 550 light combat tanks returned from service by the War Department. Repairs are being made at the company's Berwick, Pa. plant, now engaged primarily in building bulldozers to be used in rehabilitation work abroad.

■ AWARD CONTRACT FOR POSTWAR JEEP BODIES

TOLEDO, O.—Contract for 25,000 jeep bodies has been awarded the American Central Mfg. Co., Connersville, Ind., by Willys-Overland Motors Co. The bodies are to be used on a postwar version of the jeep designed for sale to farmers.

Clayton Outlines Plans For Selling Surpluses

Will L. Clayton, surplus war property administrator, last week told the Senate Defense Investigating Committee that Mason Britton, assistant administrator, is exploring the possibilities of disposing of machine tools, cutting tools, jigs, fixtures and allied equipment through groups of companies in the industry, comprising dealers or manufacturers or both.

To avoid a clash with antitrust laws, contracts would be made with individual companies rather than with a group, but even so Mr. Clayton said he will want an opinion from the Justice Department as to the legality of this procedure.

SWPA, he said, would decide what companies should be selected. To insure proper conduct these companies would contract to act as agents for SWPA and SWPA would control their sales policies. He admitted that this would put government in the business of merchandising through use of established firms and he also admitted that the scheme holds possibilities for monopolies, but thought that SWPA control of sales policies would act as a safeguard.

Asked what he thought about several recent proposals that government surplus property largely be scrapped to prevent disposal from slowing down employment in manufacturing plants in making new products, Mr. Clayton said the whole world is hungry for goods so that these surpluses can be marketed for a long time ahead without retarding new production and employment. Mr. Clayton said agents who want to buy government goods and sell at a profit are "swarming all over the place" and that SWPA proposes to permit disposal agencies to sell only to bona fide representatives of business.

End of War To Bring Expanded Demand for Containers

Much depends on government's policy in disposing of stocks of canned goods on hand. . . Several years may elapse before tin supply from East becomes as plentiful as in prewar days, due to time required to rehabilitate equipment

By B. K. PRICE
Associate Editor, STEEL

CESSATION of hostilities in Europe unquestionably will bring a broader demand for tin plate. How quickly this expanded demand will develop and how large it will be depends on several unknown factors.

If the European phase of the war ends soon, as appears probable, there may be a lag of two or three months, due to the seasonal factor, before production for next season's food pack starts. The food pack takes the largest proportion of tin plate, being estimated at about 60 per cent of total output in normal times.

On the other hand, many general line requirements should pick up rapidly. Certain of these items may be influenced seasonally to some extent, such, for instance, as beer cans, but even in such cases there should be a reasonably brisk acceleration, all of which should more than offset the drop in demand for such special war items as containers for first aid kits, portable blood banks, explosives and other powders, and so forth.

Much depends on the policy to be adopted by the government in disposing of the stock of canned goods which will be on hand at the end of the war. If the government should put these goods on the market in this country, instead of distributing them in other countries, tin plate requirements will be reduced.

The bare mechanics of lifting restrictions should prove fairly flexible but much should depend upon considerations of policy behind the restrictions, particularly with regard to raw materials. Steel should be in sufficient amount, but tin will have to be conserved until the war in the Pacific is over.

As a matter of fact, it probably will be two or three years after the war in the Far East is ended before tin will become as plentiful as it was in prewar days. This is ascribed to the fact that the Japanese, once they are forced to give up the mining properties will wreck all equipment.

Stocks of tin in this country since the outbreak of the war have never been as low as might have been supposed. First, there had been heavy purchases of tin by consumers immediately following the outbreak of war in Europe, and before this country entered the conflict. Then when this country did enter the war, Bolivian tin operations were stepped up sharply and in the spring of 1942 the Metal Reserve Co.'s smelter at Langhorne, Tex., went into operation. As a result of these developments and of the important limitations on consumption which were immediately put into effect after this country entered the war, tin never has been as critical as even copper or zinc.

However, there has been a steady decline in the amount of tin on hand, with a particularly substantial amount going into bronze; and there is every indication that tin will be rather tight for some time to come and will thus exert a certain limiting influence on tin plate expansion.

Demand for Bronze Should Ease

At the same time, once Germany is out of the war demand for bronze should ease and the situation in tin should be further relieved by the increasing use of electrolytic tin plate, which requires less tin than the hot-dipped process. While there is still much more hot-dipped plate being used than electrolytic, production of the latter has been steadily increasing, and by early next year it is believed volume will be much heavier.

By that time canmakers will have installed some additional lacquering equipment, which will spread the use of electrolytic plate. Moreover, results should be available of tests on certain food packs, which it is believed will prove highly favorable.

The whole development of the electrolytic plate process has been very rapid, compressing, in fact, a program that normally would require ten years into a

Electrolytically coated tin plate, with mirror-like finish, is shown emerging from plating and melting processes at Irvin Works of the Carnegie-Illinois Steel Corp., Pittsburgh

onsiderably shorter length of time, with result that many believe that the proc-ss is only now having a chance to come ito its own.

The saving in tin by the use of this rocess is ascribed primarily to the more ven coating which can be applied and s indicated by the fact that the electro-ytic coat runs usually around a half ound, against one and one-quarter to ne and one-half pounds for the dipped plate. For some purposes as light a oating as one-quarter pound can be sed for electrolytic plate, while for cer-ain other requirements coatings of three-uarter and one pound may be desirable. A three-quarter pound coating may be nade standard for many uses of elec-

trolytic plate in the near future, it is believed. A three-quarter pound electrolytic plate, instead of a one and one-quarter dipped plate, will likely be used before long for milk cans, and this in itself should provide an important new outlet for electrolytic plate.

Interestingly, regardless of how much tin will be available, if steel is to be had, as appears probable, there will be no lag in production of metal cans from black plate. There is a tremendous backed up demand for cans not necessarily made from tin plate but from uncoated thin sheets of steel, formerly called black plate, although today's cold reduced product is a glossy silver grey color. This product when lacquered and lithographed is entirely suitable for many products, such as tobacco, talcum powder, spice, pharmaceutical products and probably beer.

Today tin plate capacity, including terne plate, which probably does not exceed 5 per cent of the total coated production, is rated at 5,874,750 tons, of which, 2,155,100 tons is electrolytic and 3,719,650 net tons hot-dipped tin and terne plate. A little more than a year ago, tin plate capacity was rated at around 4,300,000 net tons and at the beginning of this year, 5,232,850 net tons, of which 1,780,450 represent electrolytic and 3,452,400 hot-dipped tin and terne plate. Thus, it may be noted there has been a steady increase in tin plate capacity over recent months.

According to recent figures by the American Iron and Steel Institute, electrolytic plate production for sale in June amounted to 65,475 net tons, or 37 per cent of capacity, and hot dipped, 176,-072, or 57.7 per cent of capacity for hot dipped and terne plate.

Commenting on the trend in hot dipped and electrolytic, one leading trade interest said: "There is some question as to the future of hot-dipped tin plate. Improvements being made in electrolytic tin plate together with the results of experimental packs now under way will result in the use of a substantially increased quantity of electrolytic tin plate in 1945. Whatever amount of tin may be available can be made to stretch over many more billions of cans, if produced electrolytically, than if produced by the hot-dipped method. Almost all of the electrolytic made up to date has been the .50 or ½-pound coated, whereas 1.25 pounds tin is the lightest which can be produced by the hot-dipped method."

Then with respect to capacity, he pointed out: "The coating capacity in this country is not a true index to the possible tin plate production. The real capacity is the strip tandem mill tonnage capacity in the tin mill gages, i.e., No. 29 and lighter, which supplies the thin sheet steel for hot dipping and electrolytic plating. This is something less than the total hot dipping and electrolytic capacity."

Tin plate producers are confident that they have lost little, if anything, in the way of potential markets by the substitution of other materials which have been necessary in many cases during the emergency. Fiber and various composition materials will likely be unable to retain many of their gains after the war is over. Tin plate producers declare the necessity for having to use substitutes during the emergency has given most packers a keener appreciation than ever of the advantages of tin plate.

While most canmakers have been booked up 100 per cent on war and essential civilian requirements, they have never been called upon to make important alterations in their regular canmaking equipment. In certain important cases they have been called upon to produce products quite different from their regular peacetime lines but this work has usually been done by subsidiaries and has not materially affected canmaking facilities. Consequently, reconversion to handle any pronounced increase in civilian container requirements will be virtually negligible.

WPB Cuts Fourth Quarter Tin Plate Production

War Production Board last week informed the Tin Plate Industry Advisory Committee that tin plate production scheduled for the fourth quarter, 1944, will be 125,000 tons less than third quarter output. This is due to the fact that the bulk of the summer crop yield is packed during the second and third quarters.

Approximately 148,000 tons of the 750,-000 tons of tin slated for production in the fourth quarter will be exported and the remainder will be reserved for domestic and Canadian use. Production in the second quarter of this year totaled 825,000 tons and in the third quarter 875,000 tons.

West Coast Tin Plate Industry Proposed

SAN FRANCISCO

Discussion of postwar prospects for newly-expanded steel producing facilities in the Far West appears to be concentrating more and more on tin plate as the best potential outlet for the facilities when the war ends.

Among the most recent exponents of this theory is J. R. Mahoney, University of Utah economic and business research director and an authority on steel.

Dr. Mahoney pointed out that although the West Coast does not have a single tin plate mill, the 11 western states consume one-third of all United States production of tin plate. California alone has 20 plants manufacturing tin cans, most of them concentrated in the San Francisco area and serving some 550 canning factories in the West.

Most logical source for such a development is the Geneva Steel Works in Utah, Dr. Mahoney believes.

ANALYSIS OF STEEL PRODUCT DISTRIBUTION IN 1943

(Source: American Iron and Steel Institute. All figures in net tons.)

CLASSIFICATION OF BILLING OF PRODUCTS BY CONSUMING INDUSTRIES—YEAR 1943 (Net tons)
(As reported by companies producing more than 95% of the year's output)

Industries	Ingots, Blooms, Billets, Slabs, Tube Rounds & Sheet and Tin Bars (1)	Structural Shapes and Sheet Piling (2)	Plates (Universal and Sheared) (3)	Rails: Over 60 lbs. (4)	Rails: All Other (5)	Tie Plates and Track Accessories including Track Spikes (6)	Hot Rolled Bars: Carbon including Hoops and Bands (7)	Hot Rolled Bars: Concrete Reinforcing (8)	Hot Rolled Bars: Alloy (9)	Cold Finished Bars (Carbon and Alloy) (10)	Pipe and Tubes (11)	Wire Rods (12)	Wire and Wire Products Including Fence Posts (13)	Black Plate (14)	Tin and Terne Plate (Hot Rolled Including Cold Reduced) (15)	Industries
1. STEEL CONVERTING AND PROCESSING INDUSTRIES																1.
(a) Wire drawers and wire product mfrs.	77,948	.....	980	.....	.....	200	9,497	.....	830	3,850	2,013	465,129	409,331	30	.....	(a)
(b) Bolt, nut, and rivet manufacturers	70,007	2,553	955	.....	.....	46	558,034	.....	22,110	78,509	403	279,999	171,118	147	.....	(b)
(c) Forging manufacturers																(c)
(1) Automotive and Aircraft	330,394	16	808	.....	.....	.....	86,519	.....	251,778	6,376	293	2,134	1,264	.....	.....	(1)
(2) All other	733,037	74	43,408	1,906	.....	55	190,513	.....	72,380	4,614	5,775	255	824	.....	.....	(2)
(d) All other steel plants and foundries	2,398,029	14,255	177,576	1,401	54	29,541	1,025,243	3,611	146,367	7,132	107,472	64,206	73,663	149	21	(d)
TOTAL	3,609,415	16,898	223,727	3,307	54	29,842	1,869,806	3,611	493,465	100,481	115,956	811,723	656,200	326	21	TOTAL
2. JOBBERS, DEALERS AND DISTRIBUTORS																2.
(a) Oil and natural gas industry	2,139	1,774	5,958	.....	.....	.....	8,041	.....	846	282	323,068	80	9,683	.....	47	(a)
(b) All other	36,605	410,953	559,664	3,479	11,136	24,395	915,557	32,575	110,365	368,350	1,324,475	6,634	1,296,617	62,250	24,658	(b)
TOTAL	38,744	412,727	565,622	3,479	11,136	24,395	923,598	32,575	111,211	368,632	1,647,543	6,714	1,306,300	62,250	24,705	TOTAL
3. CONSTRUCTION INDUSTRY																3.
(a) Public (Municipal, State, National)	868	6,016	8,759	43	12	118	2,724	3,965	14	517	16,818	1,731	4,276	.....	.....	(a)
(b) Highways	1,020	50,448	18,004	282	.....	23	13,558	13,096	307	341	1,637	107	4,647	.....	.....	(b)
(c) Railways	524	29,487	15,326	248	.....	11,746	5,516	1,626	121	244	563	163	1,734	19	.....	(c)
(d) Automotive and Aircraft	1,462	48,057	35,931	238	79	93	14,021	16,616	1,731	866	7,608	2,713	4,603	.....	126	(d)
(e) Utilities	6,316	16,007	91,383	2,297	7,355	407	30,898	12,301	516	222	26,364	2,785	10,983	.....	.....	(e)
(f) Bldg. trim, accessories and builders' hdw.	866	27,518	18,374	.....	.....	7	21,225	12,650	778	802	24,730	809	12,120	1,234	258	(f)
(g) All other	37,654	592,457	790,976	33,110	9,124	6,452	255,577	205,953	13,844	3,662	306,558	9,648	206,369	1,464	544	(g)
TOTAL	48,210	769,990	978,753	36,218	16,570	18,846	343,519	266,207	17,311	6,654	384,273	17,956	244,732	2,717	928	TOTAL
4. SHIPBUILDING INDUSTRY	118,144	1,820,127	7,503,124	1,133	72	175	621,670	75,996	53,690	37,114	338,406	2,211	73,025	483	478	4.
5. PRESSING, FORMING AND STAMPING INDUSTRY																5.
(a) Metal furniture and office equipment	.....	499	3,714	.....	.....	.....	9,424	.....	105	2,339	13,312	1,882	25,721	604	449	(a)
(b) Hardware and household equipment	771	1,711	14,215	.....	.....	.....	7,256	.....	278	4,992	5,952	29	11,277	33,561	5,289	(b)
(c) Automotive	28,440	20,007	167,028	.....	.....	.....	253,121	.....	151,209	29,342	36,794	26,616	35,389	7,145	4,258	(c)
(d) All other	537	3,021	77,167	.....	.....	.....	25,066	.....	4,147	1,294	38,689	9,670	61,125	17,426	7,214	(d)
TOTAL	29,748	25,238	262,124	.....	.....	.....	294,867	.....	155,739	36,967	74,747	38,197	133,512	58,739	17,628	TOTAL
6. CONTAINER INDUSTRY																6.
(a) Oil and natural gas industry	27	9,394	15,244	.....	.....	.....	1,791	.....	61	18	2,331	.....	401	7,040	17,070	(a)
(b) All other	.....	25	23,022	.....	.....	.....	27,383	.....	122	109	452	313	97,700	224,677	1,648,006	(b)
TOTAL	27	9,419	38,266	.....	.....	.....	29,174	.....	183	127	2,783	313	98,199	231,717	1,665,176	TOTAL
7. AGRICULTURAL, INCL. IMPL. & EQUIP. MFRS.	24,473	22,609	43,972	55	.....	2	262,914	.....	21,473	38,674	11,718	3,339	37,641	2,694	2,460	7.
8. MACHINERY AND TOOLS																8.
(a) Machinery and tools, not incl. elect. equip.	113,633	130,407	336,946	1,979	1,614	106	397,383	.....	100,109	153,874	172,578	7,044	23,130	3,302	322	(a)
(b) Electrical machinery and equipment	6,341	13,349	97,954	35	6	.....	58,992	.....	13,759	28,643	47,825	44,457	78,927	331	8,798	(b)
TOTAL	119,974	143,756	434,900	2,014	1,620	106	456,375	.....	113,868	182,517	220,403	51,501	102,057	3,633	8,800	TOTAL
9. AUTOMOTIVE AND AIRCRAFT INDUSTRY	208,255	57,923	242,250	52	.....	.....	258,649	.....	381,687	306,979	145,882	5,095	64,060	1,402	7,607	9.
10. RAILROAD INDUSTRY																10.
(a) All railroads	45,804	78,686	288,422	1,634,753	8,327	666,662	134,382	.....	5,808	1,568	30,843	815	16,915	.....	56	(a)
(b) Car and loco. builders and parts mfrs.	49,038	270,542	439,814	5,940	100	9,422	214,113	.....	7,072	3,738	27,015	127	5,905	24	3	(b)
TOTAL	94,842	349,228	728,236	1,640,693	8,427	676,084	348,495	.....	12,880	5,306	57,858	942	22,820	24	59	TOTAL
11. OIL, NATURAL GAS AND MINING INDUSTRY																11.
(a) Oil and natural gas, incl. pipe lines	14,966	36,390	197,218	150	8	157	28,822	.....	14,968	3,056	820,069	55	4,691	497	313	(a)
(b) Mining, quarrying and lumbering	1,223	11,849	20,153	9,889	44,926	9,099	32,236	.....	5,010	2,236	18,487	626	8,803	.....	.....	(b)
TOTAL	16,189	48,239	217,371	10,039	44,934	9,256	61,058	.....	19,978	5,292	838,556	681	13,494	497	313	TOTAL
12. MISCELLANEOUS INDUSTRIES AND EXPORT	2,506,314	241,721	1,822,183	241,969	41,755	67,535	1,161,479	86,967	1,029,017	932,802	1,314,251	270,609	564,898	39,110	393,092	12.
13. TOTAL (ITEMS 1 TO 12)	6,814,335	5,917,380	13,060,880	1,938,959	124,568	826,241	6,691,604	465,656	2,410,502	2,021,575	5,149,381	1,213,181	3,317,638	403,592	2,121,350	13.
14. LESS SHIPMENTS TO MEMBERS OF THE INDUSTRY FOR CONVERSION OR RESALE	2,118,382	1,754	123,300	385	10	14,740	708,731	17	118,859	2,514	32,710	220,339	40,964	551	.....	14.
15. NET TOTAL	4,695,953	3,916,126	12,937,230	1,938,574	124,558	811,501	5,982,873	465,639	2,291,643	2,019,061	5,116,671	992,842	3,276,674	402,961	2,121,350	15.

Industries	Sheets and Strip: Hot Rolled (16)	Sheets and Strip: Cold Reduced (17)	Sheets and Strip: Galvanized (18)	Sheets and Strip: All Other (19)	Tool Steel Bars (20)	Wheels and Axles (21)	Forgings (22)	Steel Castings (23)	Skelp (24)	All Other Steel Products (25)	Total Steel Products (26)	Iron and Brass Products (27)	Grand Total (28)	Less Shipments to Members of the Industry for Conversion into Further Finished Products (29)	Net Total (30)	Pig Iron, Ferro-manganese, etc. (31)	Industries
1. STEEL CONVERTING AND PROCESSING INDUSTRIES																	1.
(a) Wire drawers and wire product mfrs.	15,257	5,620	.....	.....	260	.....	56	.....	.....	228	991,229	34	991,263	295,635	695,628	6,018	(a)
(b) Bolt, nut, and rivet manufacturers	17,528	6,831	9	.....	75	.....	1,147	.....	.....	659	1,210,130	2,934	1,213,064	116,263	1,096,801	.....	(b)
(c) Forging manufacturers																	(c)
(1) Automotive and Aircraft	352	121	19	.....	1,390	.....	51	.....	.....	.....	681,515	1	681,516	32,874	648,642	.....	(1)
(2) All other	3,205	88	.....	.....	628	24	23,173	119	.....	269	1,080,347	7,298	1,087,645	179,545	908,100	35,440	(2)
(d) All other steel plants and foundries	645,525	118,382	709	6,060	4,752	603	13,625	12,211	563,862	2,831	5,417,286	48,266	5,465,552	3,644,834	1,820,718	7,768,211	(d)
TOTAL	681,867	131,048	737	6,060	7,105	627	38,052	12,330	563,862	3,987	9,380,507	58,533	9,439,040	4,269,151	5,169,889	7,809,669	TOTAL
2. JOBBERS, DEALERS AND DISTRIBUTORS																	2.
(a) Oil and natural gas industry	4,882	632	43	52	29	.....	549	31	.....	2	358,138	28	358,166	.....	358,166	.....	(a)
(b) All other	600,047	273,382	318,631	14,780	15,266	239	1,814	251	32	32,570	6,445,028	20,536	6,465,614	.....	6,465,614	3,101	(b)
TOTAL	604,929	274,014	318,674	14,832	15,298	239	2,363	282	32	32,572	6,803,166	20,614	6,823,780	.....	6,823,780	3,101	TOTAL
3. CONSTRUCTION INDUSTRY																	3.
(a) Public (Municipal, State, National)	32,297	1,197	3,694	.....	3	6	.....	.....	.....	236	83,294	726	84,020	.....	84,020	.....	(a)
(b) Highways	8,473	650	21,822	12	...	7	16	19	.....	1,128	135,597	32	135,629	.....	135,629	12	(b)
(c) Railways	2,900	682	219	83	8	6	20	.....	.....	469	71,704	13	71,717	.....	71,717	.....	(c)
(d) Automotive and Aircraft	77,468	1,236	1,444	292	....	2	40	43	.....	793	215,462	115	215,577	.....	215,577	.....	(d)
(e) Utilities	7,648	1,741	543	3	1	4,269	969	252	.....	205	223,465	.....	223,465	.....	223,465	109	(e)
(f) Bldg. trim, accessories and builders' hdw.	108,841	35,189	28,493	706	...	...	16	4	.....	3,503	297,623	66	297,689	.....	297,689	1,410	(f)
(g) All other	673,660	40,552	90,639	72,454	670	2,567	4,296	15,939	.....	7,699	3,381,868	75,359	3,457,227	.....	3,457,227	34,014	(g)
TOTAL	911,287	81,247	146,854	73,550	682	6,857	5,357	16,257	.....	14,033	4,409,013	76,311	4,485,324	.....	4,485,324	35,545	TOTAL
4. SHIPBUILDING INDUSTRY	383,041	34,916	116,874	1,706	877	1,958	221,258	37,845	.....	13,901	11,459,122	49,687	11,508,809	.....	11,508,809	1,995	4.
5. PRESSING, FORMING AND STAMPING INDUSTRY																	5.
(a) Metal furniture and office equipment	29,605	19,584	3,346	209	7	.....	.....	.....	.....	17,201	128,001	.....	128,001	.....	128,001	401	(a)
(b) Hardware and household equipment	90,252	89,497	21,422	6,317	34	.....	12	72	.....	1,688	294,725	1	294,726	.....	294,726	3,235	(b)
(c) Automotive	337,717	116,309	592	7,760	7	114	2,333	15	.....	23	1,222,539	.....	1,222,539	.....	1,222,539	.....	(c)
(d) All other	416,238	162,216	29,832	7,265	61	.....	54	5	.....	829	838,857	.....	838,857	.....	838,857	.....	(d)
TOTAL	873,813	386,606	55,192	21,551	109	114	2,399	92	.....	19,741	2,484,122	1	2,484,123	.....	2,484,123	3,634	TOTAL
6. CONTAINER INDUSTRY																	6.
(a) Oil and natural gas industry	377,753	62,336	2,433	638	55	.....	.....	.....	.....	4,512	501,112	4	501,116	.....	501,116	.....	(a)
(b) All other	751,200	214,381	46,959	1,351	50	.....	1,202	.....	.....	35,348	3,072,460	10	3,072,460	.....	3,072,460	112	(b)
TOTAL	1,128,953	276,717	49,392	1,989	105	.....	1,202	.....	.....	39,860	3,573,572	14	3,573,576	.....	3,573,576	112	TOTAL
7. AGRICULTURAL, INCL. IMPL. & EQUIP. MFRS	138,053	9,589	40,805	975	36	3	741	.....	.....	20,623	712,851	172	713,023	.....	713,023	85,867	7.
8. MACHINERY AND TOOLS																	8.
(a) Machinery and tools, not incl. elect. equip.	123,954	36,685	1,309	1,859	22,412	9,759	55,087	40,482	.....	6,200	1,741,074	4,834	1,745,908	.....	1,745,908	25,677	(a)
(b) Electrical machinery and equipment	244,642	74,847	3,592	38,054	1,443	2,415	14,576	4,880	.....	1,054	784,600	80	784,740	.....	784,740	342	(b)
TOTAL	368,596	111,532	4,901	39,913	23,855	12,204	69,663	45,362	.....	7,254	2,525,734	4,914	2,530,648	.....	2,530,648	26,018	TOTAL
9. AUTOMOTIVE AND AIRCRAFT INDUSTRY	471,261	236,959	7,819	36,965	2,562	47	47,448	525	.....	1,449	2,517,971	613	2,518,584	.....	2,518,584	39,869	9.
10. RAILROAD INDUSTRY																	10.
(a) All railroads	36,807	1,619	12,513	6	190	157,712	5,029	7,031	.....	38,785	3,172,735	17,140	3,189,875	.....	3,189,875	5,400	(a)
(b) Car and loco. builders and parts mfrs.	112,065	7,746	1,775	24	291	158,545	3,549	4,547	.....	4,556	1,328,253	10,678	1,338,931	.....	1,338,931	13,809	(b)
TOTAL	148,872	9,365	14,288	30	481	316,257	8,578	11,578	.....	43,341	4,498,988	27,818	4,526,806	.....	4,526,806	19,209	TOTAL
11. OIL, NATURAL GAS AND MINING INDUSTRY																	11.
(a) Oil and natural gas, incl. pipe lines	43,344	1,534	117	34	84	.....	1,553	441	.....	3,407	1,171,964	3,148	1,175,112	.....	1,175,112	.....	(a)
(b) Mining, quarrying and lumbering	10,944	322	2,134	12	657	1,734	20,117	440	.....	2,456	203,454	1,419	204,772	.....	204,772	115	(b)
TOTAL	54,288	1,856	2,251	46	741	1,734	21,670	881	.....	5,923	1,375,317	4,567	1,379,884	.....	1,379,884	115	TOTAL
12. MISCELLANEOUS INDUSTRIES AND EXPORT	1,434,591	979,038	111,398	68,682	21,757	42,837	488,990	23,901	98,656	169,599	14,153,353	37,847	14,191,200	.....	14,191,200	441,261	12.
13. TOTAL (ITEMS 1 TO 12)	7,199,551	2,532,887	889,185	266,499	73,608	382,377	907,719	149,553	662,550	372,235	65,893,706	281,091	64,174,797	4,269,151	59,905,646	8,466,032	13.
14. LESS SHIPMENTS TO MEMBERS OF THE INDUSTRY FOR CONVERSION OR RESALE	415,205	5,982	76	5,812	4,486	161	783	454	412,492	78	4,228,965	40,286	4,269,151	.....	.....	.....	14.
15. NET TOTAL	6,784,346	2,526,905	889,109	260,687	69,122	382,716	906,936	149,099	250,058	372,307	59,664,941	240,805	59,905,646	.....	59,905,646	.....	15.

Steel Ranks As Third Safest Major Industry

Only communications and electrical equipment industries led steel industry in accident-free records during 1943

IN SPITE of difficult conditions which included a high turnover rate among employes, the steel industry held fast last year to its high rank in safety, according to the American Iron and Steel Institute, quoting latest annual statistics of the National Safety Council.

As in 1941 and 1942, the steel industry last year, was the third in freedom from accidents among leading industries. Only the communications and electrical equipment industries, among 38 major industries, stood above steel in safety last year.

The 1943 accident frequency rate in the steel industry was 7.4 per million man-hours worked, the same as in 1942. The average for all industries was 14.5 last year, compared with 14.9 in 1942.

In 1934 steel ranked twelfth in safety. By 1936 it had achieved sixth place, in 1940 it ranked fourth and since 1941 it has ranked third.

So many persons were hired as replacements in 1943 that a resultant increase in accidents might have been expected in the industry. At the same time, steel plants were operating at high speed to set an all-time record for yearly tonnage output, another obstacle to safety which had to be overcome.

The new employes hired to fill the jobs of workers who had entered the armed services were unfamiliar with their surroundings, but safety engineers and departmental officials conducted an unrelenting drive against unsafe practices and saw that every newcomer was adequately instructed. In one month alone, toward the end of the year, the industry hired around 17,000 persons for hourly, piecework or tonnage work.

Curiously, the women followed safety rules more closely, with fewer accidents losing their reward, than the men hired as replacements.

AMERICAN INGENUITY: On the heels of rapidly advancing American forces in France, Yank engineers are quickly repairing and rebuilding roads and bridges wrecked by the retreating enemy. This prime mover pulls artillery equipment over a treadway bridge speedily erected by Americans. NEA photo

Alloy Steel Production Slightly Lower in July

Alloy steel production during July totaled 854,321 tons, about 11 per cent of total steel production during that month, according to the American Iron and Steel Institute.

In June, 865,967 tons of alloy steel were produced. In July a year ago, alloy steel production was 1,066,053 tons. Open hearth furnaces produced 572,324 tons of alloy steel in July. The remaining 281,997 tons of alloy steel production came chiefly from electric furnaces.

Reports Steel Payrolls 7% Above 1943 Level

Nearly $849,466,000 in payrolls were distributed to employes of the steel industry during the first half of 1944, according to a report released recently by the American Iron and Steel Institute, New York.

The half-year steel payrolls exceed by $53,000,000 or nearly 7 per cent, the total distributed in the same months of 1943. The June payroll amounted to $140,484,000, which compares with $145,427,000 in May and with $136,217,000 in June a year ago.

During June the industry employed an average of 569,800 employes, a slight increase over the May average of 569,100. In June 1943 the total number of employes in the industry was 631,000.

Wage earning employes received an average of 117.7 cents per hour in June, as against 118.4 cents in May.

Wage earners worked an average of 47.8 hours per week in June.

July Pig Iron Output 5,156,814 Tons, Less Than Average

PIG IRON production in July totaled 5,156,814 net tons, compared with 5,056,627 tons in June and with 5,434,240 tons in March, the all-time high. July output was below the average for 31-day months this year. Operating rate for July was 91 per cent of capacity, the same as in June.

For seven months cumulative production was 36,638,434 tons, compared with 35,366,188 tons in the same period last year. Average rate of production for seven months this year was 94.1 per cent of capacity; in the same period last year it was 96.1 per cent. Details of July production are as follows:

District	Pig iron	Ferro, spiegel	Total July	Total Year to date	Per cent capacity
Eastern	929 917	23 679	953,596	6,708,371	88.0
Pittsburgh-Youngstown	2,085 509	20,317	2,105,826	14,975,238	92.8
Cleveland-Detroit	511,977	.....	511,977	3,666 961	91.5
Chicago	1,099 272	...	1,099,272	7,778.716	95.8
Southern	332 529	18,669	351,198	2,543,734	86.1
Western	134,945	.....	134,945	965,414	67.3
Total	5,094,149	62,665	5,156,814	36,638,434	91.0

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

Steel Producers' Earnings, Taxes Compared

FOR the third consecutive year the steel industry's first half net earnings are below those recorded in the preceding year.

Combined first half net income of 20 steel producers, representing 88.0 per cent of the total ingot capacity, totaled $78,525,445, compared with $87,181,555 for the identical group of companies in like 1943 period. For the corresponding months of 1942 and 1941, practically the same group of producers earned $89,220,098, and $150,268.403, respectively.

Reflecting the lower net earnings per unit sale, resulting from sharply increased labor and to a lesser extent material costs, federal tax provisions have declined steadily throughout 1943 and to date this year. In first half 1942, eighteen companies in this group provided for $306,037,194 in taxes, while in like period of 1943 and 1944 provision for taxes declined to $241,166,000 and $177,991,000, respectively.

Second quarter net profit of 19 steel producers totaled $38,643,818 compared with $43,193,286 in same 1943 period.

Trend in earnings among pig iron producers and those interests with steel finishing capacity only, followed that of steel producers. Losses in table below indicated by asterisk.

	First Quarter	—Second Quarter—		—First Half—		First Half —Federal Taxes—	
	1944	1944	1943	1944	1943	1944	1943
United States Steel Corp.	$17,027,616	$15,354,917	$15,679,456	$32,382,533	$31,086,053	$49,000,000	$52,800,000
Bethlehem Steel Corp	6,432,538	6,733,843	6,614,210	13,166,381	12,842,903	49,800,000	61,610,000
Republic Steel Corp.	2,216,612	2,058,654	2,337,175	4,275,266	6,003,732	16,950,000	29,600,000
Jones & Laughlin Steel Corp.	1,708,352	1,879,835	2,411,248	3,588,187	4,810,617	5,178,000	11,500,000
Youngstown Sheet & Tube Co.	1,636,369	1,798,017	2,257,425	3,434,386	4,404,452	8,423,000	12,613,000
National Steel Corp.	2,550,143	2,863,315	2,538,015	5,413,458	5,218,865	9,725,000	12,075,000
Inland Steel Co.	2,512,396	2,659,022	3,011,333	5,171,418	5,807,654	9,546,000	10,721,000
American Rolling Mill Co.	1,229,035	1,212,456	1,694,492	2,441,491	3,229,697	4,391,000	8,219,000
Wheeling Steel Corp.	992,945	1,068,671	1,329,010	2,061,616	2,290,401	2,524,000	2,338,000
Crucible Steel Co. of America	1,279,302	1,482,517	1,798,164	2,361,819	3,714,069	12,155,000	19,374,000
Pittsburgh Steel Co.	114,939	187,840*	421,403	72,901*	1,021,524	.....	.....
Lukens Steel Co.	.....	.....	.....	654,033	485,931	.....	.....
Granite City Steel Co.	102,115	101,570	100,353	203,685	221,912	110,000	137,000
Sharon Steel Corp.	166,512	141,233	489,871	307,745	935,436	1,070,000	3,347,000
Allegheny Ludlum Steel Corp.	800,110	865,065	1,006,927	1,665,175	1,943,062	5,841,000	10,488,000
Continental Steel Corp.	155,805	167,574	216,179	323,380	334,338	229,000	285,000
Alan Wood Steel Co.	77,829	126,404	112,565	204,233	287,351	289,000	588,000
Copperweld Steel Co.	242,223	55,837	227,493	298,060	485,777	None	226,000
Follansbee Steel Corp.	171,316*	208,193*	255,803	379,509*	442,936	None	1,065,000
Rustless Iron & Steel Corp.	554,068	470,921	692,164	1,024,989	1,514,845	2,760,000	4,180,000
Total	$39,627,593	$38,643,818	$43,193,286	$78,525,445	$87,081,555	$177,991,000	$241,166,000
FINISHING CAPACITY ONLY							
Acme Steel Co.	$420,987	$436,844	$509,554	$857,831	$931,870	$3,279,000	$2,714,000
Eastern Rolling Mill Co.	98,151	35,387	48,158	133,538	171,384	560,000	911,000
Superior Steel Corp.	123,612	78,538	203,458	202,150	354,472	1,303,000	3,345,000
PIG IRON CAPACITY ONLY							
Interlake Iron Corp.	$182,573	$246,535	$230,397	$429,108	$490,827	$611,000	$885,000
Pittsburgh Coke & Iron Co.	93,588	123,839	191,374	217,427	343,686	137,000	248,000
Woodward Iron Co.	252,728	145,853	300,283	398,581	552,098	.....	.....
Sloss-Sheffield Steel & Iron Co.	170,522	171,633	123,844	342,155	478,211	170,000	320,000

R. P. Farrington Acquires Control of W. F. Potts

Ray P. Farrington has acquired controlling interest in the 111-year-old W. F. Potts Son & Co. Inc., 1224 Cherry street, Philadelphia, distributor of sheets, tin plate, bar steel, merchant shapes, nails, roofing and other building materials. Mr. Farrington will become chairman of the board and a director, with Thomas J. Quinn, president, and other officers continuing on with the organization.

Mr. Farrington has had long experience in the industry, and in 1922, with Leo Heintz, helped organize the Heintz Mfg. Co., Philadelphia, a fabricator of metal products. For several years he was vice president in charge of sales and treasurer. Both before and after this affiliation he represented various sheet producers in the East, and during the NRA days was a field officer. Subsequently for three years he was affiliated with the American Iron and Steel Institute in industrial relations work.

J. C. Lincoln Elected Bagdad Copper President

At a recent meeting of the Bagdad Copper Corp., Cleveland, with a plant at Hillside, Ariz., John C. Lincoln, chairman of the board of Lincoln Electric Co., was elected president, replacing S. A. Millikin. Gordon Macklin was elected executive vice president, replacing J. A. Hadden, resigned. New directors are J. C. Lincoln, G. Macklin of Gordon Macklin & Co., Cleveland; R. H. Jamison of Garfield, Baldwin, Jamison, Hope, Ulrich; J. J. Seaver, vice president, Day & Zimmerman, Chicago; and W. Bimson, Phoenix Bank president; F. L. Snell Phoenix, Ariz.; and N. N. Scovill.

WPB Field Offices Handle Farm Machinery Steel Needs

WPB field offices will handle applications for carbon steel and other controlled materials for added farm machinery production until Sept. 15, instead of Washington extending local assistance. After Sept. 15, manufacturers eligible for "spot" authorizations will not have their applications approved if they involve substantial quantities of steel plates, sheet, strip, tin mill products, forgings, seamless tubing, wire rope and strand, copper rod half-inch and smaller, copper fine wire cable and tubing 4 inches and over; or if materials or components are needed in categories requiring AA-4 rating.

Job Priority Views Differ

Reinstatement of discharged service men in former positions even though such displaces labor with greater seniority opposed by union representative

ASSERTING that war veterans should be reinstated in their former jobs even though it displaces men with greater seniority, Col. Paul H. Griffith, chief of the Veterans Personnel Division, Selective Service System, said in New York recently that where a company's contract with a union conflicts with selective service rulings, a company should either comply with the ruling or "hire a good lawyer and prepare to go to court."

