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# STEEL

The Magazine of Metalworking and Metalproducing

# OCTOBER 2, 1944

Volume 115—Number 14

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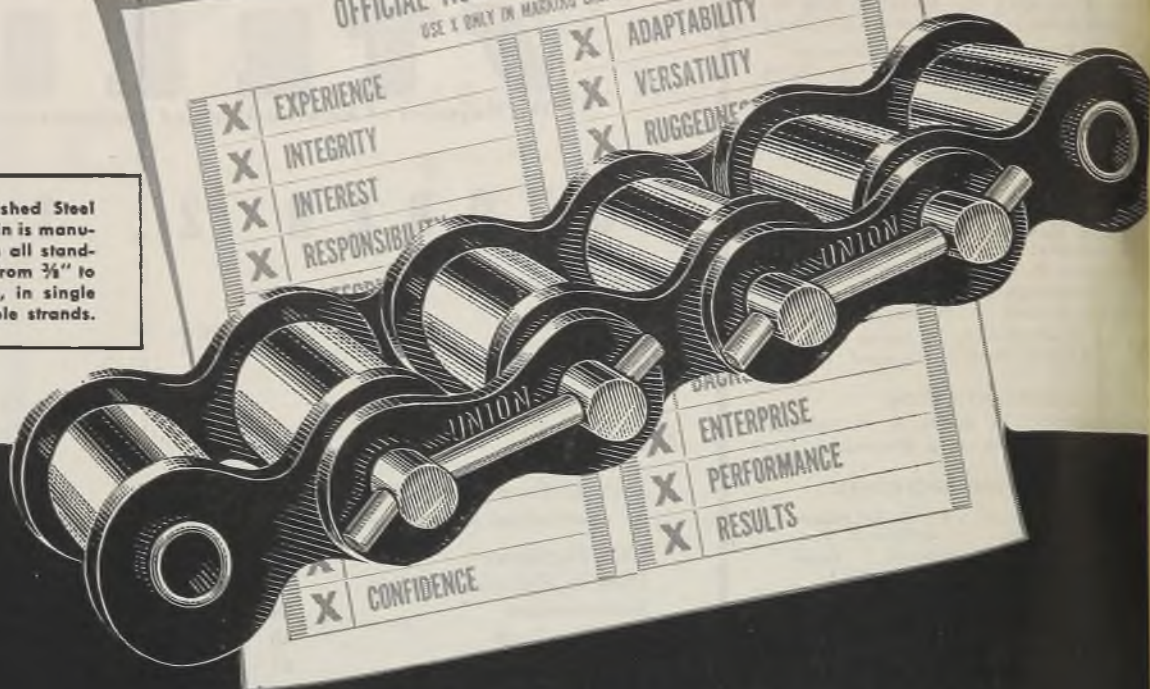
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## The Gremlins Must Go

An incident occurred in connection with the long-drawn out controversy over the Little Steel wage formula which is typical of the strategy employed by a leftish wing of the present government administration. It deserves attention because it illustrates clearly the imperative need for a change which will restore integrity in the relations between government and industry.

Fred M. Vinson, director of economic stabilization, had asked Chester Bowles, OPA administrator, to determine whether or not the steel industry could absorb any wage increases if the Little Steel formula were modified. Presumably Mr. Bowles turned over the request to OPA economists. In due course a young subordinate was instructed to make a study of steel prices and wages with a view of answering Mr. Vinson's question.

Under the normal procedure, the young man would make his study, write a report and submit it to his superior, who after approving it, would submit it in turn to Mr. Bowles. But in this instance, the young man's report apparently did not go through this routine. Somehow it "leaked" out and its text was presented in some detail in the newspapers. The report was highly favorable to the CIO side of the argument. It attempted to prove that the steel industry could absorb an increase of 17 cents per hour without an increase in the prices of steel sold.

Naturally the publication of this biased report caused trouble. Steelmakers protested the tactics, saying they should have been shown a copy before it was released so that they could reply to its charges. Mr. Bowles was chagrined. He said the report was routine, preliminary, confidential and inconclusive. "I have not examined it," he declared, "much less discussed it with members of my staff."

This unfortunate occurrence has all the earmarks of the kind of planned "accident" at which the little band of anti-business bureaucrats is so adept. These gremlins, a few of whom have been planted in almost every agency, always are on the alert to kick business in the teeth. They thwart the will of Congress, throw monkey wrenches into the administrative machinery of bills they do not like and otherwise make life miserable for numerous, well-intentioned, hard working departmental and agency heads.

The under-handed tactics of these gremlins are condoned by White House authority. There can be no integrity in government-business relations as long as they remain on the job.

**BEHIND SCHEDULE:** Plans for reconversion of plants and facilities from wartime to peacetime needs still are in a state of confusion. Numerous proposals have been made by individuals representing government and industry, but thus far actual progress in preparing for the shift is disappointing.

Some spokesmen for industry are concerned because they feel that the lack of preparedness will prolong the period of readjustment unnecessarily.

Speaking at a meeting of the National Industrial Conference Board, George Romney, managing director, Automotive Council for War Production, bluntly charged government agencies in Washington with fumbling and delay in preparing for the transition from war to peace. "Failure of the government to authorize preparatory activities for partial reconversion suggested by the automobile industry beginning a year ago," he asserted, "already has lengthened the period of unemployment that will

occur during the partial reconversion period if the war in Europe ends before December."

Mr. Romney declared that the government should place "all preparatory lead-time activities ahead of all other work except war work of the highest urgency."

Unquestionably, the administration should give reconversion a higher priority than it now enjoys.

—pp. 36, 45, 46

**NEW ROLLING MILL:** Can manufacturers have exercised a notable influence upon rolling mill practice in the steel industry. They had much to do with the advent of cold-rolled tin plate and will have a voice in the utilization of the electrolytic tin plate lines after the war ends. Now their demands have brought forth a mill, the chief characteristics of which were described at the fortieth annual meeting of the Association of Iron and Steel Engineers in Pittsburgh last week.

This mill was designed to meet the request of canmakers for a tin plate of greater temper hardness with satisfactory ductility and flatness for fabrication. It works on the principle of continuous stretching in producing these properties. It can be used not only for tin plate but for autobody sheets, furniture sheets and stainless steel panels.

The idea of stretching the metal while it is being rolled introduces interesting possibilities which will bear watching by consumers of rolled steel. —p. 36

**ERECTING "TIN FISH":** An aircraft torpedo, familiarly known as a "tin fish", is an intricate precision instrument. It consists of five sections, made up of 4000 pieces, weighs about three-quarters of a ton and is 18 feet long. Although the sections are permanently riveted and sweated together, a finished torpedo with its ends supported on horses will sag as much as 1/32-inch.

An eastern machine tool builder manufacturing these torpedoes for the British government has adopted unique methods to insure accurate alignment in construction and assembly. It assembles the weapons vertically, eliminating sag, and establishes a common vertical center line for the jigs, fixtures, mandrels and arbors. After each section has been completed, all five are erected on a vertical turret lathe, which serves both as a working machine tool and as a giant jig. This procedure insures proper alignment and concentricity of the sections.

This is another fine illustration of how American ingenuity in manufacturing methods is contributing to the war.

—p. 70

**RESEARCH TRIUMPHS:** After a long period of experimental work, scientists have succeeded in producing a promising new motor fuel—triptane—in tank car lots. An idea of the potency of the new fuel is afforded by the fact that a 12-cylinder Allison airplane engine has developed 2500 horsepower on triptane whereas its rated take-off horsepower with 100-octane gasoline is 1500. Authenticity for the merit of the new product comes from the fact it was developed in the General Motors laboratories under the direction of Charles F. Kettering.

If the new fuel lives up to expectations, it will effect important changes in fuel production and—more important—it will result in unpredictable modifications in the design and construction of internal combustion engines.

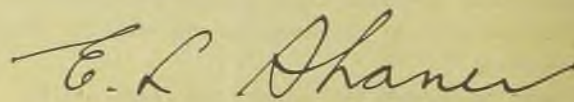
This single development again accents the importance of industrial research. Almost every week witnesses the dedication of one or more new laboratories. This is practical fore-sightedness for the postwar period.

—p. 49

**OUTPUT VS. EMOTION:** Reactions of the American public are notoriously mercurial. When our troops are advancing rapidly we go all out for optimism. When they are held to small gains we suffer an acute attack of pessimism. Recognizing this national trait of going to emotional extremes, high personnel in the Army and Navy repeatedly have warned the people against undue optimism on the ground that it may cause a serious letdown in production.

From the standpoint of mass psychology, this argument probably is sound. However, the cold figures of actual production indicate that however mercurial the man in the street may be, his reactions have not influenced production importantly. The highest point in munitions output, according to WPB's index, was recorded first in December, 1943, when the index number was 118. After slight recessions in January and February, 1944, the index again touched 118 in March. Since that time its lowest level was 113 in July. The preliminary figure for August is 115.

The record shows a stability which suggests that we may be overstressing mass psychology. —p. 66



EDITOR-IN-CHIEF



*Ryerson flame-cut steel plates being loaded aboard Zephyr for Denver shell-loading plant*

# Ryerson Rushes Emergency War Steel . . .

***Prepared and delivered 1200 miles in 23 hours!***

Disaster—damaging as enemy bullets—struck a Denver shell-loading plant. An all-important casting had cracked. Weeks were needed to replace the broken part. Production of desperately needed anti-tank shells was threatened.

At 10:30 the morning of the breakdown, a Ryerson service man suggested flame cutting steel plates to the required shape. The order was immediately phoned to a Ryerson plant 1200 miles away.

Plates of a thickness needed for the job were in Ryerson stocks ready for such an emergency. Just four hours after the order reached us, the steel was cut to shape and on its way. At 5:30 that afternoon, the Denver Zephyr pulled out with the plates—still warm from the burning operation. The shell plant got its steel at 9:30 next morning. This record-break-

ing Ryerson delivery not only saved weeks of production time—but the flame-cut plates were stronger than the casting they replaced—and cost less!

When you have a problem of steel supply, application or fabrication that needs an extra measure of "know how", extra speed and cooperation—get in touch with your nearest Ryerson plant. Stocks in the eleven-plant network are the nation's largest, including: bars, plates, structurals, sheets, tubing, stainless, alloys and many other steel products. Service is always quick, accurate, personal. It will pay you to call Ryerson for steel.

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- It permits most economical utilization of steel with minimum scrap loss. Nesting of parts, stack cutting, and multiple-torch cutting are some of the ways in which its fullest economy may be realized.
- Its accuracy effects considerable savings in machining time and cost, and often makes finish-machining unnecessary.

In view of these important advantages, more and more design engineers are including machine gas cutting in their new product plans. Some indication of the wide range of shapes currently being produced is shown by the parts illustrated above and at the right.

If you want further details on the scope of machine gas cutting and the many new design freedoms it offers, representatives of Air Reduction's Field Engineering Division will supply full information. Write to Dept. S, New York office, for further information.

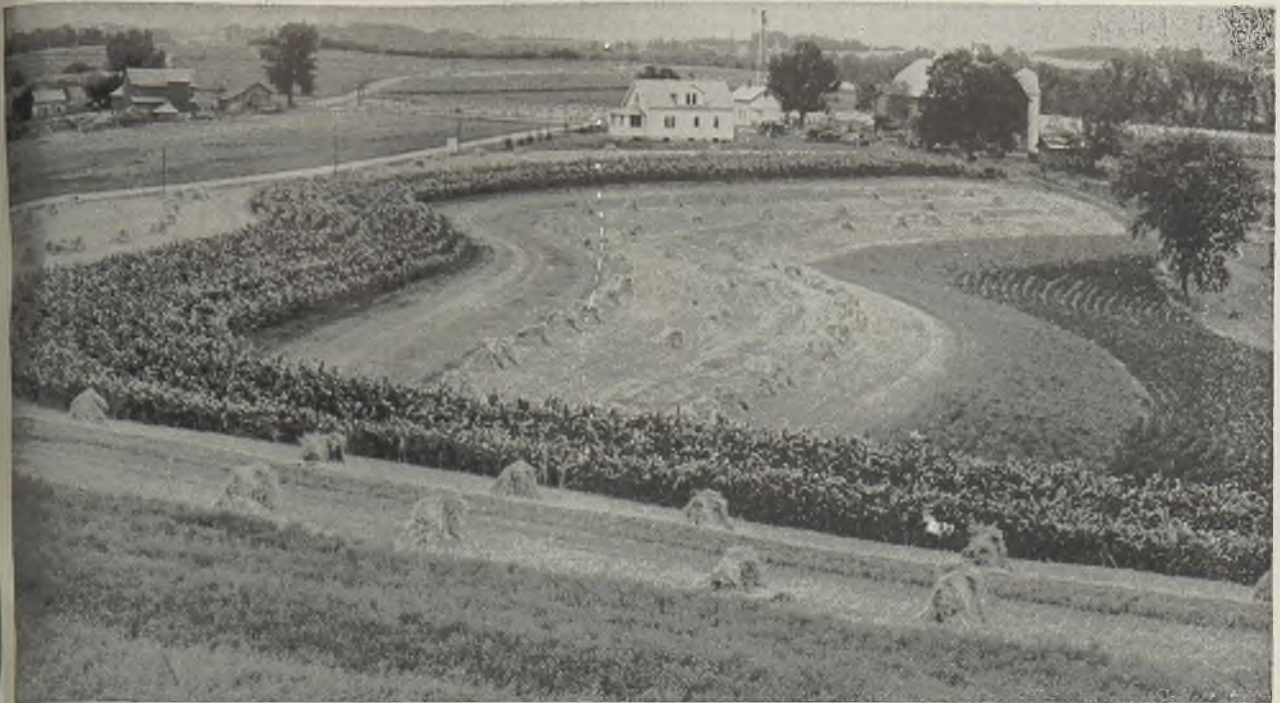


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*This illustration shows a fine example of farm terracing and strip cropping. Much special equipment will be needed to adapt some 2,250,000 farms to this type of treatment after the war*

## Farm Mechanization Expected To Increase in Postwar Period

DEMAND for farm machinery will be much greater after the war than it was before. This is the consensus of agricultural observers. Their belief is based on this economic concept: If the farmer is to be on equal basis in exchanging the products of the soil for the mass-produced goods of industry, he must employ mass-production methods on his farm.

The agricultural field holds bright prospects for many manufacturers, large and small, old and new, in the postwar period. The opportunities here are worth close examination by producers of castings, forgings, bearings, motors, metal finishing processes, welding equipment, and many other types of parts and equipment adaptable to farm use.

Vast numbers of farmers had learned their mass production lesson before the war. Additional vast numbers, under the twofold pressure of an acute shortage of farm labor and an unprecedented demand for farm products, have learned it during the war. They have found that by mechanizing they can get out their crops at lower cost and with

*Wartime labor shortage and higher requirements for food have taught farmers benefits of mechanized mass production methods. Much machinery is badly worn and will necessitate replacement when materials restrictions are lifted*

greater profit, and with far less back-breaking work. On the basis of experience, few farmers who have become informed of the benefits of mechanization will go back to manual methods.

Effect of this further pronounced trend toward mechanization has been the subject of concern to some postwar planners. They fear a sharply reduced demand for farm labor will add to the seriousness of any unemployment problems that develop after the war. The average farmer, as a result of unfortunate experiences, would like nothing better than to be able to get along without any labor at all, they believe.

A typical comment is that by Dr. T. S. Buie, engineer with the Department of Agriculture's Soil Conservation Service. "Should there be a demand upon ag-

riculture to absorb a large number of the workers returning from the war, I do not believe that farmers as a whole will resort to outmoded methods just to supply work for the surplus labor. The war has focused farmer attention on the part machinery can play in increasing production, and most farmers will wish to make the most efficient use of labor that can be made," says Dr. Buie, as reported in a recent issue of *Agricultural Engineering*.

Farm mechanization gained all over the country during the war, even in the middle western and far western areas where mechanization already had been firmly established before the war. All during the war, farmers in the middle western and far western states were unable to get as much new machinery as

they needed to combat the labor shortage and meet the demand for food.

But the most spectacular mechanization program has taken place in the East—particularly the Southeast where the introduction of machinery has wrought an agricultural revolution. In the old days when labor was plentiful in the Southeastern states, cotton was the major crop and it was customary to plant and cultivate cotton by using Negro farm workers who walked behind a mule and a plow. When the Negro workers left the farms to obtain employment in shipyards and other plants, the farmers had no alternative except to resort to tractors. Since then, the Southeastern farmer has discovered a lot of things that can be done with tractors and tractor-operated farm tools.

For example, under the influence of the tractor, the horse and mule population has been declining sharply in the Southeast, as it previously had in the mechanized farm areas. The farmers in that section are planting less hay and grain for draft animal feed. Instead, they are using more of their land for

crops whose production is facilitated by the use of tractors and tractor-operated implements—crops such as vegetable oil seeds and garden truck. With simple, inexpensive equipment, the farmer is able to plant, fertilize, spray, cultivate and harvest vast acreages of such crops with a minimum amount of labor. What is more, the taste the Southeastern farmer has had of farm machinery under emergency conditions has given him an appetite for more. Farm agents report that many of these farmers already are anxious to throw out their present mechanical equipment as soon as they can replace it with new 2-row planters, 2-row cultivators, corn pickers and the like.

Statistics as to future demands, though incomplete, offer a rough guide. On the basis of a recent census estimate that 2,000,000 tractors were on farms on Jan. 1, 1944, it can be figured conservatively that several hundred thousand of these are due for replacement either because they are badly worn or should be superseded by newer, more powerful units. Additional thousands will be needed to

replace horses and mules, for the population of farm draft animals is declining at the rate of some 250,000 annually. This means a demand for at least 100,000 tractors a year just to replace these animals, Department of Agriculture authority says.

Or, take farm trucks. Informed estimates are that some 500,000 farm trucks are needed now to replace trucks which have been in operation for more than 10 years. Without making any allowance for the fact that many farm trucks worn out in less than 10 years, it is certain that farm demand for trucks will be large in the immediate postwar period.

Still another factor is regarded as auguring a good postwar demand for farm machinery. That is the development of a number of highly desirable new machines whose manufacture on any sizable scale was prevented by the war. Among the most intriguing are the new small combines known as "all-crop" harvesters, for gathering soy beans, wheat, oats and other grains. Improved corn pickers, pick-up hay balers and a number of other items are regarded as sure to find a good-sized market after the war. Improved specialized machinery for which there is an active demand include the newer units for mechanizing the production of sugar beets and sugar cane. Use of tobacco transplanters also is gaining rapidly.

### Needs Remain To Be Solved

Many farm mechanization needs remain to be solved through the ingenuity of machine designers. Sugar beet harvesters, for example, do not yet meet conditions in all the growing districts. Another need is for machinery to facilitate the use of beet tops as livestock feed. The mechanical cotton picker, expected to prove the most revolutionary new farm machine in a generation, still is subject to further development before it is ready to meet general needs.

Consensus among agricultural engineers is that the following standard farm machinery will be most in demand in the immediate postwar period: Tractors, engine-powered and power take-off combines, pick-up hay balers, trucks, trailers, manure spreaders, hay loaders, general hay and harvesting machinery, mold-board plows, one-way plows, disk harrows, spike-tooth and spring-tooth harrows, also all sorts of tractor-operated farm tools. In other words, the emphasis will continue to be on labor-saving equipment.

The prospect for the sale of manure spreaders and fertilizer placement machines is worthy of special mention because of the expansion in the use of such

*There should be an active demand for special equipment such as this improved basin-lister in the postwar period for retaining moisture in arid and semi-arid agricultural areas*



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*A hay chopper, still in the experimental stage, is indicative of the new labor-saving tools the farmers will demand after the war. The implement chops the hay as it picks it up. Attached is a blower to carry the hay to the mows*

equipment. It now is widely used in connection with cotton, tobacco, tomatoes, corn, peanuts, garden truck, sugar beets and many other crops. Fertilizer placement machinery now is widely used all through the grain belt where its use before the war had been rare. This trend is expected to continue.

A factor that will bring about increased use of machinery by farmers in postwar period is the wartime discovery of the full significance of the soil and water conservation program launched by the Department of Agriculture some years previously. It took the war, with its huge farm programs, to emphasize the necessity for putting every potential acre to use.

Under soil and water conservation come a host of operations. These include terracing and contour farming, strip cropping, rotation of crops, furrowing of pastures, stream bank protection, roadside erosion control, irrigation, ditching, soil stabilization, rehabilitation of springs and wells, flood prevention and numerous other activities.

Conservation is here to stay because it pays dividends. Reports from 450 farmers in Georgia show that conservation increased production of cotton 26 per cent, corn 46 per cent, oats 15 per cent, peanuts 13 per cent and tobacco 9 per cent. Surveys in a number of agricultural regions showed that contour farming lowers tractor gasoline consumption by anywhere from 9 to 20 per cent.

Many farmers have accomplished their terracing, ditching and related operations with standard equipment such as standard and disk plows, harrow or wheatland plows, V-drags, slip scrapers, dragline, etc., using their own time and hence not spending any cash.

But there is a lot of special equipment for making terraces, digging ditches, leveling land and performing other operations on a large scale and in a hurry. For example, there are "land planers" 24 feet wide for terracing and digging drainage

and irrigation systems. There are hydraulic lifting mechanisms for loading dirt into trucks or trailers and for numerous lifting chores. There are road graders or terracers especially designed for maintenance of river levees.

This whole program throws out new opportunities for agricultural engineers and manufacturers. The farmers of the country have been "sold" on the benefits of conservation and are ready to listen to anybody who has something to help them at this job. In many instances the individual farmers are potential customers. In many more instances such equipment can be sold to contractors, to soil conservation districts or to county governments, for use in conservation work on a contract basis, or for rental to those farmers who want to do the work themselves.

#### Program Contains Possibilities

This program holds numerous possibilities for manufacturers. A good understanding of the possibilities may be had by talking with any regional soil conservation engineer. The magnitude of the prospect is indicated by estimates by soil conservation authorities who say there is an immediate need for terracing some 90,000,000 additional acres of cropland, representing some 2,250,000 farms. Soil conservation farming, they add, has led to a need for rebuilding farm fences on a huge scale after the war.

The farmer will emerge with numerous other needs in the postwar period. There will be a big demand for small hand tools. Farmers are in need of large quantities of barn equipment, according to county agents. In particular, they expect a big demand for such specialized equipment as poultry brooders, incubators, watering cups, etc. Too, all indications point to a big farmer demand for all sorts of electrically operated equipment

after the war as a result of the farm electrification program. This demand will include not only various types of farm apparatus, but household refrigerators, washing machines, etc.

No accurate analysis of the farmer's potential purchasing power in the postwar period—of the farmer's financial ability to buy all these things which he needs or desires, is available. However, it is known the farmer has enjoyed unprecedented net earnings during the war and it has been said in informed quarters that the total indebtedness of farmers has been reduced to some \$5 billion and that their cash position has improved materially.

What, then, are the prospects for the sale of farm products after the war? The answer to this question depends to a large extent on the postwar demand for farm products to rehabilitate and maintain the people of the war-torn countries in Europe. Up to a few months ago there was not the slightest doubt anywhere that this demand would be sufficiently large to prevent any surplus farm production in the United States for at least a couple of years. Recent experience, however, shows the peoples of occupied and ravaged countries are able to produce large quantities of food as soon as they are able to put in a planting and harvest the crop. Present indications are that the principal food deficits in Europe in the immediate postwar period will be dairy products, meat and other protein foods, sugar and some grain. Depleted herds must be rebuilt, the soil must be re-fertilized and at least some machinery, principally tractors, will be needed. In addition to food for humans, Europe will need to import a considerable amount of grain, oil-cakes and other livestock feed. There is some conjecture at present about

*(Please turn to Page 152)*

# Postwar Steelmaking Problems Discussed at Pittsburgh Convention

Fortieth annual meeting of Association of Iron and Steel Engineers highlighted by discussions on new methods for imparting high temper to strip, mill maintenance, precleaning prior to coating, and developments in intra-mill communications

**PITTSBURGH**  
SOLUTIONS to immediate postwar problems including a new method for imparting high temper to strip, new kinks on steel mill maintenance, new methods of preclaiming steel prior to coating and new developments in intra-mill communications highlighted the fortieth annual meeting of the Association of Iron and Steel Engineers, William Penn hotel, Pittsburgh, Sept. 25-27.

High point of the operating sessions was the unveiling of the unitemper mill, which was described by M. D. Stone, manager, Development Department, United Engineering & Foundry Co., Pittsburgh.

The new mill was designed in answer to the requests of can manufacturers for a tin plate of greater temper hardness with satisfactory ductility and flatness for fabrication. It is known as a unitemper mill and works on the principle of continuous stretching in producing these properties. The mill will be utilized for making autobody sheets, furniture sheets, stainless steel panels, and other strip mill products.

To meet some of the demands of can-makers, Mr. Stone stated that temper pass mills were built heavier and stronger to withstand rolling loads sometimes higher than those encountered in rolling for reduction in gage in cold strip mills.

The mill, which was tested and perfected in co-operation with the Republic Steel Corp. at Niles, O., and recently placed in full production there, appears to be a conventional 4-high mill because it has four rolls mounted vertically in the mill stand, but operated on an entirely different principle.

In the mill the strip is continuously processed by a stretching operation and to the extent necessary to obtain the desired temper, hardness and ductility in the strip while the mill operates at between 2500 to 3000 feet per minute. More will be said concerning the details of the mill and its operation in about 60 days when patents in foreign countries will have been secured.

Despite adverse transportation conditions, registration at the convention topped 2000. Hundreds were unable to secure tickets for the banquet.

At the banquet Tuesday evening the Kelly award for 1943, which was established to honor the late John F. Kelly and to perpetuate the memory of his achievements in the advancement of the association as its managing director 1917-1934, was presented to A. J. Fisher, fuel engineer, Bethlehem Steel Co., Sparrows Point, Md., whose paper on "Relation of Flame Character to Open Hearth Operations" was judged of highest merit as a contribution to the advancement of engineering and operating practice in the iron and steel industry. The presentation, the first since its inception, was made by Charles L. McGranahan, president of the association, and assistant general superintendent, Pittsburgh works, Jones & Laughlin Steel Corp., Pittsburgh.

"We are winning the war on the industrial front in such a startling manner that we have a right to expect that we can win the peace with equal success." This

## NEW OFFICERS

### President

J. L. Miller, Assistant Chief Combustion Engineer, Republic Steel Corp., Cleveland.

### 1st Vice President

J. S. Murray, Chief Electrical Engineer, Follansbee Steel Corp., Follansbee, W. Va.

### 2nd Vice President

F. H. Dyke, Assistant General Manager, Wheeling Steel Corp., Steubenville, O.

### Secretary

A. J. Fisher, Fuel Engineer, Bethlehem Steel Co., Sparrows Point, Md.

### Treasurer

J. D. Jones, Chief Engineer, Youngstown Sheet & Tube Co., Youngstown, O.



J. LEDLIE MILLER

J. Ledlie Miller, assistant chief combustion engineer, Republic Steel Corp., Cleveland, was elected president, Association of Iron and Steel Engineers, at its convention in Pittsburgh last week.

was the opinion of G. P. Comer, economic advisor, Antitrust Division, Department of Justice, Washington, who was the principal speaker at the banquet. He spoke on "The Transition from War to Peace."

"We have an enormous job to do, however, and the appraisal of this job is the first requirement. This appraisal requires a review of some statistics. We have doubled the annual national output since Pearl Harbor. At that time the gross national product was approximately \$100,000,000,000. Now it is more than \$200,000,000,000. The encouraging thing about these figures is that we have picked up the war effort on the industrial front and set it on top of the civilian economy without crushing it. Civilian production is still running around \$100,000,000,000 annually and the additional \$100,000,000,000 for war has been added.

"Doubling our national product has gone hand in hand with sending 12,000,000 of the best men and women in the country into the armed services. Another 10,000,000 or 11,000,000 have gone into the war plants. Adding up the workers on the industrial front and on the war fronts we have 65,000,000 working and fighting today, as compared with 45,000,000 in 1940. When the war is over the return to peacetime pursuits of these 20,000,000 men and women will require enormous readjustments. Not all of them must find new jobs. Approximately 10,000,000 women, older men and boys will return home and to school, leaving "full employment" at about 55,000,000 workers. This is 10,000,000 more than were employed when the war began.

"In order to give jobs for 55,000,000 people when peace returns we've got to expand our productive facilities enormously. The Department of Commerce

estimates that this expansion must be in the order of 60 or 70 per cent or from a gross national product of around \$100,000,000,000 in 1940 to \$160,000,000,000 or \$170,000,000,000 in 1946 or 1947. This is a required increase that will tax the ingenuity of American industry almost as much as the war effort.

"While this expansion is going on to give jobs to the demobilized workers we have got to be on guard against several pressures. One of these is the pressure of inflation. In 1940 the annual savings of the people are estimated at \$7,500,000,000. In 1944 they are estimated at \$100,000,000,000 and if the war runs on another year they may reach the fantastic figure of \$150,000,000,000. If there should be great scarcities in some lines when the controls are lifted after the

war, the enormous purchasing power, coupled with the scarcities, may make an explosive mixture that will wreck us if we don't watch out.

"Another force against which we must be on our guard is restraints on production and employment to support a preconceived price level. This problem may not be acute in the early months after the war when the stock bins are being filled. The problem then will be to produce enough to supply the demand. But sooner or later industry will face the inevitable problem of choosing between maximum production and maximum prices. When this day comes the choice will be vital to the employment program. In the early 1930s many of the great industries of the country seemed to choose in favor of prices and against employ-

ment. The iron and steel industry, for example, showed a decline in prices in the early thirties of about 15 per cent, and a cut in the payrolls of 75 per cent. As Pittsburgh knows, steel payrolls are high now. If they are again cut 75 per cent when the crisis comes we are in for trouble of the first order. That is the biggest problem that Pittsburgh will face if and when the downward swing follows the reconversion.

"This sets the job then to be done—the maximum of production and employment area by area, city by city, and plant by plant. Unfortunately steel products being largely capital goods, rather than products for direct consumption, the industry may not be completely the master of its own fate. Therefore, it must co-operate with the consuming industries to make more steel, to build more buildings, to make more motor cars, and more refrigerators, and more freight cars, and more wire to fence the farmers' fields.

"Steel plants built during the war west of the Rocky Mountains will cause a shift in the industry if the new plants continue operation on a considerable scale. The new western capacity equals or exceeds the prewar consumption of steel mill products in the western area. Therefore, this market may be largely lost to eastern mills. This means new domestic uses and a greater export market if the increased capacities in the East are utilized.

"Imagination and ingenuity in producing and selling a million products at the lowest prices," Mr. Comer stated in conclusion, "is the only attitude that will do the job. In view of the war record there is no reason to fear the peace on the industrial and labor front."

## Society of Lubrication Engineers Formed

The American Society of Lubrication Engineers was organized Sept. 27 by a group of 54 lubrication engineers, educators from six leading universities, makers of lubricants and maintenance men meeting in Pittsburgh.

The corporation was formed to encourage co-operation of industry and the professions in advancing the knowledge and application of the art of lubrication, to support and stimulate study and development of lubrication techniques, to sponsor research not only directly in the lubrication field but in the fields of physics, chemistry, mechanics, engineering and other related arts and sciences.

President of the new organization is C. E. Pritchard, Republic Steel Corp. Other officers are: Vice president, Dean J. C. Peoples, Illinois Institute of Technology, and secretary-treasurer, Prof. B. H. Jennings, Northwestern University. Directors are: D. E. Whitehead, Carnegie-Illinois Steel Corp.; D. N. Evans, Inland Steel Co., and I. L. Harper, Lehigh Valley railway.

## Present, Past and Pending

### ■ BENDIX MASS-PRODUCING GUNSIGHT "BRAINS"

TEREBORO, N. J.—New gyroscopic gunsight "brains," which automatically "lead" enemy planes traveling at more than 400 miles an hour, at ranges of more than 400 yards and at much higher angles of deflection than was possible previously, now are in mass production here at Bendix Aviation Corp.'s Eclipse Pioneer division.

### ■ DISTRIBUTION CONTROLS LIFTED ON FARM MACHINERY

WASHINGTON—All rationing and distribution controls of farm machinery and equipment, except over corn pickers, have been ended by the War Food Administration.

### ■ TOOL STEEL SCRAP PRICE ORDER REVISED

WASHINGTON—Tool steel scrap order has been amended, changing allowable molybdenum content. Type 1 tool steel scrap now specifies tungsten content 12 per cent or more with maximum molybdenum content 11.5 per cent; type 2, tungsten content 5 per cent or more up to but not including 12 per cent with maximum molybdenum content 11.5 per cent.

### ■ ARMY AND NAVY ISSUE FIRST REPRICING ORDER

WASHINGTON—In the first application of title VIII of the Revenue Act of 1943, the Army and Navy have issued a joint repricing order on the Lord Mfg. Co., Erie, Pa., fixing fair and reasonable prices on articles required by both services, whether manufactured directly under prime contracts or indirectly under subcontracts.

### ■ CONSTRUCTION BACKLOG REACHES \$10.5 BILLION

NEW YORK—Backlog of construction projects, awaiting relaxation of government controls and the availability of manpower and materials, exceeds \$10.5 billion, according to F. W. Dodge Corp., New York.

### ■ DPC SELLS MACHINE TOOLS AT 61 PER CENT OF COST

WASHINGTON—Defense Plant Corp. has sold 789 machine tools to the Chevrolet Division, General Motors Corp., Detroit, for \$2,379,000, reports Jesse Jones, chairman, DPC. Sales price for the 22-month old machines, which had been under lease to Chevrolet, was about 61 per cent of their cost to the government.

### ■ STEEL DIVISION, WPB, PLANS CUT IN PERSONNEL

WASHINGTON—Steel Division, War Production Board, plans to release a large number of civilian and dollar-a-year men between now and Dec. 1.

### ■ INDUSTRIAL PRODUCTION INDEX RISES ONE POINT

WASHINGTON—Federal Reserve index of industrial production rose one point for August to 232, based on 100 for 1935-39 average, and compared with 242 for the like 1943 month. Index for iron and steel alone also rose one point to 203 and compared with 210 for August, 1943.

### ■ 600,000 TRUCKS TO BE BUILT IN YEAR AFTER V-E DAY

CHICAGO—Robert Black, president, White Motor Co., Cleveland, forecast in a speech here last week production of 600,000 trucks in the first 12 months after the end of the war with Germany, and an output of 1,000,000 vehicles in each of the following two years.