He spoke at a meeting of the National Industrial Conference Board.

Victor G. Reuther, assistant director, War Policy Division, United Automobile Workers, a CIO affiliate, another speaker, took exception to much that Colonel Griffith said.

It is not the intent of Congress, Mr. Reuther asserted, that war veterans should have job priority over everyone else. A recent survey of the Automobile War Production Council showed, he said, that there will be no difficulties in re-employing veterans if they were re-employed on the basis of seniority, but that there would be "plenty of trouble" if seniority of civilian workers were to be disregarded.

He thought the selective service administration begins with a defeatist attitude when it makes rulings that will take jobs away from anyone to give them to veterans. Labor, he said, is willing to share jobs with veterans to the extent of going back to a 30-hour week.

Colonel Griffith replied that the man who serves his country for $50 a month deserves more than the man who stayed home at $150 a week with time and half for over-time. The CIO or any other organization, he said, can go to Congress to get the Selective Service act changed or can go to court to get it interpreted. Colonel Griffith said there will be 15,000,000 men in the armed forces when peace comes, "and I don't think they will take much kicking around."

Mr. Reuther said that the British and Canadian laws on veteran re-employment specify that veterans should not replace those with greater seniority rights. Colonel Griffith pointed out in reply that Great Britain has universal service, whereby civilians are drafted either to work or fight, as the government may determine.

In answer to a question on the closed shop, he said that a veteran who had a job before he went to war is entitled to get it back if he meets the criteria of the job as it was when he left. He must conform to the closed shop only if a closed shop prevailed before his war service.

POSTWAR PREVIEWS

TERMINATION LOANS— Director of Office of Contract Settlement has set up uniform procedures for termination loans. Granting of small termination loans will be speeded by authorizing Federal Reserve banks to approve guarantees up to $500,000. See page 49.

TIN PLATE— Postwar tin plate requirements in this country to depend on whether the government distributes surplus stock of canned goods here or abroad. May take several years after war ends before tin supply becomes as plentiful as in prewar days. See page 50.

RE-EMPLOYING VETERANS— Col. Paul H. Griffith, chief, Veterans Personnel Division, Selective Service System, asserts that war veterans should be reinstated in their former jobs even though it displaces men with greater seniority. See page 55.

LABOR PRODUCTIVITY— Bureau of Labor Statistics reveals labor productivity increased tremendously on war goods but has dropped on civilian goods. Improvement in productivity on postwar civilian goods expected. See page 57.

WEST COAST— Federal Reserve Bank of San Francisco in a survey has come to the conclusion that 300,000 persons in the western area will be in need of jobs when the Pacific war ends. See page 63.

POSTWAR AUTOMOBILES— Reconversion of automobile plants and rescheduling of civilian car production expected to be slower and more difficult problem than indicated. See page 65.

FINE PITCH GEARS— Manufacturing techniques for precision instrument gears, conceived and perfected during the war, have brought successful mass production into a field formerly dominated by individual handcraft methods. Resulting flexibility enhances company's position as peacetime supplier. See page 80.

DIE QUENCHING— Latest developments in die quenching to avoid heat-treat distortion seem to have considerable future significance in that less stock, less finish machining of parts, increased output, lower costs, better control of process and higher quality of work are assured. See page 84.

PILOT ROLLING MILLS— Trend toward increasing importance of physical specifications in relation to chemical composition of metals is chief reason some consumers of cold-rolled strip are setting up own tests on pilot rolling mill equipment. See page 114.

Thousands of Ex-service Men Return to Steel Jobs

One out of every 20 steel employes who left the mills for military service has already come back to work for his former company, a survey of steel companies, by the American Iron and Steel Institute reveals.

Since passage of the Selective Service law late in 1940, almost 214,000 steel employes have left their jobs for military service—38 per cent of present employment.

Of that total, 10,100 have been released from the services and have now returned to their old companies, while 600 more have gone back to work in other steel companies. In addition, about 3400 ex-service men never before employed in steel plants have been hired by steel companies.

The great majority of returned ex-service men have been fully capable, both physically and mentally, of resuming their peacetime jobs. Less than two per cent have come back with disabilities that have required special handling.

Already a large part of the steel industry has set up or is now formulating plans for handling of returned veterans, including special interview procedures as well as rehabilitation plans.

Steel companies have experienced increasing difficulties in replacing the large numbers of employes drafted for military service. The number employed in the industry reached a peak as long ago as June, 1942. Since then, employment has gradually declined despite the hiring of 50,000 women.

Steady Increase in Productivity of Labor Revealed by BLS Statistics

Advance of 3½ per cent a year registered from 1909 until beginning of present war. Output per man-hour in strictly war industries has shown tremendous increase. Airframe production up 150 per cent; Liberty ship construction speed doubled

LABOR productivity data accumulated by the Labor Department's Bureau of Labor Statistics support the belief that a large volume of business will be enjoyed by many manufacturers of industrial and labor-saving equipment in the immediate postwar period.

Since 1909, the bureau's studies show, man-hour productivity (in terms of physical production, not dollar volume) increased by an average of 3½ per cent per year until the start of World War II. Even when there were exceptions, subsequent behavior of the curve proved the rule.

During the present war the bureau has been unable to continue its labor productivity studies in certain non-war industries because of special factors. The steel industry is one of these. Whereas the steel industry continues to report its tonnage output of finished products, its labor data apply not only to these products but also, without distinction, to numerous items made directly for war, as shell forgings, armor plate, bullet cores and other munitions items. Hence, it has been impossible during the war to compile labor productivity statistics for the steel industry as such.

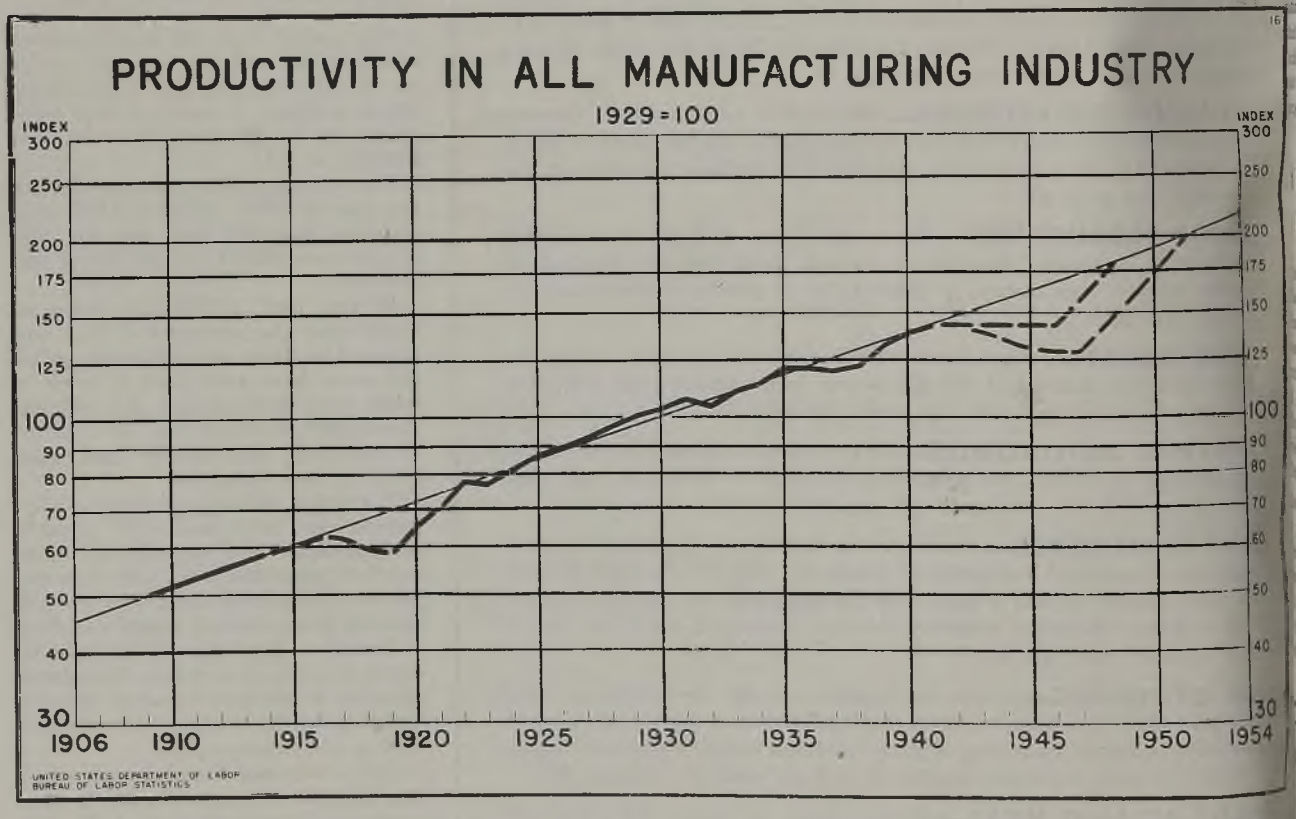
Statistics compiled by the bureau show a great increase in labor productivity in strictly war manufacture during the present war. For example, airframe output per man-hour increased some 150 per cent between the latter part of 1941 and the beginning of 1944. From the end of 1941 to the end of 1943 output of Liberty ships per man-hour more than doubled. Comparable increases in output per man-hour have been reflected in most munitions items. Bureau economists point out that these astonishing increases, gratifying as they are in making it possible to hasten prosecution of the war, should not be associated with production of non-war goods. These increases in labor productivity involve war materiel only. Hence, they have no relevance whatever in relation to production of civilian goods whose production will constitute the backbone of the postwar economy.

During the war the bureau has continued to assemble information for a number of basic non-war products. Most of these products reflect an actual loss in man-hour productivity during the war. The striking feature is that whereas an increase in labor productivity was reflected in most of these products during 1941 or 1942, or both, sharp drops followed in 1943. The trend in some typical non-war products during the war has been as follows:

PHYSICAL OUTPUT PER MAN-HOUR

Products	1939	1941-42 Peak	1943
Bread	100	96.9	94.0
Cement	100	108.4	92.1
Cotton goods	100	102.7	101.9
Flour	100	100.3	83.1
Leather	100	116.5	110.7
Lumber	100	120.8	118.5
Nonferrous metals	100	103.1	98.7
Paints and varnishes	100	113.8	109.8
Paper and pulp	100	106.7	94.2
Meat packing	100	101.2	96.9

Reasons for this poor showing in man-hour productivity on non-war products are: 1—Inability of manufacturers to get new or improved equipment under



As shown in this curve, compiled by the Bureau of Labor Statistics, United States Department of Labor, man-hour productivity in all manufacturing industry during 1909-1941 inclusive increased at an average rate of 3½ per cent per year. When in a few instances the productivity rate remained unchanged over a brief period, the trend subsequently was re-established. BLS statisticians plotted the two broken-line projections as minimum and optimum expectancies for years 1943-1952. Real man-hour productivity curve probably will fall between the two projections.

r conditions; 2 — necessity of using s desirable substitute materials; and —inability to hire enough competent oor.

Bureau of Labor Statistics economists edict that this deficiency will be cor- ted as soon as conditions permit. The d of the war, they feel increases in aver- e productivity per man-hour in manu- cturing industries should approximate per cent per year for several years. These increases, obviously, will be fected by manufacturers through: 1— e purchase and installation of latest ocessing and labor-saving equipment, —use of materials that best lend them- lve to the manufacturing processes and ove most acceptable to consumers, and —employment of more competent orkers on the average.

A factor which does not show up in atistics but which is expected to make r improvements in man-hour produc- vity in the postwar period is a better nderstanding of what can be accom- lished through good labor relations. Many employers during the war have arned how to co-operate more effec- ively with their employes. Many of hem have benefitted, for example, from abor-management committees which ave been the source of many ideas that ave led to increased productivity. Many f them have stimulated morale among workers through adoption of insurance and pension systems, free vacations and such features as free medical and dental service, recreational facilities, etc. Indi- cations are that many companies plan to continue such features, and that they expect to count them as advantages in meeting postwar competition.

Navy Cuts Back Torpedo Production Contracts

Outstanding successes of task forces in ie South Pacific, resulting in reduction f enemy submarine targets, coupled ith effectiveness of submarine and viation operations against Japanese ipping, will result in at least a tem- orary readjustment of production at veral torpedo manufacturing plants, ie Navy Department reports.

The revised production schedules will fect four plants, the Amertorp Corp. its in Forest Park, Ill., and St. Louis, d the naval torpedo stations in Alex- dria, Va., and in Newport, R. I. A adual reduction in each plant is anned, effective in October.

WPB Cites 6000 Workers or War Production Ideas

More than 6000 War Production ard commendations, honorable men- ns, certificates and citations have been arded to civilian war workers for their oduction step-up ideas," it was an- unced recently by T. K. Quinn, direc- -general, War Production Drive, WPB.

Third WLB Steel Panel Appointed To Handle Miscellaneous Cases

Will consider issues in disputes involving some 500 fabricators and miscellaneous companies whose bargaining agreements with the United Steelworkers have expired. Preliminary hearing set for Aug. 29-30

THE National War Labor Board last week appointed a tripartite panel to handle the disputes involving some 500 fabricating and miscellaneous companies whose collective bargaining agreements with the United Steelworkers of America, CIO, have expired.

These cases, pending before the board, were not included in the cases assigned to the so-called "basic steel" and "iron ore" panels.

The new panel was appointed pursuant to the procedure unanimously adopted by the Board and announced last May 1.

The public and labor members of the panel will be those who sat on the other two panels —David L. Cole, Paterson, N. J., chairman, and N. P. Feinsinger, Madison, Wis., vice chairman, representing the public, and John Despol, Los Angeles, and Stephen Levitsky, Pittsburgh, international representative of the union representing labor. Mr. Cole is chairman of the New Jersey State Board of Mediation and a vice chairman of the New York Regional War Labor Board, and Mr. Feinsinger is director of the National War Labor Board disputes division.

Industry members will be J. C. Goldrick, Detroit, vice president, Evans Products Co., and Homer D. Sayre, Chicago, commissioner with the National Metal Trades Association.

The panel will hold preliminary hearings in Washington Aug. 29 and 30 at which time consideration will be given to procedure and form of the hearings on the merits which will take place later.

The procedure announced earlier by the board provided that this third panel would, after the "basic steel" and "iron ore" hearings were concluded, "first consider and recommend to the board the most practical method of disposing of the cases before it, in the light of conditions existing at that time, including the possibility of referring certain issues to the regional boards."

As to the companies whose cases come before this panel, it was further provided that:

1. On the request of any company the issues between it and the union will be referred back to them for further collective bargaining.

2. Any company will be permitted, before hearings on the merits are begun, to request that further processing of its case be deferred until after the board has acted on the report of the "basic steel" and "iron ore" panels, without prejudice to its right to engage in further collective bargaining or to have a hearing on the merits on any issues which may thereafter remain in dispute.

In this last provision the board took cognizance of the position which a number of companies already have taken, namely, that the parties will probably be able to arrive at an agreement directly when they know what the board's rulings are in the "basic steel" cases.

Priority Referral Program Working Satisfactorily

Substantial gains in the placement of workers in urgent jobs in critical war industries have been made under the priority referral program instituted July 1 by the War Manpower Commission, Chairman Paul V. McNutt announced recently.

A nation-wide spot check of 121 firms engaged in the production of "must" war items shows increases in total employment in the first month's operation of the program.

However, Mr. McNutt emphasized, still greater gains must be made if the war plants producing critical materials are to have their manpower needs met in the crucial period ahead. These firms must show at least a 13 per cent increase in employment by October, as compared with Aug. 1.

66% of War Contracts Awarded to 33 Areas

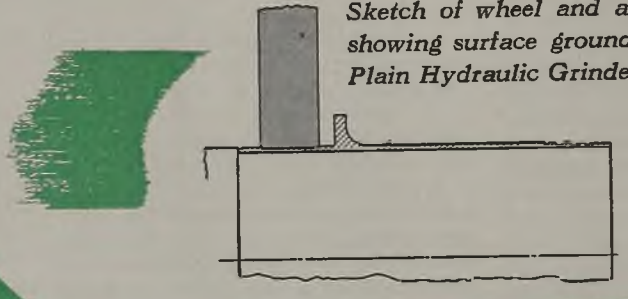
War contracts awarded in thirty-three major industrial areas have totaled $120 billion through May, 1944, or over $2500 per capita, according to figures compiled by the National Industrial Conference Board, New York.

About 45 million civilians live in these areas, which together have a per capita average of war contracts nearly twice the corresponding national average. Of these areas, Willow Run, Mich., has received the highest per capita awards, a total since June, 1940, of over $16,000 for every person not in uniform. Flint, Mich., is second with almost $8000 for every civilian, and Wichita, Kans., is a close third with fully $7000 per capita.

Up to May, 1944, a total of $180 billion of contracts has been awarded for the country as a whole.

STANDARD MACHINE

with special headstock . . . solved difficult grinding job



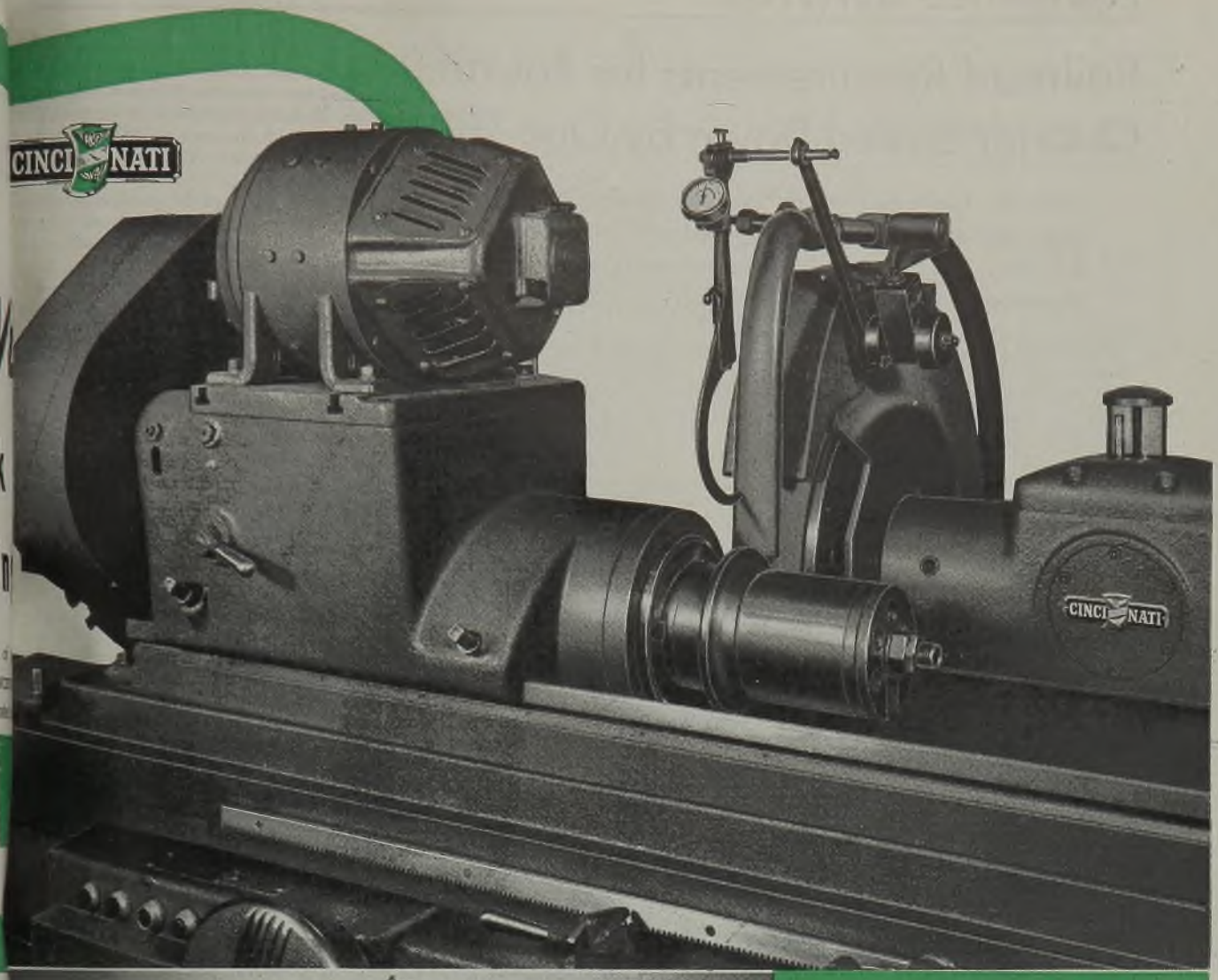
Sketch of wheel and a section of the part showing surface ground on CINCINNATI *10" Plain Hydraulic Grinder illustrated at right.*

The grinding operation on this cylinder barrel is an unusually tough job because the thin walls are easily distorted and make it difficult to obtain the desired accuracy. Yet with a minimum of tailoring, CINCINNATI Application Engineers designed special equipment for a CINCINNATI 10" Plain Hydraulic Grinding Machine which handled the job quickly, accurately and economically. This equipment included: 1) Special live spindle headstock. 2) Air operated fixture. 3) Positive table stop. You will notice there is no footstock . . . none is necessary. Standard Hand Servo infeed attachment, also a part of the equipment, retracts the wheelhead a total of 1" (about .990" rapid traverse and .010" feed rate) for convenience in loading and unloading the work. ¶ Should the original need for this setup no longer exist, the special headstock may be removed and the machine changed over for conventional work by simply buying and installing a standard headstock and footstock. No other alterations are necessary. This again demonstrates the advantage of using modified standard machines for special jobs. It's an economical way out of difficult grinding situations. ¶ Our engineers will be glad to discuss with you the adaptation of standard machines to your centertype grinding operations.

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES



Above: A modified CINCINNATI 10" Plain Hydraulic Grinder, finish grinding recess diameter at crankcase end of cylinder barrel.

Left: CINCINNATI 10" Plain Hydraulic Grinding Machine. For complete specifications, write for catalog G-490-1. Sweet's Catalog File for Mechanical Industries gives a brief description of all CINCINNATI Grinding Machines.

RINDERS INCORPORATED

CINNATI 9, OHIO, U. S. A.

TERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Railroad Requirements for Fourth Quarter Scaled Down by One-Third

Domestic transportation industry to receive only 1,039,100 short tons of carbon steel compared with a requested 1,532,-633 tons. Proportionate amounts of alloy steel, copper and aluminum authorized

CONTROLLED materials for domestic transportation have been reduced by about one-third from the amounts requested by the Office of Defense Transportation for the fourth quarter of 1944, the ODT was advised last week by the War Production Board.

ODT was notified that, under the Controlled Materials Plan, the domestic transportation industry will receive 1,039,100 short tons of carbon steel in the October-November-December quarter of 1944, compared with a requested 1,532,-633 tons. Proportionate amounts of alloy steel, copper and aluminum were authorized. In addition to the direct ODT allotment, the WPB has set aside an adequate reserve for railroad and local transit maintenance, repair and operating supplies.

Principal reductions in the amounts requested by the ODT, as claimant agency for domestic transportation, were in rail and track accessories. The new replacement rail request was cut from 550,000 tons to 360,000 tons and allocations for track accessories from 291,000 tons to 190,000 tons because of demands on rail mills for shell steel and rails for the military.

ODT was advised that, in making this decision, the WPB recognized the necessity of increasing the allotment of new replacement rail and accessories as soon as war demands permit. In addition, the WPB said that, to the extent essential military requirements and export requirements in support of war can be satisfied with relay rail and used turnouts provided by U. S. railroads, the allotment of new rails and track accessories to the ODT will be adjusted upward accordingly.

The WPB allotted 145,000 tons for automotive replacement parts, for which the ODT had requested 160,000 tons. No allotments were made for light trucks and railroad passenger cars, for which the ODT had requested 76,562 tons and 6488 tons, respectively. The WPB said these requests were denied because production facilities and manpower questions remain to be resolved.

Carbon steel for medium and heavy trucks, truck bodies, trailers, third axles and lower fifth wheels was cut from approximately 200,000 tons requested by the ODT to 90,000 tons. This latter figure is, however, sufficient to cover the authorized production schedule for these units for the first quarter of next year. The fact that this schedule is considerably less than ODT desired is due to the recent decision of military agencies to continue their heavy purchase of trucks into 1945, which limits the facilities available for manufacturing commercial trucks.

ODT carbon steel requirements for locomotives, freight cars, marine equipment, integral buses, street cars, trolley coaches, truck-trailers, including petroleum transport units, and water transport equipment, were met.

Policy Clarified on Idle And Excess Materials Sale

The War Production Board's policy on special sales of idle and excess controlled materials on an excess allotment authorization has been inserted in a new amendment to rules governing such special sales. Under this policy, sales of idle and excess controlled materials under Priorities Regulation No. 13 will not be authorized on an excess allotment basis if proposed use would interfere with war production.

When idle and excess materials are sold for use under the spot authorization rules, contained in Priorities Regulation No. 25, labor checks will be made in connection with the spot procedure and will not be required for authorization of special sales.

Special sales are those made by a person holding material in a form different from that in which he usually sells it.

In addition, the amendment to Priorities Regulation No. 13 points out specifically that its rules govern the sales of surplus materials by government disposal agencies. This is merely a clarifying amendment.

Under the amendment, idle and excess stocks of copper and copper base alloy may be sold to any warehouse.

Under the changed rules, electronic parts and equipment may be sold to distributors or wholesalers without WPB authorization on orders bearing an AA-5 preference rating. Formerly, specific WPB authorization was required before such sales could be made. In addition, rejected components for electronic equipment may now be sold freely (without authorization of preference rated orders) if the services certify that such equipment has no military value.

Laundry equipment, motion picture projection equipment and office machinery, including typewriters, may also be sold freely under the new rules contained in Priorities Regulation No. 13, as amended Aug. 18, 1944.

Other changes in the rules applicable to special sales of specific items of finished and semi-finished products and raw materials have been made to conform them to current supply conditions.

WPB Moves To Aid Smaller Firms

Procurement Policy Board issues policies to guard manufacturers of materials and components in the event of unexpected cutbacks and contract terminations

IN A MOVE to stimulate production of important materials and parts needed in war production, the Procurement Policy Board, a War Production Board committee composed of representatives of WPB, Army, Navy, Treasury and other contracting agencies, last week issued policies for the protection of manufacturers of materials and components.

The principles, announced for the guidance of the war contracting agencies, war prime contractors and subcontractors, are designed to give additional security, in the event of cutbacks and contract terminations, to these manufacturers, many of them small plants, producing as subcontractors.

Substantially every important war weapon requires for its manufacture materials and component parts which are made, not by the prime contractor with whom the government deals directly, but a number of subcontractors and suppliers with whom the government normally has no direct contract relations, WPB officials explained. These contractors and suppliers are dependent upon orders from prime contractors and higher tier subcontractors to absorb their production.

To insure a steady supply of materials and parts, these manufacturers must frequently produce in advance of the receipt of orders. In the event of sudden changes of war production programs, they may find it difficult to dispose of their inventory. Unless they have a backlog of orders entitling them to a fair termination settlement under the equitable principles of the Contract Settlement act recently passed by Congress, they may not be able to avoid loss on the inventory.

Procurement Policy Board has adopted the following four major principles to meet the needs of this important group of manufacturers:

1—Component and material manufacturers will be encouraged to require war

contractors and subcontractors with whom they deal to place orders for components and materials long enough in advance to give protection during the necessary period of production.

2—Contracting agencies will insist that war contractors and subcontractors place such orders reasonably in advance and in amounts sufficient to enable them to meet the requirements of their own contracts.

3—War contractors and subcontractors will be urged to plan the purchase, production and delivery of components on a sound basis which will ensure that components and materials will be available, but at the same time avoiding the unreasonable accumulation of an inventory in advance of production needs.

4—Component and material manufacturers will be assisted in obtaining provisions in orders placed with them, which will ensure them of a fair settlement if the orders are canceled. Standard provisions of this type for use in subcontracts were recently approved by the Director of War Mobilization.

Farm Machinery Output Increases 51% in July

Total value of farm machinery produced during July, 1944, was $73,595,553, War Production Board officials told the Farm Machinery and Equipment Industry Advisory Committee at a meeting in Washington last week.

This was 51.2 per cent higher than the average of each of the 12 preceding months, officials pointed out. July production in 15 of the 21 machine groups exceeded their average output in the preceding 12 months.

Total value of the government's program for farm machinery for the schedule "A" period ended July 31, 1944, was $68,567,790. Actual output totaled $626,402,017, WPB officials said.

Advisory Group Discusses Metal Casket Production

Projected production of metal caskets from frozen inventories, as a first step toward re-establishing normal output in the industry, was discussed at a recent meeting of the Wood Casket Industry Advisory Committee. WPB estimates that about 30,000 metal units could be made from frozen inventories in the possession of manufacturers. Under Order L-64, metal casket manufacture has been prohbited since 1942.

WPB Removes Control from 51 Imported Commodities

War Production Board recently removed government control from 51 imported commodities, effective Aug. 19, including such metals and minerals as lead, fluorspar, ilmenite, and all tin except plate scrap.

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

TAGGING ELECTRIC IRONS: Every manufacturer of an electric iron must affix to each iron delivered by him, effective Aug. 24, a statement giving the make, the model number and the retail ceiling price established by OPA for sales of that electric iron at retail. This may be done by tag, label or other device at the option of the manufacturer.

L ORDERS

LIGHTING FIXTURES: Restrictions on use of metals in utility type incandescent lighting fixtures have been removed from order L-212 and minor relaxations affecting other types of incandescent lighting fixtures have been made. Provisions formerly restricting the use of metal in utility fixtures affected chiefly reflectors and recessed fixtures. Weight restrictions on metals in residential fixtures are relaxed and revised for clarity. A total of 20 ounces of metal may now be used in the fixture. (L-212)

INDEX OF ORDER REVISIONS

Subject	Designations
Antimony	M-63
Beryllium	M-160
Lighting Fixtures	L-212
Uranium	M-285
PRICE REGULATIONS	
Aluminum Cans	No. 14
Construction Services	No. 25
Cooperage Products	No. 320
Electric Irons	Rev. SR No. 14
Farm Equipment	No. 246
Industrial Boxes	No. 195

M ORDERS

ANTIMONY: War Production Board restored governmental control over antimony by amending general imports order M-63. On Aug. 17, WPB announced that import controls had been removed from antimony and 50 other commodities. Antimony had been inadvertently included in this list. M-63 was therefore amended. (M-63)

BERYLLIUM: Allocation control over beryllium, except beryllium copper, has been removed. Present demands have leveled off sufficiently to eliminate the necessity for users to apply for permission from WPB to purchase beryllium, other than beryllium copper. Brass mills are exempted from this provision and may obtain their beryllium copper requirements directly from beryllium producers without allocation. Relaxation in general preference order M-160 will not result in any undue increase in beryllium consumption. (M-160)

URANIUM: Sales of uranium, or uranium compounds, alloys, or mixtures for certain uses continue to be forbidden, and WPB henceforth will allocate all other sales and purchases in lots of 10 pounds or more. On Sept. 1, under an amendment to conservation order M-285, the sale of more than 10 pounds per month of uranium to any person in any calendar month without WPB authorization will be prohibited. (M-285)

PRICE REGULATIONS

ALUMINUM CANS: Producers of aluminum cans to be used for packing lard, baking powder, and other specified commodities must submit proposed prices or a pricing method for these cans to OPA for approval. The price action became effective Aug. 23. Pricing provisions have been made sufficiently flexible so as to make it unnecessary for a manufacturer to report the price of the many individual items he might produce. (No. 14)

COOPERAGE PRODUCTS: West Coast distributors of cooperage products, such as barrels and kegs, will have their selling prices established by OPA on an individual basis. Under this procedure, which became effective Aug. 23, distributors apply to the OPA Lumber Branch, Washington 25, for approval of their prices or pricing methods. (No. 320)

CONSTRUCTION SERVICES: Construction industry, after Aug. 26, 1944, may add to presently established ceilings for construction services, increases in wage costs since Oct. 3, 1942, that have been approved or authorized by the Wage Adjustment Board, National War Labor Board, or Economic Stabilization Director. The difference in labor cost between the old rate and the new adjusted rate is added to the maximum price. (No. 25)

ELECTRIC IRONS: Amendment No. 165 to revised supplementary regulation No. 14 establishes maximum prices for sales at wholesale and retail of electric irons produced by 15 manufacturers. Maximum wholesale prices are fixed by this amendment at the highest price charged by the wholesaler for the same iron to each class of purchasers during March, 1942, or the retail ceiling price (reduced by the amount of the federal excise tax) less specified discounts, whichever is lower. (Rev. SR No. 14)

FARM EQUIPMENT: Coverage of the regulation governing manufacturers' and wholesale prices of farm equipment is limited to mechanical farm equipment and those categories of non-mechanical equipment, attachments and parts that are included in the partial list of farm equipment contained in the regulation. A new amendment, effective Aug. 21, exempts from coverage of the regulation those items which are sold to users primarily by hardware stores. (No. 246)

INDUSTRIAL BOXES: Provision in the industrial wooden box regulation dealing with the method that manufacturers may use in computing maximum prices has been amended by OPA so as to make it clear that this method is based upon the cost of production of industrial wooden boxes only. The action became effective Aug. 21. (No. 195)

Castings Data May Help Break Output Bottleneck

Compilation of basic engineering data on process control procedure in the manufacture of malleable, gray iron, and steel castings, begun months ago by SAE War Engineering Board, promises to aid in breaking the bottleneck to increased production urgently needed by the armed forces, according to the Society of Automotive Engineers.

The board's recommendations propose establishing process control in every plant as a preventive method of policing manufacturing processes and of reducing excessive rejections and large-scale scrap losses.

Critical Need Of New Workers In Los Angeles

California State Division of Labor report reveals decline of 14,900 workers in June, largest monthly loss

LOS ANGELES

INDUSTRIAL wage earners in Los Angeles county decreased 14,900 during June, the largest loss for any month yet noted, and an increase in job decline of more than 79 per cent over May. These figures are revealed by the California State Division of Labor. The June decline included for the first time a decrease in the number of wage earners in the durable goods industries.

Durable goods industries showing job losses in June included furniture and wood products; transportation equipment (aircraft and ship building), and nonferrous metals. Job gains were recorded in glassware and clay products, lumber and timber, electrical machinery and equipment, and autos and auto equipment.

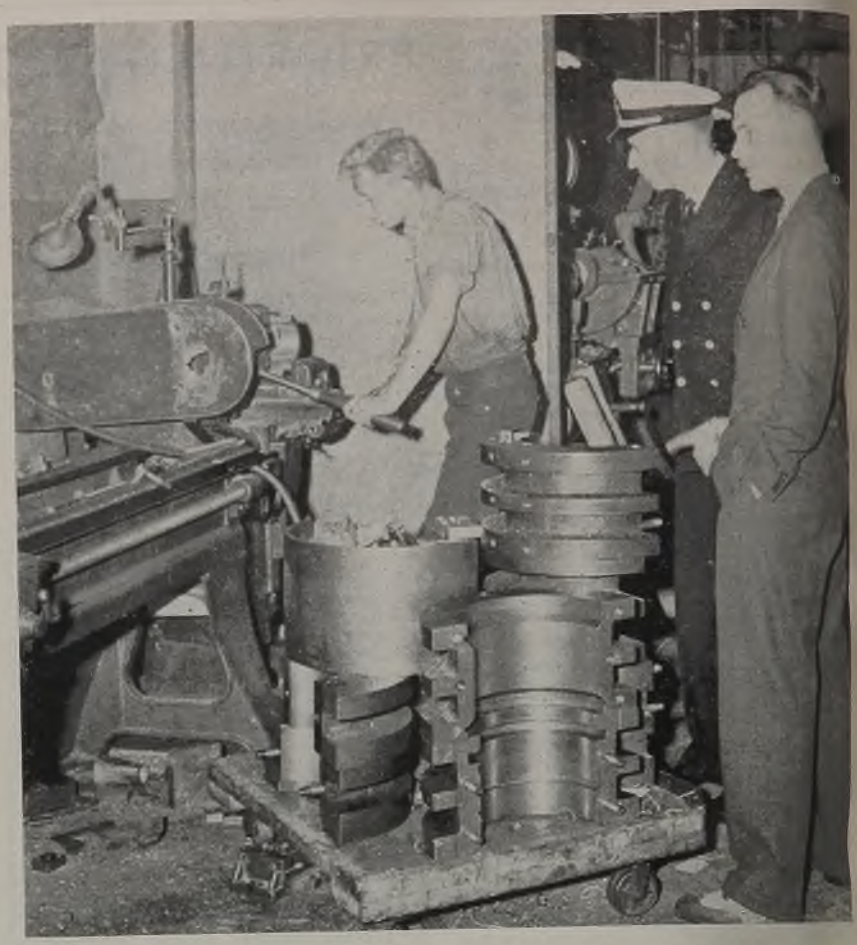
Local manpower officials are appealing to employers in non-war industries to release men for employment in tire plants, shipyards and the foundries.

Completion of the world's largest naval ordnance station and base, Inyokern, which is located 70 miles east of Bakersfield in the Mohave desert, is scheduled for March 1, 1945. In order to meet this schedule, 3000 workers must be had at once.

This base which until recently has had little publicity owing to the secret nature of the work carried on there covers 815 square miles in three counties and is to cost more than $27,000,000. It will contain one of the largest and best equipped experimental laboratories in the world according to district works officer, Capt. Alden K. Fogg, U.S.N., and will house a good sized community complete with hospitals, theatre, schools, auditorium, gymnasium and recreation grounds. Under construction are low-cost housing units for 460 families and dormitories for single men and women.

Recent cutback in airplane production will not affect Pacific Coast aircraft plants. Local military and civil officials have issued statements to workers in aircraft plants here that the military needs will require every plane that can be produced in the 12 factories of the seven aircraft companies in California and Washington.

Despite recent job losses in this area, manufacturing industry employment in Los Angeles county is 270 per cent greater than in 1939.



Dispute over a union-imposed limitation on overtime led to the seizure of 104 machine shops in the San Francisco by the Navy. Above, an officer inspects work in the Federal Mogul Corp., one of the seized plants. NEA photo

Navy Seizes 104 San Francisco Plants As Union Refuses To Permit Overtime

THE LONG dispute between the War Labor Board and the International Association of Machinists-AFL over the union's refusal to permit its members to work more than 8 hours a day and 48 hours a week resulted in seizure of 104 metalworking plants in the San Francisco areas last week by the Navy.

The plants, members of the California Metal Trades Association, have been engaged almost entirely in war work and have been supplying components for ships and aircraft.

The union had imposed a prohibition on working more than 48 hours a week last April 13, and since that time numerous work stoppages have occurred. An order by the WLB directing the union to rescind its limitation on overtime was ignored by the union until the plants were seized by the Navy.

Kaiser Opens Refractory Brick Plant on the Coast

Henry J. Kaiser has converted an adobe hacienda at Milpitas, Calif., near San Jose, into an experimental pilot plant for production of basic refractory bricks. Magnesia chrome, raw material for the plant, is obtained from nearby Moss Landing. An important market exists for the bricks in Kaiser's own steel and cement industries, as well as foundries and other industries throughout the western area of the country.

War Contracts Approved For Southern California

LOS ANGELES

Contracts for $240,727,629 were approved for Southern California industries during July by the Area Production Urgency Committee.

Most of these went to small firms, some with less than ten employes.

The committee approved new building projects totaling $19,397,511. Most of the 158 construction projects were of relatively small size, a large share consisting of additions and expansion in the 100-octane gasoline and oil industry.

Postwar Job Needs on Pacific Coast Expected To Approximate 300,000

Federal Reserve Bank survey reveals few companies, excluding aircraft manufacturers and shipyards, anticipate difficulty in financing reconversion. Increase in war production in western plants expected to follow collapse of Germany

SAN FRANCISCO

A GLIMPSE into prospective Pacific Coast postwar employment trends and corporation needs for reconversion capital was revealed at the recent small business hearings here by Oliver P. Wheeler, Federal Reserve Bank of San Francisco.

Data given the Senate committee are based on the western manufacturing survey being conducted by the bank in conjunction with the Committee for Economic Development and chambers of commerce.

Preliminary disclosure of what the bank's investigators have learned shows the following significant employment outlook:

Excluding aircraft and shipyard plants, manufacturers with 100 or fewer employes have expanded payrolls only 3 per cent since 1939. The postwar employment intentions of this group calls for an increase of 22 per cent over 1943 levels.

Boost Employment 44 Per Cent

Companies employing 100 to 500 workers have boosted employment 44 per cent since 1939, but have scheduled an expansion of only 2 per cent for the postwar period compared with 1943.

Employers of more than 500, still excluding shipyards and plane factories, show a gain of 34 per cent since 1939, and plan to reduce number of workers by an aggregate 7 per cent after the war.

When compared with 1939, the postwar intentions are for an increase of 39 per cent in plants with less than 100 workers, 47 per cent in those employing 100-500 and 24 per cent in those with payrolls above 500.

Thus on the basis of a contrast with 1943, the net indication is that it will take all gains of firms with less than 500 to offset the reduction planned by the larger companies.

Combining the reports on wartime employment with estimates on probable return of war veterans and balancing them against prospective out-migration of workers who have come to the Coast temporarily for war work and decline in number of women workers, the Reserve bank's surveyors have come to the rough conclusion that 300,000 persons in the western area will be in need of jobs when the Pacific war ends.

The survey also reveals, on the basis of preliminary findings, that few companies, excluding shipbuilding and aircraft, look for difficulty in financing the reconversion to peacetime business. More than half of the firms surveyed do not anticipate substantial outlays and, in fact, where spending is planned the gross amount is so small compared with existing investment that it is insignificant.

Corporations having slightly more than 20 per cent of total Pacific Coast manufacturing employment, excepting shipyards and aircraft, foresee a change-over expenditure of only about $33 million, of which $25 million will be spent as soon as the war ends and materials become available.

Summarizing the overall postwar prospect, Mr. Wheeler pointed out that small business has suffered some setbacks in comparison to large business during the war period, but small business has a high recovery potential and no financial impediments are thus far in sight to deter a rapid reconversion.

Industrial development has resulted in a much more rapid increase in population and labor force than in other parts of the country, and as a result western postwar readjustment may be relatively more severe.

Independent of the Federal Reserve survey, the San Francisco Chamber of Commerce has just released statistics on the tremendous wartime influx of workers into Pacific Coast industry.

More than 500,000 migrants from all parts of the country came into the San Francisco area between April, 1940, and April, 1944, the report shows. Of these, 16.7 per cent were from states east of the Mississippi river, 19 per cent from the southwestern states of Oklahoma, Texas, Louisiana and Arkansas, 14 per cent from the North Central states of Missouri, Nebraska, Kansas, Iowa, Minnesota and the Dakotas, and 36.1 per cent from Pacific Coast areas, of which 20.2 per cent were from Northern California, 11.1 per cent from Southern California and 4.8 per cent from Oregon-Washington.

Labor Shortage Threatens Western Tire Production

LOS ANGELES

Production of heavy duty truck and combat tires in West Coast plants faces a manpower crisis. At a recent meeting of executives of the four major rubber companies in Los Angeles with military and manpower officials, it was disclosed that a shortage of 2580 workers exists and this is expected to increase.

Possibility of obtaining German war prisoners for the tire industry is being explored.

Danger of a serious breakdown in civilian transportation is imminent. A large proportion of trucks are now operating without spares.

It is estimated that rubber plants now have 40 per cent of machinery idle.

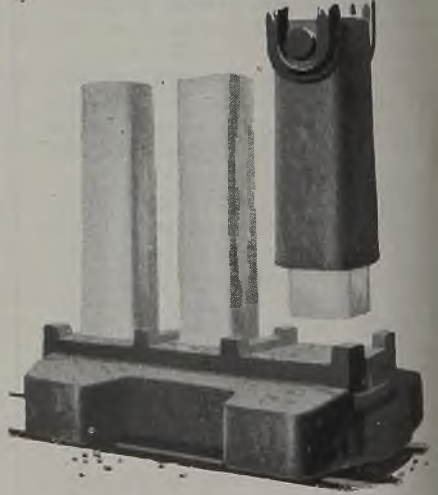
FOR WANT OF A TIRE: Ammunition trailers, originally scheduled for shipment overseas, collect dust on storage lots near Los Angeles because of a shortage of heavy duty tires. NEA photo

IMPACT 10 TONS— with 2' DROP

BEARINGS: HYATT

When the ingot sticks in the mold during the stripping operation, then lets go, severe shock loads are imposed on the journal bearings of the ingot car. The fact that more than 75% of the ingot and charging cars throughout the country are Hyatt Roller Bearing equipped indicates how well Hyatt Bearings have proven their ability to function under the most severe conditions in all types of steel mill equipment. When you design or purchase new equipment or make change-overs you will be sure of reduced maintenance charges and fewer production interruptions when Hyatt Roller Bearings are used. Call in the Hyatt man on all friction problems.

HYATT BEARINGS DIVISION GENERAL MOTORS CORPORATION
HARRISON, NEW JERSEY



This is just one of the many tough applications of Hyatt Roller Bearings in steel mill service.

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Reconversion of auto plants and rescheduling of civilian car production likely to be slower and more difficult problem than indicated by some statements of industry's top executives. Major delay likely to occur in suppliers' factories

EVERY time Lieut. Gen. Patton's armored columns move another 50 miles toward Berlin, the dopesters around Detroit have figured out a new automotive merger and have moved up the date of new car production another week. The plain facts of the case are that the reconversion of plants and rescheduling of car production are coming to look a lot tougher than at first glance. One reason for this is that the early discussions of reconverting the motor plants have been confined to the opinions of top-flight officials who naturally take a broad view of the problem and leave to their lieutenants the job of working out the details. When some of these lieutenants find a few minutes now and then to dig into the situation and report back to the brass hats, things do not look so rosy.

Few will argue auto plants have not been more seriously gummed up by the switch to war production than almost any other peacetime industry; and few will dispute Donald M. Nelson's recent statement to the effect: "The auto industry is led by some of the very best management in the country—live, aggressive fellows who know what they are doing. The same fellows who converted their plants to war will be on the job to reconvert them back to peace—with the same drive, industry and experience." On the other hand the smartest management in the world cannot guarantee that a couple of thousand suppliers of a couple of thousand essential parts for motor vehicles will be ready with their shipments when the gong sounds.

Suppliers' plants have been converted to war production in many cases and it may be difficult to spring many of them loose as quickly or as easily as the larger motor plants. Others of them are third-tier and even fourth-tier subcontractors who are among the last to be "terminated" when a prime contract is canceled. And until their plants are cleared, there is little they can do about orders which may be piling up from automobile builders.

Reversion to car production likely is going to be a piecemeal proposition. The purchasing and follow-up departments of the motor companies will have to chase down one group of components and try to break bottlenecks which stand in the way of their supply, only to return and concentrate on another group of critical items which have been slowed by a difficult reconversion.

All that is necessary to appreciate this fact is to glance at automotive parts catalog and run your finger down the column after column of thousands of piece parts going into the construction of an automobile. Then assume that nearly every one of these parts has been shut off by the conversion to war production. Exception must of course be made for those parts which are of a functional character and which have been continued in production for replacement parts. The job of the purchasing department then becomes one of: First, lining up old suppliers, then determining whether they are ready to make shipments, whether they have the machinery formerly used, whether their war work has been terminated to the point where they can handle some automotive orders, whether they are going to be able to obtain material, what their prices on the products are going to be.

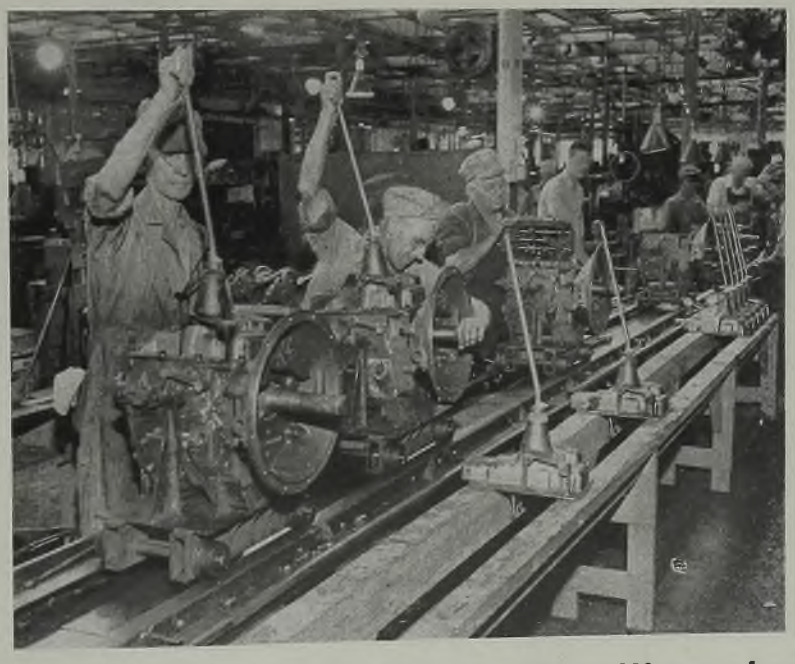
Must Realign Entire Industry

This job is far more complicated than any mere changeover to a new model which is in itself usually a distracting matter. What is called for now is virtually starting from scratch and realigning a four-billion dollar industry. Naturally, many of the preliminaries have been under way for several months but this advance planning is vague to say the least because no one knows just where he stands and replies to queries from the motor companies are often nothing more than guesses.

What this all adds up to is: The optimistic views of top managements in the motor companies about the speed of reconversion to car production must be tempered in the light of an increasing likelihood of supply deficiencies over which the producers will have no control. Steel for bodies, frames, wheels and other stampings?—o.k. Steel for gears, springs, engine parts, transmission and differential elements?—delays and hold-ups likely. Glass and rubber?—o.k. Upholstery and interior body trim, except metal?—o.k. Electrical accessories, wiring, ignition elements—highly doubtful. Exterior trim and plating?—probably delays. Paint and other finish?—o.k.

This is a quick summary of only the barest general details, but it shows the nonuniformity which must continue to exist in the supply picture, and no amount of optimistic pronouncements by the "live, aggressive fellows" is going to help.

Even though such disparities do exist in respect to materials supply, you can expect that strenuous efforts will be made to circumvent them, which leads to the obvious conclusion that the first models off the lines several months hence will not be carbon copies of the first of the 1942 models built in September of 1941, but will carry numerous substitutions and alternate equipment, just as the last of the 1942 models carried such changes in the interest of conservation of critical materials. They may not be comparable with the 1941 models as regards appear-



ASSEMBLING TRUCK TRANSMISSIONS: More than 225,000 square feet of floor space at the plant of Reo Motors Inc., Lansing, Mich., has been converted to the manufacture of special axles and transmissions for heavy military trucks. Here is a view of the transmission assembly line

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

ance, performance or quality, but at least they will be automobiles and should find a ready market, despite their "interim" appointments. The cagey buyers probably will wait for six months, if they can persuade their old cars to hold together that long, before purchasing new cars, in order to get the benefit of a fully normal material supply.

This is no reflection on the automotive industry, for certainly it would be remiss to hold up production and perhaps keep thousands out of employment until their suppliers can reconvert and until the availability of materials makes possible a product of top appearance and quality.

How good a start has been made on resumption of car production is indicated by the fact that one major body source plans to place parts orders around the middle of September, which can only mean that its engineering and purchasing staffs have been reassembled to sufficient extent that specifications can be determined and schedules drawn up. Body scheduling normally precedes other automobile component production by several weeks, so it is natural that this work should now be in the preparatory stage.

A stock market reflection of this development may be the recent flurry on Briggs Mfg. Co. common which last week drove up to a new high of around $44 against a low this year of $27. Briggs is a blue chip motor issue and not likely to be reactive to the rumor mongers which are hanging around brokers' offices these days touting one motor stock after another. This stock market rumor business, incidentally, is approaching the scale of 1929 and has already drawn the fire of exchange authorities. Privately, some brokers say they are considering renaming their board room paddocks.

JOSEPH W. FRAZER

Recently elected chairman of the board of the Graham-Page Motors Corp.

A group of six self-styled Detroit engineers has organized an unique nonprofit corporation which they call Troubleshooters Co-operative, and will offer a service calculated to aid plants and industries with their reconversion problems by means of efficiency surveys, trade information, recommended plant reforms, graphs, charts and whatnot—all for a specified fee, of course. The local War Manpower Commission has stated it is investigating the combination to determine whether there are any labor pirating practices involved such as were uncovered in connection with newly-organized engineering services catering to hastily-expanded war production plants.

Organizer of the troubleshooters says he welcomes the WMC investigation, that all his associates are partners and not employes, therefore not subject to jurisdiction of the United States Employment Service. He further explained that eventually it was the hope to build the organization into a 40-man co-operative, each participating engineer sharing in the profits if any.

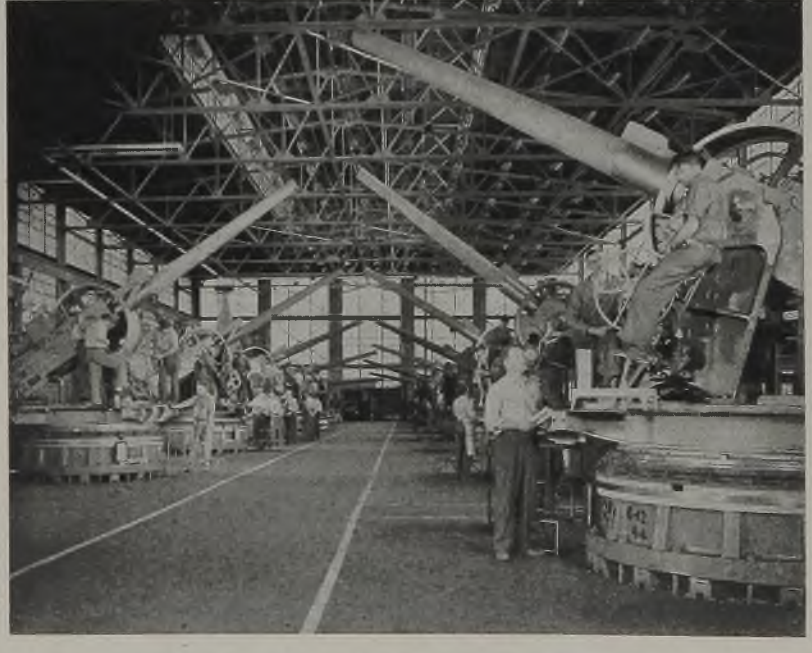
Earlier this year the WMC declared its intention to prosecute engineering service organizations which were acting as brokers for labor with special skills. However, E. L. Cushman, director, now says the practice has stopped, that the alleged violators have said that they will sin no more.

Chrysler Corp. has set up a new special laboratory to be devoted to physical chemistry research, and has engaged Dr. Orlan McGrew Arnold, formerly professor of chemistry at Rensselaer Polytechnic Institute to direct the unit, under supervision of Carl Breer, Chrysler director of research. The new laboratory will be equipped with precision apparatus for molecular and atomic research, and, among other things, Dr. Arnold will devote himself to experiments with the molecular structure of oil toward improved lubrication; the molecular structure of paint toward developing better adherence; the molecular structure of plastics, to make them stronger and provide increasing utility; and the refinement of insulation materials, textiles and other products.

Develops New Theories

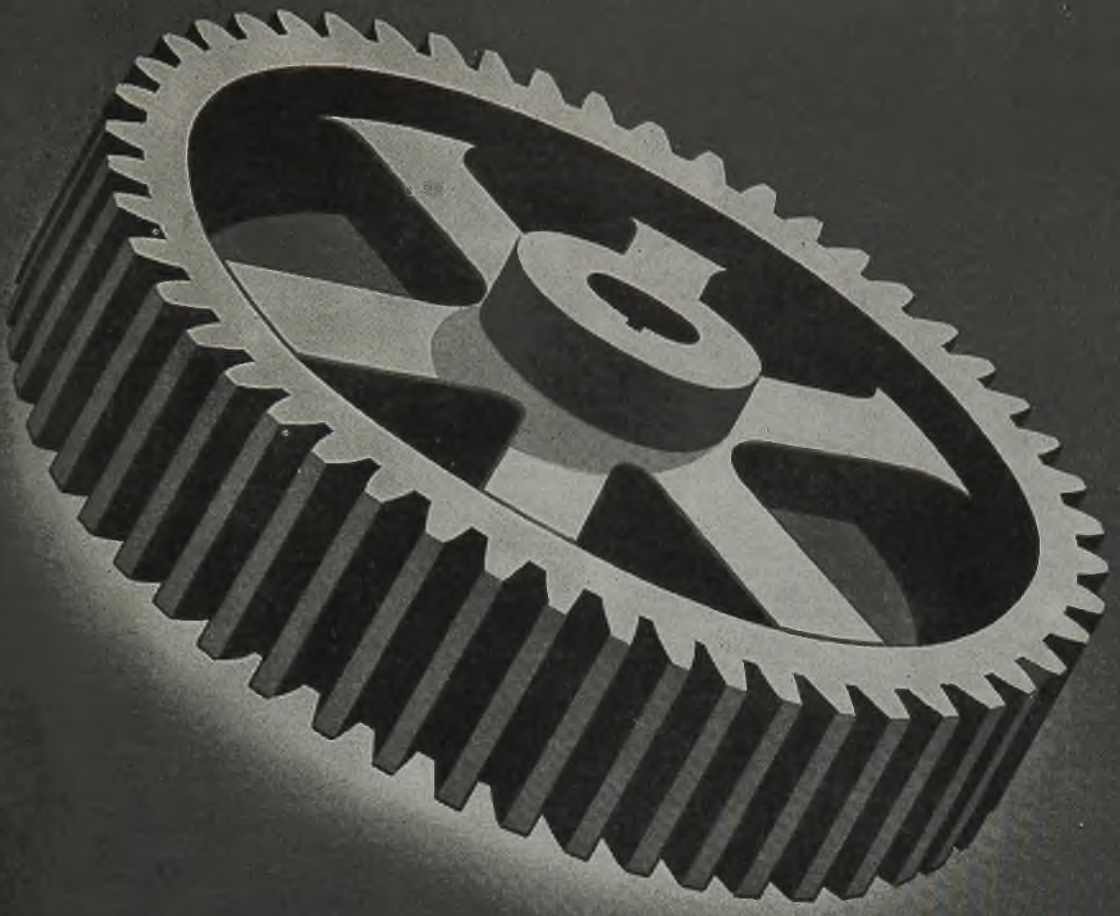
In his 16 years of experimentation, Dr. Arnold has developed new theories relating to molecular structures through the study of the characteristic behavior of several thousand compounds. He has also made intensive experiments and findings in the structure and behavior of enzymes, proteins and hormones. (What enzymes and hormones might eventually have to do with motor cars we will leave to Chrysler publicists).

Trade sources intimate at least two major automobile producers plan to build special models on the West Coast after the war. The setup presumably would involve models featuring heavier brakes, racier lines and brighter colors, and also might be sold f.o.b. the point of assembly, thus saving around $200 in freight. Alfred P. Sloan Jr. in a recent address at San Francisco, confirmed the recent mention in these pages of ten new plants for General Motors Corp. after the war. He said two of the plants would be pressed steel manufacturing units, and five or six would be assembly plants, including a new one in the San Francisco Bay area. A new die cast hardware plant such as Ternstedt normally operates, also is said to be included in the list.



BAD NEWS FOR AXIS: Huge dual-purpose 5-inch naval guns are shown in final assembly area of the Fisher Body Pontiac Division with skilled craftsmen applying finishing touches. Weight 40,000 pounds completely assembled, the gun requires the heaviest machinery ever installed in the plant

Molybdenum cast steels make tough, wear-resistant parts. Our data on practical analyses are always available.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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WING TIPS

Shifting emphasis to heavy bomber production expected to release thousands of aircraft workers. Output of C-46 transports and B-24 bombers to be reduced to permit increased manufacture of new B-29s and its still newer team-mate, the B-32

SHIFTING emphasis in aircraft production to the new B-29 Superfortress and its still newer team-mate, the B-32 Superliberator, is calculated to release 20,000 workers in aircraft plants immediately, and an additional 100,000 over the next year. Such released labor, it is hoped, will gravitate to plants producing other critical items in the war program, but if the past is any indication, only a small fraction of these disemployed will move as the government planners want them to move.

Schedule reductions apply principally to the Curtiss C-46 Commando transport and the Consolidated B-24 Liberator bomber. Higgins Aircraft at New Orleans has been relieved of contract to produce 50 of the C-46 units a month, although some of its 6300 employes will be retained for subcontracting. Curtiss-Wright plants at St. Louis, producing parts, and at Louisville, where C-46 assemblies are made, will aim toward a peak schedule of 50 monthly instead of 108 monthly, although as yet the 50-unit schedule has not been reached. Curtiss-Wright at Buffalo will work toward a schedule of 150 planes a month and taper off to 100 by mid-1945.

Production of B-24 Liberator bombers at the North American Aviation plant in Dallas has been terminated, to the complete surprise of the company management which in a statement to employes declared that its plans had been based on production continuing at least another eight months. Cutback in B-24 production at Consolidated-Vultee in San Diego, Calif., and at the Ford Willow Run plant in Michigan is reported being set at from 26 planes a day to 14 planes a day, the rate of decrease depending upon how fast the changeover to the new B-32 bomber can be effected at California. Ford spokesmen say Willow Run production will not be affected by more than two or three planes a day, the present rate being about 16 daily.

While the War Department has sought to minimize the effect of these preliminary schedule reductions, it seems almost certain they are the forerunner of sweeping readjustments in nearly all plants producing aircraft. Capitulation of Germany, for example, would immediately bring such a retrenchment, for it is just not possible to keep on absorbing 8000 battle and transport planes each month at the various fronts, and the sooner this fact is faced the better.

First public mention of the Consolidated B-32 bomber came with the cutback announcement. It is a long-range pressurized cabin type of bomber, similar in many respects to the Boeing B-29, its development in fact being undertaken shortly after the B-29 project started to roll. This writer witnessed one of its early flights from the Consolidated airport at San Diego in April, 1943. A few weeks later on another test flight the ship crashed on a marine barracks near the airport and was demolished, killing Richard McMakin, Consolidated's chief test pilot. This mishap was a strange repetition of the fate which befell one of Boeing's B-29's on an early flight over Seattle, when the plane crashed into a packing plant and killed Eddie Allen, Boeing chief test pilot and a dozen or more top Boeing engineers.

Little has been heard of the B-32 between the time of the fatal crash and the present, but apparently Consolidated's two sprawling plants along Pacific avenue in San Diego, for some months have been in process of converting jigs, fixtures and other assembly paraphernalia to the larger and heavier B-32.

While no official credence can be given to them, nevertheless reports are being circulated around Cleveland that cutbacks or cancellations may be forthcoming on the P-75 superfighter which Fisher Body is starting to build there. First production model was flown about two weeks ago, but the entire project is well behind original schedules.

B-29 Production Program Involves Complex Problems

One of the most comprehensive production programs ever attempted in American industry is now in operation for the manufacture of the Boeing B-29 Superfortress, certain phases of which were reviewed in STEEL for June 26, p. 74.

The complex task of directing the widespread manufacturing pool for the B-29 is an enormous undertaking and the bulk of the responsibility has been assigned to the Boeing organization. Chief among those at Boeing who undertook the planning of this production program is H. Oliver West, executive vice president in charge of manufacturing activities.

Small in stature, West towers with the big men in the production field. Like most of his fellow executives, he rose from the ranks, starting in the organization in 1921 as an inspector of

Observe size of engine nacelles, below, to be mounted on wings of the B-29. Wright 2200-horsepower engines will be installed. Right, lineup of dorsal fins ready for installation on superfortress tail sections

Removed–35 cu. in. OF TOUGH STEEL PER MINUTE

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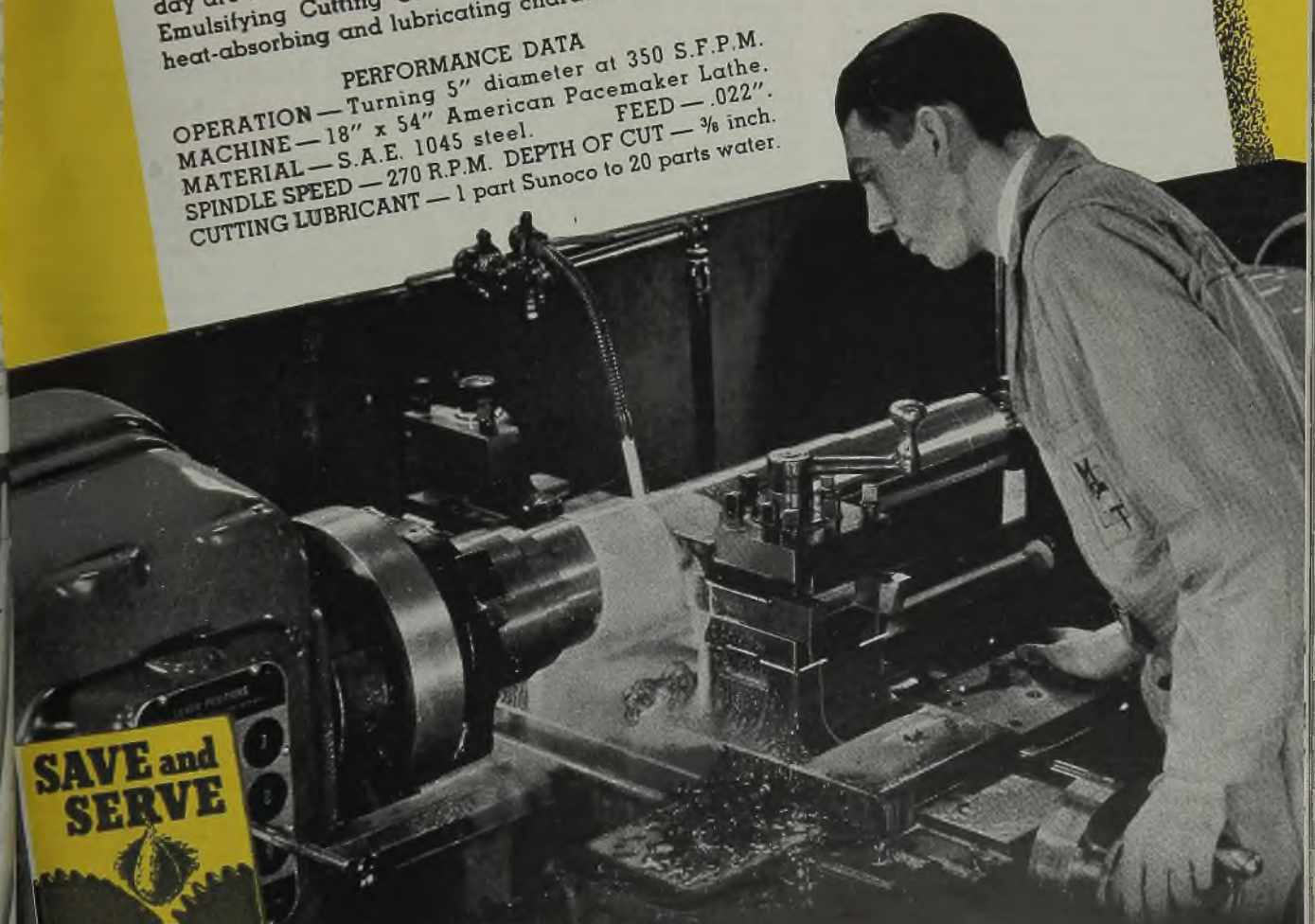
PERFORMANCE DATA

OPERATION — Turning 5" diameter at 350 S.F.P.M.
MACHINE — 18" x 54" American Pacemaker Lathe.
MATERIAL — S.A.E. 1045 steel. FEED — .022".
SPINDLE SPEED — 270 R.P.M. DEPTH OF CUT — 3/8 inch.
CUTTING LUBRICANT — 1 part Sunoco to 20 parts water.



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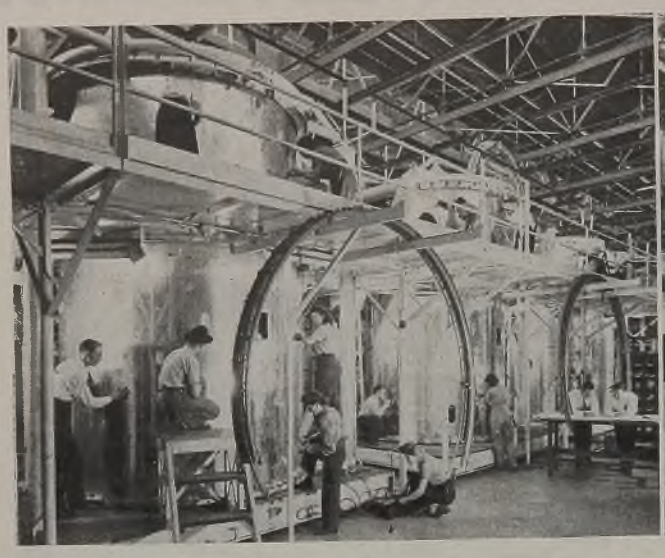


Left above, jigs for these bomb bay sections of the B-29 are among the largest used in the industry. These elements are assembled vertically. Circumferentials are hung on racks in foreground. Right, acres of wing sections and jigs stretch out over this vast assembly floor at Boeing's Wichita, Kans., plant

raw materials. Later he became production chief. From 1929 to 1939 he held top executive positions with air lines and returned to Boeing with a wealth of organizational experience. This, plus his production experience and aptitude, resulted in his design of the Boeing manufacturing system.

The B-29 was to be built at four widely separated points. Each builder was to be furnished innumerable parts by subcontractors from still more widely separated points. A subassembly, for instance, coming from Grand Rapids, Mich., would have to be built so that it would fit on an airplane under construction either in Renton, Wash., Wichita, Kans., Omaha, Nebr., or Marietta, Ga.

Boeing naturally fell heir to the intricate task of furnishing master gages to each manufacturer, so that all airplanes would be built exactly alike, and to each subcontractor, so that all parts and subassemblies would be identical. In order to supply these master gages, the first requisite was control master gages from which the masters could be made. This is one of the most exacting jobs in tooling and calls for tolerances to the thousandths of an inch.

Under the initial manufacturing arrangement, Boeing was to continue its already established plans whereby completed bombers would be assembled in Wichita and the Seattle plant would build B-29 subassemblies. Bell, North American and the Fisher Body division of General Motors were to build completed airplanes and Fisher Body also was to supply North American and Bell with outer wing panels, tail surfaces, ailerons, flaps, control columns, wing tips and completed engine nacelles.

Two circumstances changed this setup. First, increased demands were made on the Seattle-Boeing plant for Flying Fortresses and it was decided to devote this plant exclusively to B-17 production and shift Seattle's B-29 work to Wichita.

Second, in August of 1942, the Navy suddenly switched emphasis to land-based bombers and asked the Army for delivery of B-17s. The AAF was unable to supply the Navy with these ships, but offered to "trade" North American's B-25 twin-engined bomber facilities (which already had been earmarked for conversion to B-29 production) for the Navy's Boeing-Renton factory, which had been built for the express purpose of manufacturing the Sea Ranger, a twin-motored flying boat of advanced design. The Navy agreed, leaving the Sea Ranger an orphan. Subsequent efforts by the Navy to put this flying boat into production failed, due to the commitment of all available facilities to land planes.

Following the Army - Navy "trade", steps were taken immediately to convert the Boeing-Renton plant into B-29 production and Renton was designated to take over North American's commitment. Later the Army ordered the Martin-Omaha plant into the pool and assigned to it the quota of completed airplanes originally earmarked for Fisher Body. The latter firm retained a major role as producer of subassemblies, the work involving eight of its 16 war plants.

Aircraft Employe Productivity Higher

West Coast aircraft industry emphasis on efficiency shows up nowhere more dramatically than in the employe productivity index.

In the 11 months ended June 30, 1944, production in the Pacific Coast airframe plants by weight of complete airplanes increased from 26,000,000 pounds in August, 1943, to 32,300,000 pounds for June, an increase of more than 24 per cent.

In the same period, employment dropped from 304,000 to 245,000, a decrease of 19 per cent.

Employe productivity increased 44 per cent.

Cuts Production Time on B-29 Engine Nacelles

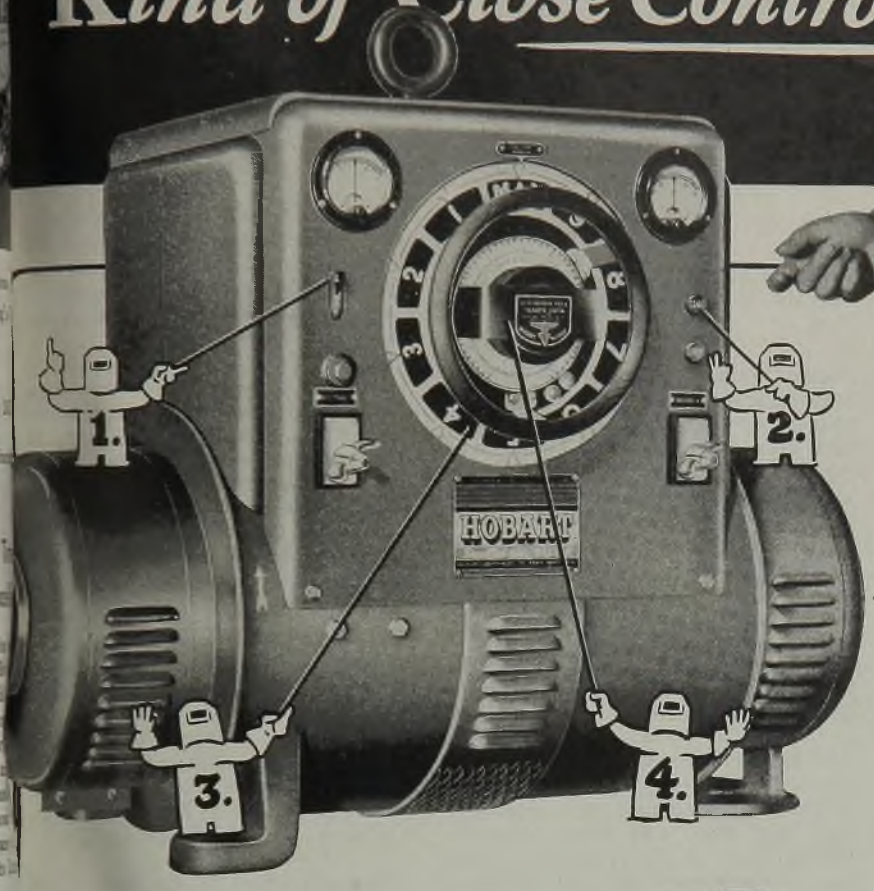
Time-saving production methods have enabled the Fisher Body division of General Motors to build engine nacelles for the B-29 Superfortress in a fraction of the time originally required. Fisher's converted automobile body plant No. 1 at Cleveland has completed 16 months of continuous production of nacelles and the company also is building these nacelles at its Lansing, Mich., plant.

Nacelles for the B-29 are larger and more complex than those on any other airplane. One set, each of which weighs approximately one ton, represents 18 per cent of the entire plane's construction and requires more man-hours than the ordinary pursuit plane.