GEORGE ROMNEY

IN VIEW of the special importance of the automotive industry in the whole program of reconversion to peacetime production, much interest centered in New York recently in charges of George Romney, managing director, Automotive Council for War Production, of fumbling and delay in Washington in preparing for the transition of the automobile companies from war production to civilian work.

"The fact is," he declared, "that failure of the government up to now to authorize preparatory activities for partial reconversion suggested by the automotive industry beginning a year ago has already lengthened the period of unemployment that will occur during the partial reconversion period if the war in Europe ends before December."

He asserted that cutbacks and reductions in war orders and over-production of raw materials had made it possible months ago for the government to authorize reconversion work without interference with the urgent war production programs, and without lengthening the war.

#### "No Modicum of Understanding"

Mr. Romney spoke at the 262nd meeting of the National Industrial Conference Board Inc. at the Waldorf-Astoria hotel at a session devoted to questions pertaining to the resumption of civilian production.

"All I can say," the speaker continued, "as an explanation for the piecemeal way of setting up the automotive industry's preparatory reconversion program is that there is not yet a modicum of understanding of the relatively simple timetable which industry has to follow to get

# Automotive Industry Conversion Delayed By Government Policy

Trade leader tells Conference Board fumbling and delay in Washington in preparing for transition of automobile companies to civilian work already has lengthened unemployment period that will occur during partial reconversion

into production of any product."

The way to prevent lengthening of the reconversion unemployment period, he suggested, is the immediate issuance by the Director of War Mobilization for a directive rescinding and revoking all existing rules and regulations which interfere with planning and preparatory reconversion work where the work does not interfere with urgent war production programs. "This should place all preparatory lead-time activities ahead of all other work except war work of the highest urgency."

Mr. Romney said, "the American people are at the moment being misinformed about the facts of industrial reconversion—as much so as they were about the facts of industrial conversion to defense work and war production four years ago." He asserted that the people who must make the policies, not administer the program, are still perfecting policies to be followed in certain important lines of reconversion. He cited the matter of plant clearance for one thing, and said that on other major physical reconversion problems, "the facts are that the recent promising Krug statement and Mr. Byrnes' report to the president of Sept. 7, are unimplemented statements that have generated a lot of thinking and talking and paper work, but haven't permitted the raising of sweat on the brow of a single automotive employe in physical reconversion work." This is also true, he added, of the 4-point program announced June 18 by Donald Nelson.

The matter of lead-time has been "completely neglected and kicked around by the theoretical and political planners." This, he indicated, has been particularly unfortunate in view of the special problems arising in these abnormal times. He cited the special engineering and tooling that must now be done on some of the smallest parts of an automobile. He spoke of bushings, for instance. Some of these soft bearing materials have been and still are among the

most critical of war materials, and ways to conserve them must be utilized in the immediate postwar period.

At this time, he explained, instead of the prewar solid bronze bushing with a wall thirty-six thousandths of an inch thick, many automobiles will have to include a new type of bushing with the same thickness but consisting of a layer of steel under the layer of bronze so that the bronze is only nine thousandths of an inch thick.

"This saves 75 per cent of the bearing metal, but it causes new and complicated production problems," he said. First of all, the suitability of the bearing must be tested, he pointed out; second, in order to supply the types and sizes of bushings needed, the bearing supplier in this instance is going to have to expand his present facilities and obtain and set up new equipment.

#### Must Study Equipment

Meanwhile, tool engineers will have to study the types of equipment necessary to do the final machining and then either adjust their present equipment or obtain new equipment. All of this extra work, the speaker declared, is necessary because the type of tools used in cutting the softer bearing material will not work satisfactorily. To prevent frequent breaking of tools caused by tools cutting through the thin wall bronze into the steel, it is necessary that all of the related operations be much more accurately controlled than was necessary for machining the old type of bushings.

The automobile industry, Mr. Romney asserted, has been recommending for more than a year that it be permitted to use relatively infinitesimal amounts of materials and the few men required to take care of the engineering and testing and procurement of tools and dies and machinery and equipment during the lead-time period as exemplified in these small parts.

Discussing problems of plant clearance, the speaker said that while Con-

gress had fixed a maximum clearance period of 60 days, it appeared that it would likely be the minimum time rather than the maximum. "The 60-day period," he said, "does not start until an 'acceptable' inventory list has been filed, but no one has been able to find out what is meant by an 'acceptable' list. On the average it will take 30 days to prepare inventory lists, which added to the 60 days means 90 days will elapse before the physical job of actually clearing the plants can be tackled."

Two realistic recommendations by which the government could trim the plant clearance job to a minimum have been made by the automotive industry. The first, he said, is a suggestion that government representatives be trained and assigned to check and approve inventory lists as they are being prepared by war contractors, so the two jobs could be done simultaneously and the inventory items removed from plants without further checking, paper work or other delays. The second is that government agencies should determine in advance of termination the exact disposition to be made of war production equipment and materials.

With almost two million employees, the aircraft industry is due for a dip of 90 to 95 per cent in production once the war is over, A. M. Burden, assistant secretary of commerce, declared. Discussing the seriousness of the problem, he asserted that specific aspects fall into four main categories, the first having to do with question of surplus planes; second, surplus plants; third, contract termination; and fourth, the matter of maintaining research and development, not only during the difficult period of readjustment, but thereafter.

A "very tiny proportion" of the planes on hand on V Day will be suitable for civilian use, he declared. Tens of thousands of aircraft not susceptible of conversion to peacetime uses will be surplus. He estimated that the probable immediate postwar market for transport planes will range from 2000 to 3000 and that the surplus of transports will be doubled to three times this estimated maximum market.

As to surplus plants the aircraft industry today has approximately 175,000,000 square feet, or 16 times the total floor space of 1939. Of this area, nearly 132,000,000 square feet or 75 per cent are owned by the government outright or through the Defense Plant Corp.

With the aircraft industry's reports showing that its working capital is just sufficient to permit operations to continue on the present scale for two or three weeks after termination, the problem of contract termination is a serious one. If equitable settlements cannot be concluded and payments promptly dispersed, there is little chance of the aircraft companies continuing on; however, he believed the problem can be solved by a sound policy and intelligent administration.

Placing special emphasis on research

and development, he declared that research is the keystone on which rests the whole arch of the country's aviation structure, military and commercial.

It is not generally realized, he declared, that improvements in aircraft in the past 15 years have been due chiefly to improved detailed design. No basic new inventions have been recorded in this period. But now, however, for the first time in nearly two decades, some fundamental new inventions have entered the field in the form of jet propulsion and radar, and further work lies ahead.

#### Urges U. S. Plane Leadership

Effective reconversion of the aircraft industry, he believed, can only be carried out on the basis of a coherent national program designed to keep America first in the air and he added that such a program is now under development. Four fundamental requirements are an adequate air force composed of superior aircraft and competent personnel; training of youth to fly and service planes; expansion of foreign and domestic air transportation; and a strong manufacturing industry with continuing world leadership in research and development.

He looked for military sales to be of paramount importance to the industry for decades to come. With a 25,000-plane air force, purchases by the military each year, he said, would be 85 to 90 per cent of the industry's estimated immediate postwar sales, even assuming the very rapid increase in the sale of commercial and private planes. Dependence on the military will, of course, lessen as time goes on.

He spoke also of the vast expansion plans contemplated by the air lines—plans which will within a decade, he believes, result in an industry eight times as large as it was in 1941. He emphasized the importance of new landing fields, asserting that the 3000 now existing should be increased by at least another 3000 within the next five to 10 years.

"The paradox of today is that business wants a return to free enterprise, but that many business men are afraid to have wartime controls taken off," said Lionel D. Edie, president, Lionel D. Edie & Co., New York. "We expect bureaucrats and politicians to want to keep the controls, but when business men want to keep them, that is news."

Fearing that some competitors would get a head start in reconversion, many business men have wanted to keep quotas and production schedules. Charles E. Wilson, while with the War Production Board, overruled this approach and developed a postwar plan of sweeping removal of restrictions and this plan, he said, has been taken up by Julius A. Krug and has been publicly announced as official policy.

"When it comes to prices there is no similar plan of taking off controls," he declared. "Here again business men are afraid of free enterprise. They have been oversold on inflation and they favor continuing OPA ceilings until there are no scarcities any more."

He believed business men were making a mistake and that business needed an Office of Price Administration price

(Please turn to Page 152)



ASSEMBLY LINE AT FRONT: American soldiers and French civilians assemble Army, 2½ ton trucks at an ordnance depot in Normandy, France. Equipment and parts were supplied from depots in England, shipped there from America. NEA photo

# Tool Industry's Lack of Manpower May Delay Vital War Programs

*Plants unable to meet demands; overloaded with subcontract work and increased need for lathes of various kinds, special machines is greater. Shortage of workers may also prolong reconversion programs*

VITAL war programs will be delayed and reconversion of a number of key industries prolonged unless the manpower shortage in the machine tool industry is quickly corrected, say trade leaders. Within the past year, tool builders have lost one-third of their employes to the armed services or to other war industries of the nation.

At this time a year ago new tool orders were declining. Most builders were gradually able to supplement operations with subcontract work on such key war programs as components for diesel and aircraft engines, etc. About 30 per cent of the industry's operations are taken up with this subcontract work. Now with most of the industry tooled up to handle war subcontracts, increased tool demand is making it difficult for producers to meet all of the calls upon them, especially since the government procurement agencies will not relieve them of subcontract work. Conflict exists priority-wise between these contracts and machine tool orders. There are also serious situations arising in some plants due to heavy pressure to increase output on these subcontracts, or due to an over-estimate by the plant as to its ability to produce with a consequent crowded order position. In a growing number of instances miscellaneous war work is falling behind schedules set up by the government.

## Seek To Meet Demands

Ability to meet the sharp increase in war requirements for lathes of various kinds, including many special machines and automatics, also supplementary units for production of fuses and boosters, originating from the augmented demand for heavy shells, trucks, artillery and aircraft engines, is the chief concern of machine tool builders at present. They have not been able to again build up their working force to handle this unexpected new tool business. However, WMC is considering adopting a policy with the machine tool builders which is now in effect with automobile and engineering service companies in the Detroit area whereby a limited number of engineers and technicians would be supplied tool builders to help plan for reconversion of facilities for civilian production.

In contrast with the liberal treatment granted the machine tool industry by WPB in helping meet raw material requirements, the WMC has to date done

little to ease the industry's manpower shortage. Manpower assistance has not been given to the industry this year, nor has it received deferments for key personnel.

Industry officials point out five-month order backlogs at current rate of operations, at least for the present, prohibit any chance to commence work on the several thousand key machine tools already ordered and essential for swift reconversion to civilian production.

## Backlog at \$195 Million

The backlog of unfilled rated orders for machine tools on Aug. 31 last was valued at \$195 million, War Production Board officials state. This represents a decline from the \$211 million backlog reported Dec. 31, 1943. But it is substantially above the low point since this country entered the war of \$153,563,000 on March 31 last. Orders for the heavy trucks and ammunition programs, and special requirement of the Army air forces,

received in large volume through the second quarter this year, were chiefly responsible for the increase in the order backlog since last March.

In addition to the growing manpower shortage situation, delays in delivery of components, particularly integral and fractional horsepower motors, has hampered machine tool output. While this situation is somewhat better than during the first and second quarters, considerable improvement is still necessary, it is said.

Preliminary estimate of machine tool output for August is placed at \$36,500,000, up slightly from the July showing of \$33,916,000. This compares with August, 1943, output of \$87,827,000, and with the exception of July is the lowest monthly production recorded since July, 1940. For the first eight months of this year tool shipments amounted to over \$350 million, compared with \$883 and \$819 million respectively in like 1943 and 1942 periods.

Possible changes in WPB orders and regulations after the close of the European war were discussed at a meeting of the Machine Tool Industry Advisory Committee recently. The committee members recommended retention of the principles of distribution provided in general preference order E-1-b, also retention of preference order E-4 and limitation order L-147. The former covers delivery of second-hand machine tools needed for urgent war programs; the latter standardizes electrical equipment on machine tools.



**NELSON RETURNS:** Donald M. Nelson, chairman of the War Production Board, has returned to the United States after a month's mission in China studying the possibilities of increasing China's industrial output for prosecution of the war against Japan. Above he is shown with Generalissimo Chiang Kai-shek. Mr. Nelson's future plans were not immediately announced. NEA photo

# OPA Disowns Report Steel Industry Can Raise Wages Without Price Hike

*Survey by price control office, released by subordinate without authorization, seen as clever move by administration and union to pave way for pre-election gift to organized labor. Industry asks postponement until V-E Day*

ON THE eve of the opening of hearings before the War Labor Board on the United Steelworkers' demand for wage increases and other concessions, a survey indicating steel producers could grant the increase without advancing prices "leaked" out from the Office of Price Administration.

The report was promptly disowned by Chester Bowles, OPA administrator, who said it was routine, preliminary, confidential and inconclusive. "I have not examined it," Mr. Bowles said, "much less discussed it with members of my staff."

Mr. Bowles had been asked by Fred M. Vinson, director of economic stabilization, to investigate whether or not the steel industry could absorb any wage increase. The request was turned over to OPA economists and eventually reached the hands of a young subordinate, who prepared a report indicating the companies could grant the increase without any increase in prices.

The subordinate figured that the return to the 40-hour week and the elimination of overtime would make possible an increase of 8 cents an hour without inflating hourly labor costs. A further saving of 6 to 8 cents an hour to the companies would result from down-grading of workers who have been up-graded during the war, he said.

This is the same line of argument presented by union spokesmen.

The report, which normally would have been presented to Mr. Bowles for study by the administrator and his staff, was given to the newspapers and published just before the WLB hearings on the case opened Sept. 26. How the "leak" occurred remained an OPA mystery.

Steel producers were strongly critical of the incident, but were not overly surprised. As one representative put it: "Sure, it is the old one-two punch just before the wage hearing opens, but that is customary procedure in Washington today."

Philip Murray, CIO president, attempted to introduce the unauthorized report of the unnamed OPA "economist" into the record before the steel wage hearing of the full War Labor Board. The board threw out Mr. Murray's motion.

John A. Stephens, chairman of the Steel Case Research Committee, appearing before the full War Labor Board, demanded that in the interests of the nation at large and of the steelworkers them-

selves considerations of wage levels be postponed until industry has returned to peacetime production.

Warning that an increase in steel wages must inevitably lead to general wage increases throughout all industry and imperil the ability of private enterprise to maintain full employment during the reconversion period, Mr. Stephens

contended the steel wage case concerns the economic stability of the entire nation, rather than just the "self-serving cause" of a half-million steelworkers.

Mr. Stephens scored union leadership for the "organized drumming into the conscience of these workers that profiteering management and inconsiderate government agencies have unreasonably opposed the wage increases." He asserted that such practice by union leadership will undermine confidence which is "essential as a pervading attitude in either healthy war or peacetime economy."

The industry's spokesman reminded the board that the steel industry in the present case has been placed in the position of defending the government's own stabilization policies, and quoted administration officials as having repeatedly said that present stabilization lines must be held if disastrous consequences are to be avoided.

## POSTWAR PRELUDES

**FARM MACHINERY**— Demand for farm machinery expected to be much greater after the war than it was before. See page 33.

**AUTOMOBILES**— Director of Automotive Council for War Production charges fumbling and delay in Washington already has lengthened unemployment period which will occur during partial reconversion of automobile industry. See page 38.

**MACHINE TOOLS**— Builders of machine tools declare they are unable to obtain the necessary manpower required to produce machine tools for use in the postwar period. See page 40.

**CIVILIAN GOODS**— WPB conducting plant-by-plant surveys in order to insure industries producing products most important to civilian economy are among first to reconvert after "V-E" Day. See page 45.

**RECONVERSION**— Manufacturers of commercial cooking equipment will be in position to resume production for civilian market without delay when cutbacks in war orders occur and the manpower situation permits. See page 46.

**ENGINES**— Triptane holds revolutionary implications in the design and construction of all types of internal combustion engines and the related uses of metals. See page 49.

**WX SCHEDULES**— Cutbacks and readjustments in aircraft production which the AAF believes will be put in force at the end of hostilities in Europe embodied in WX schedules, which have been sent to aircraft contractors. See page 54.

**PEACETIME AIRCRAFT**— Manufacturers of airplanes on the West Coast do not believe postwar military demands for aircraft will be cut back to prewar proportions. See page 62.

**TAX PLAN**— Bendix Aviation Corp. executive urges tax plan to encourage risk dollars. Plan calls for a three-year tax-free incentive period to spur new developments. See page 64.

**MACHINE TOOL FLYWHEELS**— Widely adopted in wartime tooling for superspeed milling, flywheels promise important improvements in postwar milling machines and other machine tools. See page 68.

**VERTICAL ASSEMBLY**— Developed to simplify and speed aerial torpedo construction, vertical assembly based on center-line theory achieves new precision, balance and alignment. May alter some existing systems of assembly. See page 70.

## Small Business Assured Equitable Share of Civilian Goods Steel

*Armed services will inform contractors within next few weeks of intended cutbacks after Germany is defeated. Labor unions also to be notified. Allocations of steel to be eliminated and only one war priority will be retained*

SMALL business will receive supplies of steel needed for civilian production on an equitable basis with large business when War Production Board controls are removed and steel allocation is eliminated, the iron and steel industry advisory committee assured WPB officials at a recent meeting. Committee members indicated small customers are just as important to the mills as the large users.

J. A. Krug, acting WPB chairman, told the committee the reduction in military requirements after the defeat of Germany will free capacity for production of about 17 million tons of steel for civilian production. As a result, there will be enough steel to resume civilian production at the level of 1939.

"If the war with Germany ends suddenly," Mr. Krug said, "we feel that the only sound course of action would be to eliminate all WPB controls except those which are necessary to defeat Japan and maintain a balanced civilian economy.

"If the defeat of Germany comes more slowly, the 'spot authorization' procedure will care for the areas where unemployment may develop or where facilities may become idle. If the war with Germany lasts for eight or ten more months, the spot authorization procedure may have to be expanded and modified to care for situations which may develop all over the country.

"WPB believes that small business as well as large business favors relaxation of controls as soon as possible."

The committee agreed and assured the WPB officials that the steel industry will treat small business the same as large business in its operations during reconversion.

Hiland G. Batcheller, operations vice chairman, said there is no critical overall shortage of steel at present, but asked industry representatives to aid in bringing lagging production programs, such as heavy truck components, up to schedule.

After the defeat of Germany, Mr. Batcheller indicated, there is nothing more contemplated than a single war priority to govern steel deliveries. It is not contemplated that war production will be allocated among the various steel companies. Under present plans, one steel producer might be producing 70 per cent for war and another only 30 per cent.

Norman W. Foy, WPB Steel Division director, told the committee mem-

bers that the division has recommended "X-Day" relaxation of all iron and steel orders except those which relate to ferroalloys and scrap segregation.

Arthur H. Bunker, WPB's chief of staff, said the armed services are preparing to give prime war contractors information within the next two or three weeks as to what war contracts will be canceled or reduced when Germany is knocked out of the war. Prime contractors will be expected to inform subcontractors as to contract modification plans.

Labor unions also will be notified of contract reduction or cancellation plans insofar as this information can be made available on a regional basis.

### Clayton To Return Home When New Board Is Named

Will L. Clayton plans to return to his home at Houston, Tex., as soon as the President appoints a new surplus property disposal board in accordance with the

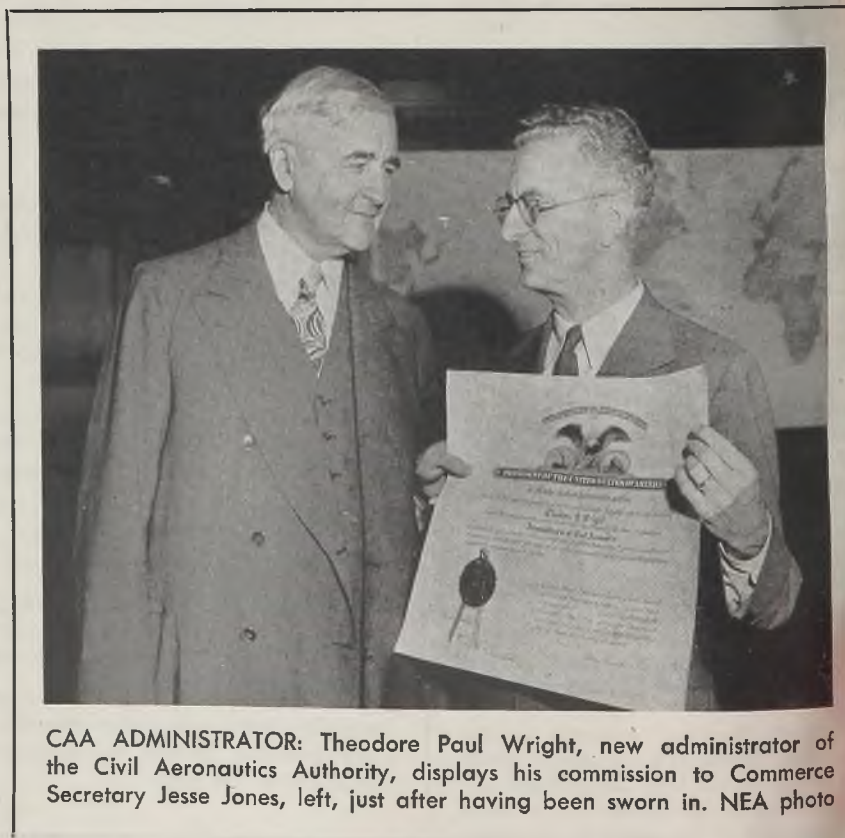
terms of the law passed by Congress just before its adjournment until after the elections. As administrator of the Surplus War Property Board created by executive order, Mr. Clayton helped prepare the property disposal bill originally approved by the House. The measure which finally emerged from the conference committee of the two houses he condemned as entirely unsatisfactory and one with whose administration he would not be identified. While Mr. Clayton has not announced any future business plans, he is expected to resume his old activities as a cotton merchant.

### Sees Great Future for Construction in Nation

If we look carefully at our economy, we will see that nothing is more important than a healthy building activity. The ups and downs of construction, as much as any one thing, help create that most serious threat to the continuance of our free institutions—widespread unemployment, Eric A. Johnston, president, Chamber of Commerce of the United States, said last night.

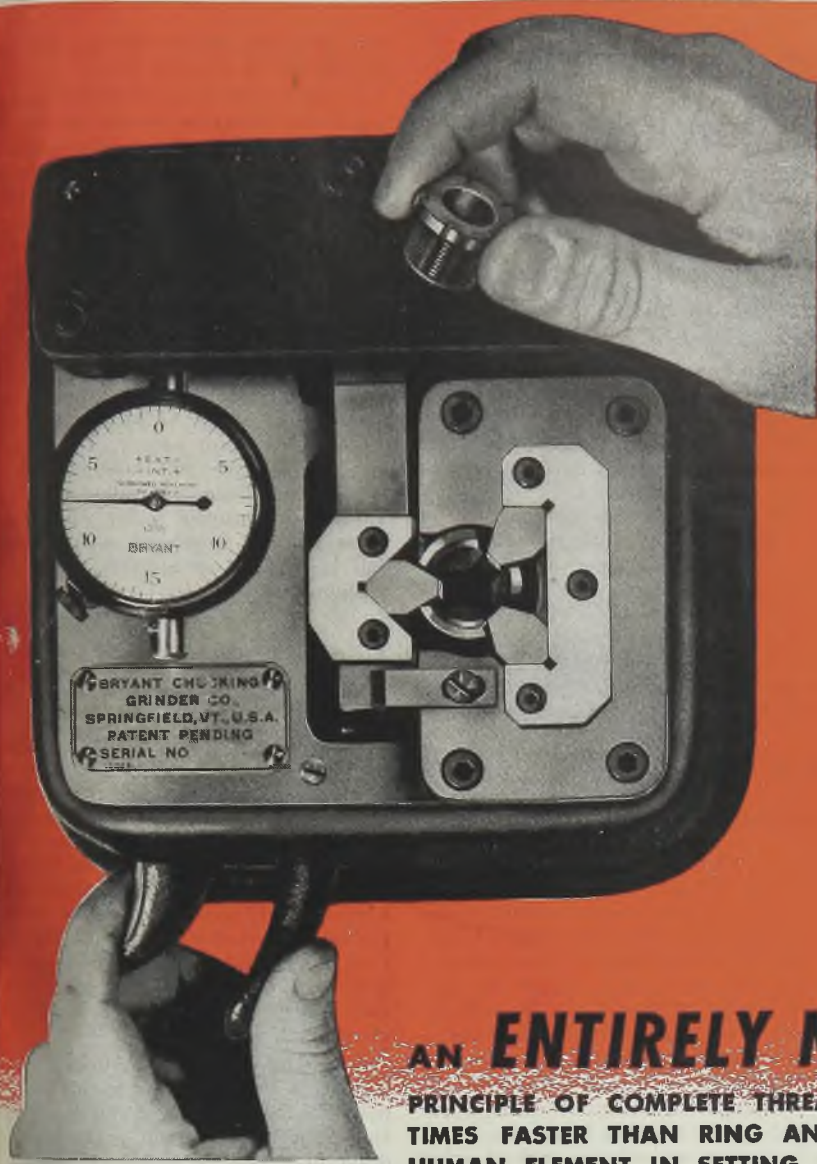
He said pentup demands, plus a high potential productive capacity, indicate a great future for construction.

"It is estimated that, postwar, there will be an available working force of some 55 million workers. Useful employment of that number should produce a gross national output of some \$140 billion at 1940 prices, or about \$2600 of goods and services per worker," Mr. Johnston said.



CAA ADMINISTRATOR: Theodore Paul Wright, new administrator of the Civil Aeronautics Authority, displays his commission to Commerce Secretary Jesse Jones, left, just after having been sworn in. NEA photo





# BRYANT THREAD GAGES

## AN ENTIRELY NEW

**PRINCIPLE OF COMPLETE THREAD INSPECTION THREE TO FOUR TIMES FASTER THAN RING AND PLUG GAGING — ELIMINATING HUMAN ELEMENT IN SETTING GAGE WITH MASTER PLUG AND DURING INSPECTION OF WORK PART.**

- ★ One unskilled operator replaces four or five skilled inspectors.
- ★ Gives complete over-all inspection in a few seconds.
- ★ Thread segments have many times the life of ring and plug gages.
- ★ Master gage accuracy transferred quickly to production parts.
- ★ Available in three standard models. (Special sizes on request.)

The NEW BRYANT THREAD GAGE checks the entire circumference of internal and external threads in a few seconds. The operator merely drops the part on the work rest, releases the control lever, and gives the work a *partial* turn only. The dial reading shows the accumulated inaccuracies in lead, taper, pitch diameter, thread form, and the presence of burrs or surface inaccuracies.

The Bryant Thread Gage makes it possible—as never before—to transfer the measurements of master thread gages accurately and quickly to the parts being produced—it eliminates tedious, slow, and expensive methods requiring skilled inspectors. Write today for illustrated folder No. G2 which gives complete details.



## BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD, VERMONT, U. S. A.

# Harnessing of Missouri River Urged as U. S. Postwar Project

*President urges Congress to give early consideration to creation of authority similar to TVA. Midwestern states' governors approve "one-river, one-problem" plan for developing basin. Arkansas and Columbia projects also to be studied*

PROSPECTS that the 2470-mile Missouri river might at last be harnessed in a manner similar to that employed on the Tennessee river are brightening. President Roosevelt has urged Congress to consider establishment of a Missouri Valley Authority. Earlier, governors of the states affected had adopted a resolution advocating a co-ordinated plan to develop the Missouri basin.

Nine states would be affected by the proposed harnessing of the river. They are Colorado, Wyoming, Montana, North and South Dakota, Nebraska, Kansas, Missouri and Iowa.

Benefits which would result from the project are flood prevention, improved navigation, irrigation, power development and kindred improvements. The Missouri is an annual spring threat to the industries and people in the river's basin; too much rain brings disastrous floods and too little rain means drouth. Last spring floods caused property damage estimated in excess of \$65 million, and the year before the damage amounted to \$47 million.

The up-river states are interested primarily in irrigation while the down-river states are more interested in flood prevention and development of navigation.

In his message to Congress, the President forwarded the resolution adopted by the governors of the affected states at a recent conference in Omaha, Nebr., in which they went on record for a "one-river, one-problem" plan for developing the region, and pointed out that there can be no effective piecemeal development program.

"The resolution," the President wrote, "asks that 'the Congress should recognize the problem in its entirety as it affects the people of the Missouri basin and their economic destiny and that of the United States.'

"I am in hearty accord with these principles. I hope that the Congress will give careful and early consideration to the creation of this federal authority to consider the problem in its entirety, remembering always that any appropriations to carry out any plan are and will be within the complete control of the Congress, and that the interests of each state in the basin will be, of course, given full consideration.

"I am sure that none of the states in the Tennessee river basin has lost any of their rights because of the creation of the authority in that valley."

The President noted also in his message that he had suggested similar au-

thorities for the Arkansas river watershed all the way west to its source in Colorado, and for the Columbia river basin in Washington, Oregon, Idaho and Montana. He renewed these suggestions in his latest message.

Bills calling for the development of the Missouri, Arkansas and Columbia river basins have been introduced in Congress periodically over the past few years.

It is the opinion of many congressmen that the development of the great river basins may constitute a portion of the federal postwar public works projects.

## MRC To Buy Excess Stocks of Planemakers

To avoid unnecessary loss to the government, Metals Reserve Co. has agreed to take over from aircraft manufacturers for a nominal sum of \$1 certain excess stocks of raw materials, parts, components, etc., which they cannot use and must dispose of, according to Jesse Jones, Secretary of Commerce. The materials to be purchased include odd lots, odd sizes and shapes resulting from design changes.

The program is being undertaken in cooperation with the War Production Board and upon recommendation of the Surplus

War Property Administration. Principal reasons for the program are:

1—To prevent the uncontrolled marketing of such materials, through speculation and scrap dealers who otherwise would buy them from the aircraft manufacturer at sacrifice prices, thus seriously affecting the market value of government-owned materials reported as war surplus; and

2—To inventory and segregate the material, some of which can be redistributed for war production and for other useful purposes.

The proceeds of the sale of the materials, when redistributed or disposed of as surplus, will accrue to MRC, a wholly owned government agency. The aircraft manufacturers who sell these materials to MRC have obtained a ruling from the Treasury Department under which their losses resulting from such sales to MRC will be allowed as inventory losses for tax purposes.

## Decree Entered Against Bar Reforming Industry

Civil consent decree has been entered in the United States district court at Chicago, enjoining trade practices in the rail joint bar reforming industry, charged to be in violation of the Sherman Antitrust act. The decree requires dedication to the public of certain patents which were pooled under agreements which the court decreed were illegal. The decree also prohibits patent infringement suits based on the reforming of rail joint bars into their original shape or into an unpatented shape.

According to Assistant Attorney General Berge, the decree, by freeing the industry of the operation of certain patents and of restricted patent practices, will result in substantial savings to the rail-



No smoke pours from the stacks of this smelter at Omaha, Nebr., as the Missouri river leaves its banks in the 1943 flood. Millions of dollars of property damage have been caused by the annual rampages of the Missouri, contra which now has been proposed to Congress. NEA photo

## Most Important Civilian Goods To Be Given Green Light First

*War Production Board conducts plant-by-plant survey to determine which industries should have war contracts canceled immediately after Germany's defeat. Especial attention to be given factories producing component parts*

STEPS have been taken by the War Production Board to insure that industries making goods most important to the civilian economy are among the first to reconvert after "V-E" Day.

WPB industry divisions were asked by Hiland G. Batcheller, operations vice chairman, to prepare lists of plants which should be cleared of war work as soon as possible after the fall of Germany. Mr. Batcheller's memorandum, it was reported, was intended to insure that such companies will not be tied up with war work and thus prevented from taking advantage of the sweeping removal of materials control that will follow the Nazis' defeat.

WPB will use the plant-by-plant list in recommending to the procurement agencies where war contract cancella-

tions should be made. The products for which such lists were sought include: Automobiles, telephones, typewriters, vacuum cleaners, washing machines, water heaters, streetcars, air conditioning equipment, electric fans, electric ranges, buses, laundry equipment, office machines and equipment, oil burners, trucks, railroad passenger cars, sewing machines, coal stokers, commercial cooking equipment, mining machinery and commercial refrigeration.

Emphasizing the importance of parts and components, which are more likely to hinder resumption of civilian goods than are raw materials, Mr. Batcheller asked the division to make a careful check of the companies which supply motors (including fractional horsepower), gears and other parts.

## Western Senators To Ask Continued Stockpiling of Strategic Metals

A DRIVE to continue stockpiling of strategic metals to assure adequate quantities for national security will be launched by western senators when Congress reconvenes in November.

The westerners are dissatisfied with the 15-month "freeze" provided in the surplus property bill approved by Congress and believe the stockpile should be continued in the postwar era. The surplus property bill provides the Army and Navy munitions board should report to Congress within three months after hostilities end on what metals should be included in the stockpile and that, barring congressional action to the contrary, the metals should be sold within a year.

These provisions were described by Sen. Edwin C. Johnson (Dem., Col.) as "only a temporary respite" for mining interests and said stockpiling should be continued throughout the war and long enough after to establish a peacetime reserve. He contended this country should never again be caught in the position it was in when it entered the war when the government found the metals it needed were not available in sufficient quantity.

Sen. Eugene D. Millikin (Rep., Col.) urged that no limitation be placed on the stockpile until "we have an adequate supply to take care of our defense."

Sen. Chan Gurney (Rep., S. D.) favors

a more comprehensive stockpiling program, but believes the provision in the present bill was the best obtainable due to opposition in the lower house to continued stockpiling.

## Plow Bolt Industry Studies Proposed New Standards

Revision of S.P.R. R23, for plow bolts, has been approved by a committee of the industry and copies of the simplified practice recommendation have been mailed by the Division of Simplified Practice, National Bureau of Standards, to interested parties for their consideration and approval.

## Steel Locker Simplified Practice Standard Revised

Revision of simplified practice recommendation R35-28, Steel Lockers, has been approved for promulgation, according to the Division of Simplified Practice of the National Bureau of Standards. It will be effective when materials become available. It omits two sizes of single tier, adds two sizes of double and three sizes of multiple tier lockers, and changes size of one multiple tier locker.

roads in the cost of rail reforming, represents an important step in the Department of Justice's program to limit patents to the precise terms of their grants, and should make the industry more attractive to new capital.

## Quincy Adams Quits Commerce Department

Quincy Adams has resigned as head of the Division of Small Business, Bureau of Foreign and Domestic Commerce, Department of Commerce, to become director of market research with International Economic Services Inc., 270 Madison avenue, New York. In this new capacity he will be particularly interested in serving small and medium sized companies that have been occupied with war work and are faced with marketing and distribution problems in the immediate post-war period.

## U. S. Merchant Marine Now 35 Million Tons

America's merchant marine has grown from 1340 ships with a total of 11,850,000 deadweight tons at the time of Pearl Harbor to 3400 vessels with a deadweight tonnage in excess of 35 million. This story of the growth of merchant shipping is contained in a report of the War Shipping Administration by Adm. Emory S. Land.

Shipments from United States ports last year totaled 46,971,000 tons of dry cargo, of which all except 10,375,000 tons went in WSA bottoms. The total of petroleum products hauled to war fronts by tankers was 15,086,000 tons. An increased flow of essential imports also was hauled in WSA vessels. Imports of 20 such commodities last year totaled 15,366,793 long tons, 26 per cent more than in 1942.

## Expect Heavy Increase in Sugar Machinery Orders

A large increase in export and domestic orders for sugar machinery and equipment is expected after the defeat of Germany, according to members of the new sugar machinery and equipment industry advisory committee, the War Production Board reports.

Heavy demands for replacement parts and new facilities for sugar processing in the West Indies and South America, after "V-E" Day, are expected, the committee members said. They are also of the opinion that sugar machinery and equipment, believed destroyed by bombings in Europe and the Far East, is in urgent need of repair and replacement.

To plan for future production, industry members recommended immediate elimination of distribution controls from order L-292, which limits distribution through preference ratings.

# Stove, Enameled Ware Industries Study Reconversion Proposals

*Deferred allotment procedure for obtaining steel may be set up for stovemakers. Enameled utensil industry urges removal of size restrictions on cooking, household and hospital enameled items. WPB reports on steel supply situation*

ALLOCATIONS of carbon steel for fourth quarter production of domestic heating and cooking stoves have been reduced by 3333 tons because of the acute shortage of that metal, the Domestic Cooking Appliance and Heating Stove Industry Advisory Committee learned at its recent meetings, WPB reports.

The reduction will be confined principally to production of coal and wood heaters and cooking stoves. Manufacturers' inventories of this type of equipment are sufficient to permit the decrease in carbon steel allocation.

Present scheduled production for the fourth quarter follows:

**Cooking equipment:** Gas ranges, 155,000; gas hot plates, 15,000; coal and wood ranges and stoves, 91,620; fuel oil ranges, 46,050; fuel oil cook stoves, 40,000; fuel oil table stoves, 40,000; fuel oil trailer stoves, 3000; combination bungalow ranges, 14,000; portable and drum stoves, 70,075;

**Heating equipment:** Gas radiant and bathroom heaters, 100,000; gas circulators, 65,000; coal and wood caboose stoves, 27,000; coal and wood school-room heaters, 300; coal and wood laundry stoves, 25,000; other coal and wood stoves (magazine, wood circulating, etc.), 100,150; sheet metal with cast iron grates, 15,000; other sheet metal stoves, 120,000; fuel oil portable heaters, 75,000; other fuel oil heaters, 51,490.

It is estimated that production under this program, however, will meet only 55 per cent of the controlled (rationing) demand for this equipment.

In discussing the reconversion problem, a WPB official said that a deferred allotment procedure for obtaining steel and copper is now being considered. Under this plan, a manufacturer who anticipates a cutback in his war contracts could request a "Z" allotment of material that would permit him to place his order on a mill schedule. The "Z" allotment would be shipped after regular CMP quarterly allotments have been filled. This deferred allotment plan is now in effect for aluminum, it was explained. The "spot authorization" procedure would not be very effective in this industry, it was pointed out, because manpower is now seriously limiting production under current approved programs.

Manufacturers of commercial cooking equipment will be in a position to resume production for the civilian market without delay when cutbacks in war orders occur and the manpower situation improves, the industry advisory committee

reported at its recent meeting. No serious reconversion difficulties are anticipated, since manufacturers in this industry have continued to make their normal products during the war period. Production schedules under the expanded quotas in order L-182 in general are being met satisfactorily, despite occasional difficulties in obtaining malleable castings and despite the manpower shortage.

Manpower is the most serious hindrance in current production, the committee said. This situation would be considerably eased, however, if manufacturers could return to the use of stainless steel since its use would greatly reduce processing time.

A small quantity of stainless steel (type No. 302, No. 1 finish) is available in a steel mill excess inventory as the result of a canceled order, WPB reported. If the material is usable for commercial cooking equipment, it will be made available for that purpose. Information concerning the purchase of this material may be obtained from the Appliance Branch, Plumbing and Heating Division, WPB.

At another advisory committee meeting, that of the porcelain enameled utensil industry, removal of size restrictions on cooking, household and hospital enameled ware utensils in preparation for the resumption of peacetime production was recommended. This would enable the industry to use materials, manpower and facilities with maximum efficiency by permitting rapid shifts from one production line to another.

The committee also requested that additional steel be made available for use in the production of enameled ware for civilians in the fourth quarter, to prevent unemployment if military orders are cut back. WPB representatives said the steel sheet situation is expected to improve in the first quarter of 1945, especially if Germany is defeated before that time and if military orders are cut back. Production of both hot and cold-rolled sheets will increase if labor shortages do not interfere. They added that enameled ware manufacturers should experience little difficulty in placing fourth quarter steel allotments.

## Construction Equipment Output Shows Sharp Rise

Twice as many tractor-mounted cranes and shovels were shipped in the second quarter of 1944 as in the corresponding quarter of 1943, the War Production

Board reports. Second quarter shipments of angledozers and bulldozers and of power cranes and shovels were 55 per cent and 47 percent greater, respectively, than those reported in the like 1943 period. Unfilled orders at the end of the second quarter of 1944 were as follows: Contractors' pumps, 44,676; angledozers and bulldozers, 21,134; tractor-mounted cranes and shovels, 6862; graders, 4536; road rollers, 2917; contractors' concrete mixers, 2800; trenching machines, 1421; street sweepers, 484; and snow plows, 456.

## Resumes Production of Domestic Oil Burners

Material has been authorized for the production of 30,000 domestic type oil burners during the fourth quarter of 1944, for replacement and hardship cases, the War Production Board reported recently. Until order L-74 is amended, only those producers who can qualify under the "spot authorization" procedure established in priorities regulation No. 25 will be permitted to begin production of the burners.

## OPA Clarifies Ruling on Component Parts Pricing

Component parts and subassemblies of combatant items are excepted from the general maximum price regulation only when they are sold pursuant to a war contract or subcontract with the United States government or an allied government, and when they have no reasonable and practical civilian use, the Office of Price Administration ruled last week. This action does not affect component parts and subassemblies that are subject to specific price regulations.

## Demand for Communication Wire Continues Urgent

Manpower difficulties in communication wire production show no signs of easing, War Manpower Commission reported recently. Because of developments in the war theaters, this item has been added to the production urgency list and has been given a high priority rating. Production, measured by miles of wire, has gone up 5 per cent, however, in contrast to the 6 per cent deficit for July. Employment in 30 of the industry's key plants must be increased by 5700 by Nov. 1 to meet the demands of the stepped up program. On July 1 women made up 38 per cent of the work force in the 30 plants.

## Appointments-Resignations

R. L. Groover has resigned as associate director of Division of Railway Transport in charge of controlled materials, Office of Defense Transportation. S. E. Shoup has been appointed as his successor.

# 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

**MOTORS:** Repair shops needing standard, rebuilt fractional horsepower motors for replacement purposes may obtain information about where they can acquire such motors by writing W. T. Wessells, Used Motor Section, WPB, Temporary "E" building, Washington 25, D. C.

**TOOLS:** Extent to which priorities assistance provided by preference rating order P-43 may be used to get tools and tooling needed to make experimental models has been clarified by WPB. Tools and tooling (dies, molds, jigs, fixtures, patterns and other tools and equipment) used in making experimental models of articles, the manufacture of which is permitted under existing WPB orders and regulations without taking advantage of priorities regulation No. 23, may be obtained through priorities assistance under P-43 regardless of whether the tools and tooling are treated as operating supplies or capital additions.

For experimental models that cannot be made except through permission granted by PR-23, priorities assistance under P-43 may be used for getting needed tools and tooling only if they are charged as operating supplies. If they are capital additions, priorities must be obtained by the standard procedures for getting tools and tooling. The question of whether a particular tool or tooling item would be a capital addition is determined by the manufacturer's established accounting practice.

The cost of any tools and tooling for experimental models that could not be made except for PR-23 must be included in determining the cost of the models. PR-23 allows a person to make such models costing in the aggregate not more than \$5000 a month in a single plant. If the cost is greater than \$5000 a month for all such models of all products, application for authorization must be made to WPB field offices on form WPB-3879. All direct costs, such as materials, components, subassemblies, labor, designing and drafting, are included.

Under P-43, only AA-3 ratings are given for tools and tooling for making experimental models of products designed primarily for civilian markets. AA-2 and AA-1 ratings (in the case of serially numbered laboratories) are granted to get tools and tooling for experimental models of products for military use.

A person who is permitted to use P-43 priorities to get tools and tooling for experimental models may also use the priorities to get materials needed to make the tools and tooling himself.

## L ORDERS

**CONSTRUCTION:** Construction of certain utility buildings has been eliminated from restrictions of order L-41 and is now governed by restrictions in orders U-1, 3 and 4. Formerly, all utility construction was controlled by order L-41, with a \$1000 allowable exemption for the construction of any single unit building or group of buildings without obtaining WPB approval. Under the amended order, only sewage system utility construction is retained in order L-41, with a \$1000 exemption allowed for any building or group of buildings that will be used directly for a sewage system and owned by a sewage system operator as defined in the order. (L-41)

**BICYCLES:** Bicycles may again be produced on an industry-wide basis. Permitted weight per bicycle, exclusive of tires and tubes, has been raised from 31 to 42 pounds. They may again be equipped with chain guards, skirt guards, and stands. Any style of bicycle frame may be used, and the minimum permitted frame

measurement has been reduced from 20 to 18 inches. Production of luggage carriers, tanks, truss rods, braced handlebars and spring forks is still prohibited. Restrictions on the production of repair parts have been removed.

Manufacturers wishing to produce bicycles for civilians must file forms CMP-4B and WPB-3820 with WPB. Rationing of civilian bicycles has been discontinued. Limitation order L-52-a, restricting the sale and delivery of new adult bicycles, has been revoked. (L-52, 52-a)

**TRACTORS:** Order L-53-a, which required producers of small track-laying tractors (class V) to obtain WPB authorization before the tractors could be manufactured, has been revoked. However, track-laying tractors of all

## INDEX OF ORDER REVISIONS

Subject	Designations
Bicycles	L-52, 52-a
Cans	M-81
Construction	L-41
Machinery, Construction	L-217
Silver	M-199
Tractors	L-53-a
Utilities	U-1, 3, 4

## PRICE REGULATIONS

Magnesium	No. 314
Zinc	No. 81

sizes may be manufactured only in accordance with WPB approved production programs, and their distribution is controlled by order L-53. (L-53-a)

**CONSTRUCTION MACHINERY:** Order L-217, the construction machinery and equipment simplification and conservation order, and its 10 schedules, which limited the manufacture of the items to certain sizes or types, have been revoked. The schedules had covered: Portable jaw and roll crushers and concrete mixers; truck mixer agitators; pumps; tank car heaters and pumping boosters or circulators; bituminous paving finishers and heating kettles; bituminous materials maintenance units and patch plants; and asphalt surface heaters. The items covered by these schedules are still subject to production and distribution control under order L-192. Producers of these items are required to obtain authorization to produce them on form WPB-1689. (L-217)

## M ORDERS

**CANS:** Manufacture of cans from secondary metal (blackplate rejects andterne plate waste-waste) for the packing of 27 product classifications has been approved by WPB. (M-81)

**SILVER:** Domestic silver quotas for small independent manufacturers of less essential civilian products have been established by WPB. A manufacturer desiring to operate under this provision must have had a gross sales of all goods and repair services not exceeding \$35,000 in the preceding year. He cannot purchase more than 500 fine troy ounces of silver quarterly, and must do no toll processing. Only 25 per cent of his silver quota may be made into findings for his products on toll by others.

Manufacture of watch crowns and bows of domestic silver is permitted without quota limitations. Use of domestic silver is permitted for occupational, educational and recreational therapy, as well as art and trade schools and classes utilizing silver in their activities. Sale

of products resulting from this use may not exceed \$300 in value, or 100 troy ounces in fine silver content per student or patient, per calendar quarter. Treasury silver is to be used in the manufacture of desalination kits and for certain other uses under specified military contracts. A manufacturer of rolled gold-plate and gold-filled stocks, whose products come within the definition of "silver" under order M-199, now may use a self-assigned CMP symbol S-4 to obtain brass mill products for use as interliners for his manufactures. (M-199)

## U ORDERS

**UTILITIES:** Orders affecting utilities operations have been amended to simplify accounting and record-keeping under the Controlled Materials Plan. Requirements for detailed accounting for controlled materials used on large construction projects have been removed.

To make Office of War Utilities procedure conform to the policy established in the "C. I. Bill of Rights," extensions of electric, gas, water and central steam heating services to hospitals and other Veterans Administration facilities may be made on the same blanket basis as extensions of such services to Army and Navy facilities. Order U-1-a now permits extension of electric, gas, water and central steam heating services to Veterans Administration hospitals and other facilities without specific WPB approval (1) if the total cost of the material for each extension, exclusive of any part built by or for the consumer, does not exceed \$10,000 and (2) if the extension does not duplicate an adequate existing facility already installed or being used as a standby service. (U-1, 3, 4)

## PRICE REGULATIONS

**ZINC:** Sellers of primary slab zinc may add an amount not in excess of 20 cents per net ton to their maximum base price when, at the request of buyers, they load the zinc in railroad cars in such a manner as to facilitate their unloading by mechanical lift trucks. (No. 81)

**MAGNESIUM:** Listing of magnesium alloys in price schedule No. 314 has been expanded so as to include specific maximum prices for all ASTM alloys now being sold in ingot form. It also adds a new provision to the effect that the maximum price of any alloy not listed shall be a price reported to and approved by OPA. Exemption of sales or deliveries of magnesium alloys not listed in the amended schedule from the provisions of the regulation (except reporting requirements) is made by the amendment when the amount involved in a single transaction is less than 500 pounds, but such sales must be reported to OPA.

The complete listing of prices follows (maximum base prices in cents per pound): Commercially pure ingot, 20.50; selected magnesium crystals, crowns and muffs, 23.50, including all packing, screening, barreling, handling, and other preparation charges; magnesium alloy ingot, incendiary bomb alloy, 23.40, 50-50 magnesium-aluminum alloy, 23.75;

ASTM B93-41T: Nos. 2, 3, 4, 12, 13, 14, 17, 23.00; Nos. 4X, 11, 13X, 17X, 25.00;

ASTM B107-41T or B90-41T: No. 8X, 23.00; No. 18, 23.50; No. 18X, 25.00. (No. 314)

## Krug Appoints J. D. Small As Executive Officer, WPB

John D. Small has been appointed executive officer in the Office of the Chairman, WPB. Previously, A. H. Bunker had been appointed as chief of staff; and Hiland G. Batcheller as chief of operations. Thus, the top organization of the agency has been streamlined to deal with reconversion problems, J. A. Krug, acting chairman, WPB, said last week.

**T**HESSE are cylinders. These are beginnings—the start of a mightier machine than even war built. For it was the American Machine of Industry that built the American Machine of War—and its greatest job will be tomorrow: building a new world of Peace and Prosperity. It will be the most gigantic task man ever faced and it is as important in its details as in its conception.

The four plants of The Weatherhead Company have produced industrial parts such as these at the rate of millions every week. When Peace is restored we

will continue to make cylinders—and scores of other industrial necessities—as our part in the rebuilding of tomorrow's great peacetime world.

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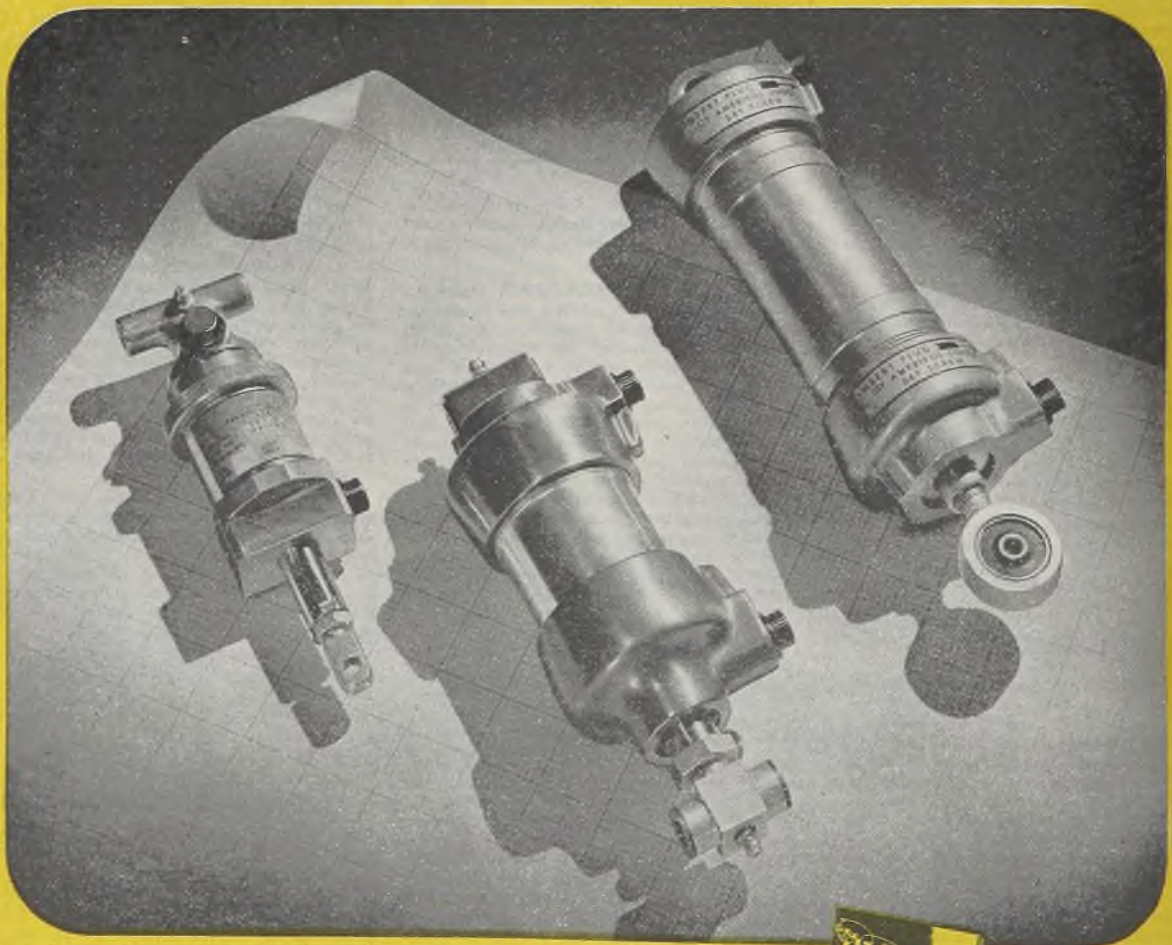
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**Method found to produce triptane, startlingly effective motor fuel, in tank car lots. Has power and economy advantages over 100-octane gasoline. Allison aircraft engine, rated at 1500 horsepower, produces 2500 horsepower with new fuel**

IMPORTANT studies have been under way for a number of years at the General Motors research laboratories on internal-combustion engine fuels, since as an engine builder the corporation stands to gain much from greater knowledge about the chemistry of combustion of the fuels in the engine to improve power and efficiency of the combination of fuel and engine. This research early showed definite limitations on the fuel-engine combination imposed by the destructive combustion disturbance called knock.

Although both fuel and engine are involved in knock, the power and efficiency of any one design of engine are dependent upon the extent to which the fuel used is free from knock and this in turn is influenced by the addition of such materials as lead tetraethyl, but still more importantly by even slight changes in the molecular structure of the atom itself, or in the way in which even the same number of atoms is linked together in space to form molecules. Such studies of molecular structure have shown that long thin molecules knock badly, and short compact ones of the same weight knock only a little, and that the differences between them may amount to several-fold changes in the potential power output of an engine using them.

All this sounds more than a little complicated, but it is merely prefatory to the announcement recently made by Charles F. Kettering, GM research chief, that a method now has been found to produce a substance called triptane 99 per cent pure in tank car quantities. Now triptane is known to fuel chemists as 2,2,3-trimethyl butane and was found years ago to be a startlingly good motor fuel based on the above considerations, but until recently it has been only a laboratory curiosity.

About 1939, some 300 gallons of the compound was prepared by the Dow Chemical Co. for the Ethyl Corp. by a laborious laboratory method using metallic magnesium, and running the cost to something like \$35 a gallon. Later research disclosed a much simpler method, details of which are still restricted except to persons obtaining proper government authority. The method progressed through laboratory, small-scale pilot plant and large-scale pilot plant stages until by the first of this year it was producing 5-10 barrels a day of 99 per cent pure triptane at a cost of a few dollars a gallon.

Next step was to run a series of single-cylinder and multi-cylinder engine tests, some of which showed amazing results. One, for example, using triptane with added tetraethyl lead amounted

to as much as four times the power and 25 per cent gain in economy over 100-octane gasoline. A 12-cylinder Allison airplane engine has been operated on triptane blends at an output of well over 2500 horsepower, although the rated takeoff horsepower with 100-octane gasoline is only 1500.

Research is now in progress to evaluate the commercial possibilities of triptane and related compounds, with some preliminary indication, according to Mr. Kettering, that the value of the fuel may justify the present cost per gallon. But more important, an engine development program is contemplated to see what may be done with engines and their applications to various uses, once the barrier of uncontrolled combustion has been removed to such a degree. The objective is to find the best combination of engine and fuel to give the greatest value per total dollar, irrespective of what form it may take.

### "Engines of Metal and Brains"

As Mr. Kettering expresses it, "As to what type of engine to build at any one time, it does not matter whether it be carburetor, injection, diesel 2-cycle, 4-cycle, nonreciprocating or whatever, so long as the overall economies are right. Engines are all made out of metal and brains and what we want to do is to put as much of the latter in as possible."

From the long-range point of view, triptane seems to hold revolutionary implications in the design and construction of all types of internal combustion engines, and the related uses of metals.

The machinery problem continues vexing for motor plants now moving in the direction of resuming passenger car production, but machinery interests do not take much stock in the plants' complaints that their principal problem is the "key" machine tools. They believe rather motor companies are seeking to obtain the latest types of automatic machines, with set feeds and speeds—equipment that requires no particular skill on the part of the operator other than to push a button. While such equipment has been designed and built, the machine tool builders at the moment cannot fill orders or even make delivery promises on nonrated automotive orders.

Actually, there are hordes and hordes of standard-type tools rushed through for the war production effort which are shortly going to flood the market. But the tool builders know, and the automotive company master mechanics know, that these will be obsoleted in no time at all, if they have not already been outmoded, so there is little point in installing them for car production when every last ounce will have to be squeezed out of costs to meet the expected high labor bill.

Machinery men laugh when they look forward to the flood of these machines being released from war plants and the effort is made to apply the carefully-theorized Clayton pricing formula to their resale. They think that maybe the British right now are being smart in unloading equipment which they own in this country (possibly upward of \$50,000,000 worth)



**DESTRUCTIVE POWER:** Armored cars fill the line in one of the Chevrolet main assembly bays. They have been in secret production for two years, primarily for the British

and which is now becoming surplus, under a pricing policy which is realizing 30 to 50 cents on a dollar. There are a number of instances of such transfers, and the beauty of the situation is that the buyer both acquires a machine at a fraction of costs and can put it into operation on postwar production at once if he can get the material and manpower.

Machines owned by U. S. agencies are wrapped up in all kinds of strings, and

for reconversion, but of course just when the latter date will be is at best a nebulous conjecture.

Around Detroit it is understood the principal changes in the first of the Nash lines will be fairly complete restyling of the front end (grille, lamps, bumper, etc.) plus a number of other minor decorative touches on other parts of the body. Mason predicted a continuation of the trend toward building

company will raise its output capacity to more than 500,000 cars a year as all restrictions are removed. In addition to the necessary plant expansion at Pontiac, several new assembly plants are planned throughout the country, with components shipped to these points for assembly and distribution.

At the moment, Pontiac has taken on a new assignment, the assembly of 37-passenger buses for the General Motors Truck and Coach division. Two floors of the Pontiac assembly plant are required to assemble the 9-ton buses. Fronts, backs and tops are assembled on the second floor and lowered by crane to the first floor where they meet the side and chassis assemblies and proceed down the looped assembly line. The buses are 35 feet long overall and the body is of all-metal construction, with roofs of riveted aluminum panels and steel braces.

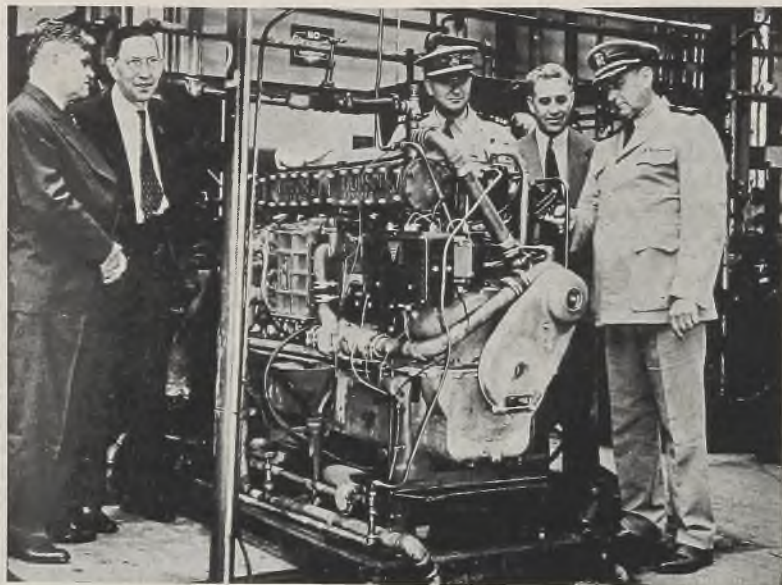
Among recent cutbacks of military contracts has been the projected suspension of production of turbosuperchargers used on the four engines of B-24 and B-17 bombers and built by Ford Motor Co. Employment in this department runs 2450 and work will be terminated Nov. 1, efforts being made in the meantime to determine whether the facilities can be adapted to other production or the employes shifted to other work. While the dollar volume of the cutback contracts amounts to more than \$170,000,000, they will be approximately 90 per cent complete by the end of this month.

### Workers Resent WMC's Action

One disturbing factor about employes released as a result of contract cutbacks is that the War Manpower Commission immediately attempts to move them to other high-priority jobs where wages or working conditions may not be as desirable as on the jobs they have left. Naturally the displaced employes resent this, and the original employer too may not like it.

Approval of the first "spot authorization" plans for resuming civilian production was granted three Michigan manufacturers last week by the local WPB office. Only a couple dozen applications for such authorization had been received, mostly from outside the Detroit area. At any rate, the Burnette Castings Co., Hartford, Mich., can now make 185,000 aluminum cooking utensils; the Handy Things Mfg. Co., Ludington, Mich., can now get going on 50,000 potato mashers and 57,000 potato ricers; and the Atkinson Mfg. Co., Ludington, can whip out 11,000 dozen closet accessories.

Chrysler Corp. has closed out its cartridge repackaging program on 45-caliber ammunition at its Evansville, Ind., plant and will discontinue packaging 30-caliber ammunition on Oct. 21, devoting full time to renovation and re-equipping 2000 medium tanks. Ammunition repackaged into steel cans totals 1,420,000,000 rounds, and required better than 2,000,000 cans plus 1,000,000 reinforced wood boxes.



**4000th ENGINE:** Hudson Motor Car Co., Detroit, has delivered its 4000th engine to the armed forces to propel invasion craft. With each engine delivering 250 rated horsepower, the 4000 engines represent more than 1 million horsepower. Pictured, left to right, are: E. A. Taylor, works manager at Hudson; W. G. LeFevre, assistant inspector of naval material for the Detroit district; Lieut. Comm. H. S. Dilcher, executive officer, Detroit Naval Inspection District; H. M. Northrup, vice president of Hudson, and Comm. Robert Velz, chief, Detroit Naval Inspection District, who accepted the latest engine

only a fraction of 1 per cent of the equipment listed with the SWPA has been released by the services to buyers. Another strange occurrence was the recent auction of some DPC equipment at an eastern plant. Many of the bids were higher than level established in Clayton formula, which figures depreciation on the basis of age of the machine. When the government was informed of the bids, it refused to release the machines on the seemingly ridiculous grounds that the bids exceeded the formula price.

George W. Mason, president of Nash-Kelvinator Corp., recently told his distributors in Chicago that Nash was "completely set" with a car-building program in both the low and medium price fields which will aim at trebling the company's prewar production figure. All initial supplies and parts are on order and much of the necessary machinery for production operations is ready. He said the first cars could be completed about 90 days after the signal is flashed

cars with integral body and frame structure and heralded the end of what he called the "30-year battle between horsepower and size and economy." It is naturally no coincidence that the smallest of the Nash models, known as the 600, embodied just such an integral body-frame construction.

Most car builders agree that their first production will have to be rationed to buyers from the standpoint of need and that those dealers, who are now accepting cash down payments for new models are just being foolish. M. E. Coyle of Chevrolet explains that while such rationing probably will be handled by the government, he wishes the motor companies could do it themselves since he feels they could "do a better job of it." What the builders likely will do is to allocate their initially limited production throughout their dealerships on the basis of cars sold in 1941, or over some base period.

H. J. Klingler of Pontiac declares his





# Everlasting Fastenings by HARPER *Chicago*

The Harper organization is known as "Headquarters for Everlasting Fastenings" because it specializes in the manufacture of bolts, nuts, screws, washers, rivets and accessories made of Brass, Naval Bronze, Silicon Bronze, Copper, Monel and

Stainless. Nothing in common steel. 4360 Items in stock. Specials made to order. Write for 104 pages, 4 color catalog and reference book. The H. M. Harper Company, 2646 Fletcher St., Chicago 18, Ill. Branch offices in principal cities.

## *Chevrolet aviation engine plant at Tonawanda, N. Y., now in third major expansion phase, typical of versatility required in design, construction and operation of war plants to meet the fluid needs of battle fronts*

TYPICAL of the versatility required in the design, construction and operation of war plants to meet the fluid needs of battle fronts is the aviation engine project operated for the government by the Chevrolet Motor division of General Motors Corp. at Tonawanda, N. Y.

This plant is now in its third major expansion phase, the latest scheduled for completion before the close of this year. Several phases overlapped during the construction period, and sandwiched in between was the interval of restrictions on structural steel, etc., so that when the project as currently laid out is completed, the two ends of the main manufacturing section will be of steel framework, with a midsection of reinforced concrete.

Further testing the versatility of the operators, general contractors and the plant's designer, Albert Kahn Associated Architects & Engineers Inc., is the fact that the size and the quantity of the Pratt & Whitney aircraft engines built and assembled here have been measurably stepped up since ground was broken for the first section of the plant.

This project stands adjacent to the peacetime Chevrolet Motor & Axle division at Tonawanda, and utilizes various service facilities of that plant. It likewise draws its steam supply from the boiler house of the motor and axle division, obviating the need for a separate boiler house.

Plans for the plant were drawn by the Kahn organization well before Pearl Harbor and construction got under way in

October, 1941. Original plans called for a one-story production layout, for the manufacture of parts and assembly of engines. No basement was called for under this area. A mezzanine was designed only for service facilities such as offices, lockers, lavatories, etc. At one end was provision for truck and railway receiving docks. A plant hospital is centrally located on the production floor. Structural steel forms the framework, with exterior walls of speed wall tile and steel sash. Asbestos protected metal extends from the sash to the roof line. The roof slab is of precast concrete tile with composition built-up roof. Floors are of wood blocks throughout the manufacturing area.

### Uses Overhead Conveyor Systems

All lights are fluorescent in the manufacturing area and both floor and overhead conveyor systems service the production floor.

After Pearl Harbor, and while construction was still under way on the first construction phase, it was decided practically to double both manufacturing and assembly areas and the test cell bank. This second construction phase got under way in April, 1942, and after it was well along, with contracts let for the necessary steel and other materials, the WPB ban on structural steel necessitated another quick change in plans. Without loss of time, the architects switched from steel to reinforced concrete framework structure and wood

sash, and the construction process continued without change in the building dimensions, although the juncture of steel and concrete sections is obvious in the exterior appearance.

The second construction phase was completed in May, 1943. It entailed not only the addition to the manufacturing and assembly area, but a considerable expansion of employe facilities because of additional manpower required. Concurrent with this phase, it was decided to add a separate office building connected by enclosed passageway to the original manufacturing area. This was started in June, 1942, and completed in September. It is a two-story wood frame structure, 170 feet by 40 feet, with a complete basement. Exterior wall surfaces are of speed wall tile with wood sash, and precast concrete trims the window sills and lintels.

The third construction phase was initiated in May, 1944, to provide for the manufacture of a different and larger engine. This called for a further plant extension, to be completed this month and complete rearrangement and modification of all existing test cells, the latter scheduled for completion by Dec. 15.

The plant is now being extended to match the original structure. Since structural steel is again available, this latest addition follows the pattern of the original building, with structural steel framework, steel sash and exterior dimensions identical with the first building in the layout. Likewise floors, lighting and other interior arrangements are similar. Mezzanines are also being included to house additional toilet facilities, fan rooms and factory offices.