The nacelle is virtually the "heart" of the super-bomber. Comprising more than 3000 parts, it houses the engines and all power plant auxiliary equipment, including turbosuperchargers, electrical lines and controls for fuel, oil and carburetors, intercooling systems, heaters and filters.

Conversion of the six-story Fisher No. 1 plant at Cleveland to exclusive manufacture of nacelles was begun in April, 1942. More than 1,000,000 square feet of floor space was made available for the B-29 program at the plant. Upwards of 18,000 jigs, fixtures, tools and dies were required to achieve assembly-line production. The first two completed nacelles were shipped in April, 1943. Thereafter output was stepped up sharply with Fisher supplying nacelles for the entire B-29 production program last year.

Today's Welding — Calls for HOBART's Kind of Close Control



The strength and high quality of the weld is due to the close control of the arc for the various types of electrodes used. That's why these "Close Control" features were incorporated in Hobart's exclusive design. **1.** Convenient and simple switch for changing polarity to suit the different types of electrodes. **2.** Starting switch located inside turret top. Start, stop and reset buttons on outside of cabinet. Switch fully protected against overload, under-voltage and conditions of phase unbalance in power supply. **3.** Outer wheel and dial for selecting the desired welding range. It provides 10 steps which, with the 100 steps in the inner wheel, makes possible a wide range of 1,000 volt-ampere combinations. **4.** Inner wheel and dial for adjustment of heat and of relation between voltage and current. Removable for Remote Control.

Note the liberal design and exclusive features of the 300 ampere Electric Driven Welder illustrated above.

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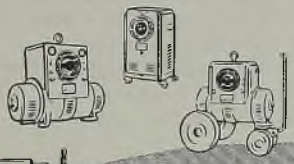

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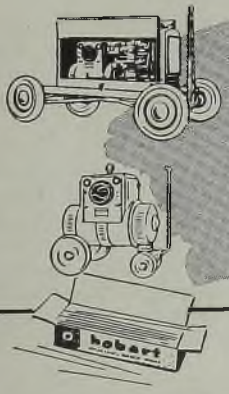

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MEN of INDUSTRY

FRED R. COOPER

C. R. TERRY

Fred R. Cooper has been appointed to the executive staff of Warren City Mfg. Co., Warren, O. Formerly Mr. Cooper was assistant to the president of Willys-Overland Motors Inc., Toledo, O. **Harry D. Beutlich** has been named director of industrial relations for the Warren company. He was previously director of industrial relations for Willys-Overland.

—o—

Robert L. Irvin has been appointed works manager of the Graham plant of Pittsburgh Screw & Bolt Corp., Pittsburgh. **George H. Lee Sr.,** former works manager of the Graham plant, will devote his entire time to experimental and advisory work for all plants of the corporation.

—o—

Gordon Spillette has been named staff manager, factory service departments, B. F. Goodrich Co., Akron, O., succeeding **Paul W. Watt,** now manager of the factory service departments.

—o—

Peter B. Kline has been appointed manager of eastern sales, and **Thomas L. Moore** has been named manager of western sales, Rustless Iron & Steel Corp., Baltimore. Mr. Moore will have charge of the New England, New York, Philadelphia, Buffalo and Cincinnati territories, and Mr. Kline will supervise the West Coast, Chicago, Detroit, Cleveland and Baltimore territories.

—o—

M. M. Clark will join Climax Molybdenum Co., New York, as metallurgical engineer Sept. 1. He will serve the Ohio district, making his headquarters at Rm. 1101 First National Bank building, Canton, O.

—o—

William E. Pennington has been appointed assistant general sales manager, Crucible Steel Co. of America, New York.

—o—

Edward C. Hardig, formerly sales manager, has been named vice president in charge of sales and a director, National Tool Co., Cleveland. **Douglas C. Albright,** formerly an industrial engineer with the A. J. Brandt Co., Detroit, has been appointed vice president and assistant to the president of National Tool.

—o—

Col. Walter F. Siegmund, formerly sales manager, Western Cartridge Co., East Alton, Ill., has been appointed general sales manager, Olin Corp., East Alton. Colonel Siegmund was honorably retired from active duty in the Army Air Corps Aug. 9, having served in the Army more than 30 years.

—o—

C. R. Terry has been named manager of the new regional and branch office sales headquarters in Cleveland of Hydraulic Press Mfg. Co., Mt. Gilead, O. **Paul E. Flowers** will serve as branch office manager for metropolitan Cleveland.

—o—

J. J. Komera, who founded Empire Finished Steel Corp., Newark, N. J., in 1936 and has served as its president since that time, will retire from the organization to engage in consulting practice, with temporary offices at 220 Madison avenue, New York. Physical assets of the corporation have been acquired by Wyckoff Steel Co., Pittsburgh. **N. J. Begle,** treasurer, also will retire from the Empire organization.

—o—

Joseph B. Horwitz has been appointed midwestern representative, New York Commodities Corp., New York, and will make his headquarters in the Rockefeller building, Cleveland.

—o—

B. R. Newcomb has been elected president of the John Waldron Corp., New Brunswick, N. J. He was formerly with Worthington Pump & Machinery Corp., Harrison, N. J., and American Optical Co., Southbridge, Mass. **S. N. Finney** and **F. W. Egan** have been elected vice presidents of the Waldron corporation.

—o—

Chester C. Thompson has resigned as chairman of the advisory board and president of Inland Waterways Corp. to become president of American Waterways Operators Inc. He has also resigned as president of Warrior River Terminal Co. **John S. Powell** succeeds him as president of Warrior River Terminal Co. and has been named acting chairman of the advisory board and acting president of Inland Waterways.

—o—

Charles Kalder, who was appointed to reorganize the Valley Mfg. Co., Miamisburg, O., for the benefit of the creditors, has successfully completed his job and has returned to his industrial engineering business at Grand Rapids, Mich.

—o—

R. G. Wingerter, for the past six years an industrial engineer for Timken Roller Bearing Co., Canton, O., has been appointed assistant chief engineer for the company's Industrial Division.

—o—

Clyde E. Smith, former factory manager, Colgate Aircraft Co., Amityville, N. Y., has been appointed assistant manufacturing manager, Ranger Aircraft Engines Division, Fairchild Engine & Airplane Corp., New York.

—o—

Two appointments in the Organization Planning Division of Carnegie-Illinois Steel Corp., Pittsburgh, are: **A. E. Dieckman,** supervisor of the division, and **J. K. Banville,** assistant supervisor. Three newly-appointed assistant works auditors for the Accounting Division of the corporation's Gary Works are: **G. A. Marks, J. H. Helenhouse,** and **E. B. Curtice.**

—o—

Fred S. Carpenter, former factory manager of the tire plant of United States Rubber Co. in Los Angeles, has been appointed manager of the synthetic rubber plant there. A. E. Jury, former manager of the synthetic plant, returns to the New Products Division, Winnsboro, S. C., and New York,

—o—

Five promotions by Ilg Electric Ventilating Co., Chicago, have been announced as follows: **Frank P. Bleier** is director of the company's new research laboratory; **Raymond V. Pfautsch** has

EUGENE B. MAPEL

Who has been appointed supervisor, administration planning, Carnegie-Illinois Steel Corp., Pittsburgh, reported in STEEL, Aug. 21, p. 93.

RALPH W. HISEY

E. F. THEIS

MILLS N. RIPLEY

DON S. BEAL

been named assistant chief engineer; **Richard Hanford** is electrical engineer; **A. J. Lenke** has been appointed production manager, and **George Biggott** is manager of production planning and scheduling.

—o—

Ralph W. Hisey, since 1935 vice president of Osborn Mfg. Co., Cleveland, has been promoted to the position of vice president in charge of all manufacturing and engineering of both the brush and machine divisions of the company. **Hugh M. Little** has been appointed works manager of both divisions.

—o—

William Shepherdson, since December, 1941, chief of the Small Business Unit of the Bureau of Foreign and Domestic Commerce, United States Department of Commerce, has been appointed staff director of the recently organized Post-War Small Business Credit Commission of the American Bankers Association.

—o—

E. F. **Theis** has been named president of L.G.S. Spring Clutches Corp., Indianapolis, Ind., newly acquired subsidiary of Curtiss-Wright Corp., New York. Mr. Theis will continue as manager of the Indianapolis plant of Curtiss-Wright Corp., Propeller Division.

—o—

Mills N. Ripley, formerly eastern district sales manager, Bijur Lubricating Corp., Long Island City, N. Y., has been appointed sales manager of the new regional and branch office sales headquarters of Hydraulic Press Mfg. Co., 500 Fifth avenue, New York. **D. L. Cleveland** will serve as manager of the New York branch office and **A. R. Rose** has been appointed manager of the new branch office in Philadelphia.

—o—

Lt. Col. V. A. Armstrong, who has been connected with the Machine Tool Section of the Army and Navy Munitions Board, Washington, for several years, has returned to inactive duty and has joined Cone Automatic Machine Co., Windsor, Vt.

—o—

Fred J. Wood, formerly affiliated with Jessop Steel Co., Washington, Pa., has been named district manager of William Jessop & Sons Inc., Detroit.

—o—

L. C. Allenbrand has been appointed manager, merchandise department, Caterpillar Tractor Co., Peoria, Ill.

—o—

J. L. Cunningham, general manager of Borg-Warner International Corp., Chicago, has been elected first vice president of the Export Managers Club of Chicago.

—o—

James D. Ransom has been named sales manager, Chemical division, Woburn Chemical Corp., Harrison, N. J.

—o—

Fred G. Gurley, for the past five years executive vice president, Atchison, Topeka & Santa Fe System Lines, has been elected president and chairman of the executive committee, succeeding **Edward J. Engel,** retired, who continues as member of the executive committee and board.

—o—

Don S. Beal, who for the past two years has been engaged in research for the Army and Navy at Northwestern University, Evanston, Ill., has been appointed enamel engineer in the Porcelain Enameling Sheet Division, Youngstown Sheet & Tube Co., Youngstown, O. Prior to his recent research work, Mr. Beal was associated with Pemco Corp., Baltimore, as sales engineer in the western territory.

—o—

Rowland D. Schell has been appointed regional director of Treasury Procurement and Surplus Property Region No. 4, with headquarters in Cincinnati.

—o—

John S. Clark, treasurer, Cleveland Pneumatic Tool Co., Cleveland, has been elected a director to fill the vacancy created by the death of D. C. Green.

—o—

Col. Nelson S. Talbott has been named supervisor of the Midcentral Procurement district, Chicago, AAF Materiel Command, Wright Field, O. Col. Talbott succeeds **Col. John G. Salsman,** who has received an overseas assignment.

—o—

A. R. Toepfer has joined Chicago-Latrobe Twist Drill Works, Chicago, as district representative for the Wisconsin and Minnesota territory, with headquarters in Milwaukee.

—o—

Clarence L. Wanamaker has been named general manager of the Munitions Division, United States Rubber Co., New York.

—o—

Lt. Col. Thompson H. Mitchell has been appointed general manager of R.C.A. Communications Inc., to succeed the late William A. Winterbottom.

—o—

Walter P. Konrad has been appointed Chicago branch manager of the Phosphate division sales department, Monsanto Chemical Co., St. Louis.

—o—

Richard D. Weinland has been appointed manager of exports, Continental Overseas Corp., subsidiary of Continental Can Co., New York.

—o—

Stewart Reed, formerly advertising manager for Goodyear-Australia, has been appointed assistant advertising manager,

W. P. SNYDER JR.

who has been elected chairman of Crucible Steel Co. of America, Pittsburgh, as announced in STEEL, Aug. 21, p. 69.

DONALD B. MacAFEE

Who has been made vice president in charge of sales, Benchmaster Mfg. Co., Los Angeles, noted in STEEL, Aug. 21, p. 94.

LOUIS W. MASON

Who has been named assistant to general manager of sales, National Tube Co., Pittsburgh, as announced in STEEL, Aug. 21, p. 93.

Goodyear Tire & Rubber Export Co., New York.

—o—

A. J. Werner, formerly vice president and general sales manager, Wisconsin Bridge & Iron Co., Milwaukee, has become a director and vice president of A. F. Wagner Iron Works, Milwaukee.

—o—

William L. Hartley, formerly manager of central-division foundry equipment applications for Link-Belt Co., Chicago, has been appointed assistant divisional manager for materials handling machinery in the company's eastern division, with headquarters in Philadelphia. **Kennard F. Lange** has been appointed to succeed Mr. Hartley.

—o—

A. E. Shelton, manager of the Stinson Division of Consolidated Vultee Aircraft Corp., Wayne, Mich., has been named manager of the Allentown, Pa., division of Convair, succeeding **Ray McMahon,** who is returning to San Diego headquarters. **A. P. Fontaine** has assumed the post of division manager for the corporation's Stout Research Division, Dearborn, Mich., in addition to his duties as assistant to the director of engineering for Convair. **W. B. Stout** continues in charge of design and engineering for the Dearborn unit. **T. Y. Smith** is acting division manager at Stinson.

—o—

Harry A. Kinley has been named manager of the Detroit district office of the Lamp division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and **Harry S. Walker** has been appointed sales representative on Mr. Kinley's staff.

—o—

Frank F. Russell, general manager of the National Aircraft War Production Council, Washington, will direct the organization on a consulting basis after Sept. 1, devoting part of his time to other business interests.

—o—

G. C. Paxton, research engineer, Food Machinery Corp., San Jose, Calif., has been placed in charge of the engineering office which the corporation has opened at 3275 Wilshire boulevard, Los Angeles, for the development of experimental models of food processing equipment.

—o—

William K. Swiggert, manufacturing advisor, Curtiss-Wright Corp., Propeller Division, Caldwell, N. J., has retired.

OBITUARIES . . .

Alfrederick Smith Ames, 60, secretary-treasurer, W. Ames & Co., Jersey City, N. J., re-rollers of bars, track spikes, track bolts, angles, reinforcng steel and similar products, died Aug. 14 at his summer home in Malletts Bay, Vt., after a long illness. Well-known in the steel industry, Mr. Ames was a member of Railroad Machinery Club of New York, American Iron and Steel Institute, American Society for Testing Materials and the Princeton Engineering Club. The company was founded by his grandfather in 1859.

—o—

Argyle Campbell, 69, president since 1908, Enterprise Railway Equipment Co., Chicago, died Aug. 12 in Santa Ana, Calif.

—o—

Peter L. Hoffman, 68, general superintendent, Richards-Wilcox Mfg. Co., Aurora, Ill., died there Aug. 17. He had filled his post 30 years.

—o—

George F. Kast, 76, since 1937 vice president of Cleveland Twist Drill Co., Cleveland, and associated with that company 55 years, died Aug. 21 in Cleveland.

—o—

Ernest du Pont, 64, a founder of the Ball Grain Explosive Co. during World War I, a director of Atlas Powder Co., Wilmington, Del., and former president of United States Flashless Powder Co., Wilmington, died Aug. 19 in that city. In 1913 he developed a special process for making gunpowder.

—o—

Earl A. Banister, 55, president of the Merritt, Chapman & Scott Corp., New York, marine contractors and wreckers, died Aug. 21 in New York. Mr. Banister supervised the raising of the French liner NORMANDIE from a slip on the East river.

—o—

L. A. Osborne, 74, retired vice president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and former president of Westinghouse Electric International Co., New York, died Aug. 18 in Pittsfield, Mass. He was a director of the parent company from 1924 to 1935, and retired in 1936.

—o—

Clarence A. Cooper, 60, sales engineer, Crucible Steel Co. of America, Chicago, died suddenly in that city Aug. 15.

—o—

Charles M. Lemmon, Cleveland lawyer, and founder of the Ohio Forge Co., Cleveland, now the Ohio Forge & Machine Corp., died Aug. 19 in North Olmsted, O.

—o—

William M. Henry, 59, chief engineer and superintendent of maintenance, Donora, Pa., plant, American Steel & Wire Co., Cleveland, died Aug. 16 in Pittsburgh.

—o—

Reynolds C. Caldwell, 56, purchasing agent, American Rolling Mill Co., Middletown, O., died there Aug. 8.

—o—

Ted Cook, 47, sales representative, Pacific Wire Rope Co., Los Angeles, died Aug. 4. He had been associated with Pacific Wire Rope for 26 years.

—o—

John M. Stahr, 60, since 1942 comptroller of manufacture, Western Electric Co., New York, died Aug. 15 while on vacation at Lake Minnewaska, N. Y.

—o—

Peter M. Iverson, 72, founder and owner of the Iverson Tool Co., Tulsa, Okla., died recently in that city.

—o—

Albert H. Killinger, 49, vice president in charge of sales and a director of Laclede-Christy Clay Products Co., St Louis, died Aug. 18 in Durango, Colo.

—o—

John Crossan Dilworth, 59, since 1934 manager of sales, Railroad Materials and Commercial Forgings Division, Carnegie-Illinois Steel Corp., Pittsburgh, died there Aug. 23. In 1905 he joined Dilworth Porter Co., subsequently becoming vice president, and he was district manager of the Dilworth Porter Division of United States Steel Corp. from 1930 to 1934.

DESIGN FOR BOMBING JAPAN

Rising Sun's war industries largely concentrated on two densely-populated islands of Japan proper, increasing vulnerability to bombing attacks. Northern Kyushu, leading steel-making district, bears brunt of first American raids

JAPAN's manufacturing industries with few exceptions are concentrated on two of the four principal islands of Japan proper, Honshu and Kyushu, making the empire's war factories especially vulnerable to bombing attacks. A third island, Hokkaido, has an iron and steel industry and some shipbuilding. The fourth, Shikoku, has no important factories.

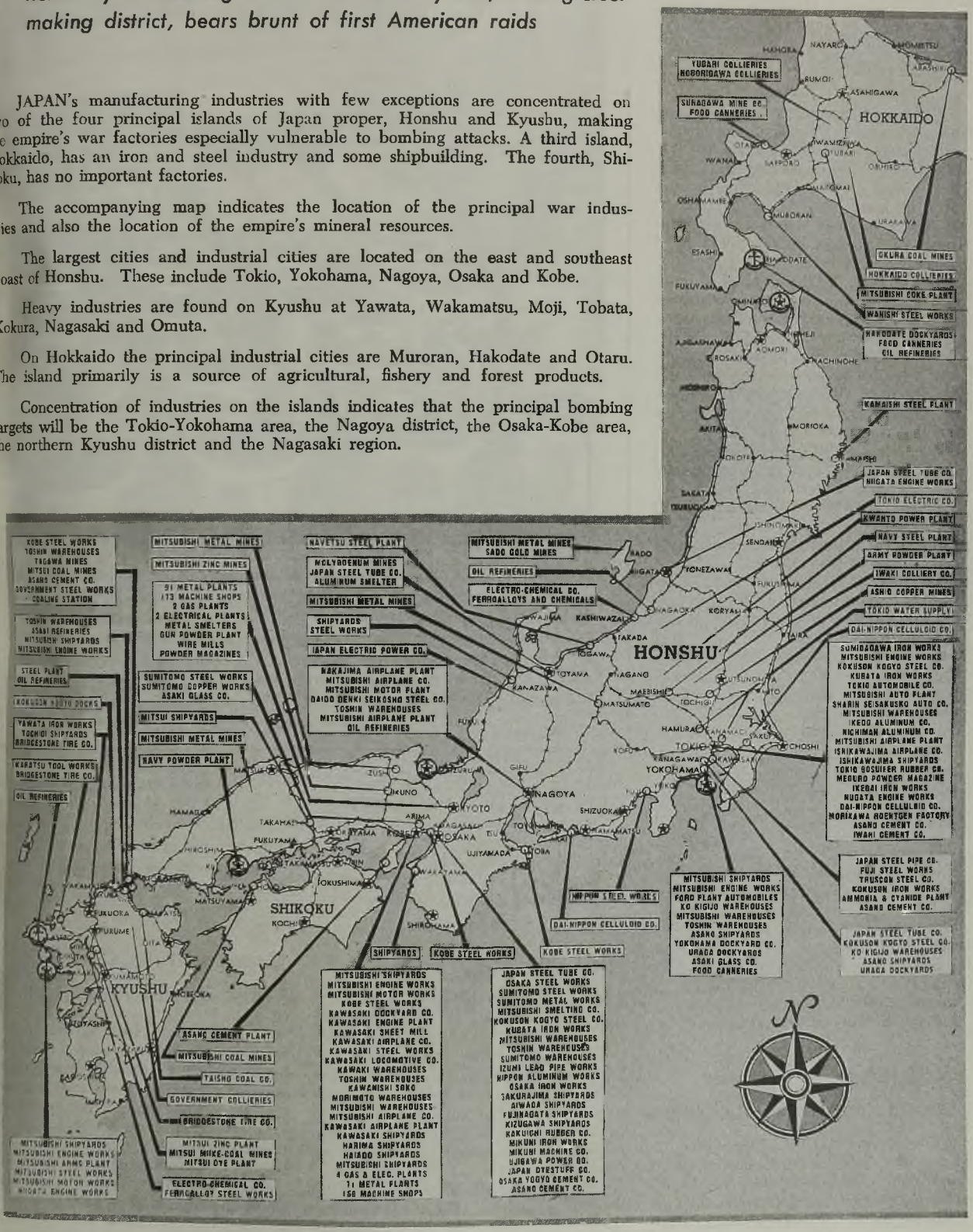
The accompanying map indicates the location of the principal war industries and also the location of the empire's mineral resources.

The largest cities and industrial cities are located on the east and southeast coast of Honshu. These include Tokio, Yokohama, Nagoya, Osaka and Kobe.

Heavy industries are found on Kyushu at Yawata, Wakamatsu, Moji, Tobata, Kokura, Nagasaki and Omuta.

On Hokkaido the principal industrial cities are Muroran, Hakodate and Otaru. The island primarily is a source of agricultural, fishery and forest products.

Concentration of industries on the islands indicates that the principal bombing targets will be the Tokio-Yokohama area, the Nagoya district, the Osaka-Kobe area, the northern Kyushu district and the Nagasaki region.



Steel Mills Cut Order Backlogs 300,000 Tons

Production schedules adjusted as result of WPB drive to reduce unfilled orders on producers' books

STEEL mill production schedules have been adjusted as a result of cancellation or deferment of purchase orders for 300,000 tons of steel, according to Norman Foy, director, War Production Board's Steel Division.

This adjustment results from WPB's campaign to reduce backlogs of unfilled orders on steel mills.

On July 11, WPB addressed a letter to a selected list of large users of carbon steel who reported sizable inventories. WPB directed them to review the demands of their current production schedules, to reduce inventories of carbon steel to minimum "working capital" levels, and to cancel outstanding purchase orders for the maximum possible tonnage of carbon steel. WPB field representatives visited plants of large steel users to assist them in reviewing their needs.

Further cancellations of mill orders are expected as a result of the item-by-item review of current requirements of carbon steel, it was reported.

Mr. Foy further pointed out that steel consumers must continue to use inventory to a maximum extent during the next two quarters so that steel mill capacity will be utilized to produce only the most urgently needed requirements. The ending of the WPB campaign does not indicate that carbon steel has ceased to be in critically short supply, he warned.

PRECISION-MACHINED BEARINGS: A nine-man "shop combat team" at the Emeryville, Calif., plant of Westinghouse Electric & Mfg. Co. turns out precision-machined stern tube bearings for Army supply vessels in record time. During a recent month, the department produced 28 stern and strut type bearings in an average of 3¾ hours each. In photo above, Edward S. Norton, the lathe operator, is checking the fit of two halves of a bearing, while James A. Wall brings up a new load of bearings ready for machining

Rheem Mfg. Co. Buys Stokermatic Co.

Rheem Mfg. Co., New York, has acquired the business of Stokermatic Co., Salt Lake City, Utah. This acquisition will permit Rheem to manufacture and distribute Stokermatic products on a world-wide basis.

Stokermatic Co. is now confining its output to valves, high pressure fittings and other products for the armed services and the Maritime Commission.

Stran-Steel To Release Information from Foundation

Trustees of the John B. Pierce Foundation, New York, recently announced an arrangement by which many of the research developments and products of its laboratories will be made generally available to the public through the Stran-Steel division, Great Lakes Steel Corp., Detroit.

The Pierce Foundation is a privately endowed organization engaged in research, educational, technical and scientific work, and has been a leader in the development of mass-produced, low-cost housing.

New Company Expedites Construction, Production

A new type of industrial service aimed at expediting construction and production by ironing out engineering kinks and eliminating costly delays between prime and subcontractors has been established in Detroit by a group of financial, purchasing and engineering executives.

Under the name, Industrial Planning Co. with offices at 1354 Book building, the group specializes in placing and following through on subcontracts.

H. Kendall Curtiss, former comptroller of Industrial Specialties Co., is president and general manager of Industrial Planning Co., and Charles Beach, former purchasing agent of Packard Motor Car Co., vice president.

Organized To Carry Out Work on Jet Propulsion

Turbo Research Ltd., Ottawa, a new company wholly owned by Canada, has been created to carry out design and other development work on jet propulsion for aircraft and on the gas turbine as a prime mover, according to an announcement made recently by C. D. Howe, Canadian munitions minister.

The new company will take over such plants and equipment as have been set up in Canada in connection with jet propul-

sion since the latter part of 1942 when the government first became interested in this development.

Westinghouse Plan Helps To Speed War Traffic

More than 9809 extra car days were saved for other vital war shipments by rail during a record 12-months demurrage-free period just completed by the East Pittsburgh works of the Westinghouse Electric & Mfg. Co.

During the 12 months nearly 16,000 cars were loaded or unloaded at the East Pittsburgh Works in an average time of 1.37 days per car and without a single car being charged demurrage. Demurrage is the "rent" charged by railroads for holding cars above the time allotted to load or unload—usually two days.

The number of cars loaded or unloaded without demurrage would make a train nearly 150 miles long.

BRIEFS . . .

Delta Mfg. Co., Milwaukee, has been awarded first place among national magazine advertising in the annual competition sponsored by the National Advertising Agency network.

—o—

Soule Equipment Co., Los Angeles, is a new company formed by the management of Soule Steel Co. to distribute Le Tourneau earth moving equipment in northern California.

—o—

Elastic Stop Nut Corp., Union, N. J., has purchased 30 acres of land adjacent to its plant at a cost of around $50,000.

—o—

National Bureau of Standards, Washington, announces that printed copies of Simplified Practice Recommendation R-344, Metal Lath and Metal Plastering Accessories, are now available.

—o—

Carnegie-Illinois Steel Corp., Pittsburgh, reports that 40,646 employes in its Chicago district plants purchased $5,500,000 worth of bonds during the Fifth War Loan drive.

—o—

Battelle Memorial Institute, Columbus, O., has been granted the Ordnance Distinguished Service Award for outstanding contributions to ordnance progress.

—o—

Warren Refining & Chemical Co., Cleveland, announces the location of its new general offices at 308 Euclid avenue, Cleveland.

—o—

Eastern Stainless Steel Corp., Baltimore, will be the new corporate name of the Eastern Rolling Mill Co., effective Sept. 1.

—o—

Continental Can Co. Inc., New York, announces removal of the Eastern division's offices from 100 East Forty-second street to the eighth floor of the Chanin building, 122 East Forty-second street.

Crosley Corp., Cincinnati, has appointed the Richardson-Wayland Electrical Corp., Roanoke, Va. as distributor in central Virginia.

—o—

Westinghouse Electric & Mfg. Co., Pittsburgh, has published its first issue of *El Ingentero Westinghouse*, a new technical magazine for Latin America. The new bi-monthly publication will be dedicated to inter-American co-operation.

—o—

New England Council, Boston, announces the 1945 edition of the directory of New England manufacturers, listing 14,000 New England companies, names of major executives, products manufactured, capital and number of employes, has been completed.

—o—

Dresser Mfg. Co., Bradford, Pa., plans to call a meeting of stockholders Oct. 16, preparatory to acquiring the assets of International-Stacey Corp., Columbus, O.

—o—

Franklin Institute, Philadelphia, will receive the Ordnance Distinguished Service Award on Sept. 13 in recognition of scientific and engineering achievement.

—o—

Pennsylvania Salt Mfg. Co., Philadelphia, announces organization of an Export Department at its main office at 1000 Widener building, Philadelphia. John Barr has been appointed manager.

—o—

Mechanical Handling Systems Inc., Detroit, has opened a new office at 1224 Commercial Trust building, Philadelphia.

Increasing Pipe Facilities at Youngstown

Republic Steel Corp. to produce 6-inch diameter pipe of ⅛-inch wall thickness. Mill to begin operations soon

EQUIPMENT to make 6-inch diameter invasion pipe of ⅛-inch wall thickness will be installed for the Defense Plant Corp. by Republic Steel Corp. in Youngstown, O., it was announced recently by R. L. Leventry, Republic's district manager.

The mill, complete with all the equipment needed to finish the pipe, will be erected in Republic's present tube mill building. It is understood that no additions will be required to the present power, water and steam facilities.

The new mill will supplement existing pipe making facilities and is expected to go into operation early in September. No tonnage figures on production can be given out because of wartime restrictions on information of this character.

HEAVY DUTY AXLES: Putting finishing touches on the first heavy duty axles off the assembly line at the Madison, Ill., plant of the Standard Steel Spring Co. Part of a $90,000,000 contract, first shipment of these 4 and 6 ton axles was made July 31, less than four months after the plant was converted to axle manufacture

THE BUSINESS TREND

War Tempo Accentuates Material Shortages

SERIOUS shortage of a comparatively few essential military items has been accentuated by the fast tempo of the war. To bring these lagging programs up to schedule an estimated 60,000 additional workers in these critical lines are needed. Both WPB and WMC are working closely in an "all-out" effort to meet the sharply expanded needs of the must programs.

Greater production is needed from foundries, for example, that are furnishing parts for heavy trucks. Steps have been taken by WPB to increase castings output 15 per cent, particularly in foundries holding these essential contracts.

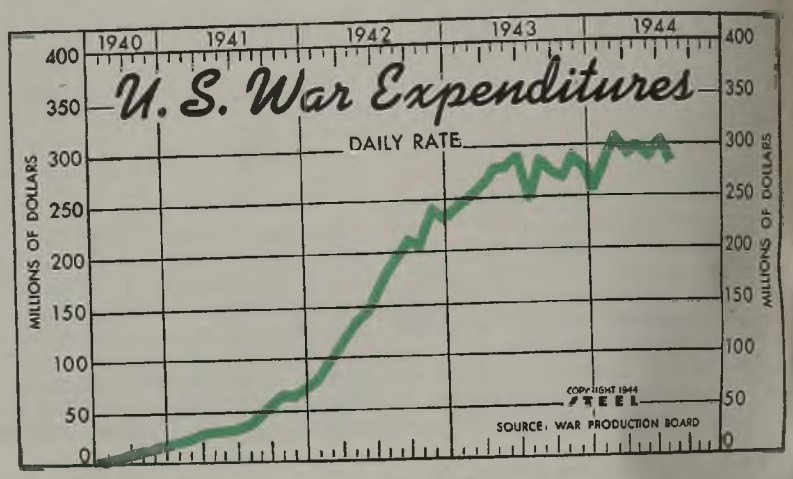
RECONVERSION—Resumption of civilian goods output in the near future will depend on extent of cutbacks in war contracts and the resultant easing in the labor supply. Recent WPB move lifting production ban on civilian goods items, providing material and manpower could be found without hampering the war effort, is aimed primarily toward a preparation of plans to make men, materials and facilities available when military requirements decline. Present procedures governing expansion in output of civilian goods will loosen quickly when and where it becomes necessary to find jobs for released war workers.

EMPLOYMENT—A slight decline in employment to 38,607,000 workers occurred during July in nonagricultural manufacturing establishments. This latest recession offset the slight upturn recorded during June, which was the first increase registered since November, 1943. Compared with July last year employment in manufacturing plants has declined about one million.

SCRAP—Shortage of manpower and work stoppages during June slowed up steel and foundry operations to such an extent that a decided drop in consumption of ferrous materials occurred. Despite this easing in consumption there was no appreciable increase in consumers' iron and steel scrap stocks, indicating buying policy is to purchase only enough for current needs as a protection against a sharp recession in requirements and possible lower price levels.

Stocks of iron and steel scrap at plants of consumers, suppliers, and producers on June 30 approximated 5,991,000 gross tons, a fractional increase over that registered at the close of the preceding month. An increase of about 22,000 tons in dealers' scrap stocks was the major factor in the moderate gain in total inventories recorded during June.

WAR EXPENDITURES—A decline of 7.6 per cent in United States war expenditures occurred during July, to $7,355,000,000. Average daily rate of expenditures last month of $282.9 million was the lowest recorded in any month this year and compared with peak of $312.3 million registered last February. From July 1, 1940, through July 31, 1944, expenditures for war purposes amounted to $207.2 billion.



War Expenditures
(millions)

	1944 Monthly Expenditures	1944 Daily Rate	1943 Monthly Expenditures	1943 Daily Rate	1942 Monthly Expenditures	1942 Daily Rate
January	$7,416	$285.2	$6,254	$240.5	$2,193	$ 81.3
February	7,808	312.3	6,081	256.4	2,401	100.0
March	7,948	294.4	7,112	268.4	3,025	116.3
April	7,493	299.7	7,290	280.4	3,461	138.1
May	7,918	298.3	7,373	283.6	3,824	147.1
June	7,957	306.0	7,688	295.7	4,218	162.0
July	7,355	282.9	6,746	249.9	4,708	181.1
August	....	....	7,529	289.6	5,163	198.6
September	....	....	7,212	277.4	5,459	218.4
October	....	....	7,105	273.3	5,722	211.9
November	....	....	7,794	299.8	6,112	244.5
December	....	....	6,951	267.3	6,125	235.6
Total		Av.	Tt'l. 85,165	Av. 272.9	Tt'l. 52,406	Av. 169.1

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	97	97.5	97	98.5
Electric Power Distributed (million kilowatt hours)	4,451	4,415	4,381	4,265
Bituminous Coal Production (daily av.—1000 tons)	2,025†	2,000	2,053	2,025
Petroleum Production (daily av.—1000 bbls.)	4,678	4,667	4,615	4,218
Construction Volume (ENR—unit $1,000,000)	$42.3	$39.5	$36.1	$41.6
Automobile and Truck Output (Ward's—number units)	18,800	18,895	19,545	19,820

*Dates on request. †Preliminary.

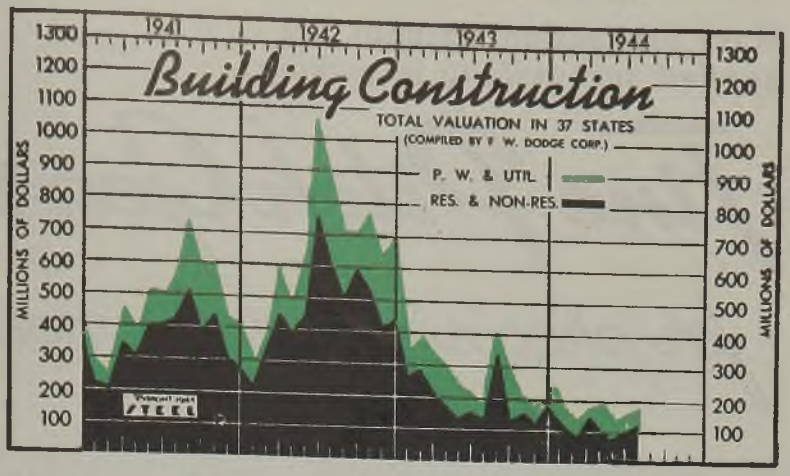
TRADE				
Freight Carloadings (unit—1000 cars)	890†	896	903	891
Business Failures (Dun & Bradstreet, number)	19	16	29	54
Money in Circulation (in millions of dollars)‡	$23,020	$22,910	$22,531	$18,214
Department Store Sales (change from like week a year ago)†	+4%	+12%	+3%	+7%

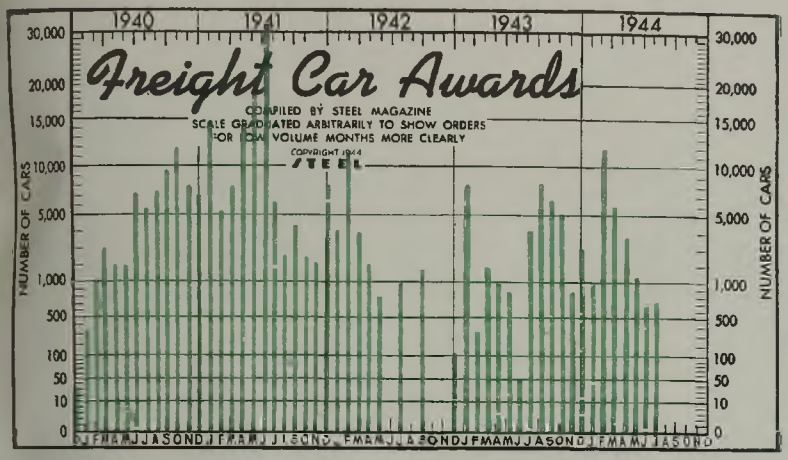
†Preliminary. ‡Federal Reserve Board.