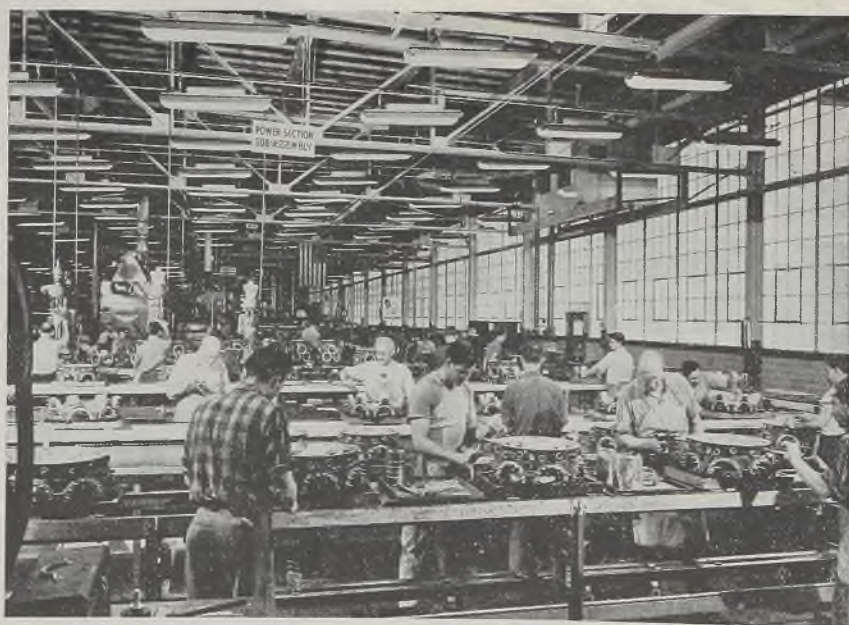
Major revisions of the test cells call for additional jet cooling and ram blowers, adding considerably to the electric power burden and requiring major additions to the system.

## Airlines Order Planes for Postwar Transport Service

A \$50,000,000 chunk of postwar aircraft business has been written by Douglas Aircraft Co., with announcement that three major domestic airlines have signed contracts for DC-4 and DC-6 commercial transports. American Airlines will buy 25 DC-4s and 30 DC-6s; Pan-American-Grace Lines will purchase three DC-4s and United Air Lines will acquire 15 DC-4s, 20 DC-6s and possibly 15 DC-6s later on. Eastern Airlines also is dickering for purchase of some of the same planes.

The DC-4 is a 44-passenger transport powered by four 1450-horsepower Pratt & Whitney engines. Present military version is the C-54 Skymaster, widely used by the Army transport services. The DC-6, of which none as yet has been built, either military or civilian, is a 56-passenger transport powered by four 2100-horsepower engines.

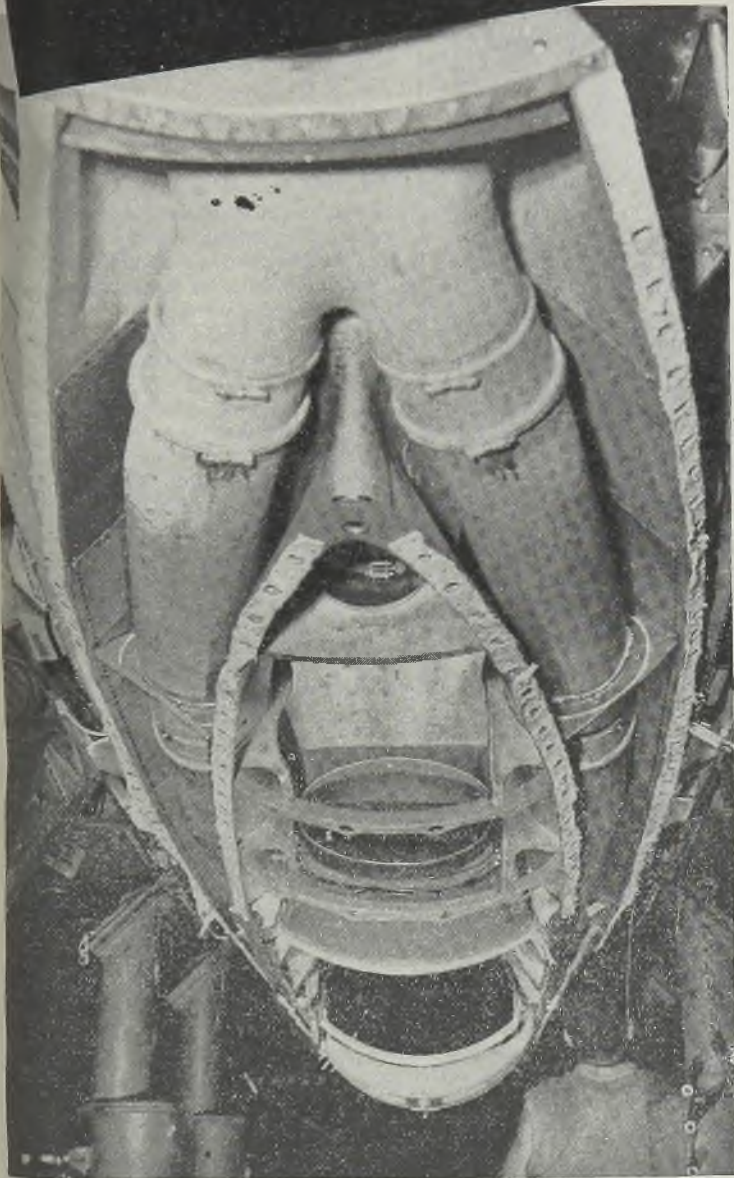
It may be possible to remodel some of the Army's C-54s into commercial



*This is an interior view of the power section subassembly department at the Chevrolet engine plant. Conveyorization, both overhead and floor and bench types, facilitates handling of units in process*



## This Is How a Thunderbolt Exhales



Here is part of a hard-hitting "Thunderbolt's" exhaust system—one of the hottest spots in a fighting plane.

Exhaust gases roar through this network of piping at temperatures of 1500°F. and higher—too hot for most metals to endure. This is why ARMCO Stainless Steels are used for the complete exhaust systems in many of Uncle Sam's warplanes.

ARMCO Stainless is doing its job well too. In firewalls and exhausts these rustless, durable metals defy red hot temperatures. In many other parts light though strong sheets of this hard, tough metal resist corrosion and the vibration of roaring engines.

If you are making vital parts for America's warplanes, consider ARMCO Stainless Steels. They are supplied in the conventional types, including the Columbian and Titanium stabilized grades. And remember them where resistance to heat and corrosion are needed in your peacetime products. For complete information about ARMCO Stainless just address The American Rolling Mill Company, 2931 Curtis St., Middletown, O.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

*The American  
Rolling Mill Company*





**HARNESSED LIGHTNING:** This engineering assistant gives a high-tension ignition system for fighter planes its final check at a General Electric Co. test chamber. Designed to prevent high voltages from running wild at altitudes up to 8 miles, the ignition system dispenses with supercharging—a departure from previous conventional design. It also combines the functions of a magneto and distributor into a single, integral unit

transports, but it is apparently the intention of the airlines to purchase completely new ships.

Meanwhile it is understood Bell Aircraft Corp., Buffalo, has retained services of a Detroit industrial designer and his staff to prepare plans for commercial transports, which this company proposes to build after the war. And it is reported that Lockheed Aircraft Corp. shortly will announce plans which airlines have concluded for purchase of giant Lockheed Constellations to use in postwar transport service.

## Reports 10% Decline in Monthly Plane Shipments

Latest statistical information on production of aircraft and aircraft engines, furnished through courtesy of M. A. Tracy, director, Aircraft Resources Control Office, Washington, reveals about a 10 per cent easing in monthly ship-

ments of airplanes in terms of numbers, but a steady upward trend in total airframe weight including spares, and in the average weight per complete airframe. Engine production likewise has held evenly from March through July, though there has been an increase in the average horsepower per unit, reflecting emphasis on production of the higher horsepower engines such as the Wright 3350 powering the B-29 Superfortress.

It is interesting to note that total engine horsepower, including spares now being produced each month, is practically 75 per cent of the comparable total for the entire year 1941. July output was 36,570,000 horsepower, or an average of 1440 horsepower per unit.

Total airframe weight including spares, 93,600,000 pounds for August, was well over the figure for all of 1941, 85,700,000 pounds, and the average weight per complete airframe, 10,064 pounds, was two and one-half times the average for airframes produced in 1941.

Shipments, weights and total horsepower are expected to show further moderate decline over the balance of the year. However, with 67,899 airplanes accepted over eight months of the current year, the total for the year is expected to exceed the 85,946 completed last year by a comfortable margin, probably coming close to 100,000. Engine production for seven months of the year, August shipments not yet being compiled, totals 158,792 units, and probably will exceed 250,000 for the year, comparing with 226,561 last year.

## Aircraft Contractors Get WX Schedules from AAF

Most aircraft contractors have received from the Army Air Forces what are termed WX schedules, or production schedules to be instituted following the fall of Germany. They embody the cutbacks and readjustments which the AAF believes now will be put in force at the close of hostilities in Europe. Reductions naturally are not uniform throughout all plants, ranging probably from 20 per cent to 70 per cent, with the overall average somewhere near 40 per cent.

WX schedules at best are somewhat conjectural, for no one can foresee what contingencies might arise in the meantime, but at least they represent an effort to forecast eventual cutbacks. Furthermore, it is entirely possible the defeat of the Nazis will not occur on any one day, but will rather be spread out over some weeks, thus leaving for later determination the exact date of X-day.

## Remote-Control Gunfire System Used on B-29

Remote-control gunfire system is employed on the Boeing B-29 Superfortress, is has been revealed. Use of the system was dictated by the fact the big bomber is pressurized, making it necessary to install a firing system which would enable gunners, encased in pressurized compartments, to operate guns outside the compartments. The firing system was developed jointly by Boeing, the AAF Materiel Command and General Electric Co.

Gunners are entirely removed from any manual contact with their guns and, with the exception of the tail gunner, fire them from remote stations. The tail gunner is near his guns but not in manual contact with them.

Many advantages result because the gunners do not ride inside turrets, the turrets can be made smaller and installed at positions on the airplane where their fire will be more effective. The smaller turrets impose less drag on the ship, increasing performance. Sighting accuracy also is improved. With the gunner removed from his guns, he is spared the jar and vibration of recoil. Thus, it is easier for him to track his target and hold his sight on it. He has to move only a small sight instead of swinging heavy guns.

# Specify Lebanon 21 for Weldments...

**CORROSION-RESISTANT QUALITIES UNALTERED BY WELDING HEAT**

**M**ORE and more industries are taking advantage of the economies offered by weldments—composite units produced by the welding together of several castings. However, the size and shape of many of these structures prohibit post-welding heat treatment—a practice normally used to restore corrosion-resistant qualities lost through application of heat during welding.

The best solution of this problem is the use of a casting alloy that loses none of its corrosion resistance during the welding process. Lebanon has developed such an alloy in **Ⓛ 21**. Through the addition of columbium, this 18% chrome and 8% nickel steel is stabilized against the action of welding heat.

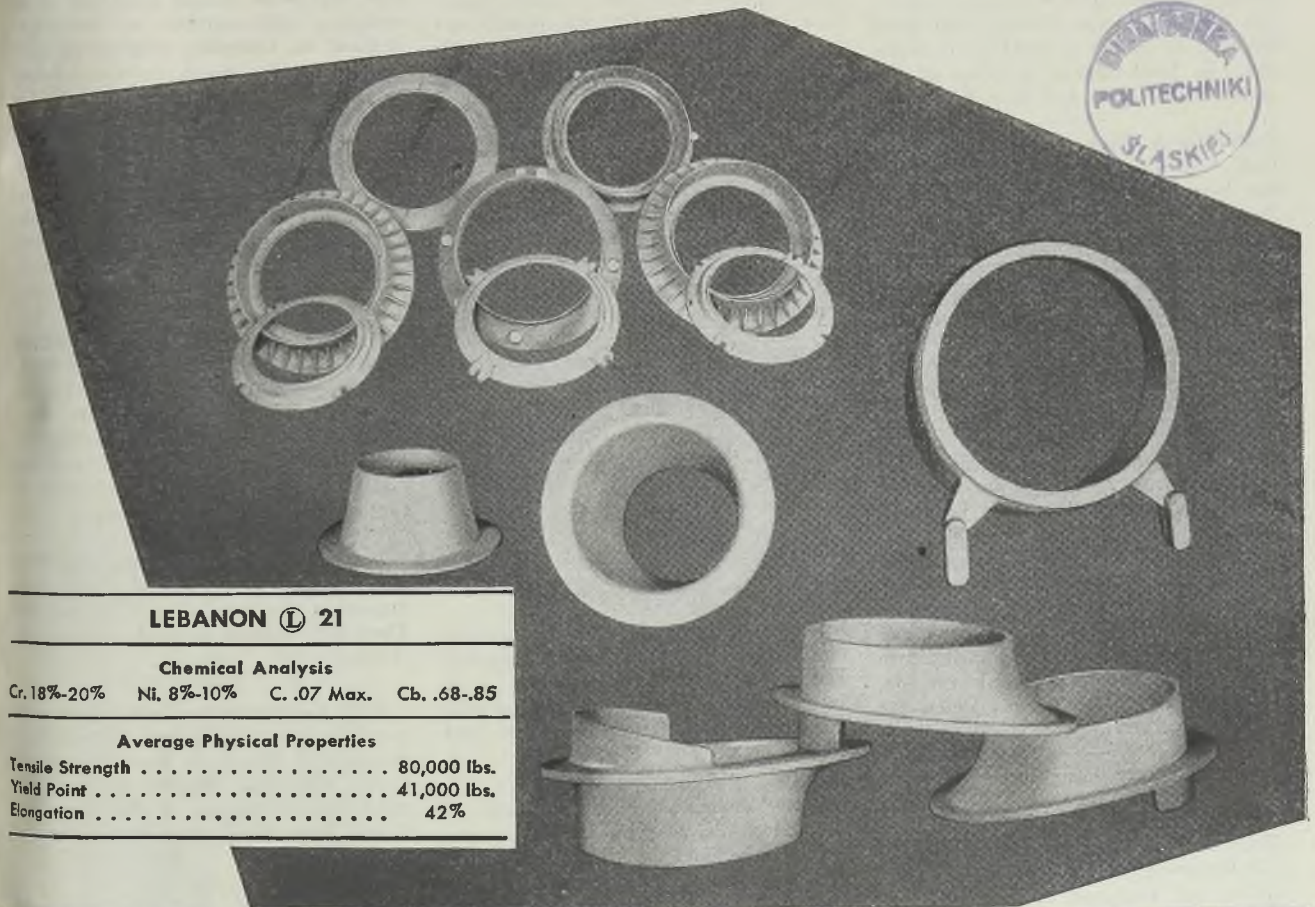
In austenitic 18 and 8 alloys, the remarkable affinity of columbium for carbon forms a stable columbium

carbide constituent. This constituent protects against carbide precipitation and inhibits inter-granular corrosion. As a result, when heat is applied to Lebanon **Ⓛ 21** during welding, the corrosion resistant qualities of this steel are retained intact. The need for post-welding heat treatment is eliminated.

Induction melting of Lebanon **Ⓛ 21** permits close analytical control. It meets U. S. Navy Specification 46S27 for resistance to salt water as well as the corrosion requirements of a great variety of chemical, food, textile, petroleum and other processing equipment.

**LEBANON STEEL FOUNDRY**  **LEBANON, PA.**

ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD



## LEBANON **Ⓛ 21**

### Chemical Analysis

Cr. 18%-20% Ni. 8%-10% C. .07 Max. Cb. .68-.85

### Average Physical Properties

Tensile Strength . . . . . 80,000 lbs.  
Yield Point . . . . . 41,000 lbs.  
Elongation . . . . . 42%

**LEBANON**



*Stainless and Special Alloy* **STEEL CASTINGS**

# MEN of INDUSTRY



J. EMMETT FINK



JULIUS A. CLAUSS



JOHN J. FARRELL



VAN M. DARSEY

**J. Emmett Fink**, general works manager, Great Lakes Steel Corp., Ecorse, Mich., has been appointed vice president in charge of operations and will continue as works manager. He has been associated with the company since its inception in 1929.

**Julius A. Clauss**, chief engineer, Great Lakes Steel Corp., has been appointed vice president in charge of engineering. During 1943 he served as special assistant to the director of the WPB Steel Division in charge of steel plant facilities. In 1940 he was president of the Association of Iron and Steel Engineers.

**William A. Cook**, vice president, Aircraft Accessories Corp., Glendale, Calif., has been placed in full charge of the Power Control division at Burbank, Calif., succeeding **Timothy E. Colvin**, who has assumed the presidency of Aerco Corp., Los Angeles.

**Willis F. Avery** has been elected secretary of the B. F. Goodrich Co., Akron, O. He succeeds **Shelby M. Jett**, who died Aug. 9.

**H. M. Cherry**, for the past five years associated with A. T. Wagner Co., Detroit, as equipment engineer, has been appointed general manager of the George L. Nankervis Co., Detroit. **Donald C. Hulse**, formerly with Great Lakes Steel Corp., Detroit, has been named designing engineer for the Nankervis company, and **George R. Young**, previously assistant to the plant engineer, Plymouth division, Chrysler Corp., Detroit, has joined the company as service engineer.

**Louis Ramirez Brau**, former chief of police of Puerto Rico, has been named executive manager of the Puerto Rico Commerce and Industrial Association, 225 Broadway, New York 7. The association will endeavor to facilitate trading between this country and Puerto Rico.

**F. Jerome Tone Jr.** has been appointed vice president in charge of sales, Carborundum Co., Niagara Falls, N. Y.,

succeeding **Charles Knupfer**, senior vice president, who has been assigned to special sales and executive activities. **Henry P. Kirchner** has been placed in charge of production for the company and **Otis Hutchins** has been named technical director in charge of research, process control and development.

**John J. Farrell**, formerly assistant treasurer, has been appointed treasurer, American Steel & Wire Co., Cleveland, succeeding **Robert E. Lewis** who recently resigned to assume the presidency of Cleveland Wire Spring Co., Cleveland.

**E. J. Lyons** has been appointed director of industrial relations for the Airplane division, Curtiss-Wright Corp., at Buffalo, to succeed **C. S. Mattoon**, resigned. **George A. Snodgrass** succeeds Mr. Lyons as assistant to **J. P. Davey**, general manager of the Columbus, O., Airplane division plant.

**Ches Herndon** has been appointed manager of the Houston, Tex., branch of Tube Turns Inc., Louisville, Ky.

**John J. Buckley** has been elected a vice president of Pacific Tube Co., Los Angeles, becoming resident chief executive of the company. **W. P. Armstrong** has been appointed sales manager.

**G. H. Griffin** has been named superintendent of the Spokane, Wash., plant of Electro-Metallurgical Co., New York, succeeding **E. H. Mangan**, who has been transferred to the company's New York offices.

**Scott Russell**, former president of Bibb Mfg. Co., Macon, Ga., during past year general counsel for the George Senate Committee, and an Air Corps pilot in World War I, has been appointed general manager of the Aeronautical Chamber of Commerce.

**C. W. Camp**, for 38 years associated with Crocker-Wheeler Electric Mfg. Co., Ampere Station, N. J., has joined Worth-

ington Pump & Machinery Corp., Harrison, N. J., as consulting electrical engineer. **William J. Van Vleck** has been appointed manager of the corporation's Atlanta, Ga., office, succeeding **Edward Stauverman**, who has resigned to engage in another line of business.

**Van M. Darsey**, technical and service director of Parker Rust Proof Co., Detroit, has been elected president of the company and member of the board. **Willard M. Cornelius** resigned as president to become board chairman. **Robert W. Englehart**, secretary, and **A. C. Larowe**, manager of the Morenci, Mich., plant, have been elected vice presidents.

**Timothy E. Colvin** has been elected president and a director of Aerco Corp., Los Angeles, succeeding **C. A. Herberts**, founder of the company, who is retiring.

**Fred J. Herbold** and **Schuyler J. Goho** have been awarded the Order of Merit, highest award of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Herbold was cited for his contributions to gray iron foundry methods, and Mr. Goho was honored for contributions to the art of sheet metalworking.

**Lucien W. Moore** has been appointed manager of the valve and fitting sales department, Crane Co., Chicago, and **Thomas J. Hanlon** succeeds him as purchasing agent.

**Paul Augenstein** has been made commercial engineer of General Electric Co.'s Range and Water division, Bridgeport, Conn. **Lloyd G. Hertzler** has been appointed sales manager of the company's Home Laundry Equipment division at Bridgeport.

The Robert W. Hunt Co., Engineers, Chicago, has made the following organizational changes: **W. H. Savage** has been appointed manager of the general equipment and materials department; **C. W. Stierer** has been made manager, structural steel department, and **H. A.**

Ford was named manager, railway car department.

—o—  
 Prof. Herbert Fisher Moore, of the department of theoretical and applied mechanics, University of Illinois, retired Sept. 1. Prof. Moore's research on the fatigue of metals in connection with railroad investigations was outstanding.

—o—  
 W. K. Cox has been advanced to the position of assistant general sales manager, Caterpillar Tractor Co., Peoria, Ill., and he is succeeded as manager of the Eastern division by William S. Ziegler. F. D. Haberkorn succeeds Mr. Ziegler as assistant sales manager, Eastern division.

—o—  
 Harry Louis Leyda, from 1927 until early 1944 general manager of Miles P. Brown Boiler Works, Franklin, Pa., and more recently associated with War Manpower Commission in Washington, has become affiliated with Dallas Tank Co. Inc., Dallas, Tex., as vice president.

—o—  
 Henry T. Platz, who until about a year ago was associated with Briggs Mfg. Co., Detroit, as chief engineer of the Tool, Fixture and Welding division and executive engineer, Aircraft Turret division, has been appointed district manager in Ohio and northeastern Indiana for Sciaky Bros., Chicago.

—o—  
 John R. Collette has been appointed manager of the new Heating Boiler division, Struthers Wells Corp., Titusville, Pa. The new division will be operated as a part of the Titusville Boiler division of the corporation. Mr. Collette was for 23 years vice president, Pacific Steel Boiler division, United States Radiator Corp., Detroit.

—o—  
 Maj. Floyd Slasor, who recently was released from the Army Air Corps after 18 months of service in the South Pacific, has been appointed head of the newly-formed Hotpoint Department Store Sales division, Edison General



C. J. HARDY JR.

Who has been elected a vice president and a director of American Car & Foundry Co., New York, reported in STEEL, Aug. 18, p. 99.



NORMAN W. SLOHM

Electric Appliance Co. Inc., Chicago. Prior to his Army service Major Slasor had been sales manager, Electric Appliance Inc., Indianapolis distributor for General Electric appliances.

—o—  
 Norman W. Slohm has been placed in charge of sales of aluminum to the steel industry for National Smelting Co., Cleveland. Previously he had been in charge of the company's Chicago office.

—o—  
 William M. Kauffmann has been appointed assistant to the chief engineer in charge of Diesel engine development, Mack Trucks Inc.

—o—  
 James L. Dunn, assistant plant manager of the Bridgeport, Conn., plant of Jenkins Bros., has been elected vice president in charge of industrial relations.

—o—  
 Walter Bloom has left the WPB Steel Division after two years' service to return to Jones & Laughlin Steel Corp., Pittsburgh.

—o—  
 David B. Peckham has been appointed comptroller of manufacture, Western Electric Co., New York, and Clifford W. Smith has been named his successor as comptroller of sales.

—o—  
 Paul E. Mohn, formerly associate professor of mechanical engineering, University of Illinois, has been named head of the department of mechanical engineering, University of Buffalo.

—o—  
 Effective Nov. 1, J. A. Mayer will become Atlantic district manager, Graybar Electric Co. Inc., New York, with headquarters at Philadelphia. A. L. Hallstrom, now Atlantic district manager, will act in an advisory capacity until Jan. 15, when he will retire after 50 years of service.

—o—  
 Dean Frederick M. Feiker of George Washington University Engineering School has been appointed to the National Research Council of the National Academy of Sciences. During the Hoover administration Dean Feiker



JAMES A. QUAID

served as director of the Bureau of Foreign and Domestic Commerce, Commerce Department.

—o—  
 James A. Quaid has been appointed Philadelphia district manager, Pressed Steel Co., Wilkes-Barre, Pa. Formerly Mr. Quaid was sales engineer with Allegheny Ludlum Steel Corp., Philadelphia.

—o—  
 W. A. Metheson has been elected president and general manager, Williams Oil-O-Matic Co., Bloomington, Ill. W. W. Williams, former president, becomes chairman of the board.

—o—  
 Regular-slate nominees for six three-year posts on the board of directors of the Gray Iron Founders' Society are: George H. Alten, owner, Alten's Foundry & Machine Works, Lancaster, O.; Homer Britton, vice president, Cleveland Foundry Co., Cleveland; Max Kuni-ansky, vice president, Lynchburg Foundry Co., Lynchburg, Va.; Samuel D. Russell, president, Phoenix Iron Works, Oakland, Calif.; Howard A. Stockwell, treasurer and director, Barbour Stockwell Co., Cambridge, Mass., and F. L. Williams, assistant secretary, Cooper-Bessemer Corp., Grove City, Pa.

Directors retiring following the 1944 annual meeting, Oct. 10-11, are: R. O. Collins of the Tallahassee, Fla., foundry bearing his name; J. D. Crain, manager, Ridge Foundry, San Leandro, Calif.; Franklin Farrell III, plant manager, Farrel-Birmingham Co. Inc., Ansonia, Conn.; A. B. Root, vice president, Hunt Spiller Mfg. Corp., Boston, and George Walton, president, The Madison Foundry Co., Cleveland.

—o—  
 Winder R. Harris, Norfolk, Va., has been appointed vice president, Shipbuilders Council of America, and will head the council's new Washington office.

—o—  
 James B. Black, president of Pacific Gas & Electric Co., San Francisco, and director and member of the executive committee of the Southern Pacific Co., has been elected a director of United States Steel Corp., Pittsburgh, to fill the

vacancy caused by the death earlier this year of William J. Filbert. Mr. Black becomes the first Pacific Coast director of United States Steel.

Edward E. Stark has been appointed second vice president of Ziv Steel & Wire Co., Chicago, and will continue as district manager of the Indianapolis branch.

Charles P. Whitehead has been elected a member of the board of General Steel Castings Corp., Eddystone, Pa., succeeding Walter L. Rathmann of St. Louis who resigned recently. Mr. Whitehead is a vice president of the corporation.

A. W. Nelson has been made district sales manager in Indianapolis by Allegheny Ludlum Steel Corp., Brackenridge, Pa. R. C. Presley has been named Minneapolis district representative.

Clarence M. Brown, Philadelphia attorney, has been recalled as chairman of Pittsburgh Plate Glass Co., Pittsburgh, to fill the post left vacant Aug. 13 by the sudden death of H. S. Wherrett. Leland



M. M. CLARK

Who has joined Climax Molybdenum Co., New York, as metallurgical engineer in the Ohio district, reported in STEEL, Aug. 28, p. 72.

Hazard, general counsel, has been elected vice president of the company, H. B. Higgins, president, has been named chairman of the executive committee, and

H. B. Brown, secretary, was elected a director.

Albert A. Hoffman and John M. Birdsong have joined the metallurgical engineering staff, La Salle Steel Co., Chicago. Mr. Hoffman formerly was associated with American Steel & Wire Co., Cleveland, and Mr. Birdsong had been affiliated with General Electric Co., Schenectady, N. Y.

W. H. Wilson has been appointed sales manager, Multigraph division, Addressograph-Multigraph Corp., Cleveland. The promotion from assistant sales manager comes as Mr. Wilson completes 25 years of service with the company.

Jack Fairchild Fleming has been appointed to head the Chicago branch of Dohner & Lippincott, New York industrial design firm.

S. H. Gorham has been named vice president of the Electrical & Steel Sales Co. Inc., Milwaukee. Formerly he had been manager of domestic dealer sales, Allis-Chalmers Mfg. Co., Milwaukee.

## OBITUARIES

Robert G. Guthrie, 48, a consulting metallurgist and chief metallurgist for Peoples Gas, Light & Coke Co., Chicago, died Sept. 20 in Muskegon, Mich., where he was doing consulting work for Campbell, Wyant & Cannon Foundry Co. Mr. Guthrie, a past president of the American Society for Metals, was one of the pioneers in high-power photomicrography and for his achievements in this field had received several awards.

Charles Beaver, 68, associate director of research and product development, Yale & Towne Mfg. Co., Stamford, Conn., died Sept. 23 in Stamford. Mr. Beaver had been director of the company's European subsidiaries, director of export sales, and general sales manager. He resigned in 1925. For two years he served as president of Lockwood Mfg. Co., Cincinnati, then retired. In 1934 the president of Yale & Towne recalled him to organize a research department. A founder and first president of Electric Hoist Manufacturers' Association, Mr. Beaver also had served as president of the Railway Supply Manufacturers' Association.

John L. Turner, 49, president of the Production Tool & Supply Co., St. Louis, died Sept. 21 in that city.

Walter W. Fitzpatrick, 49, midwest field manager in Chicago for Nordberg Mfg. Co., Milwaukee, died in Chicago Sept. 21.

Earle W. Sinclair, 70, president, Sinclair Consolidated Oil Corp. and the Sinclair Refining Co., New York, and chairman, executive committee, Sinclair Oil

Corp., died Sept. 21 in New York. Since 1921 Mr. Sinclair had been associated with the vast Sinclair oil interests.

Charles J. Miller, owner of the Milco Tool Co., Detroit, died recently.

Frank H. Reagan, 72, since 1939 board chairman of Locke Insulator Corp., Baltimore, died Sept. 10 in that city. Associated with the company more than 20 years, Mr. Reagan had been president from 1926 until 1939.

Thomas J. Dugan, 75, former superintendent in the can manufacturing department of Standard Oil Co. of Ohio, died recently in Cleveland.

Sigurd E. Anderson, founder and president of the New Monarch Machine & Stamping Co., Des Moines, Iowa, died there Sept. 13.

Frank Hyatt Lewis, 63, for many years a salesman with Westinghouse Electric Elevator Co., Jersey City, N. J., died Sept. 22 in White Plains, N. Y.

James C. Watson, 66, treasurer of Jones & Laughlin Steel Corp., Pittsburgh, from 1918 until 1942, died Sept. 23 in Sewickley, Pa. Mr. Watson, also a former director of the company, had retired after 48 years of service.

Gilbert Retzlaff, 37, president and treasurer, Crown Rubber Products Co., Milwaukee, which he and his brother, Raymond O. Retzlaff, founded ten years ago, died Sept. 20 in Milwaukee.

George E. Thackray, designer and structural steel engineer, died Sept. 24 at Orlando, Fla. For 20 years Mr. Thack-

ray was with Cambria Steel Co., Johnstown, Pa., in engineering and sales capacities. Later he was associated with Bethlehem Steel Co., Bethlehem, Pa., as consulting engineer and director of technical publications.

William F. Guthrie, general counsel and vice president of Truscon Steel Co., Youngstown, O., from July, 1917, to June, 1933, died recently in Kansas City, Mo.

Edmund F. Krause, 52, president of the Krause Wire Corp., Los Angeles, died there Sept. 19.

George W. Warner, 47, general manager of Armco International Corp., Middletown, O., was killed Sept. 23 when his private plane crashed at Hays, Kans. Mr. Warner had joined the organization in 1924 and had served in the West Indies and in the New York office.

Paul H. Krusa, 32, sales engineer for Sheffield Steel Corp., Kansas City, Kans., was killed Sept. 23 in a plane crash at Hays, Kans.

Frederick H. Jackson, 44, sales engineer for Aluminum Co. of America, Pittsburgh, died Sept. 24 in Cleveland.

Isaac Horwitz, associated for more than 50 years with the cooperage business in Cleveland before his retirement in 1936, died Sept. 22 in that city.

Peter Grabler, 82, founder of the Grabler Mfg. Co. and the Dickey-Grabler Co., Cleveland, died Sept. 22 in that city.

O. E. J. Abrahamson, 51, president of Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, died there recently.



## Stocks of Scrap Cut Slightly

**Bureau of Mines reports drop of 1 per cent in tonnage held at plants of consumers, suppliers and producers at end of July. Salvage operations down**

STOCKS of iron and steel scrap at plants of consumers, suppliers, and producers at the end of July, approximated 5,909,000 gross tons, a decrease of 1 per cent from the 5,991,000 tons reported on June 30, 1944, according to the Bureau of Mines.

Consumers stocks on July 31 were 4,770,000 tons, compared with 4,800,000 tons at the end of June, while the combined stocks of suppliers and producers were 1,139,000 tons as against 1,191,000 tons on the same dates. A decrease of 41,000 tons in stocks of scrap held by dealers and auto wreckers was the major factor in the decline in inventories.

Amount of purchased scrap consumed during July was the smallest since February, 1943, but despite the decreased use, stocks of this material held by consumers declined. This was undoubtedly caused by the reduction in scrap salvaged and produced, since inventories at suppliers' yards and producers' plants were also lessened. Combined scrap salvage and production during July were the lowest since the inclusion of such data in these studies about scrap in January, 1943.

Total consumption of ferrous materials amounted to 8,943,000 gross tons in July, an increase of 1 per cent over June. The increase was entirely due to the longer month since the average daily melt of scrap and pig iron declined 3 per cent. Consumption of scrap in July amounted to 4,423,000 gross tons, compared to 4,460,000 tons in June of this year.

Combined iron and steel scrap production by manufacturers and railroads, and calculated salvage by dealers and auto wreckers in July showed a decline of 10 per cent from 1,853,006 tons in June, 1944, to 1,658,502 tons in July.

### Futures Trading in Scrap Not Sought by Institute

Reports to the effect that leaders of the scrap iron and steel trade are advocating listing of scrap iron futures on the Commodity Exchange are unfounded on fact, E. C. Barringer, president, Institute of Scrap Iron and Steel, Inc., stated last week. Commenting on the published report, Mr. Barringer said a recent meeting of an institute committee with repre-

sentatives of the Commodity Exchange, called to consider the desirability of establishing a futures market, adjourned without any action having been taken.

Subsequently, said Mr. Barringer, the institute committee took the unanimous position that nothing had been disclosed at this meeting to indicate that any useful purpose in the distribution, shipment, or flow of scrap would be served by trading in futures contracts.

According to Mr. Barringer, the Scrap institute is not advocating futures trading in scrap, and so far as is known only two scrap companies, one newly formed, have requested the Commodity Exchange to list scrap. He said that when a similar proposal was made by the Commodity Exchange in 1940, scrap dealers and consumers opposed it.

### Blaw-Knox Building Five Rubber Pilot Plants

Five synthetic rubber pilot plants are under construction for leading rubber companies and are expected to reach completion early in the new year, it was announced recently by the Blaw-Knox Co., Pittsburgh, designers and engineering contractors of the projects.

Plants are being built for Firestone Tire & Rubber Co., Akron, O.; Goodyear Tire & Rubber Co., Akron, O.; United States Rubber Co., Naugatuck, Conn.; Copolymer Corp., Baton Rouge, La.; and National Synthetic Rubber Co., Louisville, Ky.



Raymond F. Evans, left, vice president and general manager of Diamond Alkali Co., presents Col. Donald M. Blakeslee, former Diamond Alkali employe, with a navigation watch at a testimonial dinner in honor of Colonel Blakeslee

### Blakeslee, Famed Airman, Honored by Diamond Alkali

Col. Donald M. Blakeslee, 27, one of the most decorated of U. S. airmen, and, who prior to entering the service was an operator in Diamond Alkali Co.'s Chlorine department at its Painesville, O., plant, was recently honored at a community testimonial dinner while home on leave at Painesville. Colonel Blakeslee was presented with a navigation watch at the dinner by Raymond F. Evans, Diamond Alkali's vice president and general manager, on behalf of the company.

Colonel Blakeslee is commander of the famed Mustang fighter group attached to the Eighth U. S. Air Force in England. He enlisted with the R.C.A.F. in August, 1940. (He was in England with an R.C.A.F. squadron when he transferred to the U. S. Air Force). Being the first Diamond employe to enter service, his became the very first star in the company's service flag. More than 1060 men and women from Diamond Alkali Co. are now serving their country.

Colonel Blakeslee has between 400 and 500 combat missions to his credit in the European theater. His group was the first U. S. fighting group to go to England, and is the highest scoring group in the entire American Air Force.

The frigate, U. S. S. ORLANDO, is shown at right with a pusher-type vessel attached to stern leaving for the long trip from the Great Lakes to New Orleans



## Great Lakes Shipyards Building Large Number of Naval Craft

*Vessels over 300 feet long get to salt water by way of Illinois and Mississippi rivers. Engineering ingenuity displayed in getting ships to sea adds capacities of seven shipyards to nation's fighting strength*

FIGHTING ships and ocean cargo vessels are going to war by way of Chicago, St. Louis, Memphis, and on down the Father of Waters to New Orleans, reports the United States Maritime Commission.

Vessels, more than 300 feet long, built on the Great Lakes, are reaching salt water by way of the Illinois and Mississippi rivers. Cities and villages in the heart of the Midwest are getting glimpses of frigates—306-foot submarine hunters for the American and British Navies—and cargo vessels 338½ feet long, but of light draft, for use in shallow waters where larger vessels find it impossible to enter.

### Imperative Need for Vessels

Imperative need for these vessels appeared in 1943. Frigates, fast and maneuverable, were needed for convoy duty. The cargo vessels, smaller than the Maritime Commission's standard C1 type, are desired by the Navy particularly for island operations where narrow ports and shallow water are a consideration.

Shipyards along the coast were operating at full capacity building large vessels. The yards on the Great Lakes appeared

to be the logical choice for construction of these new type vessels without disruption to the Maritime Commission's overall program. The Lake yards had the building facilities, but a serious problem interposed. The completed vessels could not get to sea by the usual route through the eastern lakes into St. Lawrence river. They were too long. The canals around the rapids in the upper St. Lawrence would only accommodate ships up to 259 feet. Another means had to be found to get these ships to salt water for use in combat areas by the Allies in both hemispheres.

The engineering ingenuity that permitted construction of these vessels on the Great Lakes was displayed when the possibility of taking the ships down the Illinois and Mississippi river was explored. It was found that Chicago's bridges over the Drainage canal, that connected Lake Michigan with the Illinois river, were too low and that the normal nine-foot channel in the rivers was not sufficiently deep for the machinery-heavy sterns to avoid scraping bottom.

The canal problem was solved by removing the masts on the frigates and shipping enough ballast to get under the

bridges. The masts removed at Chicago are replaced at New Orleans.

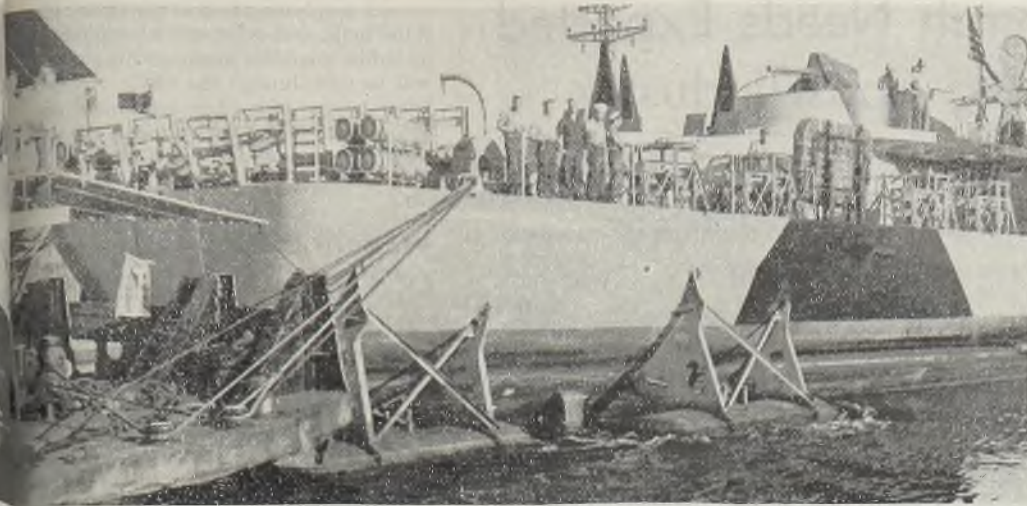
The sterns of the frigates had to be raised for the long river trip. Air filled steel drums, 9 feet in diameter and 20 feet long, did the trick; the aft part of the ship being practically lifted out of the water by four pontoons, a pair welded and bolted on either side of the vessels.

The vessels proceed through the Drainage canal to Lockport under their own power. Here the pontoons are installed on the vessel.

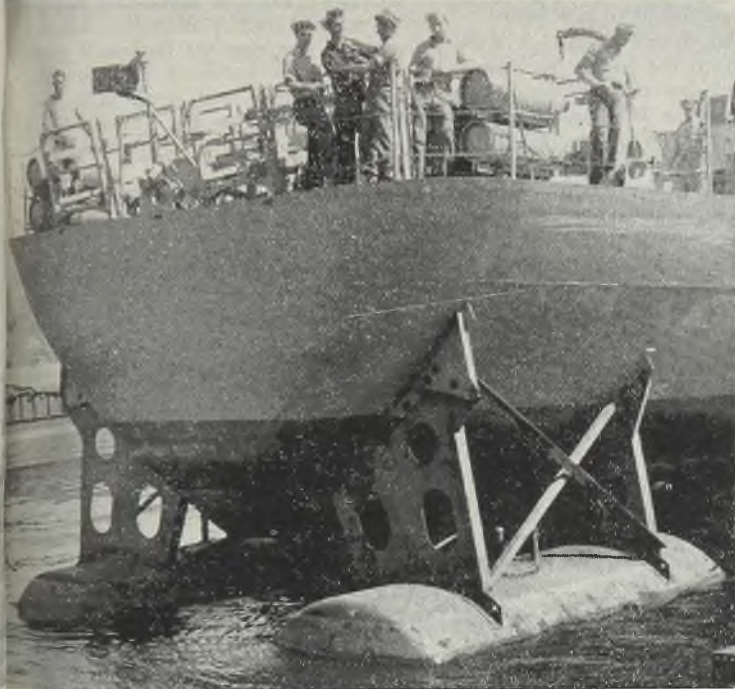
### Pontoons Attached to Vessels

After the pontoons are attached the vessels are taken in tow by pusher-type vessels, much used on the Illinois-Mississippi waterway, and are pushed through the 600-foot lock and lowered 41 feet into the Des Plaines river and move on down into the Illinois river. Here begins the trip across the middle of Illinois and to the Mississippi just above St. Louis, and on to the sea. At New Orleans the pontoons are removed and shipped back to Lockport for another trip.

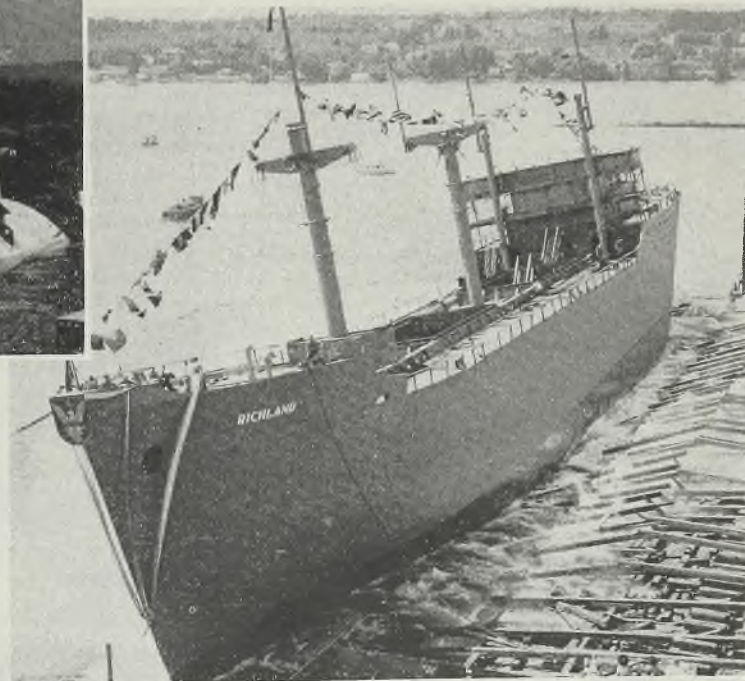
Frigates are coming off the Great Lakes shipways rapidly. The cargo vessels, just recently put into production, will follow in considerable number. The engineering ingenuity displayed in getting these vessels into ocean service has added the capacities of seven shipyards to the world-wide fighting strength of the United Nations and is considered one of the outstanding accomplishments of industry in the war.



At left, the U. S. S. ORLANDO, with pontoons installed to stern and pusher-type vessel hooked on, prepares for its journey to New Orleans



The U. S. S. ORLANDO is pictured at left with pontoons attached which raise the machinery-heavy stern of the vessel to enable it to be taken from the Great Lakes to the Gulf by way of the 9-foot shallow channel in the Illinois-Mississippi waterway



This vessel, the RICHLAND, is shown right sliding off the ways at one of the Great Lakes shipyards. From there it will be directed to New Orleans. Below, the fighting frigate, U. S. S. PEORIA, is pictured on her sea trial



# Postwar Aircraft Needs Expected To Support Big Coast Industry

*High rate of obsolescence seen creating tremendous military replacement demand for planes. Industry leaders think large volume business inevitable if nation is to maintain air supremacy. Present military demands not decreasing*

## LOS ANGELES

WEST COAST aircraft industry does not believe the end of the war in the Pacific will see military demands for aircraft cut back to prewar proportions.

Postwar demands for military aircraft will be great enough to maintain an enormous industry. This is inevitable if this nation is to maintain leadership in air supremacy, and to protect and utilize outlying airbases essential for security.

Leaders in the aircraft industry here point out, that so rapidly are improvements in aircraft made possible through technological research, that military craft have a high rate of obsolescence. Continuous replacements must be made in any air force to maintain its efficiency.

All this adds up to a big aircraft industry on the West Coast after the war, to supply our army and navy air forces, it is reasoned.

In 1940 West Coast plants produced 3050 planes. The following year, most of which had passed before the United States entered the war, these companies contributed 10,918. Full war time production was not reached until 1943 with 39,725 planes from these same companies. The peak month was March of this year with 4553 units having a dollar value of more than \$21 billion.

No one in authority here believes postwar military demands will drop back to prewar figures. Present military demands are not decreasing. Lockheed has just recently been awarded a new contract for \$214,000,000 worth of P-38 fighters by the Army Air Forces. This added to a previously announced contract for nearly \$142,000,000 in B-17 bombers and a new type fighter have raised Lockheed's backlog to more than a billion dollars.

Postwar commercial air transportation demands are anybody's guess, but the most conservative opinion here is that they will be enormous. Recently Douglas announced a new contract for commercial lines bringing this company's backlog for commercial craft to \$150,000,000. It is safe to assume that all West Coast companies will make commercial aircraft and personal planes after the war. The Aircraft War Production Council of Los Angeles is receiving many inquiries from civic bodies and officials throughout the country seeking information pertaining to planning and building airports and flying field and their equipment.

Construction of the last nine of Southern California's aviation gasoline plants will be completed at an early date. The

cost of these projects may go to \$120,000,000 in combined governmental and private funds. These high-octane units are not only of war importance, but have economical fuel producing potentialities for cars, trucks and buses in postwar years. They may also be put to use in the production of synthetic rubber and chemicals from petroleum.

New additions to and expansions of oil refining plants in the harbor area have been approved by the WPB to the amount of more than \$400,000. This includes the installation of an absorption system by the Wilmington Gasoline Co. to recover light hydro-carbon products from wells in the Harbor area to alterations in the Standard Oil Co.'s butadiene plant.

Indicative of the increasing demands for oil by the Navy is the recent approval of construction of a 73-mile pipeline to carry crude oil to Southern California refiners from the U. S. Naval Reserve in Elk Hills. This project which will cost \$1,911,462 awaits the approval of the Petroleum Administration.

The WPB redistribution division for this area will be abolished at once. Most excess inventories left over from peacetime have been exhausted. Government-

owned surpluses of raw materials, machine tools, and other capital equipment, including complete manufacturing plants, will be sold through the RFC. Automobiles, trucks and other consumers durable goods will be sold through the procurement division of the Treasury Department.

## Western States' Allotment Of Civilian Steel Small

Four western states, California, Arizona, Nevada and Idaho, have been granted only 4500 tons of steel out of the national allotment of 125,000 released by the WPB recently for production of civilian goods in its partial reconversion program.

Officials of the War Production Board's tenth regional district office here blamed manpower shortages for the small western quota and indicated this continuing labor scarcity will result in further delaying transition in the San Francisco area. WPB authorities, while admitting that the western quota is a "very small amount", forecast that supplemental allowances would be made when conditions permit.

Coincident with release of the steel quota, approval was given to 17 Northern California plants to convert to production of civilian items or increase output beyond present quota limits under the WPB's spot authorization plan.

Of a total of 30 applications filed, only one rejection was made. The other 12 applications are under consideration.

Following is a list of the 17 approved firms, together with the type of goods authorized:

Hayward Non-Ferrous Foundry, Hay-



*Modern tools, combined with engineering skill and production know-how, make possible the turning out of huge numbers of warplanes, such as these A-20s speeding toward completion on the Douglas Aircraft Co. assembly line*

ward: Cast aluminum frying pans.  
 Mart Haycock, Berkeley: Assembly of hitherto partially completed cutlery.  
 Elmer Hansen, Oakland: Fishing sinkers.  
 Frank Heide, San Francisco: Wire garment hangers.  
 Moss Mfg. Co., San Francisco: Portable lamps.  
 Rutherford & Hood, San Francisco: Box springs in addition to regular quota and inner-spring mattresses.  
 San Francisco Bedding Co., San Francisco: Box springs.  
 San Francisco Die-Casting Co., San Francisco: Aluminum cooking utensils.  
 San Francisco Wire & Iron Works, San Francisco: Metal table bases.  
 Sealy Mattresses Co., Oakland: Inner-spring mattresses.  
 Simon Mattress Mfg. Co., San Francisco: Inner-spring mattresses and pads and additional box springs above previous quota.  
 Sleepcraft Inc., San Francisco: Dual sleeping equipment.  
 Speedmaster Ltd., Oakland: Truck wheel balances.  
 Charles L. Day, San Francisco: To assemble available parts on hand-trap triggers.  
 Valley Bedding Co., Fresno: Inner-spring mattresses and increased quota of box springs.  
 Walter Mfg. Co., Oakland: Dual sleeping equipment.  
 Wilson & Jensea, San Francisco: Inner-spring mattresses and increased production of box springs.



**DISTINGUISHED SERVICE:** War Department's Special Service Award was presented at Washington by Maj. Gen. Edmund B. Gregory, quartermaster general, to J. Howard Hamilton, American Can Co. executive of San Francisco, who served as consultant to the Secretary of War. The award, first given by the quartermaster corps, carried a citation from Secretary of War Henry L. Stimson for "distinguished service in directing and developing the canned food procurement program"

### Reynolds Seeking To Buy Aluminum Reduction Plant

**SPOKANE**

R. J. Reynolds, Reynolds Metal Co., Richmond, Va., reportedly has started negotiations for the purchase of the Mead, Wash., aluminum reduction plant for operation in the postwar period, according to Sen. Mon C. Wallgren (Dem., Wash.).

Senator Wallgren said Mr. Reynolds agreed to establish plants to fabricate aluminum plate, extrusions and household articles if he could make a favorable deal for the reduction plant. Reynolds has plans for several new uses of aluminum after the war, including manufacture of a new aluminum foil for use in wrapping foods and other products which would require 400 million pounds of aluminum a year. The prewar production of aluminum in the nation amounted to only 350 million pounds.

Mr. Reynolds also is reported planning to make a new "wallboard" in which thin sheets of aluminum will be glued on each side of sheets of wood. He also plans to place sheets of aluminum on each side of steel plate for structural use where cleanliness is a consideration.

Sen. Wallgren said that cheap power and plentiful alumina clays assured the future of the aluminum industry in the state of Washington.

## Western Ownership of Government Plants on Coast Urged by Berge

**SAN FRANCISCO**

POSTWAR ownership and operation of government war plants in the West should be in the hands of western industry, Wendell Berge, assistant U. S. attorney general in charge of antitrust prosecutions declared here recently at the Western Conference of Attorneys General.

Mr. Berge said the West must end the "domination of its industries and markets by eastern industrialists" and urged new "risk-taking" western corporations to take over the operation of war-born steel mills at Geneva and Fontana, the magnesium and aluminum refineries, and other government-financed plants when the war ends. Basing his contention on the necessity of keeping these new war plants out of the hands of "monopolistic" eastern corporations that might close them in periods of depression, Mr. Berge said he believes western ownership is necessary to West's expansion of opportunities and jobs.

The Pacific Coast area's rail rate structure is set up primarily to allow eastern industrialists to dominate their markets at the expense of western industry, Mr. Berge asserted.

Singling out the Geneva Steel Works, at Geneva, Utah, as an example, Mr. Berge said the plant may be closed after the war because of its unfavorable shipping position. He cited the commercial steel rail rates of \$12 a gross ton from Geneva to San Francisco in comparison with rates of \$10 to \$11 "or even lower" for intercoastal shipment from the Atlantic Seaboard to Pacific Coast ports. Geneva, because it is shipping for the government, has been able to obtain a lower rate for the duration, Mr. Berge pointed out, but after the war when rates revert to the old differential, then the plant is likely to close, he said.

The answer to the problem Mr. Berge believes lies with western business men who must fight to get rates down to profitable competition levels.

## Urges Tax Plan To Encourage Risk Dollars

*A. A. Kucher, Bendix executive, calls for a three-year tax-free incentive period to spur new developments*

A TAX program advanced "to give individuals and industry incentive to undertake development of new products that must constitute at least 50 per cent of America's postwar production in order to guarantee full peacetime employment," was proposed recently by A. A. Kucher, director of research and chairman of the long range planning committee of Bendix Aviation Corp., Detroit.

Addressing the Indiana section of the Committee for Economic Development, Mr. Kucher offered what he termed "a research engineers' approach to the tax problem." He stressed that present income taxes, based on the calendar year, actually deter individuals and industry from taking the financial risks inherent in long-term development of new products.

As an incentive to stimulate use of "research risk dollars" in new and vitally necessary peacetime product development he proposed that a three-year "tax-free incentive period" be granted to the developer or owner of a new product resulting from research or engineering effort and expenditure. "I believe that if such a tax scheme could be worked out, the tax revenues accruing from resultant expansion would far exceed the temporary loss of revenue," Mr. Kucher said.

He pointed out that Bendix Aviation Corp., with nearly a billion-dollar gross sales in 1943, spent nearly \$15 million for research engineering and development, as compared with \$50 million gross sales and a \$4 million research expenditure in 1938.

"The point to be derived," he emphasized, "is that the amount expended for research and development is bound to have a direct relationship to the magnitude of future productivity and employment. For technical development is the key to America's greatness."

He pointed out that any major improvements in the form of new and useful products for better living require at least from three to five years from the primary development stage through proving tests to effective production and sale.

By a realistic and orderly approach to the problem of new product planning, the Bendix corporation, while meeting its wartime production responsibilities, now is able to announce several definite new peacetime enterprises. Among



**LAUNCHING PARTY:** This group participated in the launching of the U.S.S. AKUTAN recently at Tampa, Fla., where the Tampa Shipbuilding Co. launched its 49th ship for the Navy. Shown, left to right, are: George B. Howell, company president; Mrs. Roswell B. Daggett, sponsor; George M. Forrester; Mrs. Forrester, matron of honor; and Capt. R. B. Daggett, Navy supervisor of shipbuilding

these, he stated, will be manufacture and marketing of a complete line of home radio sets; radio communications systems for railroads, and new and improved aircraft, automotive, and marine devices and components.

### Publishes Brochure About Cold Finished Bar Steel

Bliss & Laughlin Inc., Harvey, Ill. and Buffalo, has published a well illustrated 32-page booklet on cold-finished bar steel, what it is . . . how it is made . . . where it is used.

The company points out that for more than a half-century it has been producing cold-finished bar steels. The brochure points out that cold-finished bar steel is a prime construction material for all types of mechanical equipment, processing machinery, scientific instruments, farm implements, household appliances, electrical apparatus, automotive parts and a myriad of other items. Bliss and Laughlin has specialized in cold-finished bars since 1891.

### Doubles Passenger Car Capacity at St. Charles

Looking forward with confidence to the modernization program now being planned by our progressive railroads for the postwar period, American Car & Foundry Co., New York, announces a considerable expansion of passenger car

building facilities at its St. Charles, Mo., plant.

The new additions which will comprise two one-story buildings of saw-tooth construction, covering 90,000 square feet, will include a coach shop, a truck and a forge shop. There will be 11 tracks for setting 33 passenger cars of maximum length, at one time, and transfer tables for handling cars and manufacturing equipment.

### AWARDS . . .

Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., receives third white star.

McGraw Electric Co., Toastmaster Products division, Elgin, Ill., receives second white star.

Weirton Steel Co., Weirton, W. Va., awarded first white star.

American Foundry Equipment Co., Mishawaka, Ind., awarded second white star.

Allegheny Ludlum Steel Corp., West Leechburg, Pa., awarded second silver star.

Divine Bros. Co., Utica, N. Y., receives third white star.

Shenango-Penn Mold Co., Dover, O., receives second white star.

Fort Pitt Steel Casting Co., McKeesport, Pa., awarded third gold star.

Edward Valve & Mfg. Co. Inc., East Chicago, Ind., awarded fourth gold star.

Brown Instrument Co., Philadelphia, receives third "E" award.

United States Spring & Bumper Co., Los Angeles, adds white star.

Farrel-Birmingham Co. Inc., plants at Ansonia and Derby, Conn., and at Buffalo, receive "M" pennants.

Kerotest Mfg. Co., Pittsburgh, adds fourth gold star.

W. H. Nichols & Sons, Waltham, Mass., receives second renewal of "E" pennant.

## BRIEFS . . . .

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

Marquette Engraving & Mfg. Co., Chicago, has issued a four page bulletin describing its line of marking devices.

American Foundry Equipment Co., Mishawaka, Ind., has published a book titled *Shot Peening and the Fatigue of Metals*, written by H. F. Moore, for many years research professor of engineering materials at the University of Illinois.

American Chemical Society, North Jersey Section, announces that the Leo Hendrik Baekeland award has been established to encourage the creative talents of younger American chemists.

Garrett Supply Co., Los Angeles, has been appointed distributor for the Carboly Co. Inc. in the Southern California-Arizona area.

American Rolling Mill Co., Middletown, O., announces the Liberty ship GEORGE M. VERITY, named in honor of the founder of the American Rolling Mill Co. went down the ways recently at the Bethlehem-Fairfield shipyards, Baltimore.

Koehring Co., Milwaukee, manufacturer of construction equipment, has opened a parts service warehouse in Sacramento, Calif., to render a complete service to customers in 11 western states.

General Electric Co., Schenectady, N. Y., reports more than 130,000 of its employes are insured for a total of \$347,000,000, an average of approximately \$3850 per employe under the company plan.

Conlon Corp., Chicago, recently received the Army ordnance flag for outstanding contributions in the field of ordnance production, specifically for producing more than 500,000 57-millimeter steel cartridge cases without a ballistic failure.

Grayson Mfg. Co., Monrovia, Calif., announces its name has been changed to Tung Tip Division, Lowell & Grayson. Plants are located at Monrovia and Detroit.

Brooks Equipment Corp., New York, opened an office in Chicago recently at 1 North LaSalle street to serve the Great Lakes and Midwest area.

Davis & Thompson Co., Milwaukee, has appointed the Luther & Pedersen Agency, Chicago, as its direct sales representative.

Central Boiler & Mfg. Co., Detroit, has published a folder citing the advantages of induction heat treating.

Universal Wheel & Abrasive Corp., Chicago, announces plans to move soon into a new and larger plant at 400 N. Ashland avenue, Chicago.

U. S. Machine Corp., Lebanon, Ind., announces leasing of warehouse facilities at 70 West End avenue, New York, and outright purchase of its Chicago branch property at 1614 S. Wabash avenue.

J. O. Ross Engineering Corp., New York, announces opening of a new branch office at 79 Milk street, Boston.

Demco Tool Service Inc., Glendale, Calif., reports it was awarded first prizes for machine tools and cutting tools at the Southern California Industrial Exposition, Los Angeles.

Junior Steel Co., Los Angeles, has purchased the fabricating steel plant and warehouse division of the Pennsylvania Iron & Steel Co., Los Angeles. It will be operated under the name of Pennsylvania Steel Co. The cold-drawn bar division of Pennsylvania Steel, established in 1942, will be operated under the name of Westland Drawn Steel Co. as a separate company.

Kent Studios Service Inc., New York, plans to enter the industrial design field with a full and complete designing serv-

ice, including factory and product engineering, product design, sales promotion and merchandising counsel.

Richmond Radiator Co., Uniontown, Pa., has purchased the equipment of the Pierce-Butler Radiator Corp., Syracuse, N. Y. The equipment will be installed in one of the Richmond plants.

Joshua Hendy Iron Works, Sunnyvale, Calif., announces appointment of the Alaska-Pacific Supply Co., Seattle, as its agent for marine and stationary diesel engines and parts.

International Detrola Corp., Detroit, recently moved its executive offices from Elkhart, Ind., to its Detroit Radio Electronics plant at 1501 Beard street, Detroit.

Ross Heater & Mfg. Co. Inc., Buffalo, has established a direct factory office at 901 Citizens State Bank building, Houston, Tex.

Westinghouse Electric & Mfg. Co., Pittsburgh, has organized a radio receiving division for the manufacture of home radio sets following the termination of the war. Headquarters will be in Baltimore.

Brown Instrument Co., Philadelphia, announces that Latin American industrialists are to be offered an opportunity to provide groups of employes of their own choosing with free technical and practical instruction in precision industrial instrumentation at the Brown School of Instrumentation, Philadelphia.



PRODUCTION AWARD: Reliance Electric & Engineering Co., Cleveland, received the 153d Maritime "M" recently for its production of motors and generators for the Victory fleet. Rear Admiral Edward L. Vickery, vice chairman, Maritime Commission, presents the pennant to Clarence L. Collens, president of the company

# THE BUSINESS TREND

## War Output Up; Still 3% Behind Schedule

AUGUST munitions output of \$5,430,000,000 was three per cent behind schedule but showed a two per cent rise over the July level. Improvement in production during the latest period was due partly to specialized production drives and to the additional manpower which is being made available for the critical programs.

Output of the "trouble" programs during August showed several of the critical items reaching record highs—for example, heavy trucks, super-bombers, heavy-duty tires and large-caliber artillery ammunition. While output of these items is still below stated requirements, in the special case of heavy field guns the August production rate almost reached the level needed to meet schedule for the rest of the year.

At the close of August about 64 per cent of the total war equipment needed for 1944 had been turned out; \$43.3 billion out of a year's requirement totaling \$67.3 billion. Production must average 8 per cent above the August volume to meet the present 1944 goal. Among the major programs, the 1944 output goals of aircraft and ship construction were 66 per cent completed as of Sept. 1. On the other hand, ammunition—reflecting recent boosts in large-caliber shell requirements—is only 59 per cent completed.

**AIRCRAFT**—Output ran to 93.9 million pounds in August—6 per cent below schedule and on par with the July level. August deliveries amounted to 7939 planes.

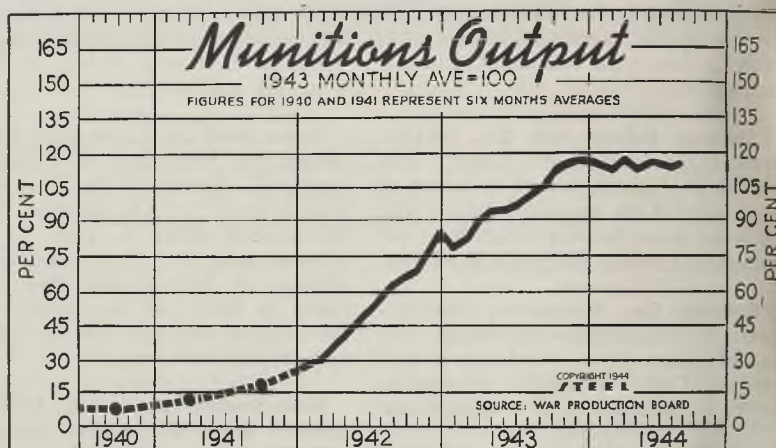
**SIGNAL EQUIPMENT**—Total communication and electronic equipment output in August was 7 per cent over July and 3 per cent behind schedule.

**MARITIME SHIPS**—Total construction of 1,161,000 deadweight tons during August represented a decline of 9 per cent under July and put the program 6 per cent behind schedule. Maritime construction is slated to rise steadily during the balance of this year and to reach a peak of 1,700,-

000 deadweight tons next March—almost 50 per cent above the August level. The emphasis will be on combat loaders. Victorys, and standard cargo vessels. Deliveries of Navy-built ships during August fell 28 per cent below July to 222,450 displacement tons. This was 5 per cent below schedule. September is slated to be a big month in Navy vessel construction with a 45 per cent jump scheduled to take place in deliveries.

**ORDNANCE**—August output of ground-army munitions rose 11 per cent to \$975 million. However, because monthly schedules in some instances had to be reduced for feasibility reasons, production in the remaining four months this year must rise sharply to meet 1944 requirements. Output of trucks reached an all time peak of 4476 units during August, but still 10 per cent below schedule.

**WPB's MUNITIONS INDEX**—Preliminary figure for August is placed at 115, a gain of two points over July but is still below the peak index figure of 118 recorded last December. In August a year ago the index stood at 105.



War Production Board's Munitions Index

(1943 Monthly Average = 100)

Month	1940	1941	1942	1943	1944
January	-	-	29	78	115.3
February	-	-	31	82	115.8
March	-	11*	36	90	119.7
April	-	-	42	95	115.5
May	-	-	47	96	116.8
June	-	-	52	97	115.8
July	-	-	58	101	113.3
August	-	-	64	105	115.3
September	-	18*	67	107	115.3
October	-	-	69	114	118.3
November	-	-	76	117	118.3
December	-	-	84	118	118.3

\*6-Month average. †Preliminary.

## FIGURES THIS WEEK

### INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	96	96	95.0	99.5
Electric Power Distributed (million kilowatt hours)	4,377	4,395	4,418	4,360
Bituminous Coal Production (daily av.—1000 tons)	1,918	1,808	1,978	2,006
Petroleum Production (daily av.—1000 bbls.)	4,744	4,746	4,667	4,344
Construction Volume (ENR—unit \$1,000,000)	\$19.2	\$42.5	\$37.3	\$72
Automobile and Truck Output (Ward's—number units)	20,880	20,865	19,855	21,490

\*Dates on request.

### TRADE

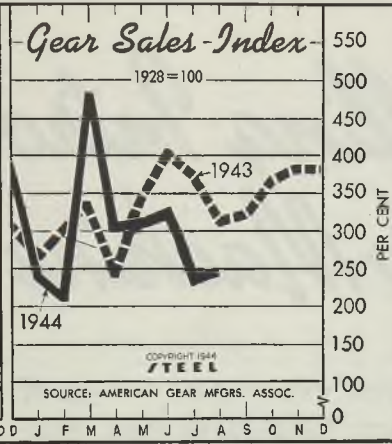
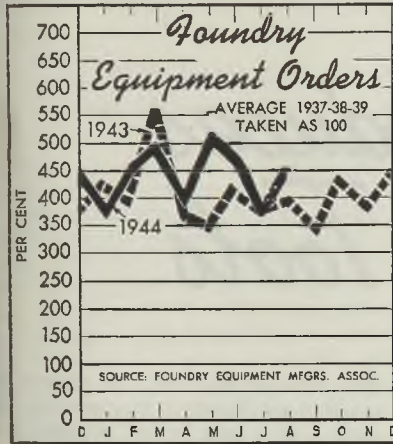
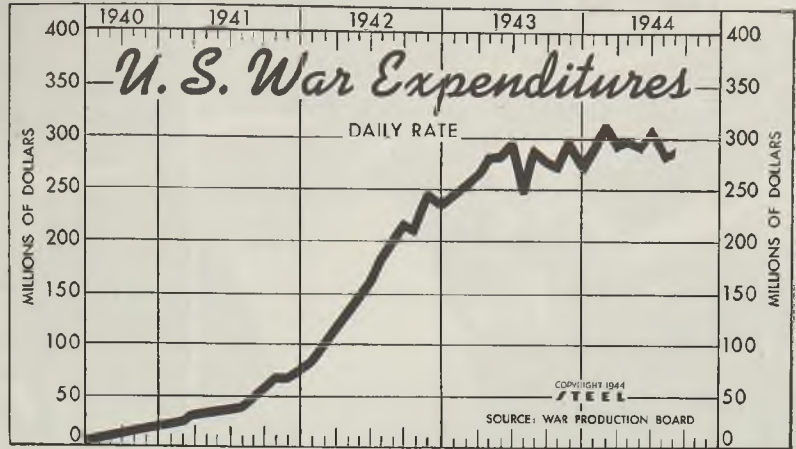
	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars)	895†	892	906	907
Business Failures (Dun & Bradstreet, number)	24	23	22	33
Money in Circulation (in millions of dollars)†	\$23,558	\$23,495	\$23,047	\$18,714
Department Store Sales (change from like week a year ago)†	+14%	+15%	+13%	+10%

†Preliminary. ‡Federal Reserve Board.