Construction Valuation In 37 States

(Unit—$1,000,000)

	Total	Public Works-Utilities 1944	Public Works-Utilities 1943	Residential-Non-Res. 1944	Residential-Non-Res. 1943
Jan.	159.2	50.3	85.8	108.9	264.3
Feb.	187.2	55.1	112.9	82.1	230.5
Mar.	176.4	61.3	123.0	115.1	216.7
April	179.3	72.0	127.7	107.3	175.6
May	144.2	55.8	95.8	88.4	138.6
June	168.9	70.7	78.8	98.1	156.8
July	190.5	80.5	50.0	110.0	133.7
Aug.	.....	.....	78.4	.....	340.8
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





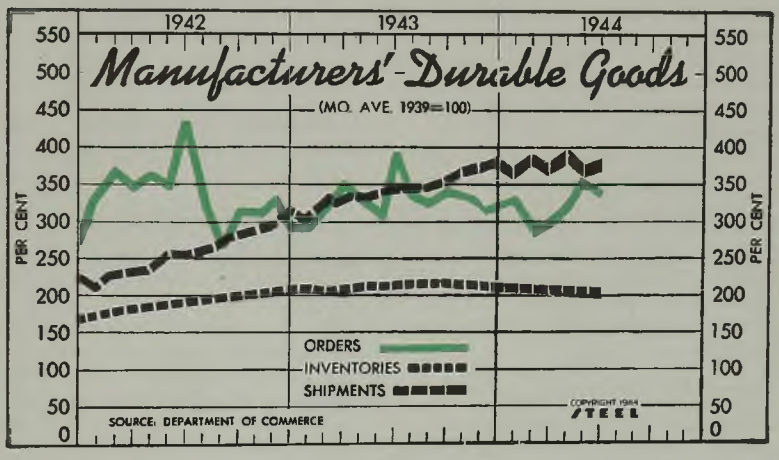
Freight Car Awards

	1944	1943*	1942	1941
Jan.	920	8,365	4,253	15,169
Feb.	12,340	350	11,725	5,508
March	6,010	1,935	4,080	8,074
April	3,819	1,000	2,125	14,645
May	1,352	870	822	18,630
June	750	50	0	32,749
July	765	4,190	1,025	6,459
Aug.	.....	8,747	0	2,668
Sept.	.....	6,820	1,863	4,470
Oct.	.....	5,258	0	2,499
Nov.	.....	870	0	2,222
Dec.	.....	2,919	135	8,406
Total	.....	41,355	26,028	121,499

*Including reinstatements.

Index of Manufacturers Durable Goods

	Orders 1944	Orders 1943	Shipments 1944	Shipments 1943	Inventories 1944	Inventories 1943
Jan.	331.5	293.5	365	208	212.0	211.3
Feb.	294.4	326.6	384	337	208.6	209.6
Mar.	309.7	349.2	369	330	207.2	210.7
Apr.	325.0	329.8	387	338	204.9	213.5
May	351.6	313.0	369	338	204.0	213.5
June	346.0	392.7	374	343	203.8	212.5
July	.....	338.7	...	346	.....	211.4
Aug.	....	325.0	...	354	.....	213.4
Sept.	....	339.5	...	356	.....	214.9
Oct.	.....	339.5	...	371	.....	214.0
Nov.	.....	316.1	...	373	.....	213.3
Dec.	.....	324.2	...	380	.....	212.8
Ave.	.....	332.3	...	339	.....	212.7



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$8,989	$8,868	$11,026	$8,688
Federal Gross Debt (billions)	$210.8	$210.5	$208.6	$147.3
Bond Volume, NYSE (millions)	$27.2	$30.5	$52.4	$28.6
Stocks Sales, NYSE (thousands)	4,722	5,641	7,511	2,698
Loans and Investments (millions)†	$56,524	$56,917	$57,211	$46,899
United States Government Obligations Held (millions)†	$42,289	$42,488	$41,917	$34,437

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	250.8	249.9	248.8	245.2
Industrial Raw Materials (Bureau of Labor index)‡	114.3	112.9	113.9	112.3
Manufactured Products (Bureau of Labor index)‡	101.1	101.0	101.0	100.0

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

Mass production methods are applied successfully in making

Fine Pitch Gears for precision instruments

By K. E. BAUERLE
Gear Engineer
Sperry Gyroscope Co.
Nassau, Long Island, N. Y.

FACED with the problem of increasing a hundred fold its output of instrument gears in connection with the war effort, Sperry Gyroscope Co. at its Nassau, Long Island plant, has worked out gear manufacturing techniques which have successfully brought mass production methods into a field formerly dominated entirely by individual handcraft methods.

The switch to mass production methods, however, has been accompanied by an actual increase in the degree of precision. Mass production methods and modern gear finishing processes give a higher degree of uniform accuracy than that obtainable by even the most skilled and competent craftsmen using hand-fitting methods.

This gigantic task of process conversion was complicated by the fact that the various Sperry products require some 2000 different gear parts including such types as spurs, helicals, worms, worm wheels, straight and circular racks, straight and spiral bevels and cluster gears representing combinations of various types.

Gears Used in Delicate Instruments

These gears go into numerous finished products, such as aviation flight instruments, the Sperry bombsight, gun sights, automatic gyro pilots, antiaircraft gun directors, searchlights, compasses, marine equipment and other less publicly known war weapons. The changeover from the previously used "toolmakers methods" of hand fitting to mass production controlled by purely mechanical means involved a complete revolution in fine pitch precision gear production methods.

Factors affecting the processing of fine pitch instrument gears of the Sperry type differ basically from those involved in conventional gearing applications. The chief requirements of instrument gears of this nature are tooth profile accuracy, accurate tooth spacing, concentricity and a smooth finish of the active involute profile, rather than the ability of the gear teeth to transmit power, since such gears carry but little load.

The main function of the majority of these instrument gears is to transmit rotary and linear motion of indexing and dividing mechanisms, smoothly and accurately.

As a result of this minimum requirement of extreme gear tooth profile accuracy, each individual tooth, placed around the periphery of the gear, will function independently as a *cam* and do its precise share of uniform motion. Thus, the gear itself is a composite part containing many of these precision "cams", spaced accurately and adjacent to each other all around the periphery.

Eliminates Highly Skilled Personnel

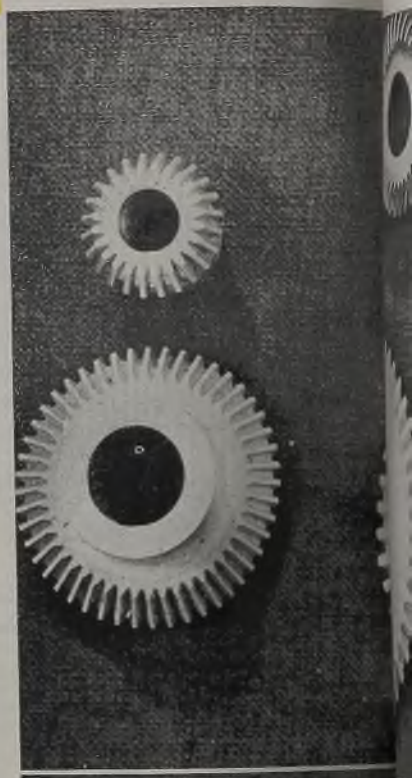
Obviously, one of the general specifications for all Sperry precision gears is that there must be no measurable amount of backlash or lost motion in the completed mechanism. Yet the gear trains must function smoothly and freely without deflections or windup in the mechanism due to friction and interference between mating gear teeth. In many of the subassemblies there are between 20 and 30 gears, the entire train of which must react with almost infinite smoothness to a faint impulse of power input.

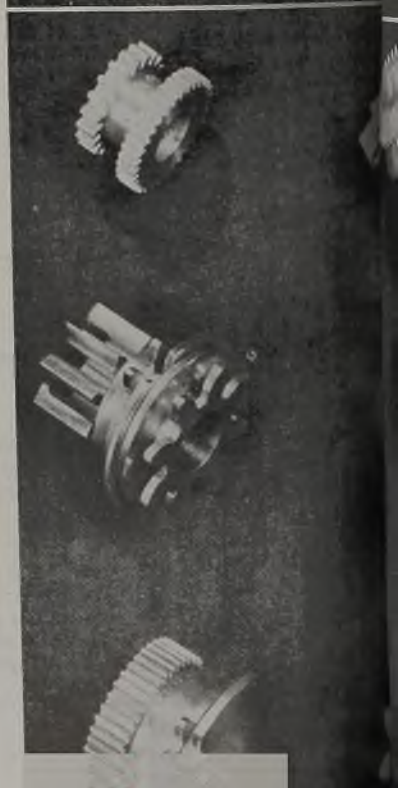
The gears range upward in size from ¼-inch. Seventy per cent of the total gear production is made up of gears 1¼ inches in diameter or less. Pitches run from 12 to 120.

In setting up the gear manufacturing processes at Sperry, dependency on the human element of skill was almost completely eliminated. Thus, uniform accuracy of a higher degree is attained with relatively lesser skilled operating personnel.

Typical of Sperry gear production is the cycle for producing many different types and sizes of spur and helical gears at the Nassau plant. Here, fine pitch precision gear cutting is supplemented by gear shaving whenever the highest degree of precision is required, because

Figs. 1 - 4—Precision instruments made by the Sperry Gyroscope Co. required some 2000 different gear parts which now are being turned out by mass production methods. Fig. 1 shows fine pitch precision straight and spiral bevel gears; Fig. 2 gears of special design; Fig. 3 fine pitch helical gears, worms and worm wheels and Fig. 4 number of typical gears





the shaving process permits automatically and economically obtaining gear tooth profile accuracy, size, finish and concentricity. As a result, final assembly can be completed without hand fitting and running-in of mating parts.

While some of the gear blanks are die cast because their particular shapes do not lend themselves easily to machining, most gears are blanked from bar stock on Brown & Sharpe automatic screw machines and Warner & Swasey turret lathes. A tolerance of minus 0.001-inch in the bore is being maintained in this roughing operation.

The side runout (wobble) tolerance is 0.0005-inch for each inch diameter of the blank. This tolerance decreases gradually with the gear size. The maximum indicated total side runout on 10-inch gear blanks or larger, however, must not exceed 0.002-inch. Finish facing or turning operations, if necessary, are done on Hardinge high-speed second operation lathes.

The holes are bored on Borematics or broached. Holes 3/16-inch and smaller are broached. Precision gear bores are held to a tolerance of 0.0002-inch. It is vitally important to have good bores, prior to the subsequent gear cutting and shaving operations in order to facilitate rigid workholding arbor assembly. Bores in some of the gears are as small as 1/16-inch in diameter.

All gear blanks are checked for side runout on the blanking face with respect to the bore from which the gears are mounted. In all subsequent machining operations this face becomes the locating face. Sheffield and Pratt & Whitney air gages are used to check the bores for size and true round and taper conditions.

Sperry produces some of its own broaches, especially for the smaller bores. The design is such that they will broach and burnish the holes in one pass. The blank hubs are drilled and tapped where necessary.

Both hobbing and shaping processes are used in generating the gear teeth. Special Michigan preshaving hobs are used for hobbing the spur and helical precision gears. These preshaving hobs

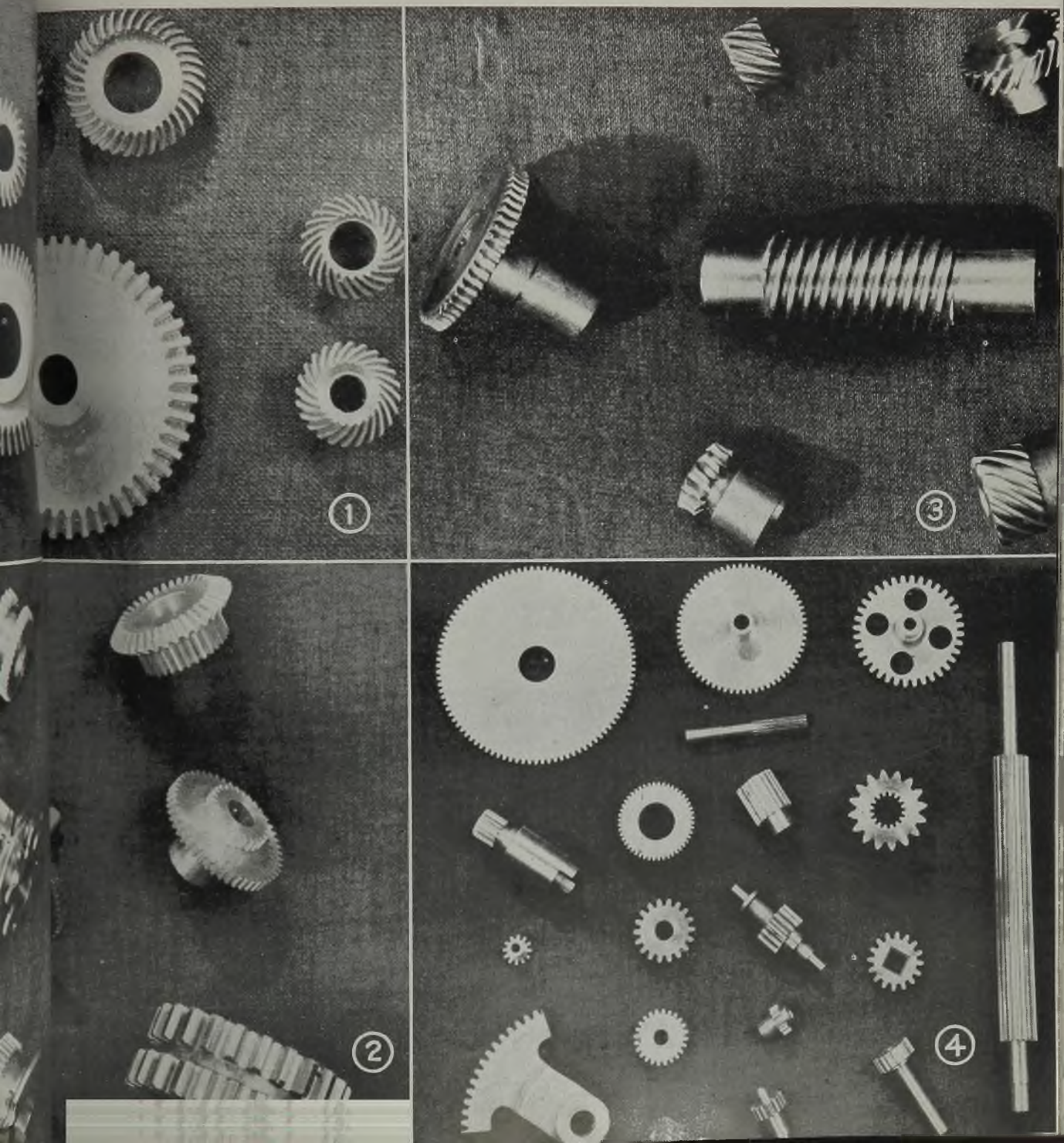


Fig. 5—A standard methods worksheet provides data for all operating process instructions, processing costs, machine load estimation and small tool requirements

Fig. 6—Starred information on the methods sheet, Fig. 5, is shown on the operation sheet. Sketches like the one shown reduce possibility of error

STANDARD METHODS WORK SHEET

ROTARY GEAR FINISHING MACHINE

DATE:- 1-
BY:- J.C.
APPROVED:- H.R.

External Spur and Helical Gears

1.	PRODUCT NUMBER	X-32
2.	PART NUMBER	D-25362
3.	PART NAME	Gear
4.	MATING GEAR PART NUMBER	D-25363
5.	MATERIAL	St. Steel 301
* 6.	MACHINE NUMBER	48
7.	DIAMETRAL PITCH	1.175 (+.0000, -.0002)
8.	PITCH DIAMETER	1.416 (+.000, -.000)
9.	OUTSIDE DIAMETER	66
10.	NUMBER OF TEETH	20°
11.	PRESSURE ANGLE OF GEAR	—
12.	HAND OF HELIX ANGLE	Spur Gear
13.	HELIX ANGLE OF GEAR	.2500 (+.0002, -.0000)
14.	BORE DIA. FOR GEAR SHAVING	One
*15.	NUMBER OF BLANKS PER LOAD	.1875
16.	WIDTH OF GEAR FACE "W"	15°
*17.	CROSSED AXIS ANGLE	1/8"
*18.	STROKE CAM USED	T-216375
*19.	CUTTER IDENTIFICATION	15°
20.	HELIX ANGLE OF CUTTER	.045"
21.	D F OF CUTTER	300
*22.	CUTTER R.P.M.	30 Secs.
23.	MACHINE CYCLE TIME	12 Secs.
24.	HANDLING TIME	42 Secs.
25.	FLOOR TO FLOOR PER LOAD	—
26.	FLOOR TO FLOOR PER PIECE	—
27.	TOTAL QUANTITY ON ORDER	—
28.	MACHINE HRS. REQ'D FOR JOB	Five
29.	NUMBER OF CUTTER REQ'D FOR JOB	.0350
*30.	PIN DIAMETER	1.4222 (+.0000, -.0002)
*31.	PIN MEASUREMENT	1.6875 (+.0000, -.0001)
*32.	CENTERDIST. WITH 2" MASTER GEAR	T-123964
*33.	WORKHOLDING FIXTURE (METHOD)	T-29143
*34.	INSPECTION FIXTURE	

CYCLE TIME GEARS 24/36

5

* STARRED ITEMS MUST BE INDICATED ON OPERATION SHEET

are designed to leave a slight amount of stock on each tooth flank, about 0.0003 to 0.0006-inch of stock being left on the tooth flank for shaving. The total permissible runout of the hobbed (preshaved) gear must not exceed 0.001-inch, indicating the preliminary roughing accuracy required for the subsequent finish shaving operation.

Single thread, Class A and AA hobs with straight gashes are used almost exclusively in order to achieve this accuracy. For gears of a class which do not require the extremely high precision provided by shaving, topping hobs are used. Topping greatly facilitates the screw machine operation by making it unnecessary to work to close outside diameter tolerances on the blank diameter.

Proper Hob Sharpening Important

The use of topping hobs also facilitates quality control of gears-in-process (floor inspection). The generated outside diameter of a topped gear lends itself to indicate size and concentricity variation of the pitch diameter of gears-in-process. A periodic check of the outside diameter by the operator using a simple dial indicator stand, informs him whether the hob is wearing and when readjustment of the machine setup becomes necessary. The use of Class AA Michigan topping hobs with a properly modified hob tooth profile also insures elimination of "kick-out" due to edge interference between meshing gear teeth.

Proper hob sharpening, a very important item, is controlled by the use of a Michigan hob sharpening checking fixture (see Figs. 1 and 2). Flute spacing, cutting rake, parallelism of gashes and lead angle are all checked by this fixture. Recent modifications make it possible to also check the pressure angle of the hob tooth, tooth spacing between adjacent hob teeth, hob tooth depth and taper conditions in the various rows of hob teeth.

The checking of the last four elements is confined mainly to incoming hobs.

Gleason generators are used to produce all of the straight and spiral bevel gears and curvic clutches. Here again, great strides have been made by the manufacturer of these machine tools to achieve the ultimate in fine pitch gear accuracy on an economic mass production basis.

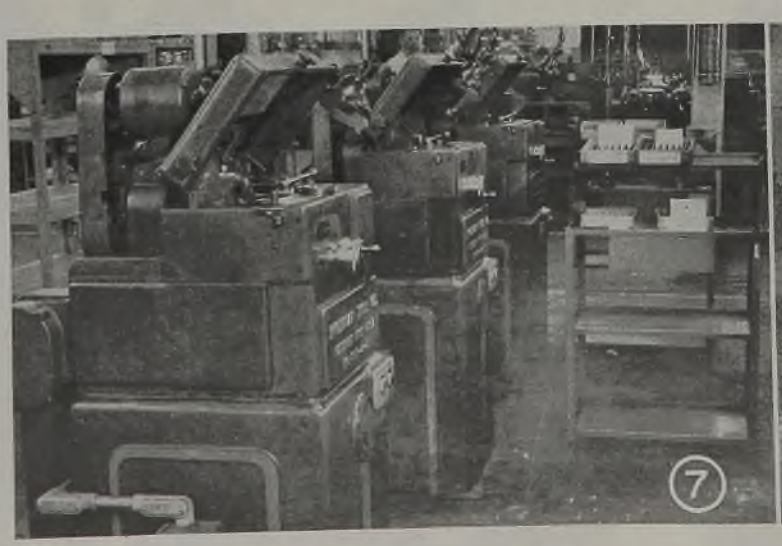
Straight and circular racks, cluster gears, internal spur and helical gears, face gears and the coarser pitch worms are produced on Fellows generating equipment.

Hobbing equipment consists of various types of Barber-Colman, Gould and Eberhardt, Mikron and Hamilton Hobbing machines.

Worms of the coarser pitches are thread-milled on Pratt and Whitney and Hanson-Whitney machines whereas the finer pitches from 24 diametrical pitch and finer are ground out-of-the-solid on Jones & Lamson automatic thread grinding machines.

A hobbed or shaped gear, regardless of the care taken in generating its tooth profile is, for Sperry precision purposes a *rough* gear. A finishing operation, to produce the desired tooth flank finish and to eliminate high spots and minute profile irregularities is essential for all Sperry gears.

For the gear whose precision function is a minor one, a burnishing operation on a Fellows 4B is usually sufficiently corrective. While this operation produces a smooth and hard surface on the tooth profiles and tends to break sharp edges and to dull undesirable protrusions



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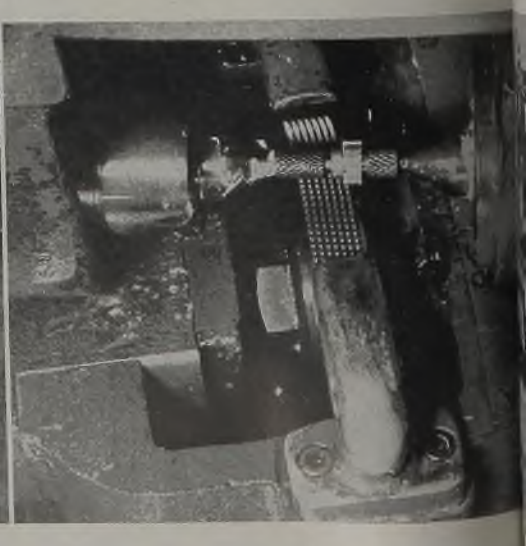


OPERATION SHEET

PLANT	PART NAME	PART NUMBER
Nassau	Gear	D 25362

ISSUED BY	APPROVED	DATE	PRODUCT
J.C.D.	R.E.B.	1/25/44	X-32

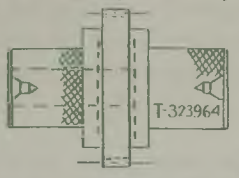
MATERIAL	SIZE	WEIGHT	MINIMUM QUANTITY	TOTE BOX
Stainless Steel	1 7/16		300	T 524

METHOD CHANGES

OPERATION NO.	DEPT. NO.	PROD'N STATION	OPERATION DESCRIPTION	SET-UP C OPERATION	TOOL NAME	TOOL NUMBER
6	8230	126	Gear Shaving			
			Mount work arbor Assy. on machine centers			
			Start machine and shave gear		Cutter	T 216375
			Load and unload idle work arbors (See sketch)		Arbor	T 323964
			Clean finished piece and place in tote box		Tote Box	T 524
			Remove work arbor Assy. from machine			
			Wipe machine centers clean			
			NOTE - Submit "First" piece to inspector for approval and every thirtieth piece thereafter			

OPERATION SKETCH AND SETUP DATA

1- Withdraw from tool crib - Cutter T 216375, 2 work arbors T 323964, Tote Box T 524
2- Provide clean flushing fluid
3- Mount cutter
4- Set crossed axis angle to 15 degrees
5- Mount 1/8 stroke cam
6- Adjust cutter reverse cam
7- Set head and tail stock to suit work arbor
8- Set cutter head to proper depth
9- Mount cycle time change gears -- 24/36
10- Measuring pin Dia. .0350
11- Overall pin measurement 1.4222 +.0000 - .0006



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in the path of mating gear teeth, it does not correct inherent errors of eccentricity or tooth spacing.

For the precision (Class "AA") gears, where all tooth elements must be held within 0.0002-inch, the shaving process has come close to perfection. No other single advancement in the art of fine pitch precision gear manufacture has contributed more to the achievement of mass production of Sperry instrument gears than this process.

Good design, rigid workholding tools, proper speeds and feeds, good supervision and quality inspection during the generation of the tooth profiles, all contribute greatly. But, shaving produces ultimate in finish and accuracy for the fine pitch precision gear tooth profile required, since profiles of the individual gear teeth must perform their cam function of sensitive index motions accurately. All precision spurs and helical gears are shaved after the gear cutting operation. They range in size from ¼ to 4-inch pitch diameter.

The capacity of a battery of nine Michigan gear finishing machines at the Nassau plant is ample to take care of the scheduled monthly requirements of several hundred kinds of gears. Operation is fast and flexible and does not require specially skilled operators, although careful and deft handling of the equipment is a requirement. These machines at Nassau are all operated by women. Ninety-five per cent of the Sperry spur, helical and cluster gears are within the shaveable range.

Gears calling for less than 0.0005-inch eccentricity and such special consideration as "zero" backlash and smooth mesh at assembly are shaved. The machine cycle on many of these gears is often very short. In some cases, in fact, the operating cycle time is shorter than the idling (coasting) time of the shaving cutter. A special motor brake device, developed by Michigan Tool Co. eliminates this time consuming coasting and reduces the total machine and handling cycle time down to 15 seconds. This is a negligible expenditure of production time when compared with the superprecision achieved by the process.

The shaving operation is primarily a finishing operation in that it provides for fine finish and eliminates minute profile and ordinary spacing errors. Obviously, it should not be expected to salvage bad work. Excessive eccentricity and tooth spacing errors produced by the previous roughing operation cannot be corrected easily.

Perpetual Checking of Work

Quality control is a story all by itself and cannot be covered here in great detail. However, it is obvious that the rigid standards of quality imposed on the production departments calls for perpetual checking of work in process. Only after acceptance by the final inspector of an official "first piece" of each lot, is production of the entire lot permitted to resume. After that, floor inspection controls the quality of work in process to conform to the official "first piece" approved by the final inspector.

To maintain the original accuracy of cutting tools the importance of proper and frequent resharpening and checking is stressed. Machine tools also undergo a perpetual check by specially assigned maintenance men.

Finished lots are subjected to 100 per cent inspection after the burring operation. This consists largely of a rolling check with hardened master gears, or—as in the case of straight and spiral bevel gears—with master gears identical in proportions as the mating gear.

Such a composite inspection test, revealing an actual condition as encountered at final assembly, has been found to be economical and reliable.

Total discrepancies from all causes, as observed from the movement of the indicator hand of a 0.0001-inch dial indicator, must not exceed 0.00025-inch on high precision gears and 0.00075-inch on standard gears.

Prepinning of clusters of gears on a single shaft, before assembly has been achieved by the use of preassembly fixtures. Where gears are to be located

(*Please turn to Page* 120)

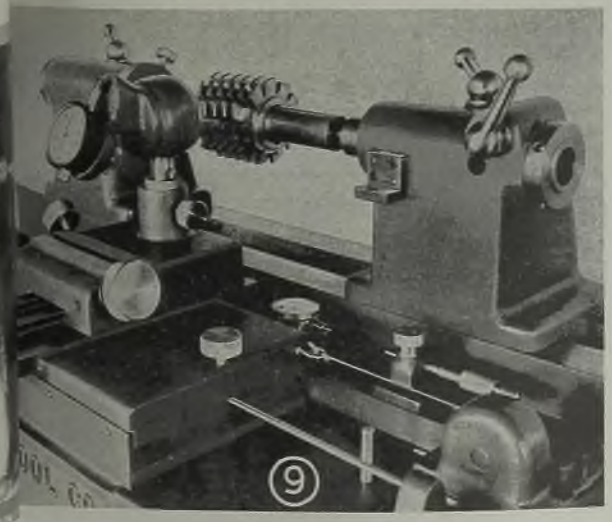

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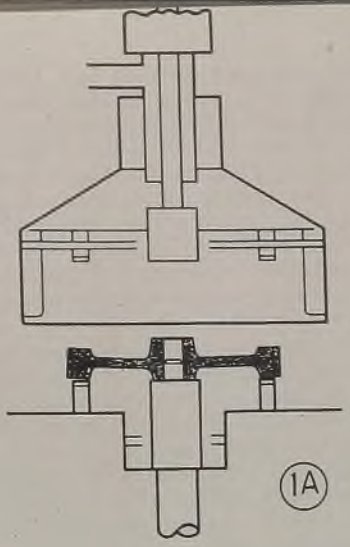
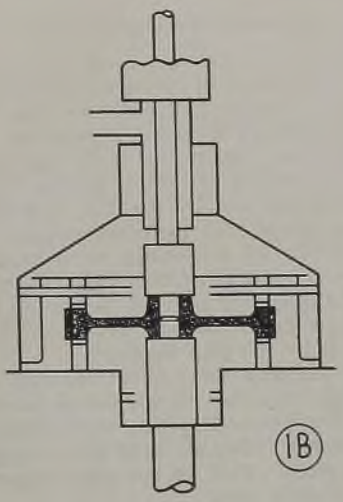
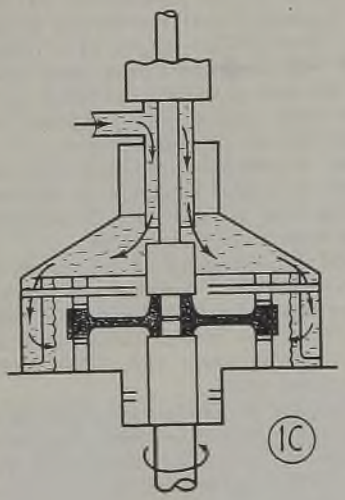
Fig. 7—All precision spur and helical gears are shaved on a battery of nine finishing machines, part of which are shown here. Sperry finds women make excellent operators for this work

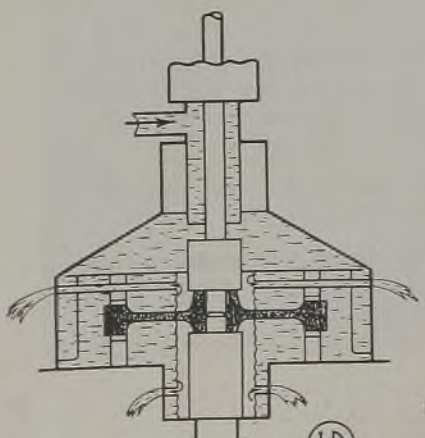
Fig. 8—This finishing operation close-up shows the cutter and work

Fig. 9—Hob sharpening fixture for determining rake angle of hob and axial lead of gash. Another fixture checks depth of tooth









How to Avoid Heat-Treat Distortion by....

DIE QUENCHING

Distortion can now be held within extremely close limits by special equipment designed to correct warpage from heating and to prevent "out-of-shape" from cooling by holding distribution of temperature gradients throughout work under strict control. Advantages so gained include need for less stock and less work in finish machining, increased output, lowered production costs and better control of heat-treating cycles with resultant higher quality of parts.

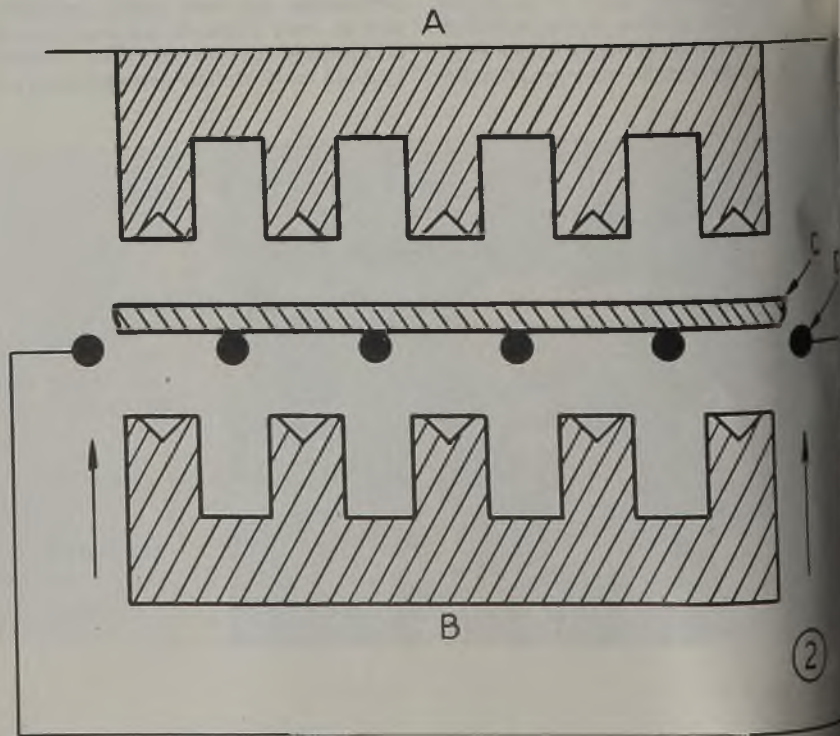
Originally developed for gears, shafted parts, and symmetrical flat shapes, method is now being extended successfully to unsymmetrical parts such as machine gun components

EXCESSIVE temperature gradients throughout the work piece are the cause of distortion in both heating and cooling cycles, according to heat-treating authorities. The reasons are quite simple: First, excessive temperature gradients mean that certain portions of the work will be at a much higher temperature than others, resulting in unequal thermal expansion and contraction, with consequent warpage and distortion from plastic flow.

Second, the uneven temperatures result in phase changes occurring at different times throughout the work. Since phase changes (from gamma to alpha iron, etc.) are accompanied by volume changes, some portions of the work may be increasing in volume at the same time other portions are either not changing or are decreasing. Obviously, serious

Fig. 1—This series illustrates centrifugal die quenching as developed by Hannifin engineers: "A"—hot gear is placed on lower die; "B"—top die engages work, aligning and rotating it with lower die; "C"—flow of quenching medium controlled by centrifugal force; "D"—quench gradually progresses toward center of work

Fig. 2—Schematic showing die quenching machine for treating armor plate and similar large shapes. Roller conveyor carries work under dies. Lower die lifts work against top die, quenching then being done by jets between die fingers. This is Drever pressure-quench machine



By G. W. BIRDSALL
Associate Editor, STEEL

distortion is the almost inevitable result.

As was explained in detail in STEEL, May 15, 1944, p. 86, there are many things that can be done to minimize heat-treat distortion. But if distortion persists, there are two ways in which it can be corrected:

—The cold part can be straightened mechanically by bending it in a press *after it has been quenched.*

—The hot part can be straightened mechanically between dies in a press *before it is quenched,* and distortion from quenching minimized by controlling the flow of the quenching medium against the work.

Press Straightening While Cold: The first method is not always satisfactory because it produces locked-up stresses in the work. Then as the piece is finish machined, some of the stock will be removed and in so doing some of the stresses will be released. Remaining stresses then cause further distortion. For this reason, the machining cycle must be interrupted by repeated straightening, or additional metal must be allowed for the extra machining required.

Press straightening of the part after it has been quenched thus is not a positive operation, for subsequent machining again throws the work off. Equally important, such straightening is an extremely critical operation as it is easy to break or permanently damage a part by inept handling. And that is expensive, for you are working with a finished part.

Too, press straightening of the part after it has been quenched requires a highly skilled workman. In fact, some men never quite get the "knack" of doing it.

Die Quenching: For the above reasons, quenching of many critical parts in open tanks has given way to quenching in special machines and fixtures designed particularly to avoid these faults. With such units, the amount of distortion that exists just before quenching is not important, because the machine clamps the work between dies so designed that just prior to start of the quenching cycle the die surfaces contacting the work true it up correctly and remove all distortion.

The quenching liquid (usually oil) is then forced rapidly through the dies against the work. Dies are designed to prevent free flow of quenching liquid around the part, confining the flow to certain portions of the work as required to produce uniform cooling rates and thus minimize distortion tendencies.

Oil Flow Control: Standard die-quenching machines employ two prominent methods of controlling the flow of quenching oil against the work. Both of them give excellent results because they help attain the goal of heat treatment—the production of exact metallurgical conditions in the finished work—by providing positive control of quenching.

Control of heating cycles is facilitated by many devices and methods, but control of cooling cycles has been without comparative facilities until recently. There are few heat-treating departments that attempt to provide facilities for accurate control of cooling cycles.

Companies specializing in heat treating have long known the benefits of quenching in fixtures to minimize distortion and have employed special fixtures for straightening the hot part and directing flow of quenching medium for proper cooling. G. B. Berlien, chief metallurgist, Lindberg Steel Treating Co., Chicago, reports his company has had considerable experience with special quenching fixtures for control of distortion in cooling. Not only are dies used in quenching from the hardening heat, but also in the tempering operation. The same dies are not used, however, for the operating requirements differ.