War Expenditures (millions)

	1944		1943	
	Monthly Expenditures	Daily Rate	Monthly Expenditures	Daily Rate
Jan.	\$7,416	\$285.2	\$6,254	\$240.5
Feb.	7,808	312.3	6,081	253.4
Mar.	7,948	294.4	7,112	263.4
Apr.	7,493	299.7	7,290	280.4
May	7,918	293.3	7,373	283.6
June	7,957	306.0	7,688	295.7
July	7,355	282.9	6,746	249.9
Aug.	7,798	288.8	7,529	289.6
Sept.	.....	.....	7,212	277.4
Oct.	.....	.....	7,105	273.3
Nov.	.....	.....	7,794	299.8
Dec.	.....	.....	6,951	267.3
Total	.....	.....	.....	.....
Avg.	.....	.....	Tr'l 85,135	Av. 272.9

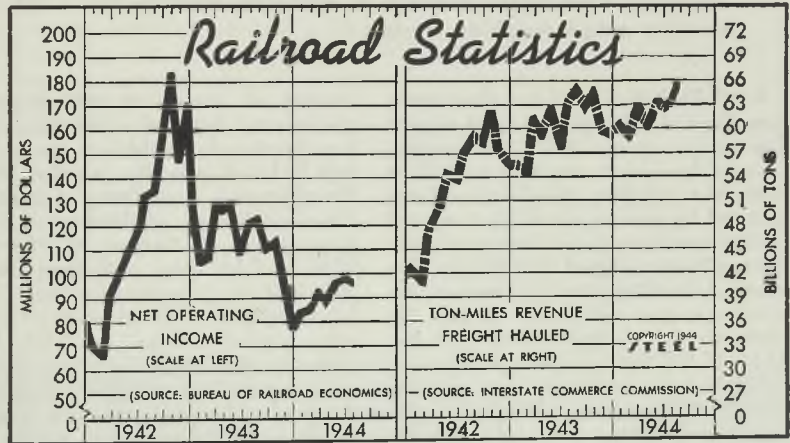


Foundry Equipment and Gear Sales

	Monthly Average (1937-38-39=100)			Index (1928=100)		
	1944	1943	1942	1944	1943	1942
Jan.	378.8	429.8	532.7	246	268	288
Feb.	456.8	399.5	567.9	214	303	358
Mar.	498.4	562.7	1122.4	485	334	455
Apr.	385.7	362.7	1089.3	308	240	378
May	503.9	348.9	653.6	305	342	421
June	466.1	413.6	774.0	328	401	378
July	375.8	379.4	800.8	242	374	344
Aug.	450.5	390.4	510.8	247	312	380
Sept.	.....	346.6	446.4	.....	320	351
Oct.	.....	436.6	540.6	.....	368	268
Nov.	.....	388.0	338.8	.....	387	359
Dec.	.....	442.8	382.5	.....	387	300
Avg.	.....	440.3	646.7	.....	336	355

Statistics of Class I Railroads

	Net Operating Income		Ton-Miles Revenue Freight			
	1944	1943	1944	1943	1942	1941
	(millions)		(billions)			
Jan.	\$82.8	\$105.8	\$66.8	60.5	55.1	43.0
Feb.	84.5	105.8	64.4	59.3	54.4	40.8
Mar.	92.5	129.7	90.6	63.0	61.2	48.3
Apr.	87.7	128.7	101.6	60.4	59.1	50.0
May	98.5	129.5	109.7	64.0	62.1	54.2
June	99.8	109.0	118.7	62.0	58.0	53.9
July	98.6	127.8	133.6	62.3	63.7	57.0
Aug.	.....	124.6	135.9	65.9	65.1	58.6
Sept.	.....	110.2	155.1	.....	62.5	58.2
Oct.	.....	113.1	184.8	.....	65.0	62.2
Nov.	.....	96.4	149.0	.....	59.6	57.0
Dec.	.....	76.9	174.4	.....	59.4	55.0
Avg.	.....	\$113.5	\$122.9	.....	60.5	53.2



FINANCE

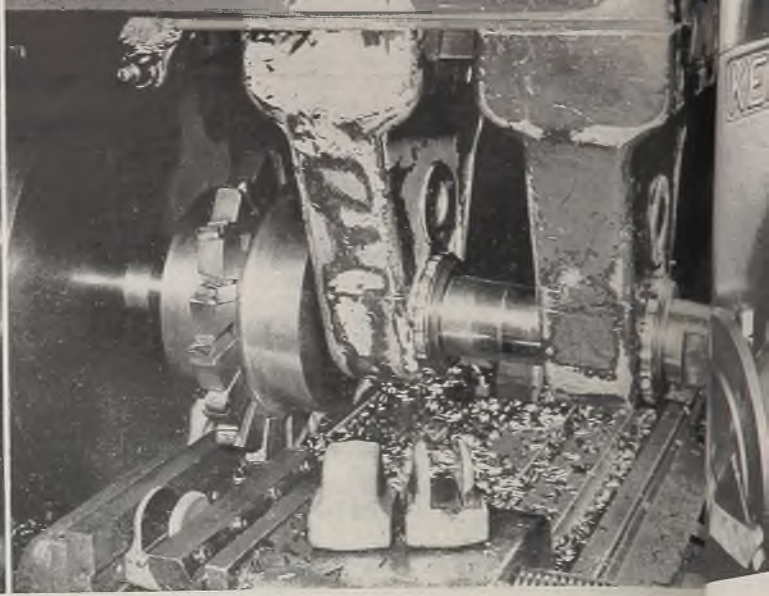
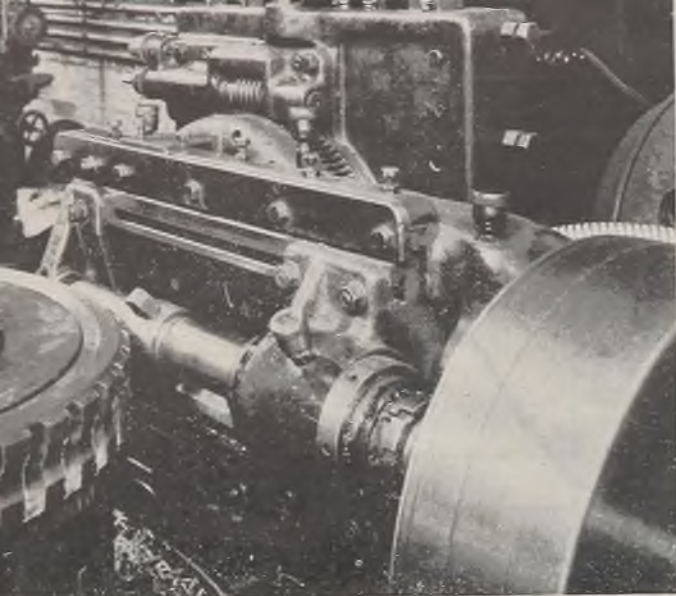
	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$10,859	\$9,331	\$8,793	\$11,231
Federal Gross Debt (billions)	\$210.6	\$211.3	\$210.9	\$158.4
Bond Volume, NYSE (millions)	\$29.2	\$30.8	\$28.5	\$57.0
Stocks Sales, NYSE (thousands)	3,175	3,644	3,792	4,143
Loans and Investments (millions)†	\$55,041	\$55,493	\$56,383	\$49,393
United States Government Obligations Held (millions)†	\$41,113	\$41,446	\$42,229	\$35,584

\*Member banks, Federal Reserve System.

PRICES

	Latest	Prior	Month	Year
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	250.7	250.1	250.6	248.5
Industrial Raw Materials (Bureau of Labor index)†	112.8	112.7	114.3	112.2
Manufactured Products (Bureau of Labor index)†	101.1	101.1	101.1	100.1

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



# Super-Milling Introduces Flywheels to Machine Tools

*Widespread adoption in connection with wartime tooling, of these hitherto unfamiliar elements, foreshadows their incorporation into basic designs of postwar milling machines and certain other machine tools*

WAR PRODUCTION has done much more than to bring thousands of women into machine shops. It has, for example, brought flywheels to machine tools. Prior to the war, a battery of milling machines operated by women would have aroused far less comment than a battery of milling machines equipped with massive flywheels. To what extent the women machine operators will carry on into the postwar era is a debatable question, but as far as the flywheels are concerned, it certainly looks as though they are here to stay. Superspeed milling with carbide tipped, coarse tooth cutters certainly is here to stay, and flywheels are vital adjuncts to that method of machining.

Back in the July 28, 1941 issue of STEEL, when supermilling (if any) was still veiled in secrecy, I had an article with this somewhat apologetic title, "Flywheels on Machine Tools, question mark". In view of the manner in which some of my predictions in that article have come true since that time, I have been tempted to entitle this follow-up article, "Flywheels on Machine Tools, exclamation point".

Three years ago, my flywheel article was largely theoretical, or possibly I should say conjectural. I was hard pressed to find any illustrations for it. The present article deals only with actualities, in the form of case histories. I have been almost embarrassed by the

number of interesting photographs of machine tool flywheel installations which have been made available to me by Herbert B. Lewis, executive secretary of the Manufacturing Engineering Committee, American Society of Mechanical Engineers; by J. H. Grayson of Monrovia, Calif. and by other authorities on the technique of superspeed milling. The 2-page spread presented herewith represents careful selection from this large collection of material.

Among the first to break with the tradition that "flywheels are never used on machine tools" were the builders of

gear hobbing machines. In view of the excellent results which they attained with them over a long period of years, it is rather surprising that manufacturers of other types of milling machines clung so long to the "no flywheel" tradition.

There were, however, a few notable exceptions to that rule. Many years ago the Oesterlein milling machine was equipped with a large diameter, rim-type flywheel which was mounted at the rear end of the spindle. Sundstrand Machine Tool Co. likewise furnished a spindle flywheel for certain models of machines. This Sundstrand flywheel could be put on or taken off—as occasion demanded.

As a touch of early history as far as supermilling is concerned, I present Fig.

*Fig. 4 (Right)—Twin flywheels have been found necessary to help this triple cutter successfully to climb mill tough steel forgings at 581 surface feet and 17½ inch feed per minute. This is a negative rake job employing 8 inch cutters with boiler plate bodies and Kennametal tips. Lockheed photo, courtesy ASME*

*Fig. 5 (Extreme right)—This may look like "a lot of flywheel" for a small job, but it has what it takes to mill SAE 4130 steel forgings of 120,000 p.s.i. tensile at 549 surface feet per minute with 10 inches per minute feed. The cutters in this case are 10 inches in diameter. Boeing Aircraft photo, courtesy ASME*

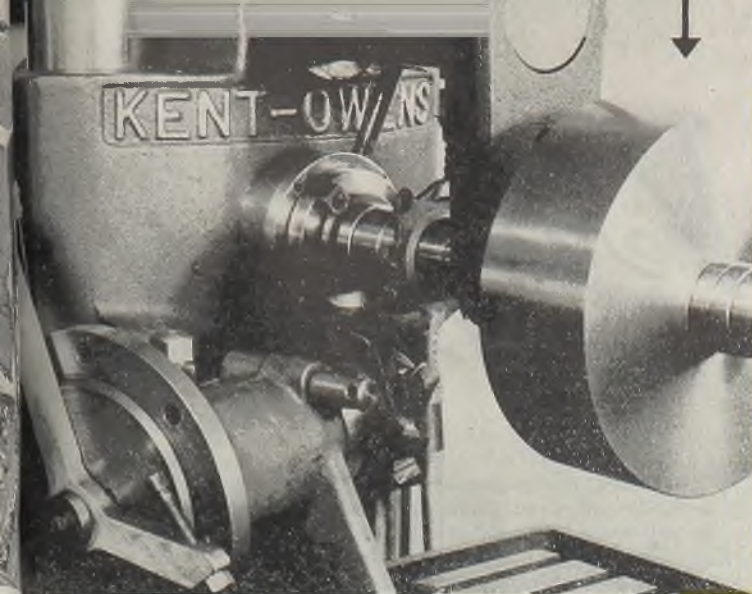


Fig. 1 (Extreme left)—This is an early and interesting example of the use of a flywheel to smooth out what ordinarily would be a "bumpy" hobbing operation involving the use of a single tooth hob of flycutter type. Photo courtesy Braun Gear Corp.

Fig. 2 (Center, left)—Here is a case where the flywheel effect of heavy flanges on a 10-inch tungsten carbide cutter is supplemented by a heavy flywheel mounted on the arbor. Boeing Aircraft photo, courtesy ASME

Fig. 3 (Left)—In this photograph, a coarse tooth, cast body, carbide-tipped cutter is shown milling seats for carbide seats in another similar cutter, with the help of a flywheel mounted beyond the overarm support. Lowell & Grayson photo, courtesy ASME

By GUY HUBBARD  
Machine Tool Editor, STEEL

1 showing an ingenious and significant application of the single-tooth, formed flycutter to the hobbing of a large bronze worm wheel in a Reinecher hobbing machine. This is a prewar photograph taken in the plant of the Braun Gear Corp., Brooklyn, N. Y. This setup utilized a rugged high-speed steel, tooth-form blade which took a hearty bite of tough bronze every time it swept around. What otherwise would have been a definitely bumpy job of interrupted cutting, was made smooth, steady and altogether satisfactory through the use of a heavy flywheel on the hob spindle. This wheel is visible in the lower right-hand corner of the illustration.

Incidentally, flycutter setups comparable to this, often used to be considered as stunts or makeshift expedients. Many of them—and certainly this one—never did deserve to be brushed off that lightly. With the advent of carbide tooling, and through the ingenuity of the tool engineering fraternity, including Ralph R. Weddell, president, Weddell Tools

Inc., Rochester, N. Y., flycutting rapidly is winning proper recognition as a highly effective method of superspeed milling on a wide variety of production jobs. Among other things, Mr. Weddell has developed standard spindle nose flywheels with which his flycutters are close-coupled, thus eliminating "wind-up" between flywheel and the cutting edge.

The setup depicted by Fig. 2 illustrates a typical case wherein the flywheel effect is depended upon for double duty. Not only does it insure smoothness of action on the part of a large diameter (10-inch) coarse-tooth cutter, but also it constitutes a storage reservoir of power which helps to propel the cutter through the 2-inch long slot without subjecting the motor to what otherwise would be a sharp peak load.

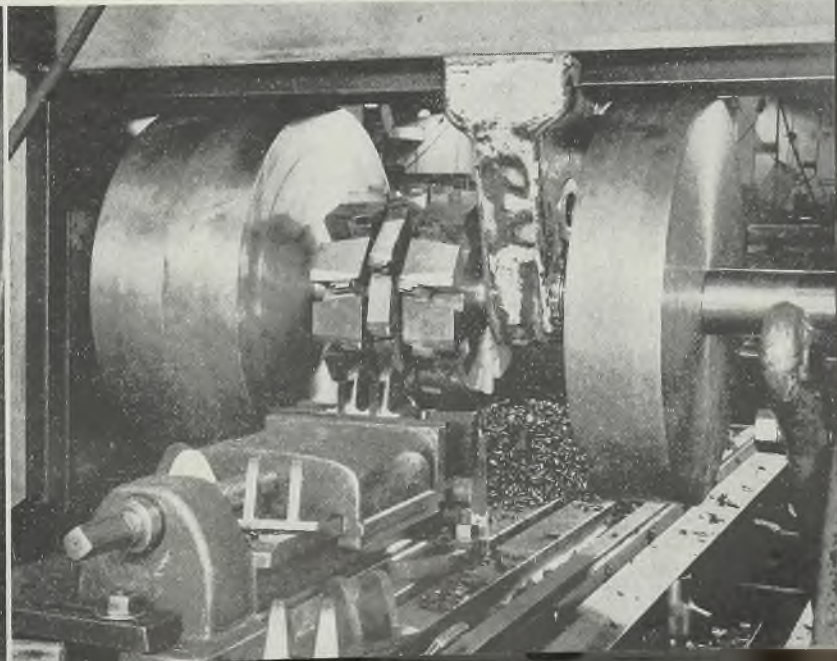
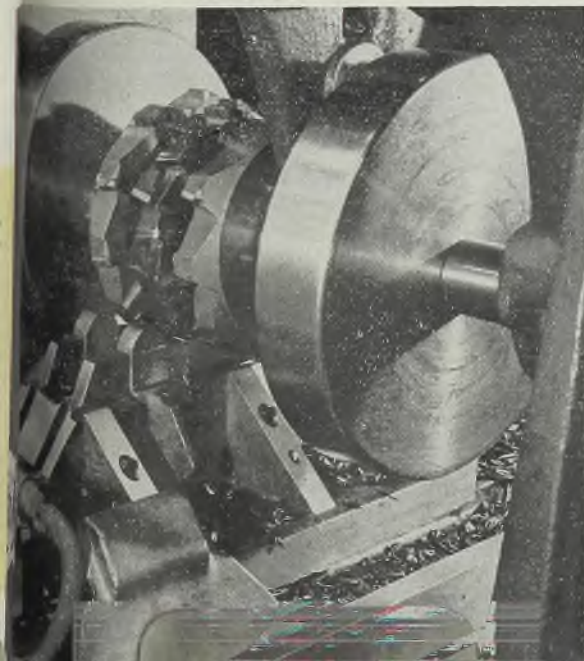
If stabilization of the cut (that is, ironing out of "bumps") was all that was necessary, the flywheel effect inherent in the heavy disk flanges of this cutter undoubtedly would be sufficient. (Incidentally, many of the earlier superspeed setups did attempt to make the flywheel integral with the cutter.) At the same

time, the heavy flanges serve another important purpose in that they give the cutter much more lateral rigidity than a thin, unsupported disk would have. Where this support is not integral in the cutter, it frequently is found necessary to mount the cutter between two heavy disks similar in proportion to the flanges on this solid cutter body.

Getting back again to the matter of flywheel effect, it will be noted that the real "punch" in this case, as far as driving the cutter through the SAE-4230 forging (90,000-120,000 pounds per square inch tensile) is concerned, is delivered by a separate large diameter disk wheel mounted on the arbor close to the spindle nose. This is visible to the left of the cutter. Running at 210 revolutions per minute, this heavy wheel undoubtedly has momentum sufficient to carry the cutting load independent of the motor.

According to information furnished by Boeing Aircraft Co., Seattle, Wash., this Cincinnati Hydromatic setup is run at 528 surface feet per minute at 5 inches per minute feed. Milling from the solid

(Please turn to Page 109)



# Vertical Assembly.



FROM the engineering department of a machine tool plant at Bridgeport, Conn., have come developments that produce British aircraft torpedoes with new precision and dispatch.

Engineering innovations worked out by the Bullard Co. include a method for precise overall alignment of the torpedo, and mass production with complete interchangeability of parts fixed to the curving sides of the casings. They include a method of milling propeller blades that cuts previous time in half; also "envelope jigs" that permit up to 551 holes to be drilled in a casing at a single setting.

These and other engineering achievements help to put together more quickly and accurately the 4000 pieces that make up an 18-foot "tin fish".

All torpedoes are precision instruments. Aircraft torpedoes, which in use of tin are dropped into the water from a height of several hundred feet, must have the added ingredient of ruggedness.

The quality of precision has always been difficult to attain in the overall alignment of this product because it has five sections—the warhead, air vessel, balance chamber, afterbody, and tail—weighing in all nearly  $\frac{3}{4}$ -ton. Even though these five sections are permanently riveted and sweated together, a torpedo supported on horses will sag as much as  $\frac{1}{32}$ -inch.

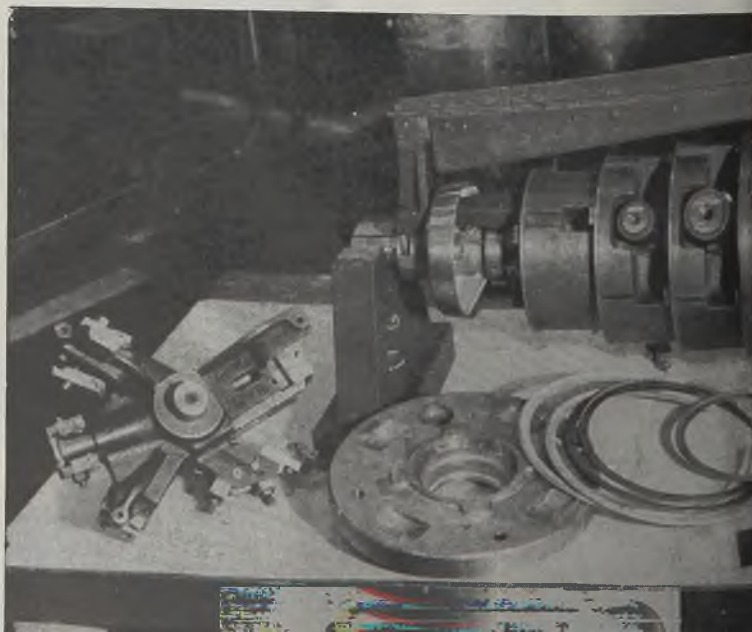
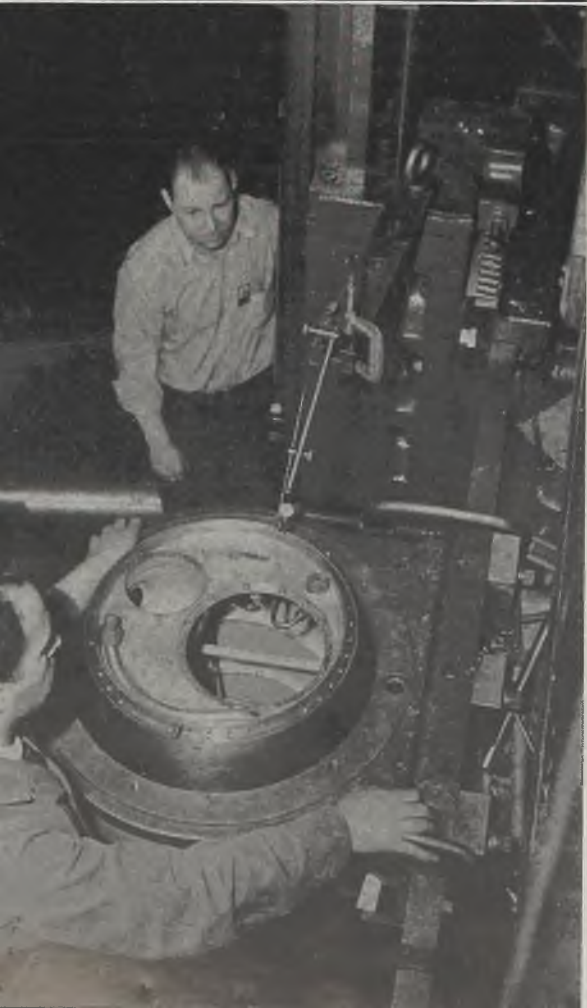
This problem was solved by assembling the torpedoes vertically, eliminating all sag. It was decided to establish a common center line for all of these weapons and to develop the pigs and fixtures, mandrels and arbors that would make this center line a

70

*Fig. 1 (Above, left)—An 18-foot torpedo is stood on its nose on the table of a Bullard 74-inch vertical turret lathe to determine whether or not center line of projectile has been established and maintained throughout manufacture*

*Fig. 2 (Left)—Afterbody section is lowered into envelope jig which will permit more than 500 rivet holes to be drilled at one setting through afterbody casing into fittings bedded on the inside*

*Fig. 3 (Below)—Seventeen fixed fittings for the afterbody here are in place on specially designed turning arbor which enables shop to reduce machining time from days to a few hours*



**method of constructing aircraft torpedoes achieves precise balance and alignment. Center-line theory—developed for this application—inspires creation of clever jigs and arbors, simplifies machining of fittings and castings; dominates assembly of sections on large lathe**

positive control for all measurements. Torpedo as mounted in vertical position on the table of a vertical turret lathe is shown in Fig. 1.

The application of this center-line theory starts with the steel casings, which are hammered to an inside diameter within close limits upon an accurately machined mandrel.

Remarkable savings in time are gained by applying this center-line method in preparing the 48 parts of the mechanism known as the "fixed fittings", which are bedded and riveted to the curving sides of the torpedo casings. There are 26 of these fittings in the balance chamber, 17 in the afterbody and five in the warhead. Previously, these were machined one at a time to correspond closely to the contours of the casing, and the job was finished by long and tedious hand-fitting.

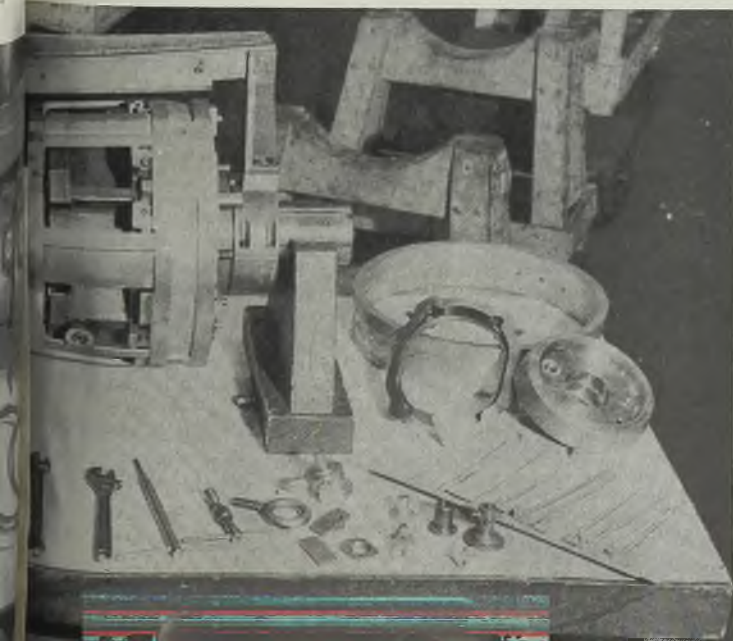
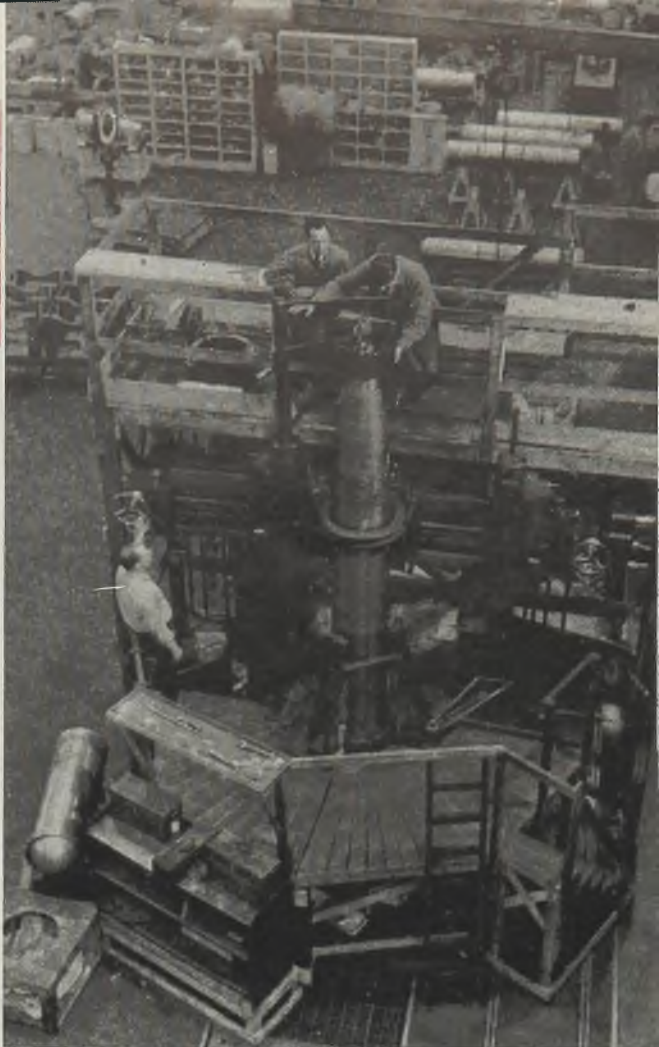
Today, these fixed fittings for each section of the torpedo are machined accurately and simultaneously in Bullard-designed turning arbors on horizontal lathes. (Fig. 3.) Because these arbors have the same center line and radius as the mandrel on which the casings are stretched, the fittings bed with precision, eliminating all hand-fitting. The 26 fittings for the balance chamber, for example, are finish-machined in 4 hours. Hand-fitting required days.

Proportionately large savings in time are effected in drilling the casing sections for rivets as shown in Fig. 6. Because the fixed fittings will now locate themselves accurately inside the torpedo, the casing can be slid over them while they are still in the turning arbor. Then an envelope jig, Fig. 2, is slid in turn over the casing and all rivet holes drilled through into the fittings with a radial drill at one setting.

The time saving is graphically illustrated by the fact these  
(Please turn to Page 86)

Fig. 4 (Right)—Aft end of balance chamber is checked for concentricity as it revolves on table of vertical turret lathe with special fittings. Indicator is on control arm operated by tool's lefthand ram

Fig. 5 (Above, right)—Afterbody section is lowered into place on top of forebody. Sptgot on small end of afterbody will be indicated to run true within 0.001-inch before it is secured



# ALEMITE COLOROUTE PLAN LUBRICATION ANALYSIS BEECH AIRCRAFT CORPORATION-WICHITA, KANS.

COLOR	LUBRICANT	○	□	⊙	▽	◇	TOTAL
		DAILY	WEEKLY	MONTHLY	6-MONTHS	YEARLY	TOTAL
●	ALEMITE No. 696	954	1828	388			3170
●	ALEMITE No. 38	110	523	2106	150	150	3039
●	ALEMITE PYRO No. 41			23			23
●	ALEMITE No. 27	3890	340	348			4578
●	ALEMITE No. 29	70		140			210
●	NEATSFOOT OIL	20					20
●	SPINDLE OIL	217					217
●	ALEMITE E.P. 140	152	201	192			545
●	ALEMITE No. 339	180	317	519	100		1116
●	ALEMITE Industrial Oil No. 1	301					301
●	ALEMITE Industrial Oil No. 2	921					921
●	ALEMITE Industrial Oil No. 3	421					421

Fig. 1—From the guide cards and other data obtained on survey, a master lubrication analysis chart is prepared. The one shown here provides a condensed picture of the complete lubrication job at Wichita, Kans. plant of Beech Aircraft Corp.

SURELY no other phase of plant maintenance deserves more care and attention than a program to assure adequate lubrication of the machines employed, for production efficiency depends directly upon continued proper lubrication. In fact, lubrication directly affects life of the machine. So lubrication is doubly important since machine tools and other metalworking equipment usually involve a considerable investment. And often they are irreplaceable without serious production delays.

While proper lubrication is thus one of the most important phases of plant maintenance, there are many practical difficulties that often make continued efficient lubrication almost an impossibility in many plants today.

In the first place, every machine that comes into a plant usually arrives with

detailed instructions concerning lubrication: Use this (specifying make, type, grade) oil here, put in this much, do it at these intervals; at this point use this (specifying make, type, grade) grease here, use this much, do it at these intervals; and so on for perhaps 20 to 50 lubrication points.

Multiply this sort of thing by the number of machines in a plant . . . and what do you come up with—a problem that soon becomes a hopeless jumble because some 40 or 50 lubricants may be specified in many grades and types. Even an expert spending his full time would have a tough job seeing to it that the right lubricant reached the right place at the right time under such a setup.

“Lubri-Chaos” Develops: Then when this confusion from natural and logical

*Color Aids Improved System for . . .*

## LUBRICATION CONTROL

Effective plan routes each lubricant from barrel to bearing; highlights hidden lubrication points so none is missed; helps prevent over or under lubrication; reduces number of different lubricants required by 30 to 75 per cent; enables inexperienced workers to do expert job of lubrication

causes is compounded by a succession of plant men who may specify yet additional lubricants because of brand preferences and the whole picture made into a hodgepodge by lack of a single qualified expert to control lubrication in the plant . . . the result is likely to develop into an extremely chaotic situation.

While part of this confusion can perhaps be attributed to overselling specialty lubricants, each plant can take some of the responsibility if it has no definite central lubrication control system worked out and in charge of a qualified expert on the subject.

**Identification Difficult:** The difficulty usually begins in the room where the lubricants are stored. With perhaps 50 different lubricants in all sizes and shapes of containers, it is no small job to identify them. The make, type and grade do not appear on all containers in the same place, or may not appear at all.

Then the smaller containers used to distribute the lubricant about the plant involve another difficult identification problem. Few plants have a system that identifies lubricants at every point

By C. I. KRAUS  
 Manager  
 Alemite Industrial Lubrication Div.  
 Stewart-Warner Corp.  
 Chicago

in handling, for of course, grease guns and oil cans likewise involve the same identification problem. How is the operator to know whether or not he has the right lubricant in the gun, unless he has just filled it from the barrel in which it arrived.

Perhaps an extreme case, but illustrative of what can happen, is the bearing that burned out even though it was filled. But what do you suppose it was filled with . . . shellac. Someone had mistaken shellac for oil.

In another instance, an air compressor had an oil well equipped with a filling attachment and a small overflow pipe. Someone saw some oil coming out of the overflow pipe and plugged it up. You know what happened the next time the well was filled . . . oil overflowed into the cylinder and wrecked the compressor when the motor was started.

**"Ideal" Program:** Most plants have gone at least part of the way in an endeavor to find a path out of this "lubri-chaos", as it has been termed. The ideal, of course, would be to eliminate all overlapping grades and types, at the same time switching to one make to avoid duplication by makes. Most large manufacturers of lubricants produce a complete line; in fact, if someone would work out a chart classifying all standard lubricants according to types and show which makes, grades and types were interchangeable, it would be a most valuable service to industry in helping to simplify the lubrication problem. It would go a long way toward eliminating much of the confusion that now exists.

While it is true that most plants have attempted to eliminate this overlapping

(Please turn to Page 126)

Fig. 2 (Top, right)—This is the "Lubrication Guide Card" prepared in detail for each machine in the plant. It carries the color key, totals number of points to be lubricated with each type and grade and has space for special notations

Fig. 3 (Right)—The color key affords positive assurance that the machine will be lubricated by a gun filled with the proper lubricant, in turn filled from the right container, in turn filled from the correct barrel . . . an almost foolproof system. Machine shown is a hydraulic forming press, equipped with a "merry-go-round" transfer table to move work and male dies rapidly under the universal rubber pad female die carried by the upper press platen

7

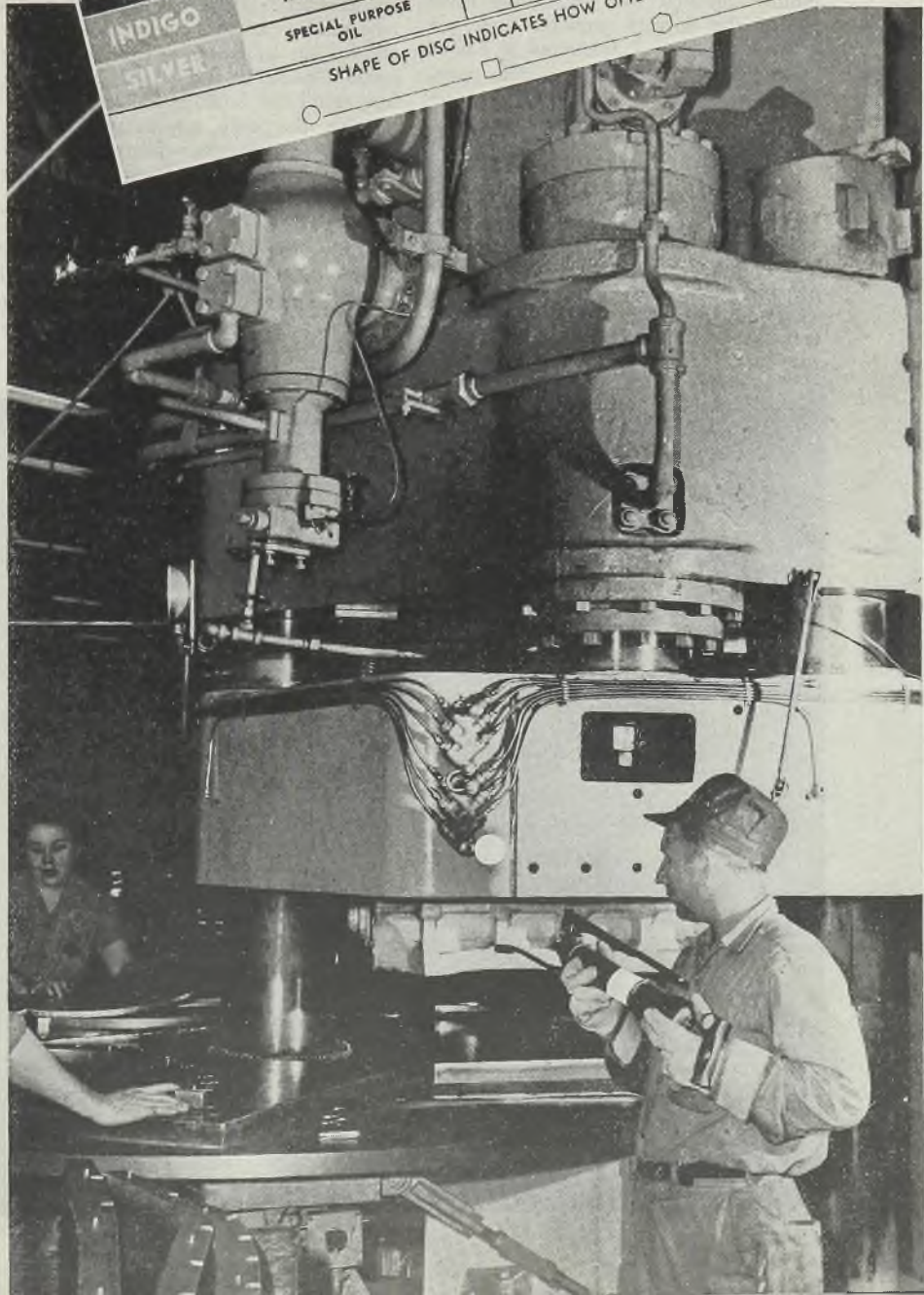
**ALEMITE** [REDACTED] **LUBRICATION GUIDE CARD**

MACHINE NAME \_\_\_\_\_ NUMBER \_\_\_\_\_ LOCATION \_\_\_\_\_

MACHINE NAME	TYPE OF LUBRICANT	NUMBER OF POINTS TO BE LUBRICATED WITH GRADE				REMARKS
		1	2	3	4	
<b>BLUE</b>	GENERAL PURPOSE GREASE					
<b>RED</b>	ANTI-FRICTION BEARING GREASE					
<b>TAN</b>	SPECIAL PURPOSE GREASE					
<b>YELLOW</b>	GENERAL PURPOSE OIL					
<b>WHITE</b>	SPINDLE OIL					
<b>GREEN</b>	EXTREME PRESSURE OIL					
<b>INDIGO</b>	HYDRAULIC OIL					
<b>SILVER</b>	SPECIAL PURPOSE OIL					

SHAPE OF DISC INDICATES HOW OFTEN TO LUBRICATE

Fr



# CORROSION-RESISTANCE OF STEEL

is greatly extended through chemical treatment of electroplated zinc, cadmium and galvanized surfaces in bichromate salt bath. Method also can be applied to die castings

ZINC and cadmium have inherent advantages as protective coatings for steel that have been utilized for a long period. Their peculiar relationship to iron, from the electrochemical standpoint, tends to defer the corrosion of the base metal at the expense of the more reactive zinc or cadmium.

Since this process is in a sense sacrificial, it is obvious that a chemical treatment of the zinc surface which will inhibit corrosion will extend the usual life of the finished product. Inasmuch as such a chemical treatment is almost entirely applied to electroplated parts, some fundamental background data on electroplating may prove helpful.

## Theory of Electroplating

It is quite generally known that when an electric current is passed through an aqueous solution of a salt, the deposition of the free metal may occur. It is not possible to plate from an aqueous solution those metals which combine actively with water, such as sodium,

potassium, calcium, aluminum and magnesium.

Since the metal in solution carries a positive charge, the metal 'ion' (metal particle in solution) wanders toward the negative or 'cathode' pole. At the surface of the cathode, the positive charge on the ion is neutralized, and the free metal deposits on the cathode itself. The free metal has no electric charge.

Since the only requirement of the cathode (or negative electrode) is that it be a conductor of electricity, metals

can be plated onto a variety of materials, provided they are conductors.

However, the usual practice is to make metal parts to be plated the negative electrode. Thus, the "work" (material to be plated) is hung on the "cathode bus bar" and the positive electrode (anode) is composed of highly purified zinc, cadmium, lead, silver, etc., depending upon the type of plating.

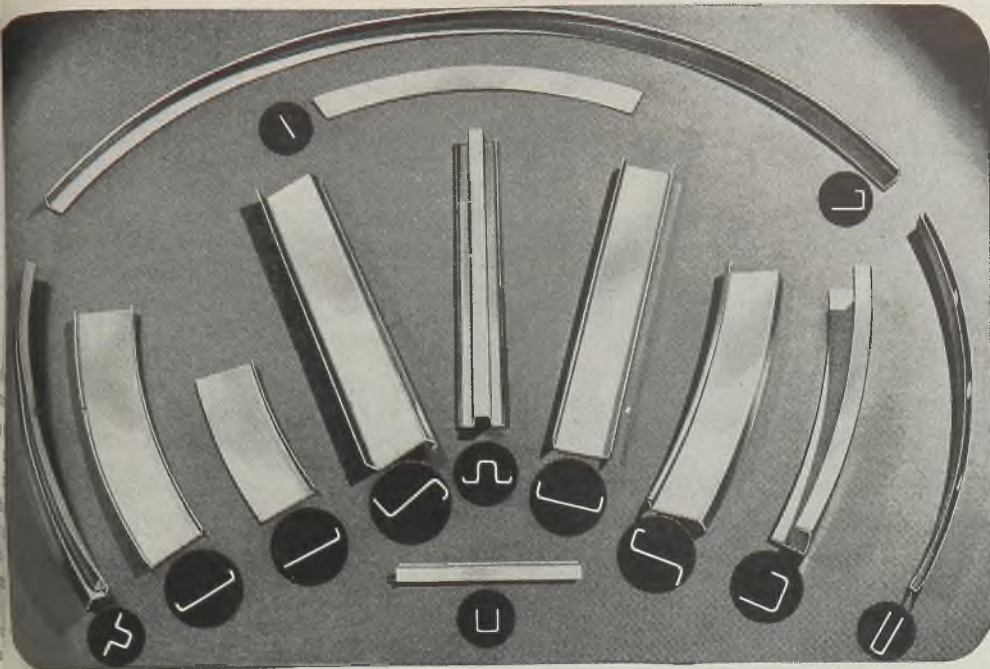
The zinc plating solution in most common use is the alkaline cyanide bath. This has largely replaced the acid sulphate bath used formerly, for the following reasons: The bath offers greater *throwing power*, and is capable of forming truly bright deposits. Throwing power is the ability to deposit metal on irregular surfaces and on surfaces which

By DR. R. M. THOMAS  
Vice President and Director of Research  
Rheem Research Products Inc.  
Baltimore

*This Rheem Research Products Co. production department at Baltimore follows straight-line production methods in turning out coated steel parts. These parts progress through zinc plating tanks and after plating are chemically treated for further protection. In the background may be seen a drying oven served by a monorail conveyor which dries the parts after dipping*







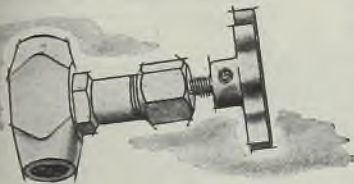
### Design Flexibility

These shapes illustrate what you can do with easy-to-fabricate Carpenter Stainless Strip. Lighter gauges and sharper radii are possible with this versatile metal. The life of the product you are designing now can be lengthened, its sales appeal enhanced by making it from bright, uniform Carpenter Stainless Steels.

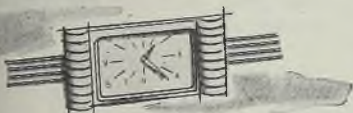
## You get these NEW DESIGN POSSIBILITIES with Carpenter Stainless Steel



**LOW UNIT COST** To gain sales appeal yet keep price competitive, kitchen implements, like the egg beater shown above, gain distinct advantages when made from Carpenter Stainless Steel.



**LONG LIFE** Valves made from Carpenter Stainless provide resistance to corrosion from a wide range of chemicals and withstand heat, pressure and wear.



**EYE APPEAL** Unusual eye-catching designs captured in sparkling Stainless! It's easy when you specify Carpenter! For this Stainless trim a light gauge was used without sacrifice of strength and rigidity.

That gleam in your designer's eye probably means one thing: you're planning to launch some exciting new or redesigned product in the postwar market.

There are three ways you can benefit by working with Carpenter in your postwar planning:

1. By starting with Carpenter Stainless Steels, which, through rigid control in manufacture, can be counted on to have the same uniform qualities, lot after lot.
2. Through a service program which aims to help Stainless users select the analysis that will best meet the particular fabrication, corrosion, and physical requirements.
3. By taking advantage of Carpenter metallurgical and engineering assistance in solving new and different problems in the use of Stainless Steels. This helps prevent trouble *before it starts*, speeds production, and reduces fabricating costs.

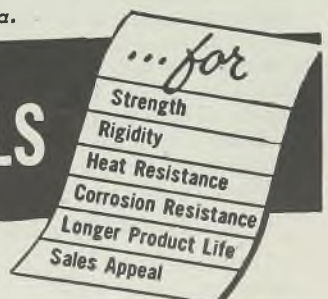
Take the first step to secure this helpful Stainless design-engineering cooperation by calling in your nearby Carpenter representative. Talk over your problems with him—get the benefit of his long Stainless experience. If you have not already received a copy of our 98-page book, "Working Data for Carpenter Stainless Steels", drop us a line on your company letterhead indicating your title.

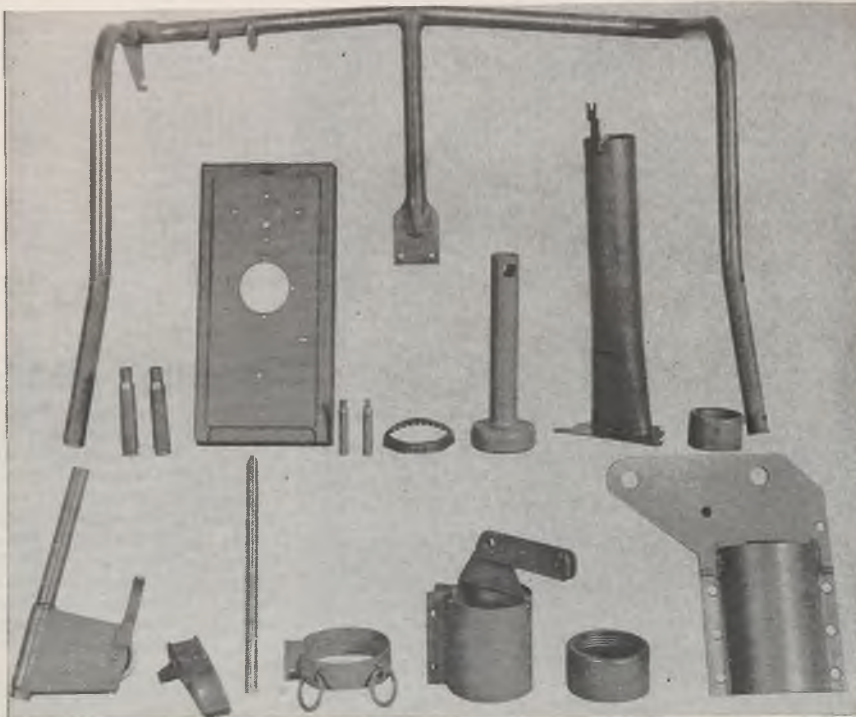
The Carpenter Steel Company, 139 W. Bern Street, Reading, Pa.

# Carpenter STAINLESS STEELS

#### BRANCHES AT

Chicago, Cleveland, Detroit, Hartford,  
St. Louis, Indianapolis, New York, Philadelphia





*These typical steel parts, including ordnance items such as cartridge cases, were made more corrosion resistant by zinc-plating followed by treatment in a bichromate salt bath*

are not directly in line with the anode. In theory, the metal particles tend to plate out somewhat like light falling on a surface, leaving shadows on those surfaces which are out of the direct path. Furthermore, the electric charge on the interior surface of a hollow container is almost negligible; therefore, plating the interior of cavities, recesses and drilled holes is seldom successful, unless specially placed anodes are used.

Metals vary considerably in their throwing power, effectiveness declining in the following order: Tin, cadmium, copper, zinc, nickel and chromium. However, the type of bath affects this considerably. An acid zinc bath is almost as poor as chromium, in comparison with an alkali cyanide zinc, which is very high in throwing power.

Electroplaters seldom are inclined to build up the necessary fixtures to insure even plating of recessed parts, more often depending on the fact that a flash coat of metal will eventually plate out to form a visible coating in some recessed part. This results in the most uneven distribution of metal, and provides one of the trying difficulties in the application of a chemical protective treatment. It is often said that success in chromium plating depends upon the ingenuity with which the plater can design his anodes to insure even plating on all surfaces. Good throwing power is thus a great advantage to the plater, provided visual inspection is the only criterion of thickness.

#### Types of Plating Equipment

There are three general types of equipment in use, which favor the han-

dling of various types of work. Large and irregularly shaped objects are plated in a "still" or simple steel tank with sufficient depth and other dimensions to handle the work. No mechanical conveying or agitation is used.

Fully automatic and semiautomatic tanks, supplied with chain or other type of conveyors are favored when a great number of uniform pieces are to be plated. The automobile industry, the largest user of such tanks, had many fully automatic installations which were designed to take a piece of bare steel and successively plate it with copper, nickel, and finally chromium, without any intermediate handling.

Barrel plating is the only satisfactory method of plating large quantities of small parts, such as nuts, bolts, washers, and other items which obviously could not be individually racked economically. Since in barrel plating the contact between the work and the cathode bus bar is made solely by casual contact with a free cathode ball, and by successive contacts between individual pieces of work, the efficiency of barrel plating is considerably less on a time basis than by other methods. As the parts tumble through the solution, out of contact with one another or with the cathode bar, they are not plating.

#### Plating Solutions

In discussing zinc solutions, there are three fundamental components which are essential: Zinc, sodium cyanide and sodium hydroxide.

Assuming that the bath is in operating condition, these three components are present in the form of sodium zinc-

ate, sodium zinc cyanide and zinc cyanide. In other words, these are the three forms in which zinc may be present in the bath.

It is evident that the bath is made up of a mixture of zinc complexes; the determination of the actual percentage of one or the other at any time being a matter of considerable difficulty. It is brought up here only to explain the many variations in the basic cyanide formula that are in use, and to show why these variations are all capable of producing an excellent plated finish. In fact, the variations in any given plating bath during operation, and between additions of chemicals to restore depleted components, may be very great without showing up in the form of rejected work. The functions of the various components, insofar as can be stated with any accuracy, are as follows:

The cyanide is needed in order to induce the zinc to form readily soluble complexes of the type mentioned above. If the zinc is present in very low concentration, because of the lack of soluble complex salts, plating will occur only at the expense of producing spongy surfaces of poor quality.

The sodium hydroxide (or caustic) is primarily responsible for the original solution of the zinc metal from the anode; the zinc then recombines with the cyanide. Plating without caustic in solution is possible but at efficiencies down around 15 per cent, and the finish is of poor quality.

The proper operational limits are set by a constant which is expressed as follows:

$$K = \frac{\text{Sodium Cyanide} + \text{Sodium Hydroxide}}{\text{Zinc Cyanide}}$$

Various simplifications of this ratio have been put forward, and are satisfactory. A little study of the ratio shows that the variations in plating bath formulas mentioned above may exist from bath to bath, or in any bath from hour to hour, and still lie within the limits set by the term "good operating condition". For example, two good baths are often used, with the following concentrations of chemicals:

	Bath A	Bath B
Zinc Cyanide . . . . .	8	12
Sodium Cyanide . . . . .	3	7
Sodium Hydroxide . . . . .	7	12

Solution A above has a ratio as expressed above of 1.25, while solution B has a ratio of 1.58. Solution B is designed for high current density operation, A for a lower density. In each case, it is recommended that the constituents be kept within plus or minus 10 per cent of the figures given for steady satisfactory operation.

As the caustic is very easily controlled, and since the ratio of total sodium cyanide to zinc metal is the "essential" ratio, this figure is the one most often employed by platers.

The following table shows some of

# PORTER Diesel-Electric SWITCHERS



100-Ton PORTER Diesel-Electric Switcher

*Custom Built*  
**POWER!**

You can order a PORTER Diesel-Electric Switcher with the assurance that it will be engineered, designed and built to fit the requirements of your own particular switching or hauling job. An expert knowledge of switching problems accumulated over a period of 78 years enables PORTER Engineers to design switching power that will give you the utmost in service at the lowest cost for operation and maintenance. Let us analyze your switching requirements and recommend the type of unit best fitted for the job. Such an analysis may reveal possibilities for substantial savings.



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Mt. Vernon, Ill. • Newark, N. J. • New Brunswick, N. J.

## "CUSTOM-BUILT POWER"

This 20 min. kodachrome sound film showing the building of a PORTER Diesel-Electric Switching Locomotive is available for exhibition at clubs, meetings, etc. Applications for booking may be addressed to the Locomotive Dept.

the effects of varying this ratio:

Total Sodium Cyanide		Efficiency
Ratio M =	Zinc Metal	
Ratio M	Bright Plate Current Density Range Amps. per sq. foot	
2.25	37-93	92%
2.50	18-93	88
2.70	9-93	82
3.00	4.7-75	69
3.20	2.8-75	54

This table indicates that as the ratio goes upward from 2.0 to 3.0 or above, that the permissible current density at which a bright plate will still be obtained goes down. Also, the current efficiency drops somewhat. Practice generally indicates a ratio of about 2.75.

So far, the discussion of plating baths has centered around the ingredients and their function. A great deal is heard about bright zinc plating. There is no essential difference in the theory or in the compounding of a bright zinc bath

as compared with what is called a straight cyanide bath. The development of the bright zinc plating method was the result of research work which showed that bright plating could be done under the following conditions:

- 1—The plating bath is to be free of heavy metals as impurities.
- 2—Rigorous control of the composition of the plating bath.
- 3—The removal of oxide films by following with a bright dip.

It has been recognized that even traces of heavy metal impurities can affect the surface and brightness of deposits. Copper and lead are common offenders. Several methods have been employed in purifying baths. The inclusion of a small amount of molybdenum salts, is thought to rid the solution of lead by forming a complex compound. This is generally added with the brightener. Its effect on removing other impurities is not well established. The addition to the bath of sodium sulphide (from 0.03 to 0.33 ounces per gallon) precipitates lead; the addition of zinc

dust in the same amount (followed by stirring and filtration) removes other metals.

Control of the plating bath is more important in the bright zinc plating formulas. In general practice, platers will determine at just what levels they obtain the best results and thereafter adhere to that analysis.

Bright dipping after plating is usually done in a very dilute nitric acid bath (0.25 to 0.50 per cent). Nitric acid removes the zinc oxide film and tends to passivate the surface, making it considerably less vulnerable to finger printing and darkening on exposure.

Various types of addition agents are added to the plating bath to induce bright deposits. They are without exception organic compounds, usually of a complex type, and many are covered by patents. The indication for the addition of brighteners to the bath lies almost entirely in the discretion of the plater.

#### Chemical Treatment of Plated Surfaces

As indicated earlier, the service life of zinc-plated surfaces can be extended considerably through chemical treatment. The Iridite or chromating process, developed for this purpose, is based upon a chemical reaction between the zinc and the chemical bath which results in the formation of a tightly adherent film, the essence of which is a chromium containing compound or compounds. After a brief immersion in the bath and subsequent rinsing and drying, the finished product is uniformly covered with an opaque, olive green coating which affords remarkable resistance to salt spray, and adverse atmospheric environments.

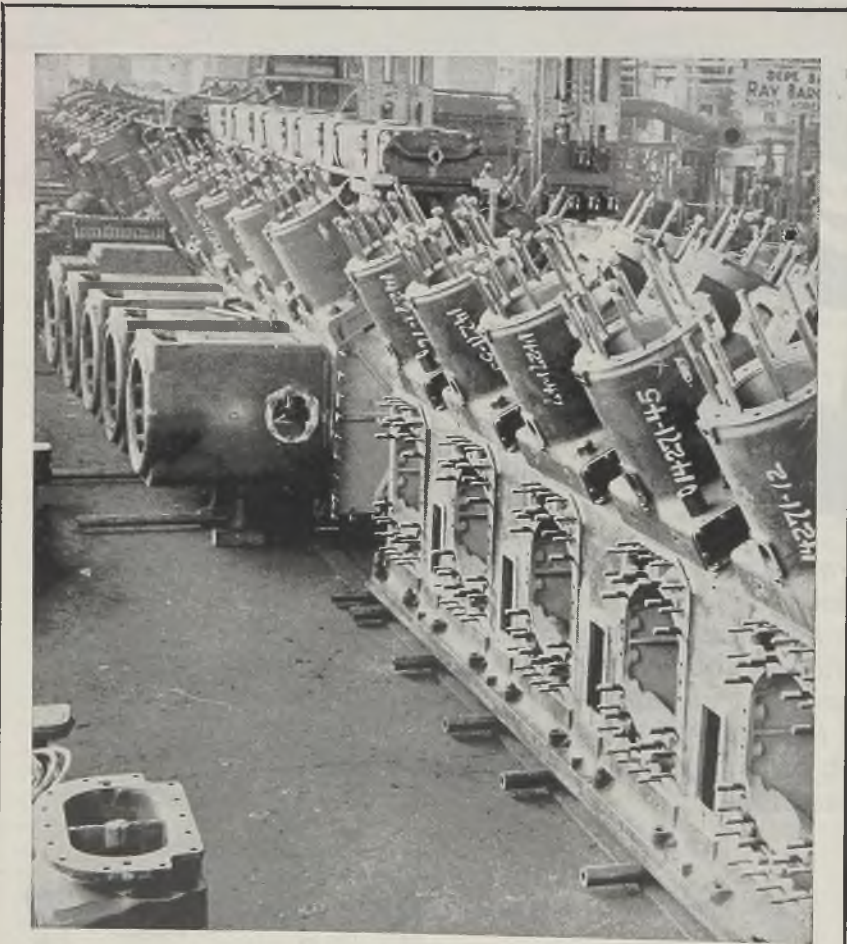
The luster and smoothness of the finish is dependent upon the character of the underlying metal surface—if it is smooth and shiny the finished product will be similarly smooth and shiny, and if the underlying metal is etched or roughened, the finished product will have a lackluster appearance.

The deep olive green or olive drab color of the film has enabled a large number of zinc-plated parts and zinc die castings to be provided with a corrosion resistant finish which at the same time provided the requisite camouflage for wartime purposes.

The precise nature of the chemical reactions that occur in the process are somewhat obscure. The bath is supplied with chromium in the form of bichromate salts; if the solution is acidified, the introduction of zinc metal initiates a reaction in which the chromium salt is reduced from a higher valence to a lower; this represents a reduction in its potential insofar as reactivity is concerned.

In the Iridite bath the solution is acidified with the aid of an organic acid, which not only supplies the acid component of the bath but accelerates the reduction of a large amount of chromium

(Please turn to Page 118)



**GIANTS ON PARADE:** Assembly-line type of production designed by Cooper-Bessemer Corp.'s Mt. Vernon, O. factory for 56-ton compressor units is speeding construction of this large equipment. Engine bases mounting steel skirts roll from station to station over steel tracks embedded in the erecting floor. Arrangement permits locating various component parts of the type GM-V compressors (note engine frame, foreground) at selected spots along the line, eliminating much of the work formerly done by hauling and overhead cranes



**"THEY CLAIM DUPLICATION OF ALL DESIRED PHYSICALS AND ACCURACY IN COIL AFTER COIL"**

**"WELL, LET'S INVESTIGATE—WE'VE EVERYTHING TO GAIN AND NOTHING TO LOSE"**

*That's the way . . .*

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## THINSTEEL FACTS

- GAUGES THIN AS .001"
- WIDTHS UP TO 24"
- COILS UP TO 300 LBS. PER INCH OF WIDTH.
- EXTREMELY CLOSE TOLERANCES.
- STANDARD AND SPECIAL TEMPER.
- STANDARD FINISHES.
- CARBON AND ALLOY GRADES.
- WIDE RANGE OF PHYSICALS.

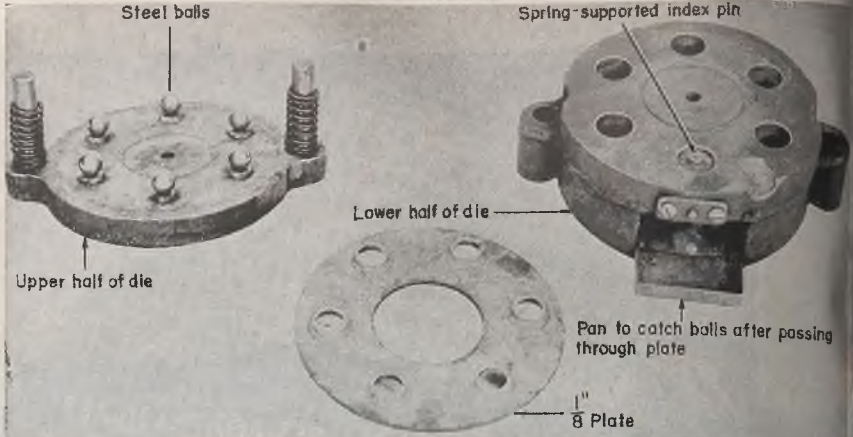
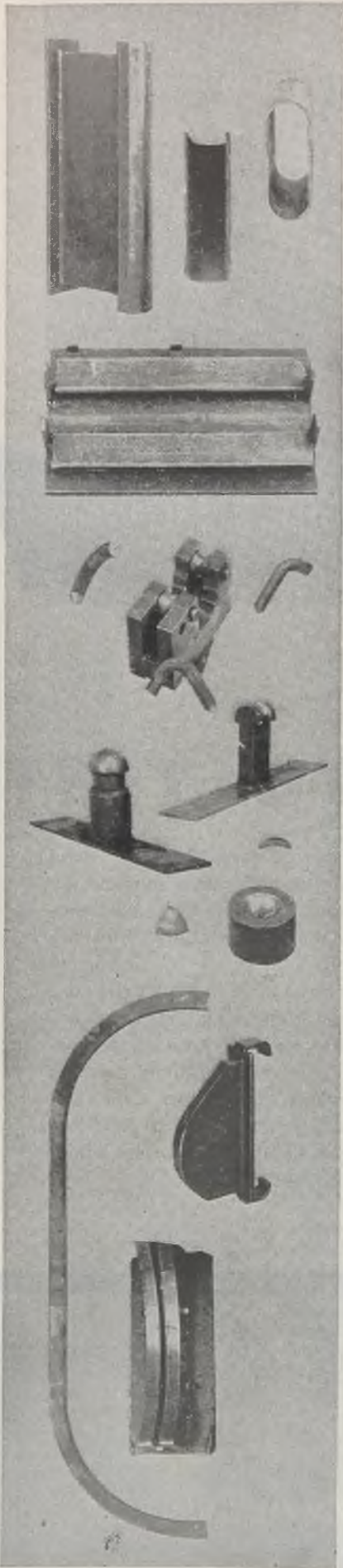
Product improvement and new design always present fabrication problems. Material specifications demand the most important initial decisions . . . bound by considerations of physicals, costs, fabrication adaptability and the product's finished appearance. To best prove all phases of profitable production planning, no better preliminaries are known than actual material sample fabricating tests. In cases where light gauge cold rolled strip steel may be under consideration, CMP, the pioneer in precision cold-rolling, perhaps can help you gain many fabrication economies. CMP will cooperate in supplying the right metal tailored to your job. And in your investigation of CMP Thinsteel . . . and actual tests . . . we're sure you'll find the answer.

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SUBSIDIARY OF THE  
COLD METAL PROCESS CO.

**YOUNGSTOWN, OHIO**





# Low Cost Tools...

*built without elaborate designs and drawings, yet require little testing*

ELABORATE drawings and designs are not always necessary when new tools, fixtures, or dies are needed for limited manufacturing purposes. Adequate tools often can be obtained in shorter time and at much less cost by simply assigning the job to skilled mechanics who can design, develop, and test the tools without drawings, and frequently with very little machining.

The accompanying illustrations show several low-cost tools designed and built by Michael Reichlin of General Electric Co.'s Lynn River Works.

Blocks between upper and lower dies in Fig. 5 are for illustration purposes only. Tapped holes and bevels on the lower section are the sole machining necessary. Worn die corners can be built up by welding and ground to contour by hand. The soft steel die has been in use about three years and shows little wear. Conventional bending dies cannot handle such heavy steel plate.

The dies in Fig. 4 cost less than tool

drawings ordinarily prepared for similar jobs. Blank disks are placed on lower half of die and located by a spring supported index pin. A 3/4-inch steel ball is put over each hole and the upper half of the die set in position. Balls are forced through the holes by a hydraulic press, producing the extruded eyelets, and then drop into a collecting pan.

Both halves of the die in Fig. 1 are flame cut, ground by hand and welded. It forms air-tube halves in a hydraulic press from 1/4-inch steel plate; these are then welded together.

An adjustable die for forming various sizes of lifting lugs from 1/4-inch bar steel is shown at the left of Fig. 2. The die at right is used to form odd-shaped corner pieces for welding a round cornered box.

Casing-joint flanges, such as the piece shown in the lower portion of Fig. 3 are formed in a hydraulic press from the welded steel plate die. A few holes in the lower part of the device were the only machine work required.

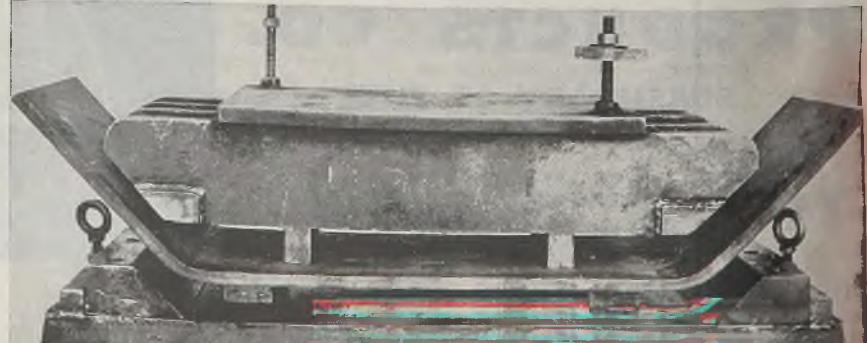
Fig. 1 (Top, left) Forming die for air tube halves and sections of finished ducts

Fig. 2 (Center, left)—Adjustable die for lifting lugs, and die for forming corner pieces

Fig. 3 (Bottom, left)—Flange die of steel plates and finished strip


Fig. 4 (Above)—Upper and lower halves of press die; finished 6-eyelet plate

Fig. 5 (Below)—Soft steel die used to form 3/4-inch steel plates





# LET'S RING IT AGAIN!



America is at the cross-roads. Never before has a Presidential election meant more to the future of our country. Where we put that "X" on our ballots is mighty important this year! The issues to be decided are not of the moment, but may alter for all time our established, American way of life. The results of this election are far-reaching . . . will affect you, your children and their children's children. This year's vote is both a national and personal matter.

Whatever happens, capitalism will remain. It is the bed-rock of our Democracy . . . as essentially democratic as the town pump! Neither labor nor management would change our economic set-up, because both realize our capitalistic system has made us the greatest nation on earth. The "common man" in America has uncommon advantages that outweigh all "isms". However, there are different kinds of capitalism. Under the one, you make your own decisions; under the other, they are made for you.

America is in favor of private enterprise—freedom for G. I. Joe to return home, start a business, and prosper without unwelcome help . . . or interference. America wants open competition—an unfettered opportunity to put our billions to work on profitable investments. America is in favor of unrestricted liberty for all—not domination by any group—government, labor, or management!

Yes, your vote is important this year! It calls for serious thinking. Every American has a stake in the decision you make as you enter the voting booth. All of us must ask ourselves what we are about to gain, not what we are about to lose.

The Liberty Bell—let's ring it again!