Principle of Operation: He points out that design of such special quenching fixtures is based upon a comparatively

Fig. 3 — Spiral bevel ring gear in Gleason 25-inch quenching press, just loaded and ready for top die to come down on work

Fig. 4—Centrifugal die quenching machine in use by International Harvester for treating tractor transmission gears, track sprockets, etc. Hannifin photo

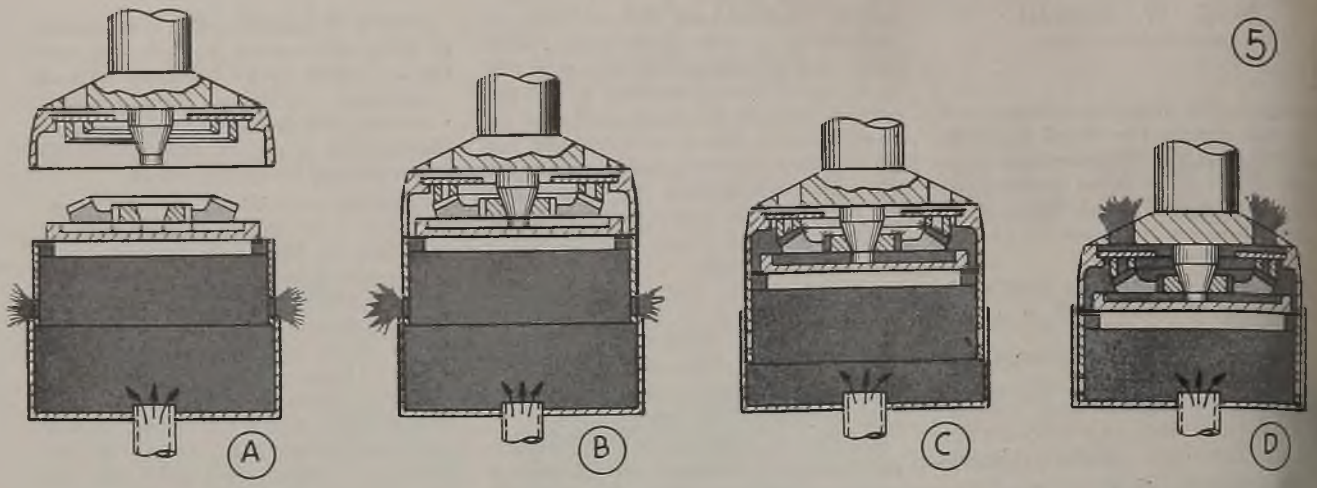


Fig. 5—Action of Gleason die-quenching press is shown in this series: "A"—hot gear is placed on lower die; "B"—upper die contacts work, aligning it while still in plastic state; "C"—submersion begins, oil being forced through dies which control quenching action; "D"—complete submersion, quenching oil continuing to flow through dies and about gear

simple principle—that distortion results from thin sections cooling more rapidly than thick sections. This nonuniformity can be evened out by shielding the corners and thinner sections from the quenching medium or by increasing the flow of the quenching medium against the heavier sections by use of jets or similar devices. Thus by removing heat faster from the thicker sections where heat storage is greatest, their temperature is brought down along with the thinner sections, avoiding any tendency toward distortion.

It is this control of temperatures throughout the work, Mr. Berlien emphasizes, that is the controlling factor in preventing distortion. Die pressure of course can easily straighten the hot work before quenching but even if distortion during cooling is prevented by use of tremendous die pressures, stresses can be produced in the work which will result in distortion the instant the die pressure is removed.

Control Application of Quench

For this reason, all types of die-quenching machines and fixtures provide means for not only straightening the hot work but also for controlling the application of the quenching medium to the work.

Automatic, correct, mechanically directed flow of quenching medium against the work is a great advance, especially in quenching circular parts such as ring gears. Engineers of Hannifin Mfg. Co., Chicago, point out that conventional open-tank quench methods are all similar. In spite of variations in detail, they all consist in plunging the heated part into a body of cooling liquid, with inevitable distortion of circular parts such as ring gears.

Quenching Without Dies: To show what happens when parts are quenched without dies, consider the case of a ring gear. As explained by Hannifin engineers, holding the gear flat while lowering it into the quench causes the lower surface to be chilled first, while the upper portion remains hot for a short interval before it too is immersed. Such quenching may produce a part reasonably round, for the circumference gets uniform treatment. But *it will not be flat*, for the upper and lower surfaces have not been given uniform simultaneous treatment.

Inserting the gear into the quench while holding it on edge would assure both side surfaces receiving the same treatment and would produce a *flat* gear. *BUT it would not be round* because the circumference would not receive uniform simultaneous treatment. However, if the quenching medium could be applied uniformly to the entire circumference and progressively from the circumference toward the center, the cooling contraction would be uniform and the gear would be both *round and flat* even without dies, according to Hannifin engineers.

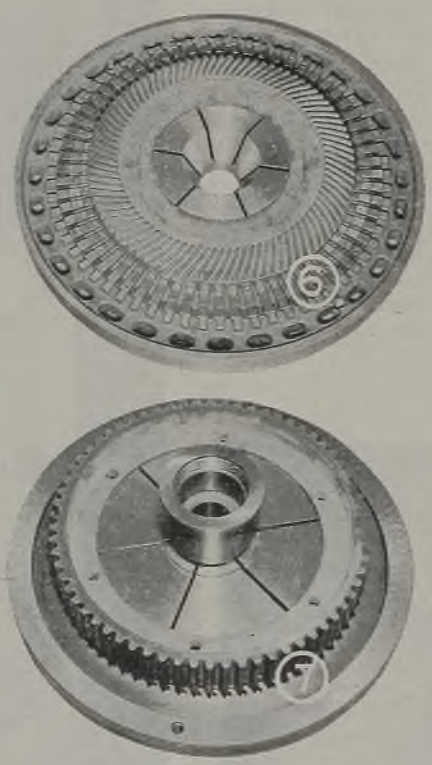


Fig. 6—Closeup of lower die equipment for quenching large spiral bevel ring gear in Gleason press. Note radial slots for directing oil circulation

Fig. 7—Another lower die, this one being equipped with a series of holes around periphery of gear for control of oil circulation. Gleason photo

For this reason, special equipment developed by Hannifin Mfg. Co., Chicago, not only corrects heating distortion by clamping the work flat and round by use of dies, but also employs centrifugal action to control the flow of the quenching medium and thus control the cooling cycle.

H. H. Adams, vice president, lists following as features of such equipment:

—Correction of heating distortion by pressure prior to quench.

—Uniform contact of quenching medium against outside circumference of the work, regardless of thickness of the piece.

—Reduction of distortion and internal strains due to this uniformity.

—Volume of quenching fluid pumped is 200 gallons per minute for 15 and 25-inch machines, 80 gallons per minute for 6 and 10-inch machines (maximum).

—Reduction of quenching time to one-third or one-fifth usual time.

—Adjustable overflow permits all-over or partial quench where the hub is left soft for subsequent machining.

—Quenching time under automatic electric timer control.

Centrifugal Quenching: Operation of such a centrifugal die-quenching machine is illustrated in the sequence in Fig. 5. At "A", the hot gear is placed on lower die. At "B", top die has engaged work, aligning and truing it up to remove any distortion. In "C", the dies and work are rotating and the quenching medium has started to flow in, being directed as shown by the arrows to first strike outer

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circumferential surfaces. At "D", flow of quenching medium continues, the centrifugal action assuring that hub section is last quenched. Continued flow of cool oil through fixture at high rate rapidly quenches gear.

Entire operation is very fast and also is fully automatic; the attendant needs only to insert, press "start" button and remove work. Such rapid quenching not only reduces labor and steps up output but also affords superior quality of work. Available machines handle maximum diameters of 6, 10, 15 and 25 inches.

Tractor gears: Fig. 4 shows equipment of this type in operation at Chicago district plant of International Harvester Co. where it is used in heat treatment of tractor transmission gears, tractor track sprockets and similar work. In handling tractor transmission gears, this method of quenching not only produces work perfectly true and without any distortion but it facilitates finishing operations by allowing subsequent broaching of the center with the gear chucked on the pitch diameter, with a uniformity and simplicity otherwise unobtainable.

On tractor sprockets, sectional quenching mentioned above gives different hardness values on rim and hub without distortion. Use of the method on this work increased production on subsequent finish machining of the centers from 4 to 12 pieces per hour.

This method of quenching is recommended for many different kinds of circular parts, including gears, sprockets, circular cams, disks, flat cams, rings, bearing races and similar parts. Important applications include use in quenching extremely complicated aircraft parts, such as gears with long hubs that must be held true.

Armor Plate: One of the important developments in processing armor plate has been the use of die quenching in production heat-treating lines served by specially designed conveyor tables. Improved equipment now produces perfectly flat plate that needs no subsequent straightening. Since the job of straightening hardened armor plate is critical, time-consuming and costly at its best and a most difficult bottleneck at its worst, heat-treating engineers attribute the development of such lines as an enormous aid in production of armor plate.

Fig. 8 — Loading receiver of .50-caliber machine gun into special die in Gleason 15-inch quenching press

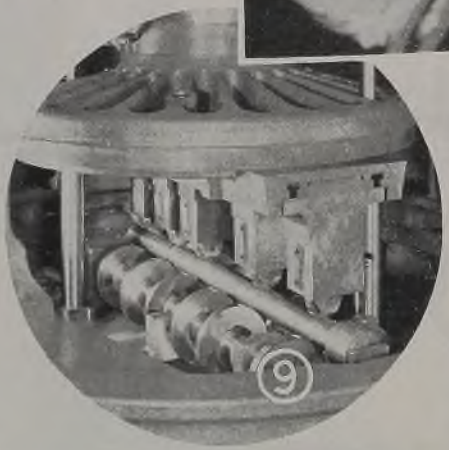

Fig. 9—Roller dies in Gleason 25-inch quenching press contacting shaft just prior to submersion in the quenching fluid

Special die-quenching machines and setups have been designed for this work. Their method of operation is schematically diagrammed in Fig. 2. As soon as the roller conveyor has delivered the hot plate from the heating furnaces to dies of the quenching machine, the lower die platen is actuated to lift the work from the conveyor and clamp it securely against the upper die. In this position it is held perfectly flat while water jets between the die fingers spray the water or oil quenching medium against both upper and lower surfaces of the plate. The upper die platen remains stationary.

Upon completion of the quench, the lower platen is retracted, allowing the plate to rest upon the roller conveyor which then is actuated to deliver the work to the next station in the continuous processing line.

An outstanding installation of such equipment at the Fall Creek Ordnance Plant, operated by E. C. Atkins & Co., Indianapolis, Ind., was described in STEEL, June 24, 1944, p. 122. In the June 5, 1944, issue, p. 100, various arrangements of such continuous lines were detailed by A. C. Kramer of Drever Co., Philadelphia, makers of this equipment.

Obviously, such systems are not limited to handling merely flat plate. Work of various shape and contour can be die quenched with equal facility simply by providing dies of the correct contour.

Gears of All Types: Fig. 3 shows a quenching press built by Gleason Works, Rochester, N. Y., especially for

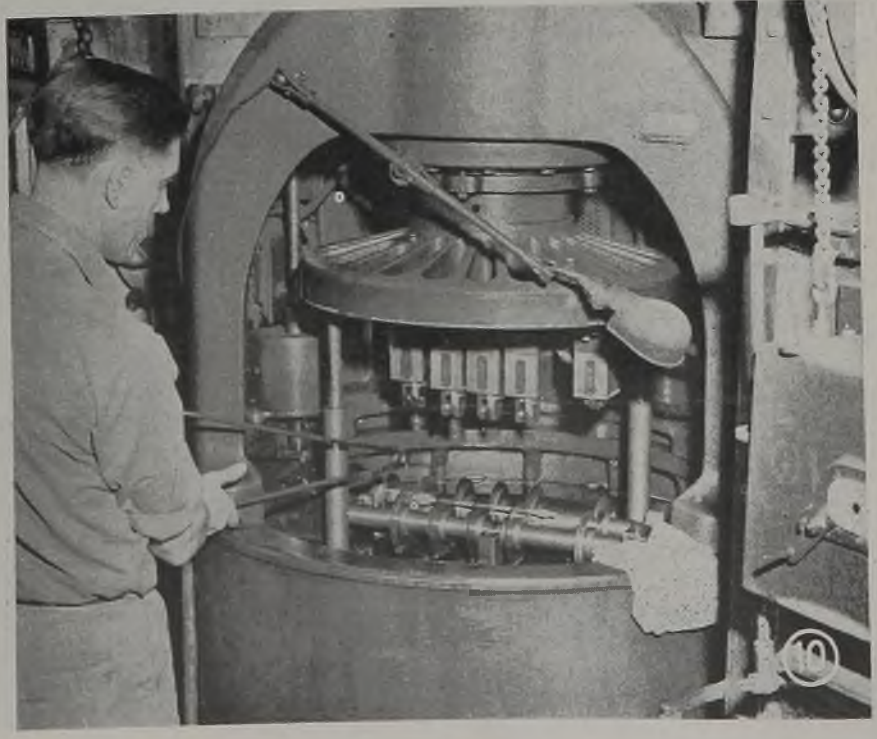

Fig. 10—Closeup of die-quenching machine with roller dies for quenching shafted parts at Jack & Heintz Inc., Bedford, O.

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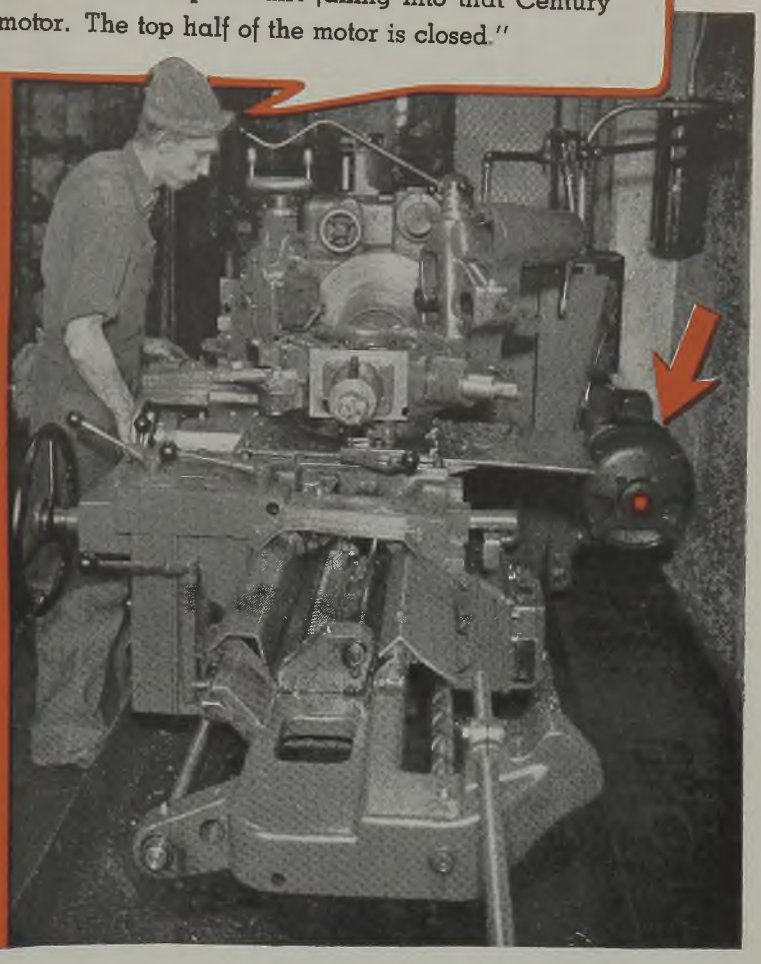

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Fig. 11—*Same press as in Fig.* 10 *but here top die has come down, work is being quenched. Operation cycle is completely automatic, total time is* 115 *seconds*

die quenching bevel ring gears. In this machine, the gear is placed on the lower die and a "start" button pressed, initiating the automatic cycle of operations which proceeds as follows: First, top die is lowered by an air cylinder till it contacts work and clamps it securely against lower die, pressure being so applied that die fingers mechanically align the work while still in the plastic state.

Pressure on upper die then increases, causing both dies and work to be lowered into the quenching medium. In descending, fresh oil is forced past the work at a high rate of speed. Work contracts in normal manner, dies controlling the oil flow. At end of predetermined interval, the automatic sequence timer operates air valves to return the dies to their original position. *Average time cycles vary from* 15 *to* 90 *seconds.*

Fig. 5 diagrammatically illustrates this sequence. It shows arrangement of the cylindrical case which encloses the dies and work during the quenching cycle. It also shows how the rate of oil flow is controlled.

Controlled Oil Flow: Since flow of oil determines the quenching action, oil control rings are incorporated in the lower die to obtain proper quenching. They direct the flow of oil against those parts of the work that require it and restrict or completely shut off the flow of oil to other parts as needed.

Since quality of the hardened-and-quenched work depends directly upon rate of cooling, this is controlled also. Initial drastic quench is obtained by the arrangement shown in Fig. 5. Here oil is pumped continuously through the lower center pipe into the quenching chamber below the lower die. When in normal and "start" positions as at Figs. 5A and 5B, holes located just above the drum bearing act as a by-pass to permit passage of normal flow of oil through the machine without going through the die proper. As downward movement of drum begins, Fig. 5C, these holes are closed and all of the oil in the drum is forced upward through the die at high speed. This oil flow is in addition to the normal flow from the center pipe which continues to pass through the die after complete submersion as shown in Fig. 5D. By this means, rate of oil flow through the dies is reduced after the initial drastic chill has been applied.

Various lower-die designs have been worked out for the different types of gears. Fig. 6 shows lower-die equipment for quenching large spiral bevel ring gears.

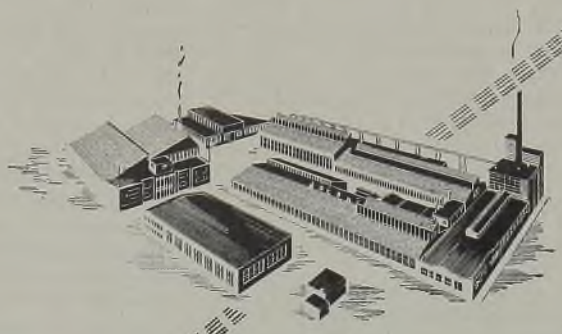
Contrast its design with that of the lower die for holding a spur gear, shown in Fig. 7. Note that in the former, radial slots are used for passage of the quenching oil, whereas the latter employs a circumferential row of holes to direct the oil flow.

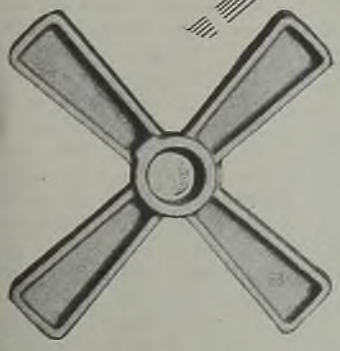
Symmetrical Parts: Gleason engineers report that equipment of this type is finding wide application in ordnance work. Its field of usefulness is rapidly being expanded to not only include bevel, spur and helical gears for jeeps, tanks, trucks, tank retrievers, landing barges, PT boats, and the like, but also to include many flat and symmetrical parts for aircraft—such as bearing rings

Fig. 12 — *Overall view showing portion of installation of quenching presses in heat-treating department of Jack & Heintz Inc.*

One purpose . . .

the IMPROVEMENT of Metals





Cross type handle forging for controlling airlines on pneumatic tools. Because forging gives greater strength in lighter sectional thicknesses, the thin I-beam section of each arm of this forging possesses the strength and toughness to resist shock and impact, and provides a greater margin of safety against breakage.

by Forging

Forged handles and levers provide a greater margin of safety for the control of operating mechanisms. Strength and toughness to resist shock, impact, bending, and vibrational stresses are just as essential in these parts as in parts of the operating mechanism itself. Be sure the controls on your postwar product *assure its dependable performance* under all service conditions. Through the broad experience of our forging engineers, you may obtain that priceless "give-and-take" quality in metal parts that underlies dependable performance. Knowing how to employ the exact forging technique to develop the utmost IMPROVEMENT OF METALS BY FORGING is the result of forging hundreds of shapes and sizes from a wide range of metals. In the coming buyers' market, the use of forgings for control and operating parts of your product can be a beneficial influence in meeting postwar competition.

DROP

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barrel cams, liners, sleeves, cone clutch disks and cam gears. Many of these parts require special types of dies and special consideration of oil flow for proper quenching.

Unsymmetrical Parts: The high degree of success obtained in die quenching symmetrical parts in this type of equipment has resulted in extension of the process to unsymmetrical parts. These include many items for aircraft engines such as counterweights, segments, split bearings, and radial engine crankshafts. This last item required changes in the standard quenching machine to make it adaptable for use of water as the quenching medium instead of oil.

Machine Gun Parts: Typical of the versatility exhibited in these newer applications of the process is the handling of machine gun parts formerly heated and quenched several times for treating specific areas which required hardness, where heating and quenching all surfaces in one operation was not practicable because of distortion.

But on the bolt for the .30 and .50-caliber machine gun, for example, special dies were developed for die quenching in Gleason presses of the type described above with the result that hardening is now completed in one heating and quench. At the same time, distortion is prevented.

In addition to the superior product so obtained, fewer man-hours and less equipment is required. A similar technique has also been highly successful on other gun parts such as barrel extensions, breech block and trigger mechanisms. Die setup for handling a .50-caliber receiver is shown in Fig. 8.

Gleason engineers emphasize that the many improvements in design of quenching presses and quenching dies in connection with war production indicate postwar applications of die quenching will be of tremendous value in hitherto untouched fields.

Small Shafted Parts: One of the die developments that is finding increasing use is the roller die attachment illustrated in closeup Fig. 9 and also in Figs. 10 and 11. This device consists of a lower die having two parallel drive shafts which carry supporting disks mounted opposite each other on the two shafts in pairs in such a manner as to provide the equivalent of V-blocks. These support the shafted part to be quenched as shown in Figs. 9 and 10.

Upper die consists of a series of rollers set to contact the work just above each pair of supporting disks. Each roller is mounted on an individual piston in an air cylinder directly over the work centerline. This provides individual correcting action at each support point.

Upper and lower rollers can be adjusted in a lengthwise direction as desired. Also supporting disks and pressure rollers can be made to accommodate a shafted part that may have different diameters along its length, like the part in Fig. 10.

Quenched While Rotating: The two drive shafts in the lower die are rotated continuously by a suitable combination of variable speed drive and gear reduction unit connected to an electric motor. This arrangement revolves the shafted part being quenched, affording an unusually uniform and effective quenching action.

At the same time, all the benefits from distortionless hardening by die quenching are obtained. Gleason engineers inform us that it is common for these precision roller dies to oil quench a shaft 20 inches long and 1½ inches in diameter, yet retain a total runout not to exceed 0.001-inch when checked on centers.

Result of this high accuracy is that many shafted parts need no further grinding or finishing after quenching in this manner, so are ready for immediate assembly.

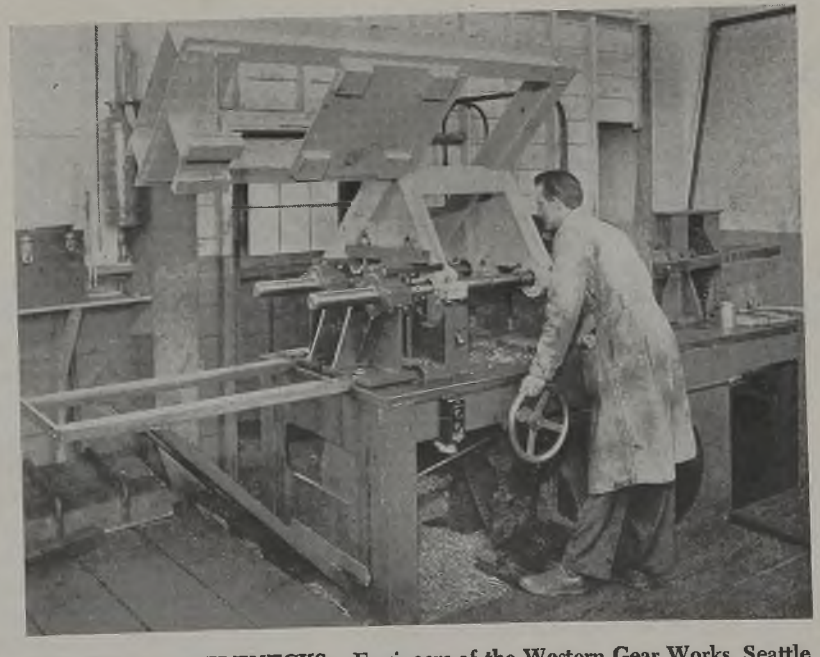
Carbine Barrels: One of the most advantageous applications of roller die quenching is on barrels for the Army's new carbine. Formerly the barrels were heat treated and straightened, then partially machined and subsequently straightened several times, because machining relieved some of the straightening stresses to cause further distortion. Barrels now come out of the roller die quench straight and free enough from stresses to require no straightening even though subsequent machining operations are involved.

Aircraft Components: An outstanding installation of Gleason die-quenching machines is found at Plant No. 1 of Jack & Heintz Inc., Bedford, O., well-known producers of aircraft engine starters, starter clutches, starter gears, auto-gyro horizons and other aircraft instruments and components. Illustrated in Figs. 10, 11, and 12 are some of the seven quenching presses in one portion of the heat treating department. Note that there is a furnace immediately alongside each quenching press, affording quick loading and quenching of the work.

Here die quenching is employed to heat treating clutch rings up to 7 inches in diameter, internal ring gears (5 inches maximum diameter), clutch gears, irregular shaped landing gear parts, and shafted parts up to 12 inches in length with cut gears integral. The clutch rings include a wide variety of cross sections from extremely thin units of 3/32-inch or thinner, up to nearly ½-inch thick sections. Practically all of these parts are made from SAE-4820 steel, heat treated to obtain maximum physicals and minimize wear. Some SAE-4340 steel is also employed for certain parts.

While largest ring handled here is about 7 inches outside diameter, the quenching presses could accommodate 18-inch diameter units if necessary. Extremely thin rings are handled in stacks of two to four rings, total stack height being ¼-inch or under. Such stacking is done merely to increase output.

A typical clutch ring has a flat section approximately 1 x 3/32-inch and is about 5 inches outside diameter. Made of SAE-4820 steel, it is easily hardened to 48 rockwell C and a 3-point tolerance limit met. Heated to about 1575 degrees Fahr., it is die quenched in a Gleason unit, the dies exerting a clamping pressure of about 50 pounds to hold the part flat during quenching. Radial elements move against the inside of the ring to hold out-of-round to within 1/1000-in.



BREAKING BOTTLENECKS: Engineers of the Western Gear Works, Seattle, designed and built this machine for simultaneously boring and facing four bearing pedestals on bedplates for landing ship-tanks. Western Gear's capacity for machining each pedestal separately had been sufficient until orders came through to step up deliveries of gears and machinery. Production time has been reduced more than 75 per cent

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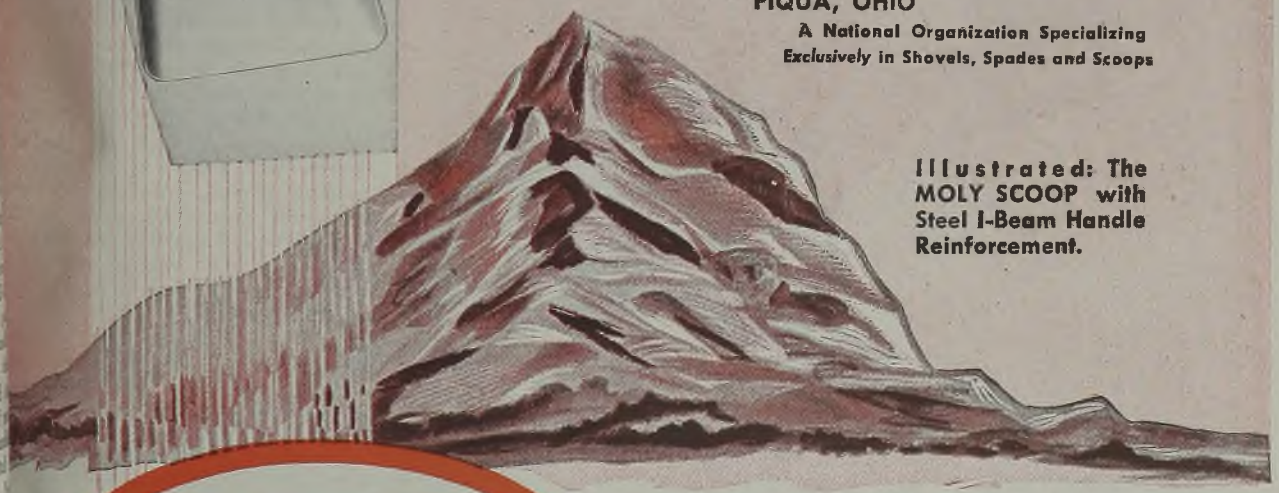

Illustrated: The MOLY SCOOP with Steel I-Beam Handle Reinforcement.

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MO-LYB-DEN-UM
ALLOY
SHOVELS

The automatic quenching cycle immerses the part in the quenching medium for 44 seconds.

Rings are easily held flat within 2 or 3/1000-inch. Perfect flatness is essential in clutch rings to assure proper action of the clutch and to avoid uneven wear. Many ring parts with toothed outside diameters are checked 100 per cent against a master mating part.

Too, certain clutch ring units are not flat but are tipped or dished in slightly. This dishing must be controlled accurately, for upon it depends the clutch action. When flattened, the outside diameter of the ring expands slightly. Heat treating such parts is greatly facilitated by die quenching, since this method assures production of the precise shape wanted.

Shafted Components: Some of the most critical units are the shafted parts with integral cut gears, used on electric starter motors and on electric generators. These are die quenched, using roller fixtures described previously.

Fig. 10 shows a typical part with integral gears (a generator shaft) being removed from the quenching dies. Note the two shafts with supporting disks in the lower die. These revolve continuously to rotate the work at about 200 revolutions per minute during the entire quenching cycle.

Upper die mounts five individual rollers, four of which are being used on this shafted part. These rollers are mounted on individual air cushions to equalize the pressure on the work. Total force of about 30 pounds is exerted on the shafted part. This is ample to correct any heating distortion and to hold alignment during quenching.

Operating Cycle: Operator removes heated part from adjacent furnace, places it in lower die, starts automatic quenching cycle by pushing "start" button. Automatic timer operates air valve. Piston then lowers upper die till it contacts work and builds up required clamping pressure. Continued flow of air into upper cylinder forces piston carrying upper die to push both of the dies and the work on down into the quenching oil, as seen in Fig. 11. It takes about 15 seconds to "hit bottom".

After a "dwell" or cooling period of 70 to 80 seconds, the automatic timing mechanism causes the dies to return to their former position, where the work is removed from the lower die, as in Fig. 10. Entire machine cycle covers a 115-second interval.

After reloading, cycle is repeated by again pushing the "start" button. Output is 30 units per hour.

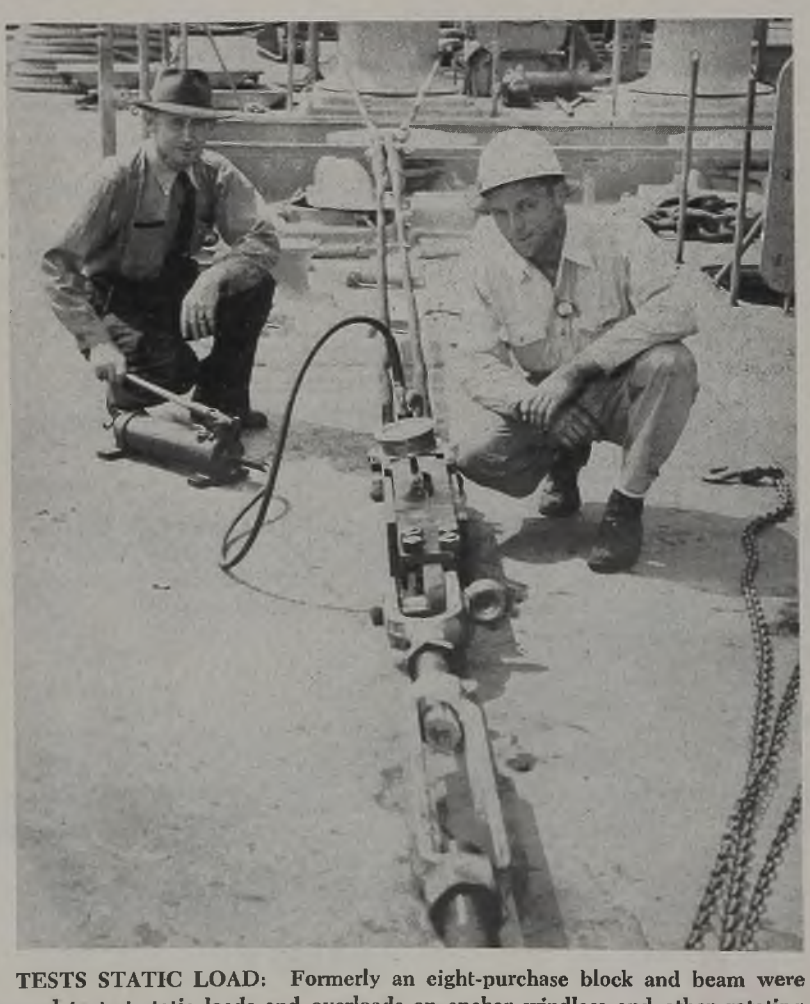
This equipment can handle shafted parts up to 18 inches in length, 1½ inches in diameter. However, most units here are considerably smaller, ranging up to about 12 inches long and from ¾ to 1-inch in diameter.

Oil Cooling: To obtain desired physicals and to assure uniform quenching action, the temperature of the quenching oil is held at about 70 degrees F. Each die-quenching machine has its served by a separate oil pump which circulates the quenching oil through a water-cooled heat exchanger. Water so used is returned to a storage tank and recirculated.

While this works well, an improved system is being installed at the present time. A large common oil reservoir with a large heat exchanger will serve all machines and eliminate individual systems at each machine. By making practical better filtering, better control of oil temperature, etc., this new Lindberg central oil-cooling system is expected to provide cleaner oil for quenching and to assure still more uniform results.

Heating Equipment: High-heat furnaces serving the quenching presses are Lindberg and Hayes units, electrically heated and provided with controlled atmospheres. An unusual feature is the use of "bottled" gas (Philgas) for producing the controlled atmospheres by partial combustion of this fuel instead of natural gas which is commonly employed. The use of bottled gas is required by the absence of any natural gas supply here.

Heat-treating department of course has full complement of other equipment besides that shown in Fig. 12. This includes several series of salt baths, continuous chain-belt furnaces, air tempering units and the like—all devoted to handling a huge volume of the comparatively small parts found in these aircraft components.

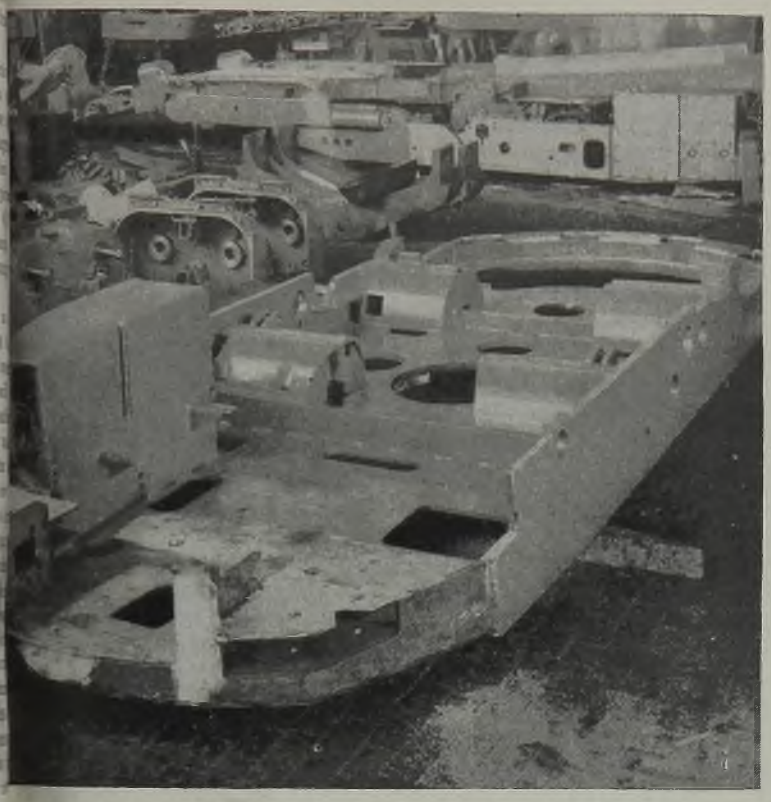


TESTS STATIC LOAD: Formerly an eight-purchase block and beam were used to test static loads and overloads on anchor windlass and other rotating shafts, requiring a gantry crane and 8 to 10 riggers for several hours. C. A. Hamilton, left, of Ingalls Shipbuilding Corp., Pascagoula, Miss., is shown with the jack he rigged up which made the test in 40 minutes with one leaderman and four riggers during a recent trial. The invention saves more than half the man-hours formerly required for such tests

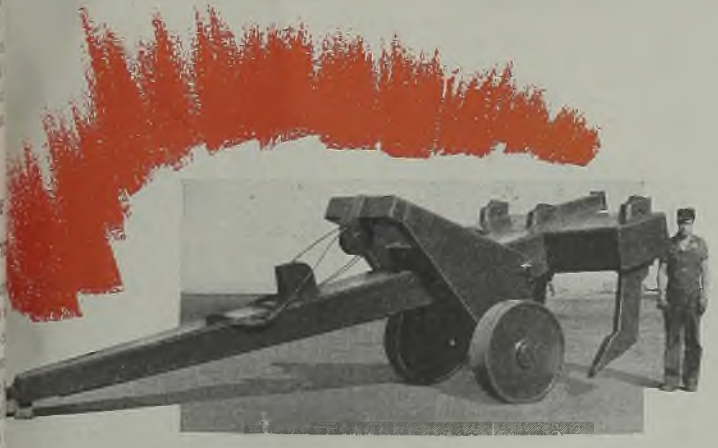
New Power Service Battery Eases Shortage

To relieve shortages, Electric Storage Battery Co., Philadelphia, has made available the new Exide-Power-clad battery which supplements the production of Exide-Ironclad. It meets the most exacting requirements encountered in motive power service, the company claims.

Embodying an exclusive design of the positive assembly, it is a plate completely enclosed by a slotted polystyrene retainer. In combination with the separators, it assures effective retention of the active material, and provides rapid diffusion of the electrolyte. This assures long life and capacity discharges at usable voltages.



LOADING MACHINERY, used in coal mining, manufactured by the Jeffrey Manufacturing Company, is subjected to severe vibrations and stresses. Frames are all welded from specially shaped plates, bars or tubes. Murex electrodes are used, most welds being fillet welds—either single or multipass, continuous or intermittent.



PPERS, special heavy-duty construction implements manufactured in antity by the Southwest Welding & Manufacturing Company for the med forces, require approximately 325 feet of welding per unit, incipally automatic. Each unit consists of three main assemblies—main ame, wheel frame and wheels. Murex Type F electrodes are specified r the welding because of their excellent physical properties, good pene- ation, high ductility and soundness of weld metal, which must with- and the severe daily stresses which are imposed upon this equipment.

CHEROKEE DAM GATE is one of three identical 135,000 pound giants that were 95% welded by Murex electrodes for the T.V.A. Welds were ¾" and all were peened to relieve undue stresses set up by heating, with some sections pre-heated to prevent warping. Gate members were clamped together on a large surface plate during welding operations.

PROVING GROUND for testing Murex electrodes comes to the production line of the M & T plant. Groups of electrodes are taken at random and thoroughly tested by welders for rod performance, soundness of weld metal, arc and slag action, and other characteristics. Just another reason for the superiority of Murex electrodes and their assured uniformity.

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JOINING

Aluminum Alloys

Brazing procedure is covered in fourth section on fabrication of aluminum and aluminum-manganese alloy. Sections from 0.006 to ½-inch may be readily joined. Physical properties and design factors are discussed

By E. C. HARTMANN, G. O. HOGLUND and M. A. MILLER

Aluminum Research Laboratories
Aluminum Co. of America
New Kensington, Pa.

BRAZING aluminum differs from welding in that special fluxes and filler material having a lower melting point than that of the parent material are used for making the joint without melting the parent parts. The availability of these low-melting-point filler materials plus the development of special fluxes which permit the filler material to completely wet the surfaces in the joint are the essentials that make aluminum brazing possible. The cost of brazing is generally less than the cost of either gas or arc welding, and brazed joints are neater and require less finishing. Furthermore, parts too thin to be welded may be satisfactorily brazed.

Brazed joints are classed by the methods used in applying the brazing heat. These are: Furnace brazing, torch brazing and dip brazing.

Furnace brazing is done by applying a flux, assembling the parts and raising the temperature of the entire assembly or batch of assemblies in a furnace to a point that will cause the filler material to melt and flow into the joint, but without melting the parent parts.

Torch brazing is done by dipping the filler material in a flux and melting this material into the joint with a torch.

Dip brazing is done by assembling the parts and dipping the entire assembly into a bath of molten flux held at a temperature somewhat above the melting point of the filler material but below the melting point of the parent material. This method offers interesting production economies, except for closed containers such as floats or tanks in which good drainage of the flux cannot be obtained.

Lap joints rather than butt or scarf joints are generally used with brazing. However, in making any kind of a joint, clearance between the parts is necessary for the flow of the filler material. This flow depends on gravity and capillary forces; so pressed or tight fits in assembling the parts must be avoided. Clearances of 0.006 to 0.010-inch are suitable for laps less than ¼-inch long; clearances up to 0.025-inch are used for longer laps. The correct clearance for any given joints is best determined by trial.

The design should permit easy assembly of the parts prior to brazing, and closed assemblies should be designed to provide for the egress of gases during the brazing process. The use of jigs and fixtures for holding the parts in alignment, particularly if of steel or stainless steel, is not usually feasible. The difference in thermal expansion between steel and aluminum in most cases will force the parts out of line. Aluminum fixtures for this use are satisfactory only if made from an alloy that will not melt at the brazing temperatures and so shapes that there is no contact between the fixture and the molten brazing flux and filler metal. In most applications, it has been desirable to design the parts to be self-jigging or held in alignment by rivets or projections that remain on the part after brazing.

Commercially pure aluminum and aluminum-manganese alloy are the only wrought nonheat-treatable alloys for which commercial brazing processes have been developed. Since brazing requires heating these alloys above their annealing temperature, designs involving the use of the nonheat-treatable alloys must be based on the strength of the annealed or soft temper of the material. The heat-treatable aluminum magnesium silicide alloys are used for brazed parts where higher strength is required. Parts can sometimes be quenched directly after

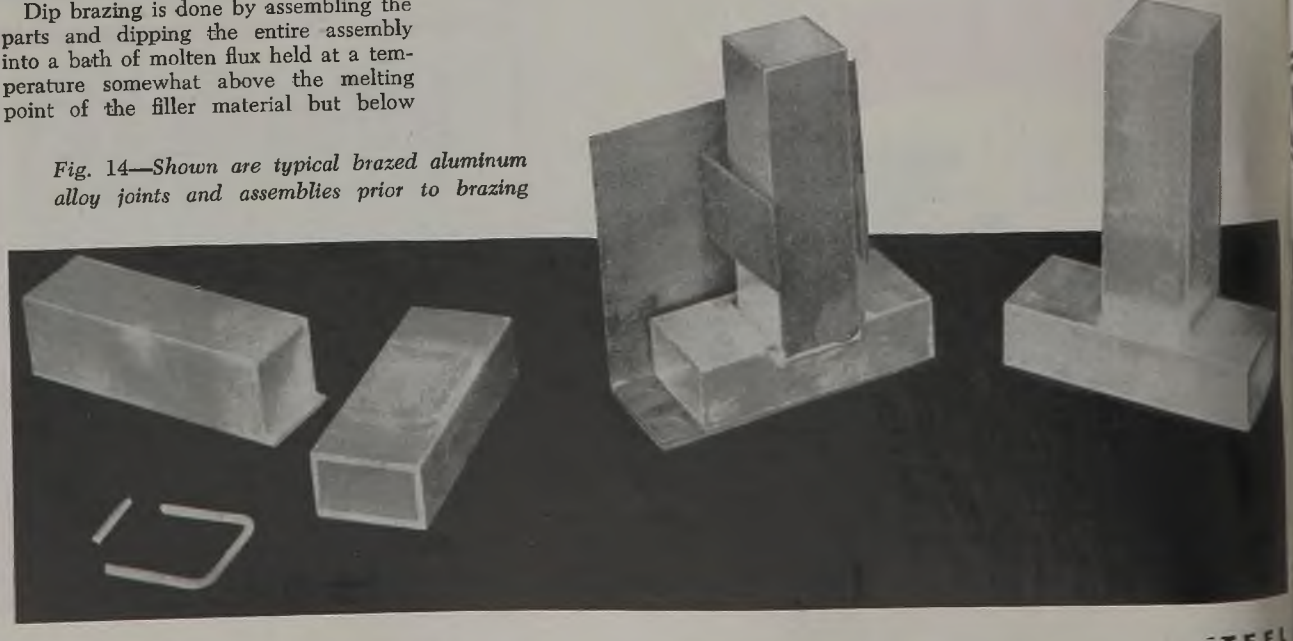

Fig. 14—Shown are typical brazed aluminum alloy joints and assemblies prior to brazing

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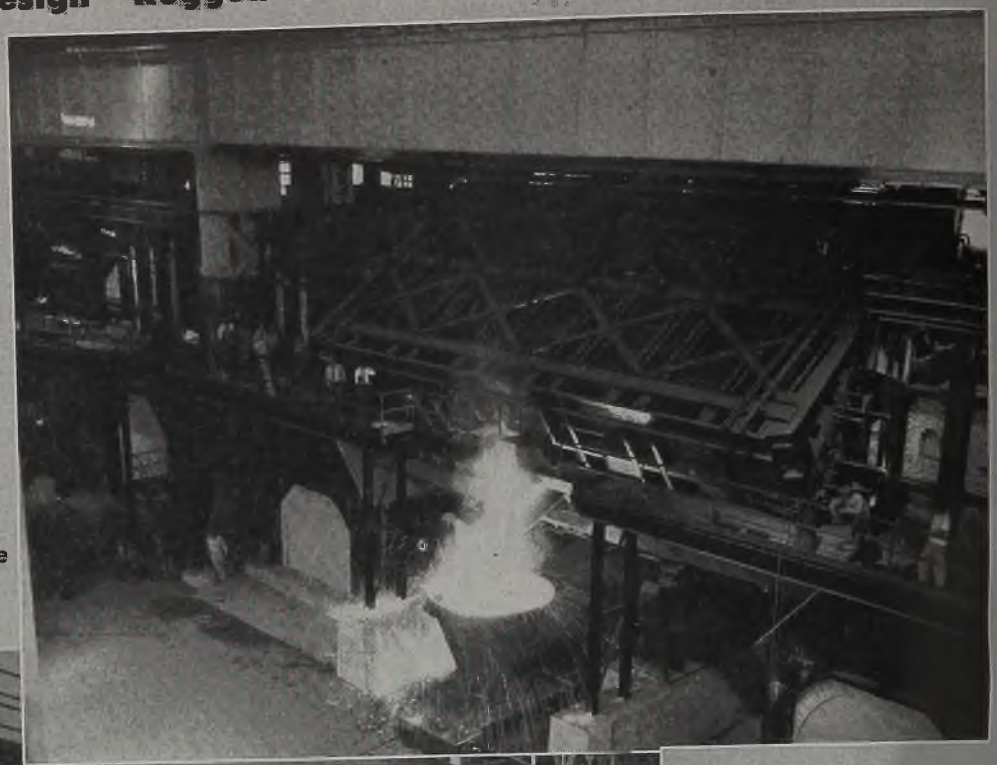

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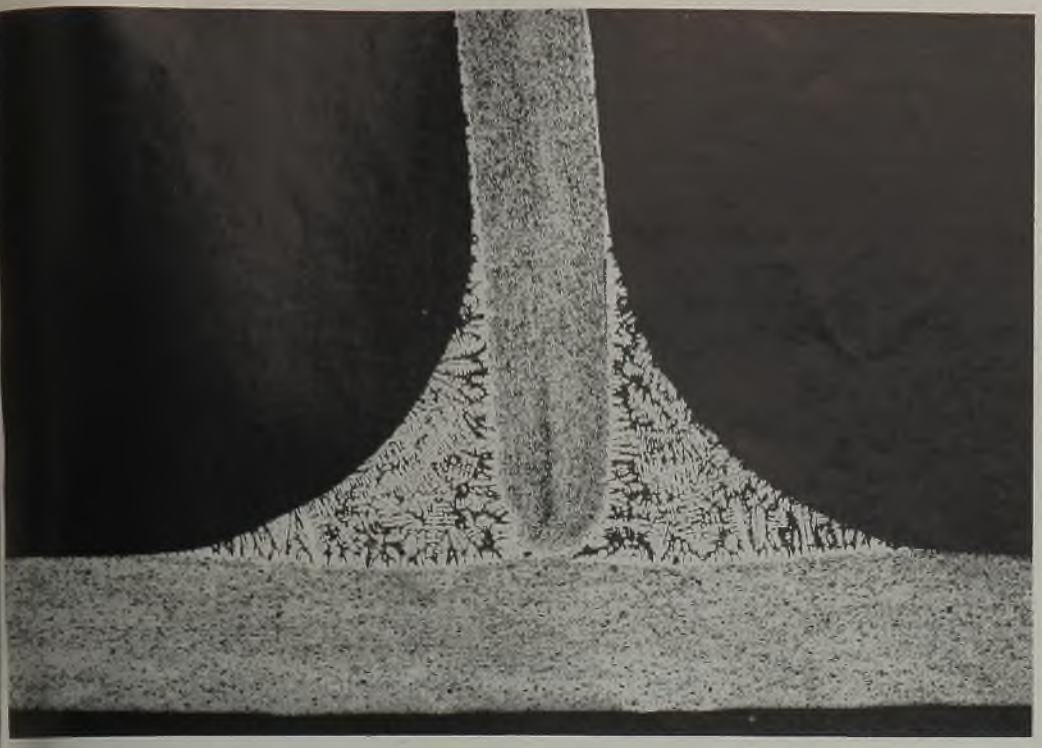


Fig. 15—Cross section of a typical brazed joint

the brazing operation, or the heat treatment can be performed in a separate operation.

The strength of torch brazed parts is approximately the same as gas welded assemblies. The heat being applied locally anneals the metal in the neighborhood of the joint, and the amount of annealing is in proportion to the amount of brazing. Therefore, the strength of torch brazed parts should be determined by test.

Filler material is provided in the form of wire, washers, clips, bands, etc. which are placed right at the joint to be formed. It is held in place mechanically in or around the joint, or may be placed in slots or reservoirs. The volume of the filler material should be sufficient to form generous fillets.

A special material, known as brazing sheet, is available. When this is used, no separate filler material is required to complete the brazed joint. This is a duplex sheet consisting of a core with a coating of filler material. A description and uses of this product will be given in more detail later.

Fig. 14 illustrates a number of brazed joints and shows the appearance of the assembly, before and after brazing. A cross section of a typical brazed joint is shown in Fig. 15.

Resistance to Corrosion

There is not yet sufficient experience to establish definitely the resistance of brazed aluminum joints to corrosive attack. However, there has been enough testing in salt spray, atmospheric, and other kinds of exposure to indicate that the resistance to corrosion of brazed joints is comparable to that of welded joints in the same alloy. If the exposure conditions are such that the parent material would need protective paint coatings, the brazed joints in the assembly should be given the same treatment. If the aluminum parts need no protection, it is quite likely that the brazed joint also will perform satisfactorily without it.

Preparing Materials for Brazing

The parts to be brazed and the filler material must be thoroughly cleaned and free from dirt and oil to obtain satisfactory results.

The removal of foreign material is usually sufficient cleaning for torch brazed joints. When furnace or dip brazing, however, parts should usually be prepared for brazing by an etching type cleaner. This is particularly required when brazing a casting whether the surface has been machined or not.

When cleaning is done by an etching method, this may be performed by immersing the parts for 20 to 60 seconds in a 5 per cent sodium hydroxide solution held at 150 degrees Fahr. The time is varied to suit the condition of the surface. This is followed by a water rinse and a dip in nitric acid of 10 per cent or higher concentration. This is followed by another water rinse, usually in hot water, to accelerate drying. The etching procedure removes metal; consequently dimensional allowances must

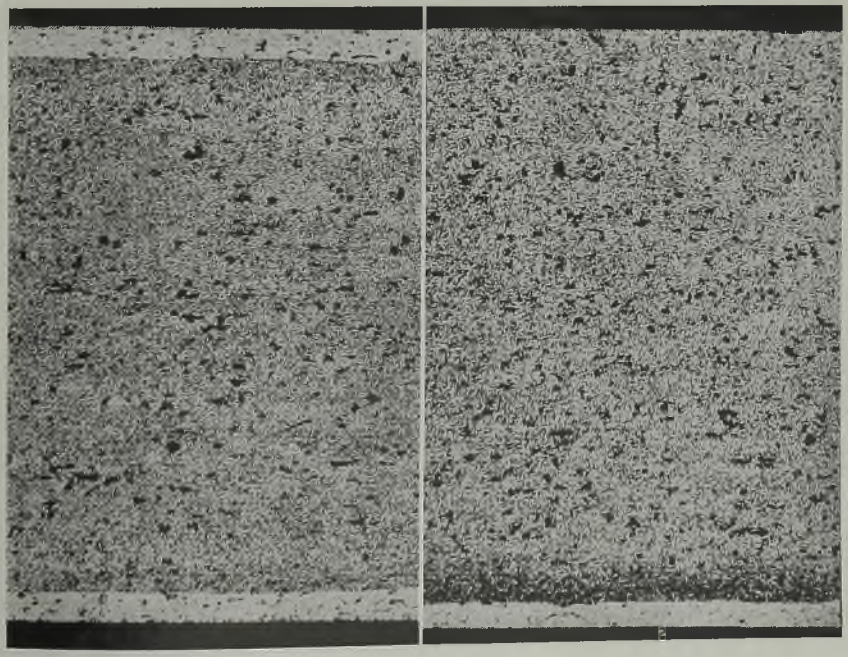


Fig. 16—Cross-sectional structure of brazing sheet showing layers of brazing metal integral with the parent aluminum alloy

be made on threaded or machined parts.

The filler material should be cleaned after the wire or washer has been formed or punched to the shape in which it will be applied on the assembly. It is generally advisable to use the etching method as described above.

Many of the proprietary alkaline and solvent cleaning materials are suitable for precleaning the parts to be brazed. It is important to provide a thorough rinsing operation for the last cleaning dip as the presence of even small quantities of residual cleaners in the joints interferes with the fluxing action.

Furnace Brazing

Furnace brazing technique varies in detail for different aluminum alloys, although the same principles and equipment are used for all. Designs for joints to be furnace brazed include parts having a thickness up to ½-inch and down to 0.006-inch. Furthermore, it is best not to design furnace brazed joints having a wide range of thicknesses, because of the varying rate of temperature rise that would occur during the brazing operation in the furnace.

Brazing Flux: Three types of brazing flux have been found suitable to cover the commercial range of furnace brazing operations. These include a low-melting-point flux of maximum fluxing activity at temperatures below 1100 degrees Fahr. which is used particularly for brazing the heat-treatable aluminum magnesium silicide alloys. Another lower price flux for the alloys that can be brazed at temperatures from 1100 to 1185 degrees Fahr. is widely used as a general purpose material for metal heavier than 0.020-inch thick. A third flux with less activity is used for brazing parts with thin sections, in the range from 0.005 to 0.020-inch thick.

The flux is packed as a dry powder, and is usually mixed with distilled water in the proportion of three parts of flux to one of water to form a thick paste for application by brushing or to a thinner consistency for application by spraying to the joint areas. Filler materials also may be dipped in the flux mixture. If this is done, a mixture of about 50 parts flux and 35 parts water is suggested. To assist in obtaining a uniform spread and thickness of the flux on the metal, a wetting agent may be added to the mixture.

Most assemblies can be placed in the furnace immediately after fluxing, but in the case of large fluxed surfaces such as on radiators or aircraft intercoolers, it is essential to remove most of the moisture from the flux, which might otherwise interfere with the brazing process. To do this, the assemblies should be preheated for 15 to 20 minutes at a temperature of approximately 400 degrees Fahr.

When furnace brazing hollow assemblies with only small openings, hydrogen gas may be formed if a water-mixed flux is used. Ignition of this hydrogen may be of sufficient violence to push the assemblies out of alignment. The formation of this gas can be prevented either by a preliminary drying operation or by mixing the flux with either methyl or ethyl alcohol instead of water.

Filler Material: The brazing alloy is added to the joint in different forms, depending on the design and location of the parts. In most cases, a wire ring or flat shim can be fitted into the joint. The choice of alloy, form and size of the filler metal depends on the alloy and shape of the parts to be brazed.

Filler material for many parts made from sheet can be supplied most economically by using brazing sheet. In this product, a thin coating of special alloy filler metal is bonded to one or both sides of the sheet in the mill (see Fig. 16). Parts are formed by bending, drawing, hammering as may be required. The coating forms with the parent metal to the shape of the piece and is in position for brazing with no further work.

Furnace Equipment: Brazing is performed in standard types of furnace equipment. Temperature regulation within plus or minus 5 degrees Fahr. of the nominal temperature is necessary to get consistent results. This requires automatic temperature control. For most parts, circulation of the furnace atmosphere is not essential to the brazing operation but is a desirable feature in furnace construction in that it reduces the heating time and results in more uniform distribution of temperature in the furnace. If the parts to be brazed are subdivided into passages too small in area to permit uniform temperature rise by the natural convection currents in the furnace, forced circulation is absolutely essential. Both gas-fired and electrically heated furnaces have been used, as well as batch and continuous types. When using a gas-fired furnace, best results are obtained if the furnace is made so that the products of combustion do not come in contact with the parts to be brazed.

The furnace design should be based on an operating range of 1000 to 1200 degrees Fahr. The design also should provide for the insertion of baffles, so that radiant energy from the heating units does not locally overheat the load. Precautions should be taken to prevent drops of molten flux from coming in contact with the heating elements.

Brazing Time: The total time that an assembly to be brazed is exposed to the furnace temperature depends on the thickness of the parts, and must be determined by trial. Experience indicates that furnace brazed parts can be made from material 0.006 to ½-inch thick. Material 0.006-inch thick will reach brazing temperature in a few minutes, while it requires 40 to 45 minutes for ½-inch thick material to reach temperature. A period of 2 to 6 minutes after the metal reaches the brazing temperature is required to melt the filler material and flow it into the joint. As stated previously, because of the varying rate of temperature rise, it is not good practice to design an assembly so that a wide range of thickness occurs in its various pieces.

Brazing Temperature: Brazing temperatures depend on the alloy used, the design of the parts, and the size of fillets desired. The actual load temperature should be measured by means of a thermocouple attached directly to one of the parts being brazed or preferably to a "dummy" unfluxed part to prevent destruction of the thermocouple by contact with flux. Larger fillets are obtained at the upper end of the temperature range.

Torch Brazing

In torch brazing, the heat required for melting the filler material is applied to the joint locally with a welding torch. Oxyhydrogen, oxyacetylene, or oxy-natural gas flames may be used. However, the first two procure smoother and cleaner joints and are faster than the third. The choice of the torch tip depends on the thickness of the parts and can be most easily determined by trial. Best results are obtained with a reducing flame.

The flux is mixed with water and applied to the filler wire by dipping. Heat is then applied to the assembly with the flame until the temperature reaches a point where the flux and filler material melt and wet the surface of the parent parts with little or no melting of the latter. In this brazing process, the filler material is more fluid and flows more freely than in gas welding. Fur-

(*Please turn to Page* 124)

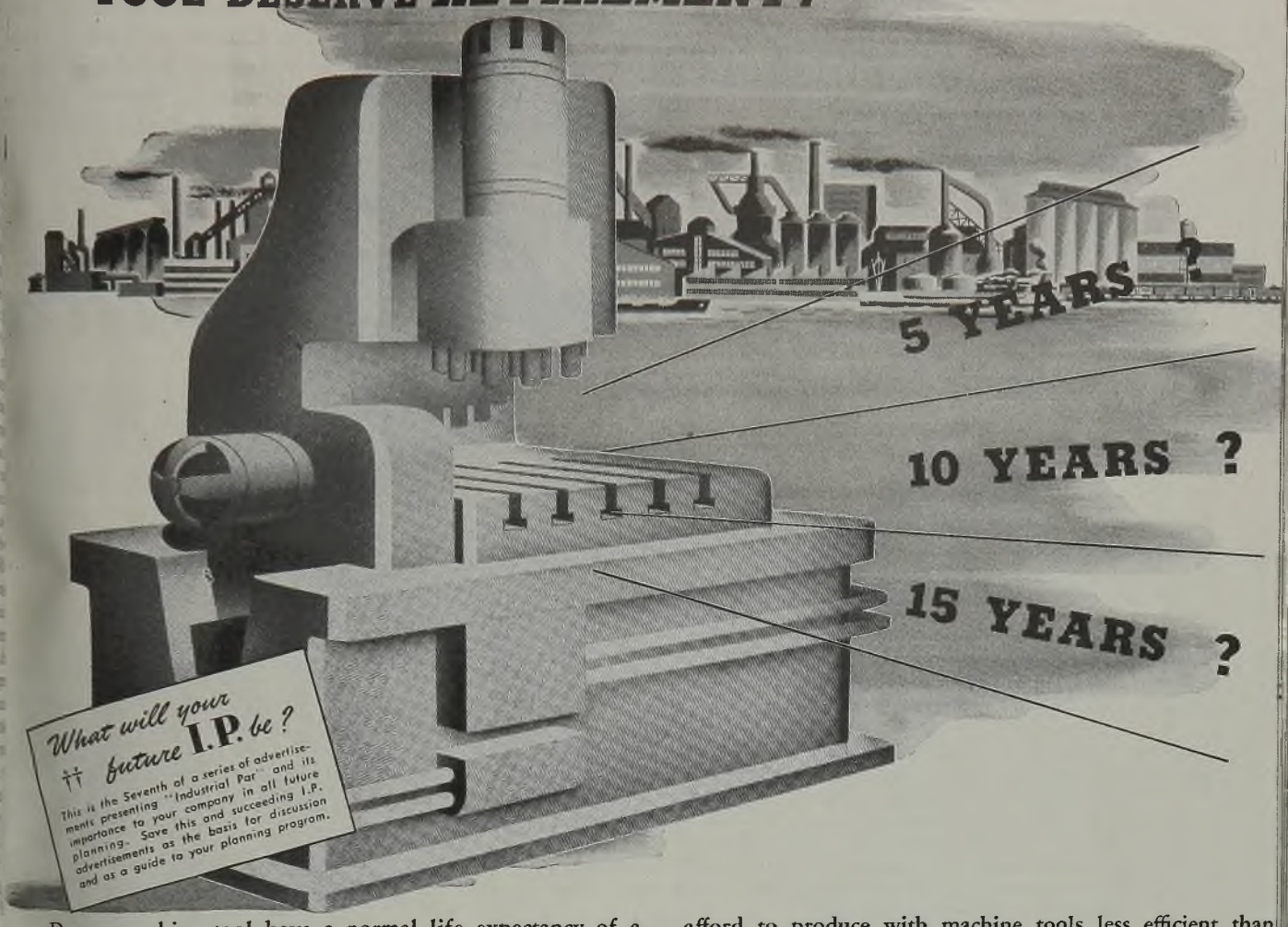
Small Fixture Marks Instrument Motors

Saving considerable time in operation and giving perfect imprints, a small fixture stamps identification marks upon assembled units of small instrument motors. It was designed by P. S. Boucher, a toolroom employe at a General Electric plant.

A standard printing ink of high viscosity is used with the press. A wooden frame with tracks to fit the

motor is placed on an incline. The motor is rolled slowly along the track. Rubber type is placed on a hinged pallet so it lies flat between the tracks and prints on the motor housing as it rolls over it. This pallet may be folded back 180 degrees to an inking surface and then easily re-inked.

AT WHAT AGE DOES A MACHINE TOOL DESERVE *RETIREMENT?*



Does a machine tool have a normal life expectancy of a stated span of time?

Yes — it varies with the machine, of course, and the standards of production and performance to which it is expected to measure up, but time is not the only yardstick to apply to determine when it should be "written off."

For a machine tool becomes obsolete not so much by age but by an inexorable law of industrial competition. Any machine tool — standard or special — that can increase output per man-hour and reduce production costs "puts the finger on" less efficient machines — dooms them to comparatively early discard. For no manufacturer can long afford to produce with machine tools less efficient than those of his competitors.

Manufacturers who are planning to offer better products with price tags that appeal to mass markets have taken the first step to postwar security and employment. Machine tools — the most modern and advanced types — will be an important part of their production planning — indispensable equipment to win the fight for lower costs — to provide jobs and wages for the greatest number of workers — to attain or excel *Industrial Par* as presented in this advertisement as "Spotlight Facts for Your Future I. P. Planning."*

Milwaukee Machine Tools

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

* *Spotlight facts for your future* **I.P.** *planning*

*Production methods — developed in wartime — increase man-hour output; pent-up buying power — released in peacetime — demands increased production.

*The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.

*Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.

*Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment—in keeping with increased output.*

*The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

ACK THE ATTACK . . . BUY MORE BONDS

By F. H. CRATON
Transportation Divisions
General Electric Co.
Schenectady, N. Y.

Heavy 2-axle locomotives up to 80 tons and equipped with two identical power units meet requirements found in most steel mill yards in moving materials. Choice of high or low-speed equipment depends on such factors as character of service, number of hours to be used annually, type of maintenance and number of locomotives operated in the plant

Small Diesel-Electrics

Adapted to Steel Mill Switching

AMONG the first to adopt the efficient, time and labor saving diesel-electric locomotive was the steel industry. These locomotives sold at $200 per horsepower in the twenties and a few discerning pioneers saw their way clear to buy them and put them to work on steel mill assignments. Even at the staggering prices of those days it was a good investment; the units have now paid for themselves several times over. These early locomotives were fundamentally costly because the engines and electrical equipment revolved slowly compared to present-day standards; a lot of material rotated and reciprocated to produce tractive effort at the drawbar. However, these units had a high degree of reliability and operating economy, resulting in the steel industry taking hold of the diesel-electric idea seriously. The development for years was largely along the lines of big units; steam was used for the lighter jobs because there were no suitable diesel-electrics available.

Industry Tries Small Unit

In 1938, the small diesel-electric appeared with high-speed engines and electric drive, first as a 20-ton, 150 horsepower, then 45 and 50-ton 300 horsepower and at the astoundingly low price of from $60 to $70 per horsepower. Again, with the same pioneering spirit of the twenties, the steel industry bought a few and tried them. To the amazement of many, these so-called "pinwheel" designs proved their worth. There were troubles, but ways were found to iron them out gradually until today the small diesel-electric has made a place for itself in this toughest of all industrial assignments, steel mill switching.

The term "small diesel-electric" has come gradually to mean locomotives of 80 tons and under as contrasted with units of 100 tons and over which were developed primaily for Class I railroad use. "Small" perhaps is an unfortunate adjective to apply to this class of motive power because to some it may imply locomotives relatively too fragile and impotent for the rigorous demands of steel mill work. The performance of these "small" diesel-electrics in a score of steel plants during the high-pressure, record-breaking period of production now going on has proved beyond peradventure that any such inference as to their potency does them a rank injustice. In sizes from 20 tons on up to 80 including all the inbetweens, they have been doing yeoman work.

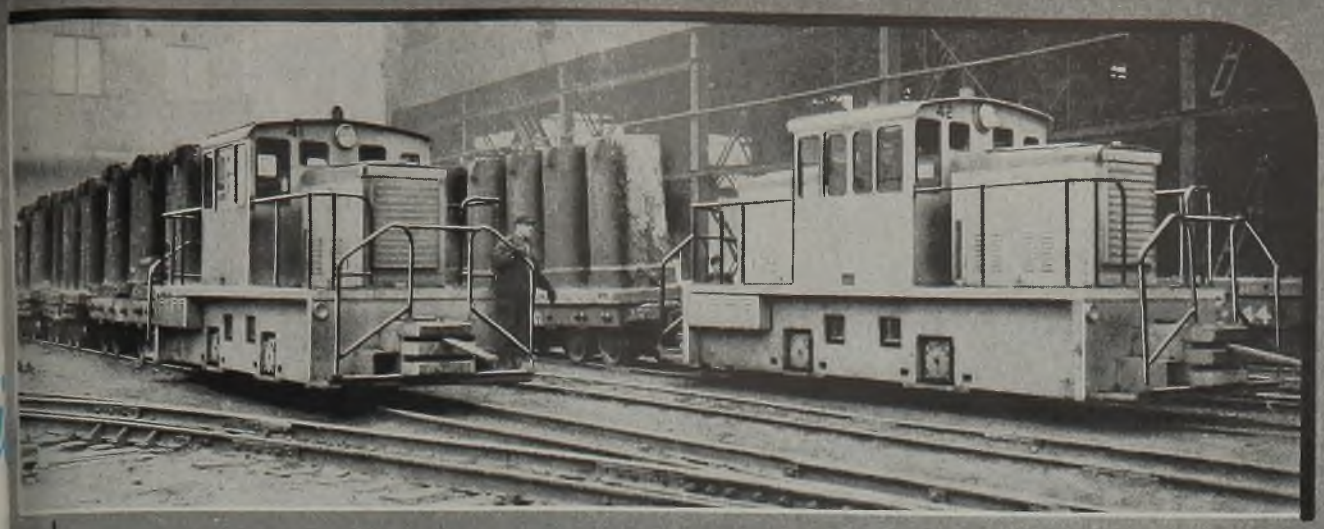
Supply Is Restricted

Due to WPB restrictions on locomotive manufacture since the inception of General Limitation Order L-97 in April 1942, the steel industry has received relatively few new units but the fortunate operators who have had even one or two during this period have expressed their appreciation for these efficient, tough, labor saving, round-the-clock operating transportation tools.

A favorite rule-of-thumb in the steel industry is to figure carefully what a design should be to stand up successfully under the sledgehammer conditions to be faced and then multiply everything by two. Having taken this precaution, the equipment may have a fighting chance of survival. This axiom was well known to the designers of small diesel-electrics when they were adapted to steel mill work and broadly speaking, operating experience was good. Here and there on some detail, the designer multiplied by one and a half with consequent complaint, expense to himself and extreme irritation to the customer—but few developments go along smoothly at the start. Perhaps the greatest tribute to the small diesel-electric is the fact that in many cases, standard industrial models have been

applied successfully to it. In other words, locomotive manufacturers have built such extreme ruggedness into some of their standard designs that they are indeed universally applicable locomotives for industrial service. Some of these standard units are shown in the accompanying illustrations of steel mill applications.

The high axle weights and concentrated loads of steel-mill rolling stock result in most plants having heavy rail, adequately supported, be it by roadbed or bridge structure. Consequently such plants have been able to use heavy 2-axle locomotives successfully instead of the 4-axle type thereby getting an inherently simpler, stronger piece of motive power mechanically, at the same time acquiring these advantages at somewhat lower first cost. As this reduced price for the same weight and horsepower may strike a responsive chord almost anywhere, it is sometimes the locomo-



1

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3

Fig. 1—Ingot buggy specials—50-ton, 2-axle 300-horsepower locomotives for hauling heavy drags at low speeds

Fig. 2—This standard 45-ton industrial switcher handles slag and ladle cars at Tonawanda Iron Corp. plant

Fig. 3—Everything from small charging buggies to standard hopper cars is handled by this 25-ton diesel-electric

Fig. 4—Wear and tear on scale pivot points are reduced because of the smooth manner in which this 65-tonner eases cars off and on scales

4

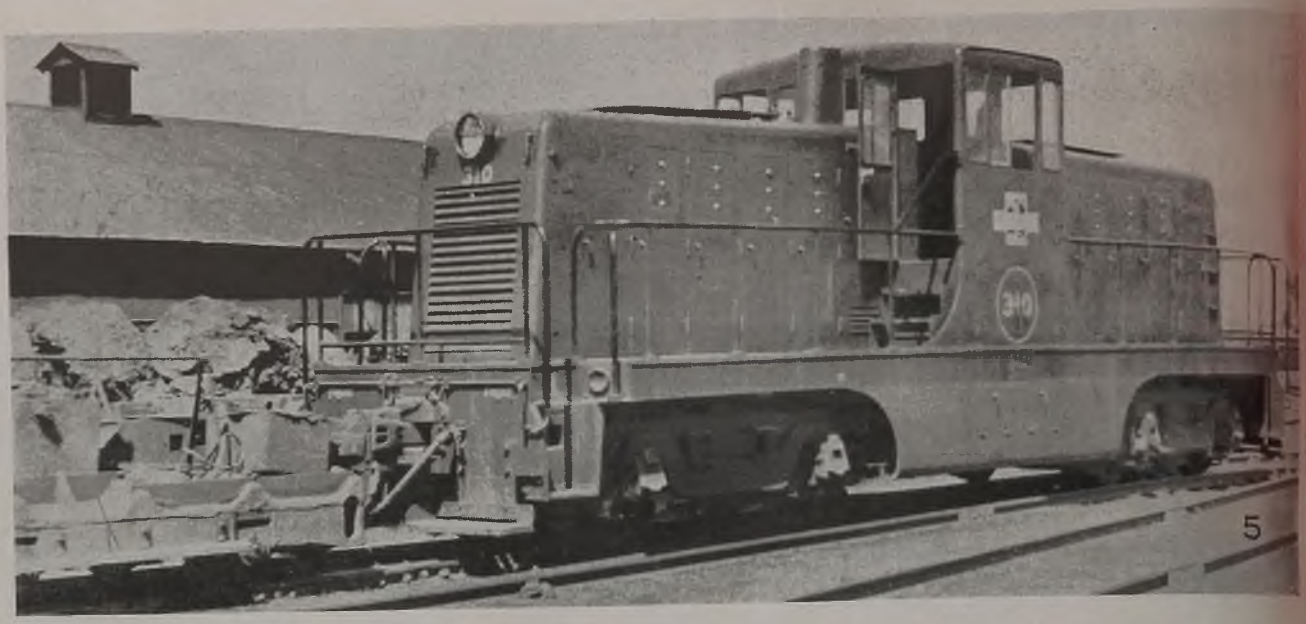


Fig. 5—Swivel-truck construction permits the 80-ton 500-horsepower unit to negotiate any curve in steel mill

tive manufacturer's duty to point out to a customer with less rugged track and structures that unless he is prepared to have the locomotive on the ground periodically, he would do well to purchase the slightly more expensive 4-axle swivel truck design. In most steel mill work however, the 2-axle locomotive has turned out well and is seldom out of service.

The 2-axle, 50-ton locomotive is a good example of a design tailored closely to meet the requirements of a specific job, that of handling charging cars and ingot buggies between scrap yard, open hearth, stripper and soaking pits, usually on narrow-gage track. While this design is a "special" in that it is not one the average industrial customer should use, nevertheless for steel mill work it may be regarded as a standard unit with wide application. Fig. 1 shows one of these tough little locomotives handling ingot buggies in a large eastern mill. The enormous strength of the box-type understructure is apparent in the illustration; side frame members are 5 inches thick, end plates 5 inches and deck plate 3⅞ inches, all welded together into an almost indestructible unit. End plates are dropped to within 3 inches of the rail to act as plows. The two 7-inch axles are carried in 7-inch roller journals. The chassis rides on four nests of double coil springs resting on two sets of twin equalizers; there is no part in the entire spring rigging and equalization system that is subject to any appreciable wear. The low coupling arrangement results in minimum weight transfer, thus contributing to the terrific pulling power of this type of unit. Simplicity and ruggedness when contrasted with a 4-axle swivel-truck design come from the ability to halve the number of axles, wheels, journals and pedestals and eliminate entirely center and side bearings, cranks, counterweights and side rods. Against this must be balanced more track maintenance, more liability of derailment and greater wheel wear. In the final analysis, the choice hinges upon the design of track and structures. If there is any doubt about the unit standing up under the required service it is best to use the more flexible swivel-truck construction.

This 50-ton locomotive has an electric drive whose ability to take punishment is along the same generous lines as the mechanical structure. The locomotive has two identical power units; each consists of a 150 horsepower, 1800 revolution per minute diesel engine-generator set and a traction motor geared to one axle. The engine delivers its power into the armature of the generator which converts this rotating energy smoothly into current carried to the motor through cable. This conversion of mechanical to electrical power in the generator is not a fixed sort of thing but rather a flexible and inherent transformation automatically adapting the full engine output to the requirements of the load at any given moment. If the locomotive is moving slowly, the generator delivers high current and low voltage corresponding to high tractive effort and low speed.

As the locomotive accelerates, inherently the generator gradually raises the voltage and lowers the current thus maintaining constant load on the engine, protecting it against abusive stalling and loss of output. Thus the generator becomes in effect a transmission with infinite ratios automatically shifting to the optimum ratio for the conditions of the moment, getting the most out of the engine but never overloading it. Furthermore it acts with the motor as a cushion against track shock, isolating the diesel engine from mechanical connection with axles, wheels and rails, thus giving it the most ideal conditions under which to operate.

Power is applied or cut off by the closing or opening of one or two contactors controlled by movement of the locomotive throttle handle—and always smoothly by easing current into and out of the motor circuit. Advantages of the electric drive have been pointed out

(*Please turn to Page* 127)

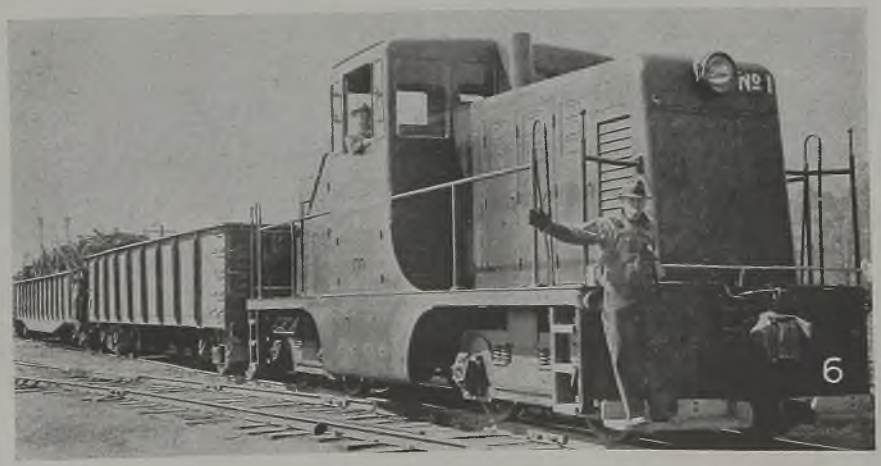


Fig. 6—This 50-ton 4-axle switcher is equipped with two engines and single reduction gear for slow-speed operation

How to Evaluate Insulating Firebrick

1. Temperature Resistance
2. Light Weight for Low Conductivity
3. Stability
4. Volume Change
5. Manufacturer's Responsibility
6. Value

4 A Simple Index of Durability

Longer service life, less maintenance, and continuous production are directly related to the durability of insulating firebrick.

And reliable evidence of durability is readily available in ASTM test C-93-42. This test shows compressive strength, flexural strength, and permanent linear change after heating. It is a service-simulated test that indicates brick durability—or premature, costly failure—in your furnace.

Your local B&W representative will gladly supply the above test data on B&W Insulating Firebrick. He can also help with information on the five other simple checks you can make in selecting—with facts—the insulating firebrick that is most economical and has longest life.

THE BABCOCK & WILCOX COMPANY
Refractories Division
85 LIBERTY ST. NEW YORK 6, N. Y.

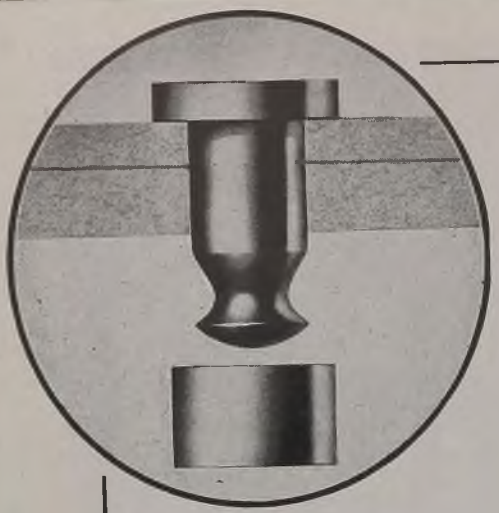
ARMY E NAVY

BABCOCK & WILCOX

★ BUY WAR BONDS! BUY MORE THAN BEFORE ★

High tensile strength, convenience of handling and economy are features of

New High Shear Rivet



Before Riveting

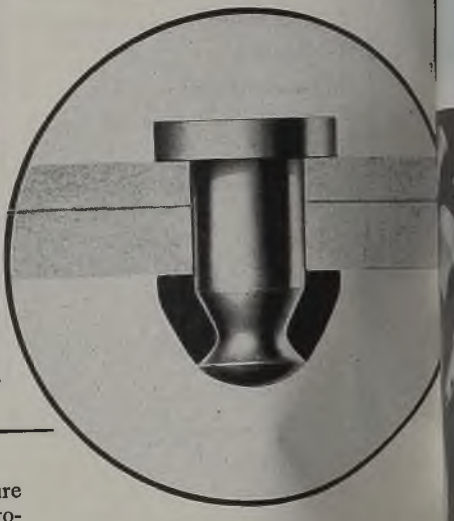
ENGINEERING laboratory tests and results obtained in production of military aircraft are providing sufficient data to indicate that a new type rivet known as Hi-Shear is a forward step in improvement of production technique. The fastener, produced by Pheoll Mfg. Co., Chicago, under license from North American Aviation Inc., also is said to save assembly time and materials, to cut down weight and cost less to use. Another outstanding feature is the ease and convenience of handling and the regularity with which uniform and well-driven rivets can be installed continuously.

The rivet consists of two parts, the pin and collar. The pin is made of alloy steel, heat treated to a minimum tensile strength of 125,000 pounds per square inch and cadmium plated. As such hard material cannot be squeezed or hammered down to form a head, a malleable collar is provided. This is made of A17ST aluminum alloy anodized. Pins are the same as comparable sizes of AN hexagon-head aircraft bolts in regard to material, heat treatment, body diameter and finish. Shear strength, therefore, is the same as that of the corresponding size aircraft bolt.

A simple 1-piece rivet set is used which, by means of a conical bore in the end, swages the collar into the grooved pin end, as shown in accompanying illustrations. A port is provided through which rings of excess collar material are automatically ejected by pressure from succeeding rings. This special set can be used as part of the bucking bar or fitted to the riveting gun.

After the pin is inserted, a bucking bar is placed against the pin head and rivet collar is slipped over the pin end. Set is placed over the collar and as pressure is applied, the soft collar is forced into the groove at the end of the pin. The ring of waste material, pinched off when the collar is formed into a conical head, is expelled through the waste port of the rivet set. Design of Hi-Shears is said to permit the use of light-weight equipment, adaptable to high-speed riveting in even larger sizes than is practical with soft rivets.

After Riveting



Zinc Base Die Casting Salvaged

An improved gas welding rod, 195, now being marketed by the Eutectic Welding Alloys Co., 40 Worth street, New York 13, makes it possible to reclaim zinc base die castings. The rod has a lower melting point and a still lower bonding temperature than the original alloy which makes it easier to apply without danger of damaging the parent metal. It is also easier to build up with, has greater tensile strength and matches the hardness of the die castings.

A zinc base fuel pump die casting which has the whole top section broken off is an example of what can be accomplished with EutecRod 195. Previous attempts to build up the part with ordinary rods have been futile, for at the point at which the alloy had to be applied there was a hole approximately ⅜ to ½-inch in diameter. This had to be bridged without the help of a back-up material inside the assembly. To repair this part effectively the regular technique recommended by the company's research department was adopted.

The break was "V'd" out to about a 90-degree angle and the section to be welded was cleaned thoroughly. The entire casting was preheated with an acetylene excess flame to about 700 degrees Fahr., at which temperature EutecRod 195 bonds to zinc. Autochemic Eutector Flux 195 was sprinkled over the metal and, as soon as this melted, the rod was placed in front of the torch.

The lug was built up to its normal height in less than five minutes and only 1 inch of a ¼-inch rod was used. The manufacturer is now saving hundreds of these defective castings which previously had been discarded.

Broaching Tool Institute Issues Broaching Textbook

Under the title, "Broaches and Broaching," an 8 x 11-inch, clothbound textbook of nearly 100 pages has just been published by the Broaching Tool Institute. This book ably prepared by W. Wilson Burden of Detroit, is sponsored by 10 of the leading American manufacturers of broaching tools and broaching machines who are members of the Institute.

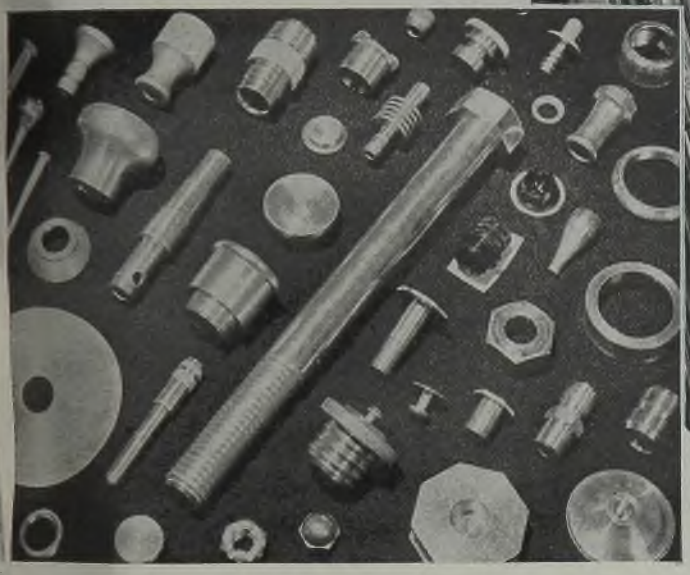
Chapters are as follows: History of broaching, its advantages and applications; types of broaches; cutting action; material to be broached, and its preparation; broach design; cost factors; information needed when designing, manufacturing and quoting broaches; handling, including initial inspection and tryout; sharpening; broaching machines; setting up; broaching fixtures; and cutting fluids. More than 180 illustrations, both half-tones and drawings, are used to unusual advantage throughout the book to augment the clearly written text.

A final chapter entitled, "An Open Letter to Broach Users," concludes with these words: "It is the earnest desire of the members of the Broaching Tool Institute in publishing this book to present to the users and prospective users of broaches a helpful handbook to guide them in broaching problems. The information it contains represents the combined effort of all the members of the Institute, it being their intention, through the Institute, to compile standards, encourage research, and develop new broaching methods. It is hoped that this will stimulate helpful relations between users and manufacturers of broaches. The members of the Institute intend to expand this service for the benefit of all those interested in broaching."

Copies of "Broaches and Broaching" are available at $3.00 each from the Broaching Tool Institute, 74 Trinity place, New York 6.

Alcoa

WAS AGREEABLY DISAPPOINTED



Alcoa Aluminum products for your assembly line or Alcoa stock for your screw machines

With the millions of aluminum screw machine products required at the start of the war, and hundreds of new fabricators coming into the picture, a flood of requests for help was expected. Alcoa had always served as a clearing house where all fabricators could come for information on aluminum alloys, the design of parts and tools, machine speeds, feeds and lubricants. Alcoa's engineers had given freely of their time to help others get into aluminum production.

But the spadework, getting industry ready to swing into aluminum production, had been well done before the war. As a result, a surprisingly small number of requests for help developed.

Alcoa's Screw-Machine-Products Division serves a double purpose. Our skilled personnel manufactures untold millions of pieces for use in the war effort, parts requiring great accuracy. This division serves, too, as a proving ground for new alloys and improved methods of production.

It is Alcoa's intention to continue to aid industry in employing lightweight, strong and fast-machining Alcoa Aluminum Alloys to best advantage.

Winning the war comes first. But, as the manpower situation permits, aluminum is now being used for other-than-war purposes. Our representatives will be glad to discuss the availability of aluminum with you. Write to ALUMINUM COMPANY OF AMERICA, 2112 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALIEN PATENTS

Available to Industry

STEEL is presenting a list of enemy patents of interest to the metalworking industries. Many of these are available on a nonexclusive royalty-free basis under simple licensing terms. Copies of any patents listed may be obtained by addressing the Commissioner of Patents, United States Patent Office, Washington 25. Include 10 cents for each patent, specifying serial number.

These patents are classified by types of operation, such as metal founding, metalworking, metal rolling, metal bending, metallurgy, metal treatment, metal forging and welding and the like. Included are enemy patents, patents pending and patents in enemy-occupied countries.

CLASS NO. 266—METALLURGICAL APPARATUS

LIST OF ENEMY PATENTS

DESCRIPTION	PATENT NO.
Apparatus for annealing metal	1674431
Annealing and pickling plant	1981411
Furnace for the continuous annealing of bands, sheets and wires	2185655
Continuous heat treating furnace of the vertical type	2206734
Apparatus for hardening the runners of ice skates	1711633
Device for hardening the surfaces of cylindrical bodies	1879850
Apparatus for surface hardening of the inner wall of hollow bodies	1892843
Annealing furnace	1582036
Machine for tempering saw blades, plane knives and similar tools	1662516
Hardening of the heads of railway rails	1745023
Apparatus for strengthening the heads of railway rails	1752646
Machine for bending and tempering leaf springs	1816377
Apparatus for the manufacture of rails with hardened heads	1858860
Automatic machine for hardening gears	1948480
Method of and apparatus for hardening gears	2166731
Apparatus for treating metal sheets in liquids	2114782
Apparatus for cleaning metallic articles	2163276
Machine for receiving and conveying into and out of the pickling tanks, piles of sheet, billets, semi-finished rolled products, sheets and other material to be pickled	2168205
Melting furnace	2161181
Process and apparatus for the direct recovery of heavy metals of the nonferrous group from ores and other primary materials	2223569
Apparatus for melting metals	2161180
Device for flued chimneys and the like	2181232
Distillation of metals	1985171
Apparatus for the distillation of zinc and other volatile metals	2007332
Rotary furnace	2013486
Distillation of readily volatilizable metals	2017401
Apparatus for the fractional condensation of metal vapors in a condenser rotating about a horizontal axis	2021365
Apparatus for the smelting out of zinc from dusts containing metallic zinc	2208418
Distillation apparatus for the production of zinc or similar volatilizable metals	1966627
Apparatus for sintering roasted materials	1877608
Machine for guiding cutting burners	1748870
Transportable guiding device for cutting burners	1773664
Autogenous cutting apparatus	1801916
Cutting and welding machine	1825606
Cutting mechanism	1901254
Device for guiding implements, particularly the burner of cutting burner or welding machines	1921887
Machine for guiding cutting or welding burners, electrodes and like implements	1921888
Self-fed autogenous fusing machine	1932641
Automatic feed welding and fusion cutting machine	1974513
Machine for the guidance of tools and more particularly of fusing burners	2017475
Autogenous welding and cutting machine	2055765
Portable blowtorch apparatus	2058672
Self-advancing autogenous torch	2185781
Cutting apparatus	2207787
Cutting torch	2249413
Cutting machine	2269643
Furnace bottom	2211127
Cupola furnace	1668133
Method of blowing blast into shaft furnaces	1830683
Device for retaining the flue dust in blast furnaces	1742733
Process for reducing the dust losses from shaft furnaces	1941545
Process for cooling furnaces by means of cooling chambers	2006266
Smelting furnace	1647608
Device for the refining, mixing and purifying of molten metals and metal alloys	1863686
Apparatus for treating matters in hot liquid state	2182064
Apparatus for the direct recovery from ores of heavy metals of the nonferrous group	2229383
Apparatus for the direct recovery from ores of heavy metals of the nonferrous group	2238815
Melting furnace	1717813
Apparatus for treating materials under reduced pressure	2193034
Carrier for slag pans and the like	1861946
Cupola or hearth furnace	1592520
Cupola with forehearth	1681043
Tuyere for cupola furnaces	1866764
Apparatus for moving tamping machines	1841338
Tamping machine	1849995
Furnace construction	1704902
Metallurgical furnace	1825011
Mortarless masonry	2231498
Refractory material for use in basic process siderothermic furnaces	2206277
Tuyere for shaft furnaces	1994115
Electromagnetically controlled hydraulic governor for electric and other arc furnaces	1774213
Machine for hardening the bearing points of driving shafts and the like	1801090
Apparatus for hardening the flanks of spindle and worm threads	1887098
Apparatus for surface hardening metal articles	2132110
Apparatus for surface hardening the teeth of double helical gears	2151971
Apparatus for surface hardening toothed wheels	2199313
Apparatus for and the cooling of annealed goods in cooled vessels	1895680
Metallurgical apparatus	2315123
Process for manufacturing dihydroxy perylene	1629194
Cyaniding apparatus for treating gold ores	1673982
Blast furnace	1735293
Method of forming basic linings of furnaces	Re 22050

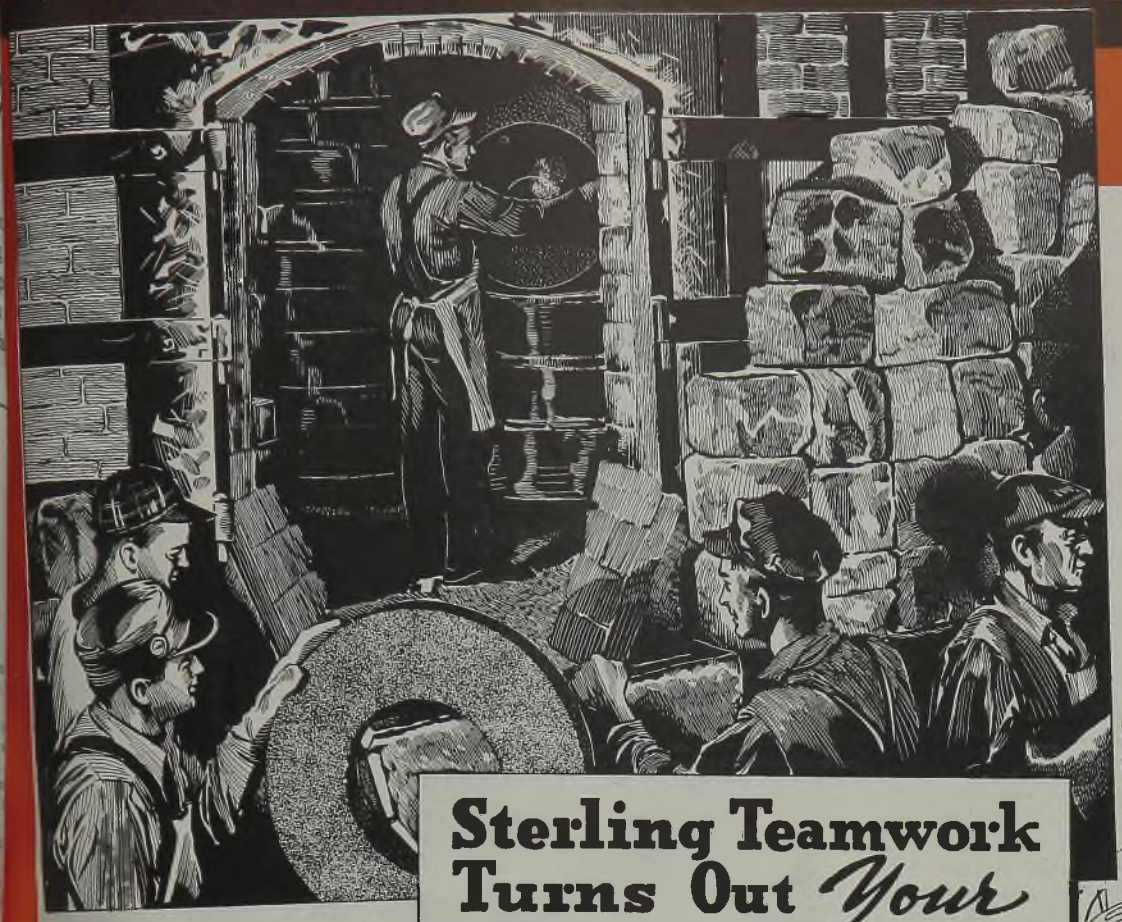
LIST OF PATENTS FROM ENEMY-OCCUPIED COUNTRIES

DESCRIPTION	PATENT NO.
Vessel for treating materials in the chemical and metallurgical industry	2305823
Apparatus for tempering rails	2095946
Apparatus for heat treating metallic goods in baths	2297447
Gas case hardening furnace	2109711
Furnace for heat treatment under high pressure	2269595
Device for handling metal section members and more particularly rails in order to harden them	2143754
Cooling system	2305811
Method of operation in metallurgical and like processes	1579340
Metallurgical furnace	2255844
Condenser for zinc vapors from electric furnaces	1715961
Roasting apparatus	1857735
Roasting furnace	2202444
Continuous apparatus working with drawn or blown blast or gas	1774135
Apparatus for agglomerating and roasting minerals	1784658

(Please turn to Page 122)

STERLING

THE WHEELS OF INDUSTRY



Sterling Teamwork Turns Out *Your* Wheels Faster

Sterling "kiln gangs" are working faster these days, helping turn out the "Wheels of Industry" as fast as is consistent with high quality. Everyone at Sterling—in the laboratories, the plant, and offices—is trying his or her level best to make and ship your Sterling Grinding Wheels on time.

If our deliveries sometimes seem slow, it is not lack of interest in your problem . . it is simply the result of wartime conditions that stretch out the time necessary to make wheels of the high quality demanded by your difficult grinding jobs.

We like to think that Sterling Grinding Wheels are helping industry hasten victory. That is why so many Sterling workers are interested in turning them out as fast as possible. Many of us have sons and daughters in the service—that is an incentive, too!

What is your unusual grinding problem . . we would like to help you solve it. Sterling engineers are ready at any time to consult with you on the best methods to use in obtaining quality grinding. Often some small change in setup will do it. There is no obligation . . write us today for any help we can give!

Have you a copy of Sterling Catalog No. 44? It will be sent on request.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION

OF THE CLEVELAND QUARRIES COMPANY

TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Production Control

. . . keeps work flowing through Ohio Tool Co. plants

By ROBERT DIXON
Production Control Manager
Ohio Tool Co.
Cleveland

(Above)—How much and when goods are to be produced is the function of Ohio Tool Co.'s production control manager

(Right)—All material movements and inventories are recorded in a central control ledger, providing accurate perpetual inventories, proper material identification and production records by departments

THERE is no accepted definition of the term production control. Perhaps, however, an accurate definition in the case of the Ohio Tool Co. would be that it functions as a procedure of showing how much and when goods are to be produced.

This includes the problem of meeting promised delivery dates, maintain a steady flow of work in the shop, utilizing the available equipment and manpower properly, and avoiding congestion or bottlenecks in the plant. Routing, dispatching and scheduling are the prime factors of production control. Tools necessary for the successful operation of a production control system include blueprints (both for reference and plant work), order files, ledger and shipping, routing sheets, stock control records and files, bin tags and storage, tool control system, drawing number system, material identification system and department identification symbols.

Routing involves an analysis of each operation in order to prescribe the path the material will travel throughout the shop. The need for routings is most essential, as we make a large variety of complicated tools. The production control operation is concerned only with the use of the routing data. It is not concerned with the problem of deciding which operations should be done, where they are to be done or on what machine.

An order system is essential to a production control system. In our case we use a material move receipt in triplicate. One is to stay with the material for identification, one goes to the production control ledger department to be recorded on master ledger card and the final copy to the accounting department. This system allows maintenance of accurate perpetual inventories, proper material identification and production records by departments.

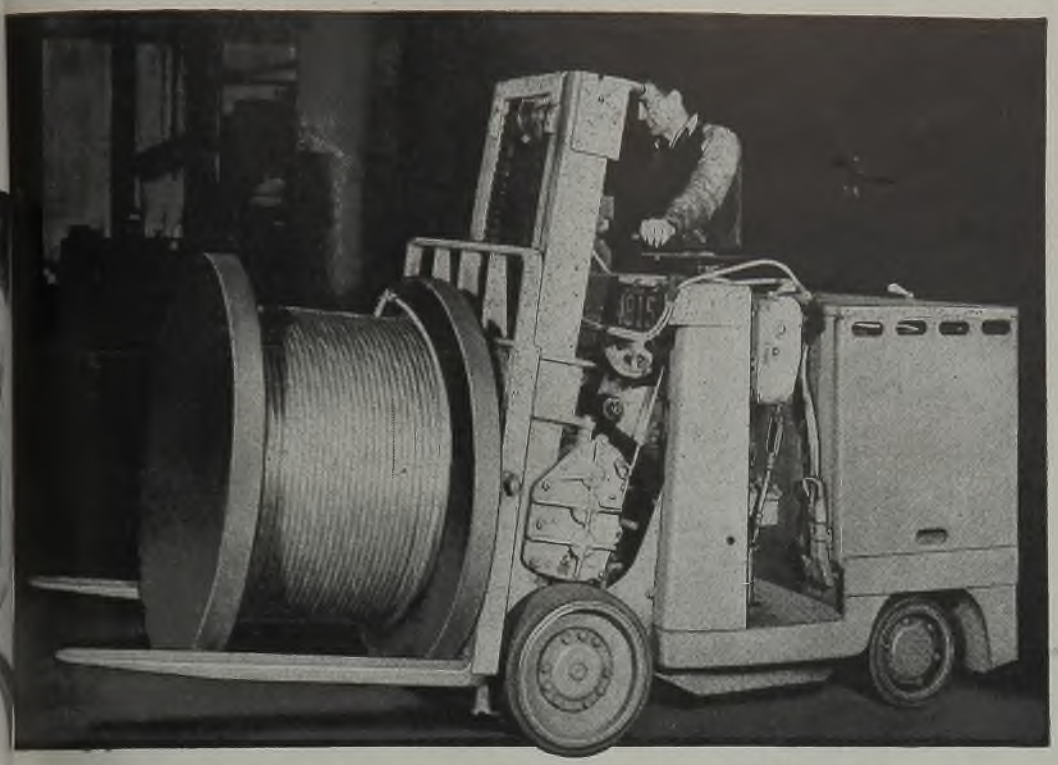
Stock control, one of the most important functions of production control, is done to show at all times, on any particular order, the amount in process, the balance to be shipped, stage of manufacture, location and all pertinent information necessary to give complete detail story at all times. Essentially, stock control is a perpetual inventory control, showing movements of stocks and balances.

Tool control is of prime importance to production control for the reason that all tools must be planned and provided before the scheduled production date. This is done in much the same method of follow up as in material control. Tools are properly identified and moved in accordance with identification tickets, etc., until ready for use in manufacturing the order or job for which such tools have been designed.

To properly maintain an adequate system of identification of the many different types of tools made, it was found advisable to utilize the drawing number system. Material and parts symbols have provided a convenient method of identity and an exact means of maintaining inventory control.

At this point it should be noted that scheduling, dispatching and progress control are also functions of the production control department. The head of this department is responsible to the production manager. He schedules all production, follows the machine load, conditions or department manufacturing capacity and has charge of the expeditors or stock chasers. Speaking of stock chas-

STOP AND GO



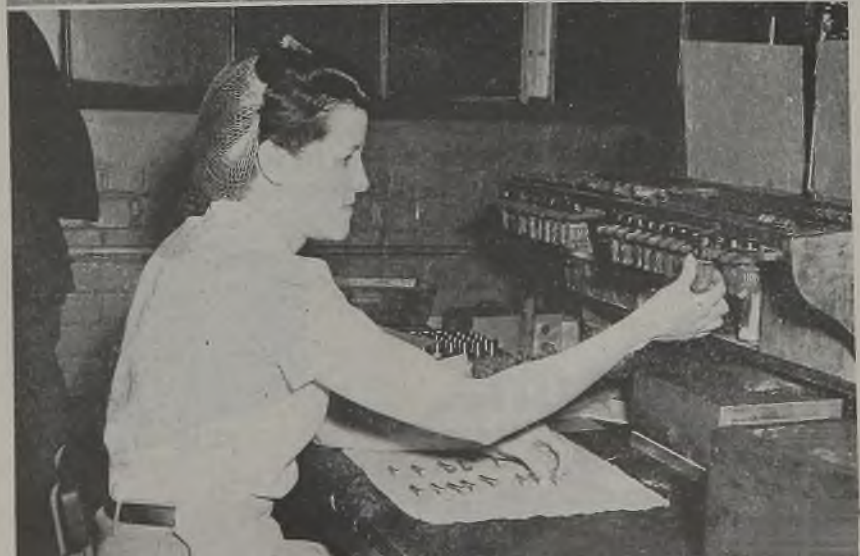
Modern, center-control fork trucks handle palletized unit loads; can also pick up and carry many types of loads without the use of any kind of dunnage. With batteries exchanged once or twice a day, they operate 24 hours a day with maximum dependability. Articles describing modern handling methods appear regularly in STORAGE BATTERY POWER. Write for sample copy if you do not already receive it.

In replacing a loaded skid box with an empty beside a machine, an industrial truck will make an average of approximately 14 moves forward, backward, up and down. A battery industrial truck has a natural advantage in this kind of stop-and-go service because it gets the necessary surges of power instantly from its battery, yet consumes no power during the stops. Thus it is not only economical of power, but the electricity used for charging its batteries is low-cost power.

Its electric-motor drive operates quietly, without vibration, and thus with well-nigh negligible repair requirements. With batteries exchanged two or three times per 24 hour day, it is continuously supplied with power and, since one battery is charged while the other works, the truck need not stop work for servicing of its power unit.

For 24 hour-a-day material-handling work, therefore, a battery industrial truck is an inherently dependable and economical machine, especially when powered by Edison Alkaline batteries. With steel cell construction, a solution that is a natural preservative of steel, and a foolproof electrochemical principle of operation, they are the longest-lived, most durable, and most trouble-free batteries. *Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, New Jersey.*

Edison
ALKALINE BATTERIES



(Top to bottom)
This counting machine for small parts helps Ohio Tool keep accurate inventory records

Work is expedited through the shop by move clerks. "Move" tickets are attached to each tote pan

Tool control is of prime importance in controlling production. All tools are marked for identification purposes

ers, they watch the progress of the work, and work closely with the foremen. They help eliminate bottlenecks in the plant and keep the material moving smoothly between the various departments or, in other words, act more or less as co-ordinators of material.

Scheduling, or preparation of production schedule, is the principal planning function of production control. The two basic scheduling functions are: Establishing the time that operations will occur on individual orders, and laying out the work to be done in the various departments. The scheduling of an order involves assigning a starting and completion time for each operation.

Move Tickets Help Expedite Work

Dispatching is the next step in production control after scheduling. Dispatching means putting things in motion or starting them on their way. It means, in terms of production control, initiating the first operation on a job and making certain that the work flows smoothly from one operation to another. Production control clerks maintain their desks or dispatching stations in the departments throughout the plant. As the work flows in and out of the department, the clerk maintains inventory records and maintains a complete stock control. Blueprints on all jobs, along with our routings, are kept filed in the departments for the use of operators and foremen.

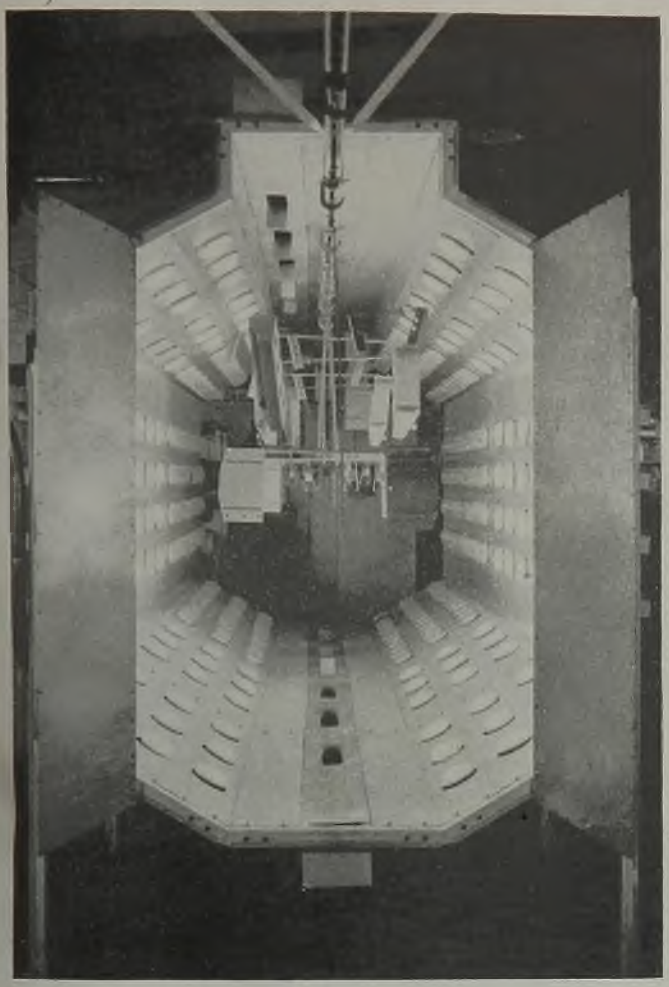
A move ticket is a form commonly used to handle goods after each operation. The presence of a move ticket on a tote pan is an authorization to stock handlers to move the work to its next destination. These move tickets show the information regarding the materials to be moved, the order number, department from which they are being moved and the destination department.

Dispatching is related to expediting to the extent that it covers movement of goods between departments. One function of expediting is to see that goods are not shunted aside. The functions of expediting may be divided into two parts. First, the personnel engaged in following up on slow moving work and second, the tools used in making this follow up.

One duty of the expeditor consists in detecting slow moving orders and pushing them through to completion at or near their schedule date. The expedi-

(*Please turn to Page* 131)

Infra-Red Radiant Heating Equipment ... Engineered for Efficiency



A conveyorized or batch oven of 90 KW capacity with variations in heating intensity for the drying and baking of finish coats on miscellaneous parts used in the fabrication of office furniture, such as filing cabinets, file drawers, ink stands, letter racks, and small desks.

• C. M. Hall Lamp Company has engineered practical innovations in the field of infra-red radiant heating which have become standard in the design of infra-red ovens as a production tool. Among such advances are:

COMPLETELY ENCLOSED OVENS PERMITTING FULLEST USE OF HEAT — BOTH RADIANT AND DERIVED CONVECTED HEAT, ASSURING BETTER TEMPERATURE CONTROL.

PREFABRICATED PANEL CONSTRUCTION — SIMPLIFYING ERECTION AND REDUCING OVERALL COST.

REMOVAL OF ALL VITAL PARTS (WIRING, LAMP BASES, AND SOCKETS) FROM THE HEAT ZONE TO OUTSIDE THE OVEN WALL.

POSITIVE VENTILATION CONTROL THROUGH THE USE OF EITHER A RECIRCULATION OR AN EXHAUST SYSTEM.

These exclusive Hall features are built into infra-red equipment employing radiant heat sources varying from 250 watts to 1000 watts.

C. M. HALL LAMP COMPANY INVITES YOUR QUESTIONS AS TO HOW INFRA-RED RADIANT HEATING EQUIPMENT CAN SOLVE YOUR HEATING PROBLEM

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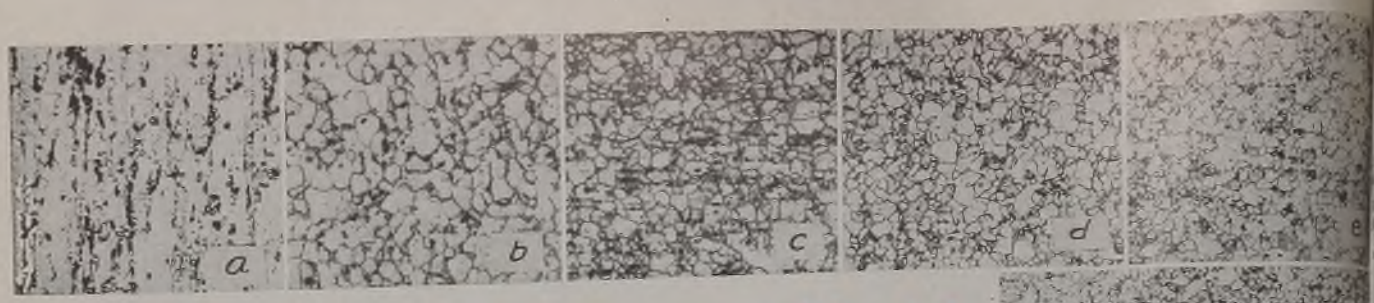

Pilot Rolling Mills

aid in checking physical specifications in relation to chemical composition

By R. L. HARTFORD
Pittsburgh Editor, STEEL

BUYERS of metals—ferrous and nonferrous—have long been accustomed to maintaining their own laboratories to determine whether the material purchased complied with their specifications. In the past, the function of these laboratories has been largely chemical, in that metals were specified on chemical analysis, and therefore the check was primarily to see that the producer kept his bargain. Later, some physical properties assumed greater importance and began to take their place alongside chemical specifications.

In recent years, there has been a strong

(Above)—Results of a typical series of tests on tinplate provide an example of what may be learned through research with pilot mills. These photomicrographs show what happens to tinplate when more than the usual number of temper passes is employed. All are 120 *diameters. Nital etch. From left to right (a) as rolled condition, Olsen cup test* 0.100-*inch; (b) mill anneal, Olsen cup test* 0.333-*inch; (c) one temper pass, Olsen cup test* 0.272-*inch; (d) two temper passes, Olsen cup test* 0.266-*inch; (e) three temper passes, Olsen cup test* 0.299-*inch; (f) four temper passes, Olsen cup test* 0.261-*inch; (g) five temper passes, Olsen cup test* 0.250-*inch; (h) six temper passes, Olsen cup test* 0.250-*inch*

(Below)—Pilot rolling mills are being used by a number of companies to check the effects of rolling on steel and metals purchased. This test is being run on strip