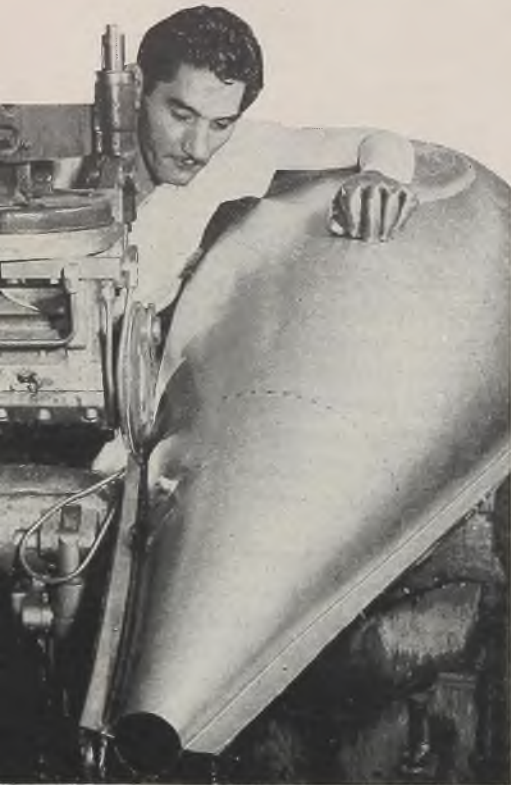
EVERY STERLING GRINDING WHEEL WE MAKE IS DEDICATED TO LIMITLESS PROGRESS IN A FREE, UNSHACKLED AMERICA.

• STERLING ABRASIVES •  
THE  
**STERLING GRINDING WHEEL DIVISION**  
OF THE CLEVELAND QUARRIES COMPANY  
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

# Light Weight Tanks

for aircraft are drawn from long terne sheets and joined by torch, spot and continuous seam resistance welding in West Coast plant. Special jigs and fixtures aid production



EXTRA RANGE for American fighter planes is obtained by streamlined, laminar flow drop-off tanks, released by the pilot when he goes into combat. Each tank carries 165 gallons of high test aviation gas. Two, carried by the Lightning, give it a ferrying range of 2200 miles, enough to cross the Atlantic ocean.

Each tank weighs 90 pounds when empty, and an even ½-ton when full. The tanks are 10 feet long from tear-drop nose to trailing tip and measure 27 inches across at the widest point. Their form is so perfect, aerodynamically, that they reduce top speed only about 4 per cent.

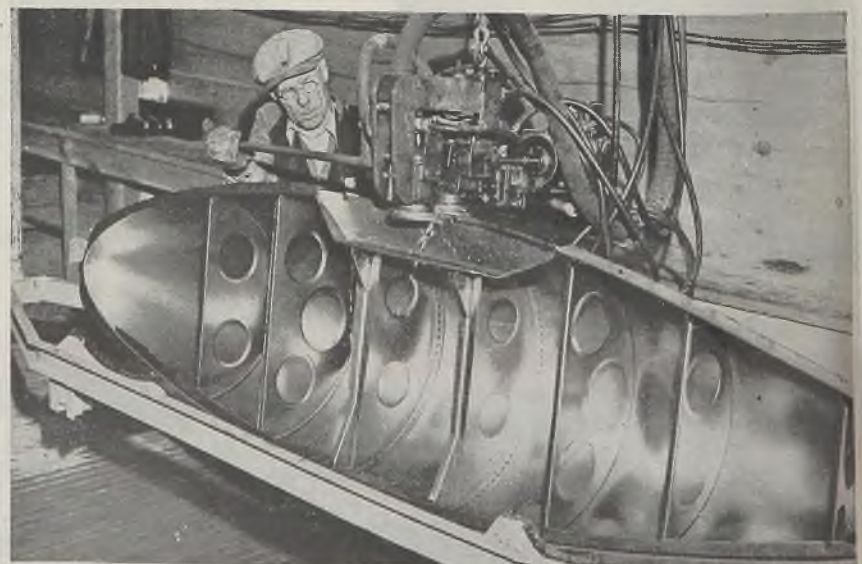
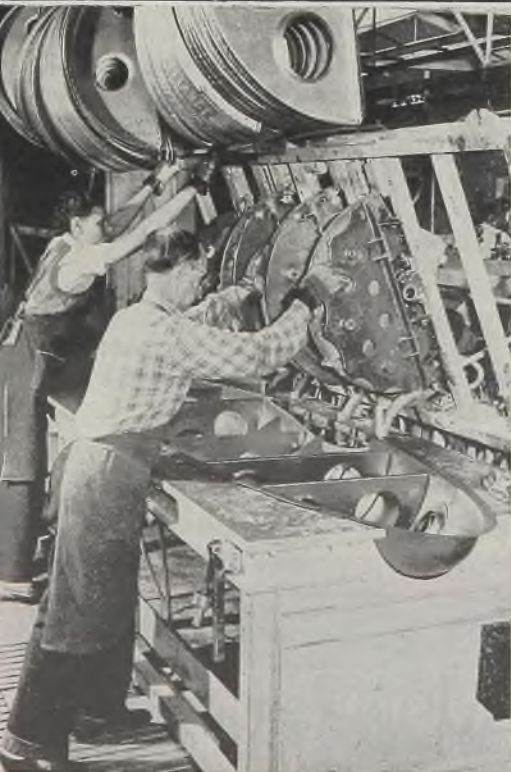
High production rates are achieved by the Weber Showcase Co., Los Angeles, through co-ordination of stationary and moving production lines. Half-shells are stamped from 44 x 144-inch sheets of 0.035-gage long terne sheet steel, and drawn to a depth of 14 inches on large presses. After trimming, skins move to the production area.

Formed skins are placed in a fixture which pierces tooling holes in the outer

*Fig. 1 (Above, left)—Seam welding tank halves together after installation of all component parts*

*Fig. 2 (Below, left)—Four vertical bulkheads about to be welded in half-shell by single operation*

*Fig. 3 (Below)—Seam welding the pan in place*



flange and stamps out filler cap and vent line openings. Half-skins are notched and flanged to receive pans, the recessed portion of the tank into which bomb anchor brackets and sway braces are fitted. The pan is designed to take the bomb fairing of both the P-38 and P-47. The sump plug ring is gas welded in the bottom side, and the filler cap adapter is seam welded in the left-hand skin by means of a special welder which welds the flange holding the cap to the inner skin by means of two welding spools rotating in opposite directions. Three bulkheads of varying sizes, placed in locating jigs within the welding fixtures, are lowered and clamped within the half-shell and spot-welded in position. The machine is entirely automatic and the welding spool spaces spots on half-inch centers instead of making a continuous seam weld, requiring no more time than continuous seam welding. The skin is transferred to a second fixture, and the remaining four bulkheads are spot-welded into position, as shown in Fig. 2.

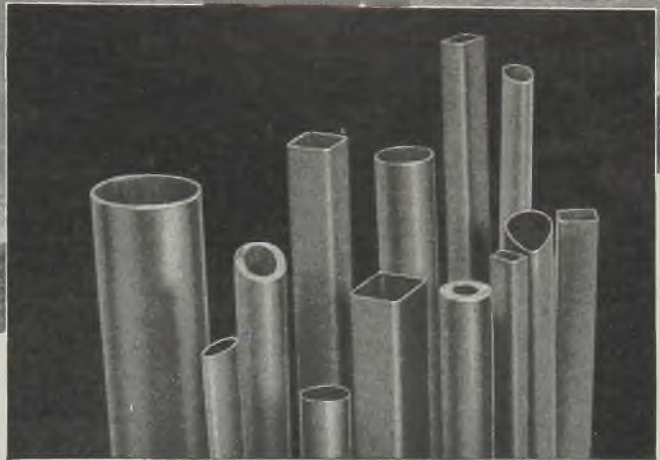
## Gussets Give Additional Strength

Left and right-hand skins are placed in corresponding "A" frame jigs, where reinforcements (gussets) are spot-welded to each side of two stress bulkheads to provide additional strength. Portable spot welders are used in this operation. The "A" frame jig locates gussets with stress bulkheads and they are clecoed in position and spot-welded to the bulkheads. Half-skins, alternately left and right, are placed on a conveyor line moving approximately 100 inches a minute. Stiffeners are clecoed to gussets and spot-welded to stress bulkheads. A piece known as the keelson angle is installed on the bottom side of each half-skin and spot-welded in position, acting as a stiffener for the tank bottom, and serving to equalize tank load and transfer it to each of the seven bulkheads. Its form is cut to conform with the contour of the skin, and shaped on a metal brake to form a right angle.

Fuel and vent lines are placed in



QUALITY —  
NOT FIGURED ON THE BLUEPRINT



## SPECIALIZED EXPERIENCE Has Produced Ostuco Quality Tubing

Whether you're looking forward to continuing present production for peacetime promotion or whether you're developing new products, you know that using quality materials will help boost your position competitively. And *quality* is the goal set at OSTUCO in the manufacture of seamless steel tubing—tubing that is well known to design and production engineers for its many applications to machine tools and products they produce.

OSTUCO has always specialized in the production of seamless tubing for out-of-the-ordinary tubing applications. This experience, coupled with high inspection standards, and precision testings, is responsible for the *quality* of OSTUCO tubing—a *quality* that has withstood the test of time by establishing a long, continuous record for low rejections. At all times, you will find OSTUCO delivers *quality* seamless and electric-weld tubing that goes beyond blueprint specifications.

OSTUCO's experienced sales representatives can offer you the services of expert engineers who have been instrumental in developing *quality* tubing, and who will gladly assist you in solving your particular tubing problem for the reconstruction period ahead.

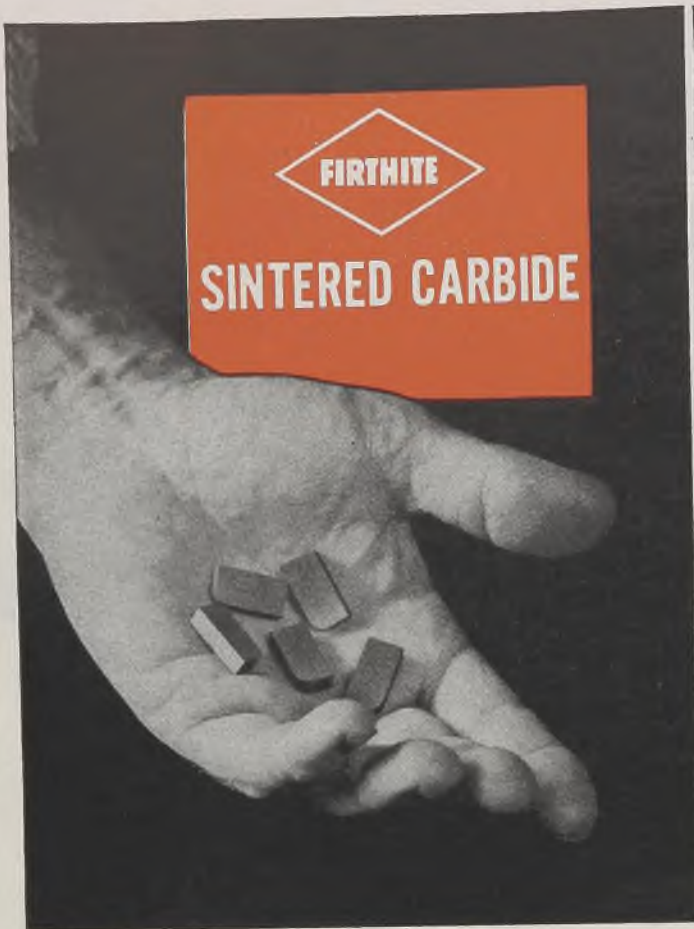
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Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least 25%* faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

*For instance:*

**FIRTHITE** removes 730 pounds of gray-iron casting metal per hour instead of 180 pounds;  
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*enables* milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

*For instance:*

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### *Firth-Sterling Steel Company*

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the left-hand skin, and tack welded in place. A pan is installed, forming one-half of the well for fairing carrying the release mechanism on the bottom of the plane. Four clecos hold the pan securely in place, and it is resistance welded as shown in Fig. 3. Stiffeners and gussets are welded in position by means of a 150-kilovolt-ampere portable seam welder. Hanger brackets and sway braces are bolted to the half-skins through the gussets and stiffeners. The vent line is tested for leaks. Prior to mating left and right skins, close inspection is made of all welding and inserted parts. Skins are then removed from the conveyor line.

A leak-proof seam must be made in joining the two halves. Opposite skins are mated, lined up by the tooling holes on each outer edge, and held by a special type nut and bolt which securely fastens hangers into two strong, complete brackets. Tanks move to a 150-kilovolt-ampere rotary seam welding machine which joins the seam on both sides into a single fused strip, traveling 10 feet per minute, and placing 14 to 16 overlapping spots per inch, as shown in Fig. 1. Overlapping assures a leak-proof seam. To make certain the device functions properly, spot-welded seams are checked four times daily by means of a pillow test, under which two sheets of metal 12 inches square (forming the pillow) are welded together and subjected to air pressure of 105 pounds per square inch.

A flange of metal approximately 1 inch wide left on both sides of the tank is removed by an electric hand nibbler. Tanks are moved to stationary welding jigs, where left and right-hand pans are torch welded together, and the drain plug ring welded in the aft end. Units

*Fig. 4—Infra-red heat lamps baking exterior and setting interior finishes*

are taken to a battery of concrete tanks and submerged under water. If leaks are noted, seams are welded closed.

Hanger brackets and sway braces are properly fitted, guided by a fairing jig. Differences are remedied by an automatic milling machine which turns sway braces down so each will fit the jig.

Tanks are placed four at a time in a special slushing cradle, seen in Fig. 5, and filled with 20 gallons of an aromatic-resistant slushing compound which resists corrosion from high octane gasoline. The cradle, with tanks in place, resembles and revolves like the blades of a lawn mower. Tanks are held individually on the bias, secured firmly by a strap near the tail and a basket-like nose muzzle. Each group under treatment is revolved two minutes right, then two minutes left, at a rate of eight revolutions per minute. Following slushing, tanks are transferred to a series of drain racks in a nearby booth. For 6 minutes, hot air—supplied under pressure from a pipe line—forces both slushing compound and solvent vapors down and out through the drain plug. Tanks now are ready for final air pressure tests.

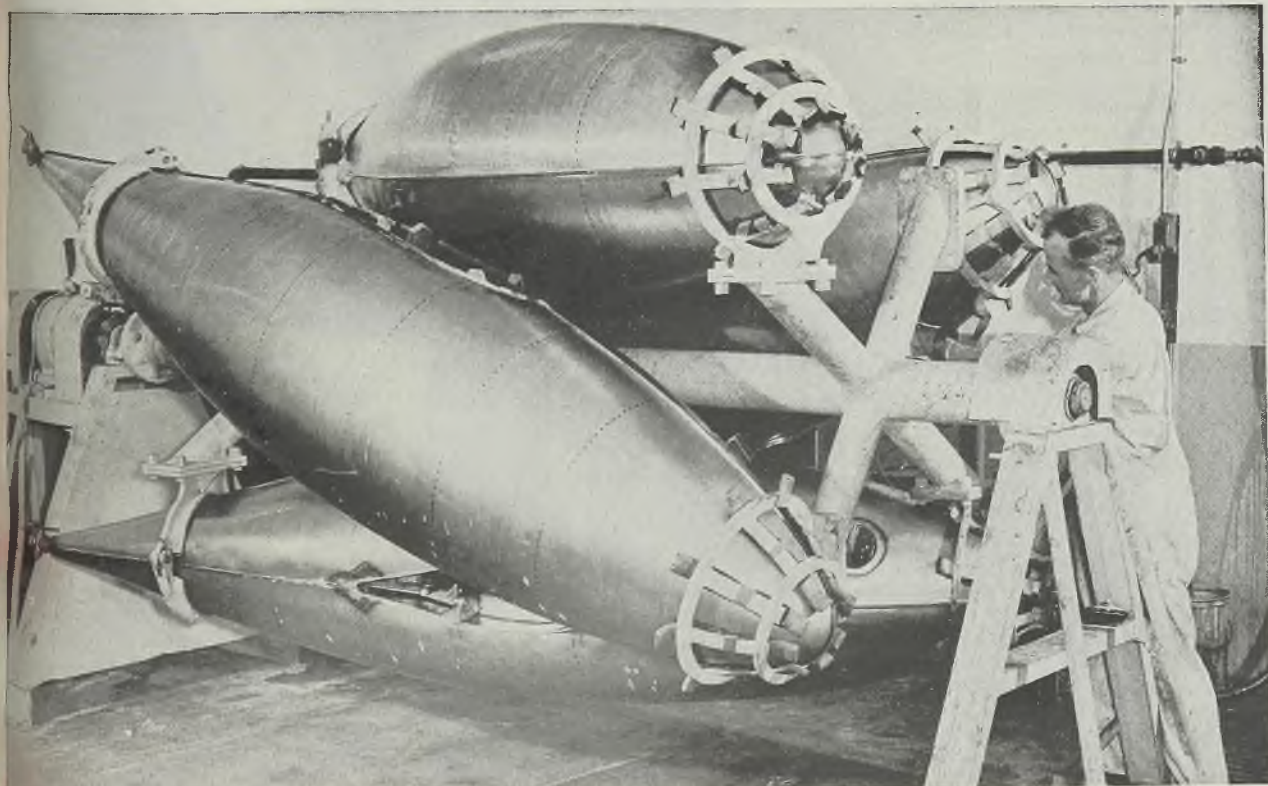
When tanks have been approved by Army Air Forces Materiel Command inspectors, they are hooked on to a third assembly line. Dirt, grease and any other foreign substances are removed by cleaning solvent and hot water to fur-



nish a spotlessly clean surface for finishing. Forced air drying removes moisture. A single coat of aluminized varnish is sprayed over the exterior. The tank passes through an open tunnel 35 feet long lined with infra-red lamps for 5 minutes, shown in Fig. 4, baking the exterior burnished coat and setting the interior aromatic resisting lining. One thousand and fifty-six lamps with hexagonal gold-plated reflectors are used. Normal operating range varies between 240 and 250 degrees Fahr.

Identifying decals are applied, and after checking by inspectors, the tanks are individually boxed and shipped.

*Fig. 5 — Revolving fixture for coating interior with slushing compound*



## Vertical Assembly

(Continued from Page 71)

envelope jigs precisely locate 551 rivet holes in one section of the torpedo, 366 in another and 162 in a third.

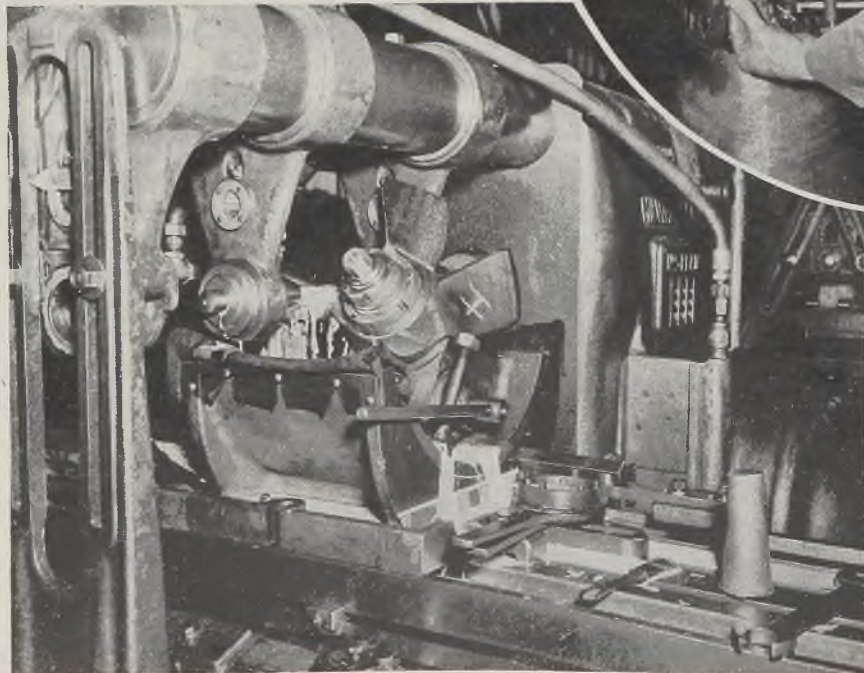
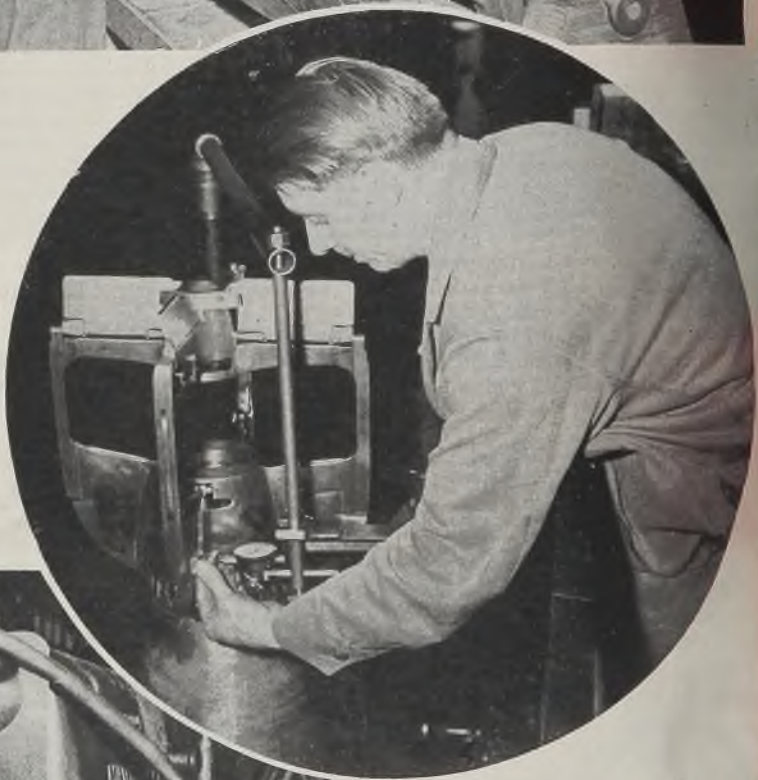
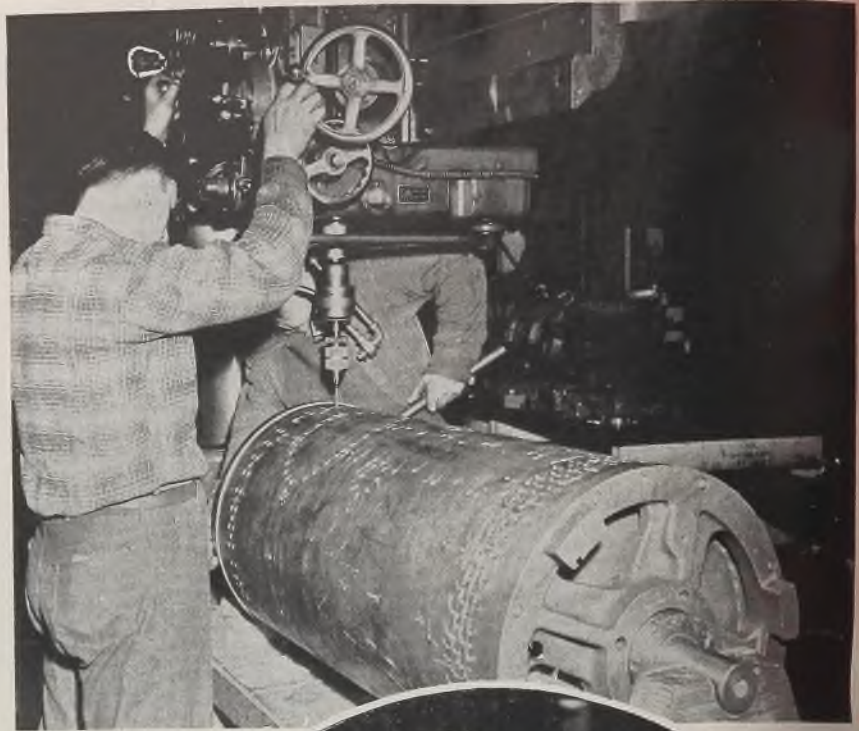
The torpedo depends upon precise balance and alignment for the functioning of various controls set in action automatically as it leaves the plane. Upon alignment, too, depends whether or not the torpedo will carry its devastating load of high explosive straight to its target.

Each section is constructed separately. Each section of casing and each part of mechanism in the casing are accurately located in relation to the center line. How much each step in manufacture under this center-line control contributes to alignment of the entire torpedo is de-

*Fig. 6 (Right)—More than 360 rivet holes are drilled at single setting through the casing and into fixed fittings of torpedo section. Fittings locate themselves automatically on casing interior*

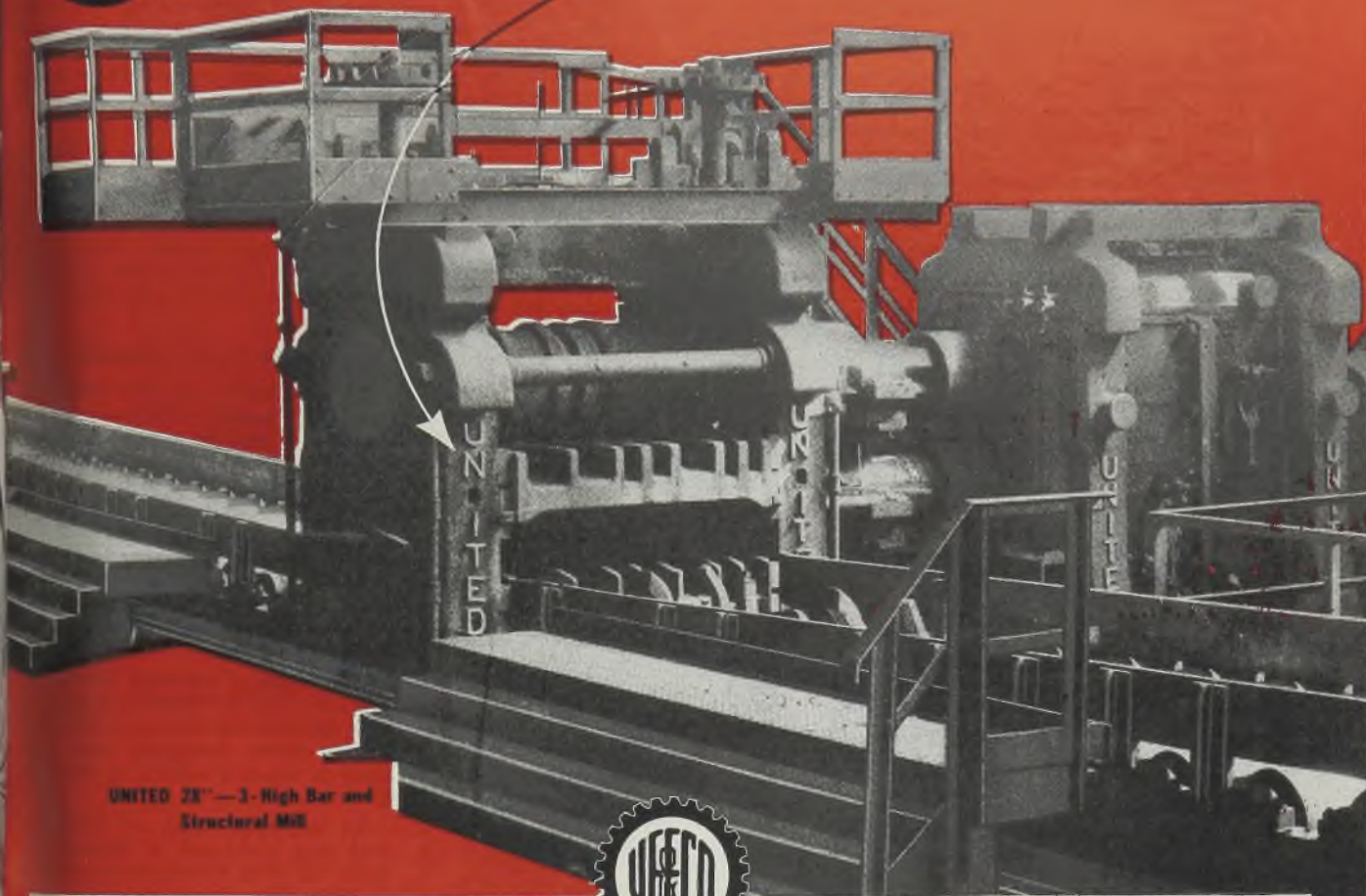
*Fig. 7 (Circle)—Inspector checks alignment of tail section, one of many which come off assembly line with their vertical and horizontal axes within 0.005-inch of completed torpedo's corresponding axes*

*Fig. 8 (Below)—Another innovation, this rocker jig, produces a 50 per cent time saving in preparing flat surfaces of torpedo propeller blades. Cam motion feeds propeller under milling cutter and, in effect, generates series of lines to create surface ready for polishing operation*



termined by checking the final assembly. Vertical assembly of the completed sections is accomplished on a Bullard Cutmaster vertical turret lathe with a 74-inch revolving table, Fig. 1. It serves both as a working machine tool and as a sort of "giant jig" in final erecting of a torpedo. Because its massive uprights are in axial alignment with its table to a closer tolerance than is required for any torpedo measurement, it serves to show conclusively whether or not each section is in alignment and concentric. With the assembly of the tail unit the center of the projectile is determined, the vertical and horizontal axes of the tail are demonstrated to be within 0.005-inch of that true center, and

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Dominion Engineering Works, Ltd., Montreal, P. Q. Canada

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the radial position of the tail within that same limit. Inspector makes final check for this condition in Fig. 7.

Assembly starts with the mounting of the air vessel, forward end down, in a fixture which has three adjustable uprights. Registry keys in the fixture correspond to slots in the forward end of the air vessel. The two ends of the vessel are held in concentricity through adjusting screws in the uprights of the fixture. Check on the concentricity is made with an indicator, illustrated in Fig. 4. The machine table is revolved and the angle then is cut on the aft circumference of the air vessel where it will be joined to the balance chamber.

Next the balance chamber is lowered on to the air vessel, held in a locating fixture. The pieces will locate and mate exactly because the registry slots in the aft end of the balance chamber and in the forward end of the air vessel are all located off the surface of the Cut-master's table.

The aft end of the balance chamber now indicated to run true, as shown in Fig. 4, and the two sections are riveted together into the unit known as the "forebody."

After an intermediate step to check the location of various mechanisms in relation to the center line, the afterbody is swung into place and secured. Initial stages of this operation are illustrated in

Fig. 5. The aft end of the afterbody is then indicated to determine that it runs within 0.0001-inch, total reading.

The accurate relationship between the machine's table and its uprights and crossrail comes into play again when the tail section is assembled to complete the job. The torpedo is indexed, through four registry slots exactly 90 degrees apart in the mounting fixture on the table, so that its horizontal center line is parallel to the face of the vertical turret lathe. An indicator on a control arm is then moved along the crossrail and reset to zero at the forward end of each forward fin. Readings are then made to insure that the variation in height of the fore and aft fins from the axis of the torpedo is not more than 0.005-inch. A bearing in the propeller shaft next is indicated to a total runout of not more than 0.005-inch.

Thereafter, the position of the axis of the tail with relation to the torpedo's axis is determined. The torpedo is rotated until both horizontal fins are the same distance from the face of the turret lathe. The torpedo is indexed 180 degrees and the readings in this case must not vary more than 0.010-inch. The same procedure then is followed on the vertical fins.

The average of the four readings locates the true center of the torpedo and the average of the readings on each fin

must be within 0.005-inch of that figure, proving that the two axes of the tail are within 0.005-inch of the corresponding axes of the projectile. Radial position of the tail is determined in a similar manner. This final check of the complete torpedo, as performed in Fig. 1, proves that its center line has been maintained throughout the manufacturing process.

Other engineering innovations introduced throughout the process of manufacturing these weapons are: A method of preparing the casings for the torpedo sections; a tool for rapid removal of rivet heads; numerous centering bars and arbors; and a rocker jig for milling flat sides of propeller blades.

The Bullard organization at the very start, found it necessary to develop its own method of preparing section casings. These are bought in commercial sizes and then, because they have a slight taper, can be beaten to size by light air hammers on mandrels that revolve by hand.

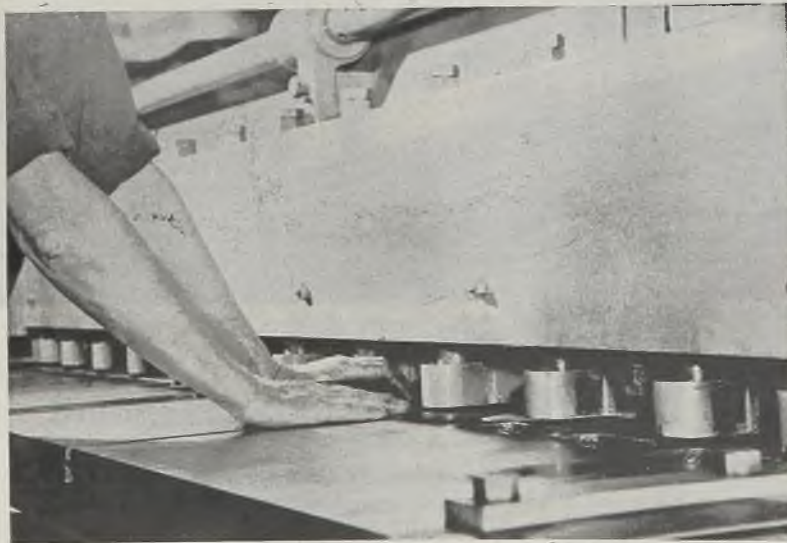
#### Finish-Grind Eliminated

Rapid removal of rivet heads was solved by a simple tool whose use makes unnecessary the lengthy and laborious hand-filing that had been in practice. An end mill was produced by cutting a slot in the end of a small drill. A metal collar controlled by a spring action fit over the rivet; the pseudo end mill passes through the collar which serves as a guide and removes the rivet head, the length of the operation being controlled by a positive stop.

Many types of centering bars and arbors have been developed to permit multiple operations at the same settings and permit various machining cuts to be taken in constant relation to the centerline.

An important piece of engineering work was performed in designing the rocker jig (Fig. 8) to permit milling of the flat sides of the propeller blade for the torpedoes. Through use of this unique device, the flat sides of the blades are ready for polishing after two milling cuts. Under the previous method, it was necessary to finish-grind before polishing. This rocker jig effect time savings up to 50 per cent over the old method.

This jig has a semicircular, concave bed to which a cradle is gibbed. The cradle has a cam path cut into its underside, the cam path riding over a roller on a rectangular bar which slides in a groove in the base parallel to the axis of the cradle. The outboard roller is secured to the base of the milling machine. The jig assembly is mounted to the table and is fed longitudinally under the cutter. As the table is moved, the cradle is cammed around its own center carrying the propeller with it. Cam on the periphery of the cradle is so designed that the flat side of the blade is actually generated as a series of fine lines which remain parallel to a plane through the axis of the propeller nut and which rotate at right angles to this plane about the axis of the blade.



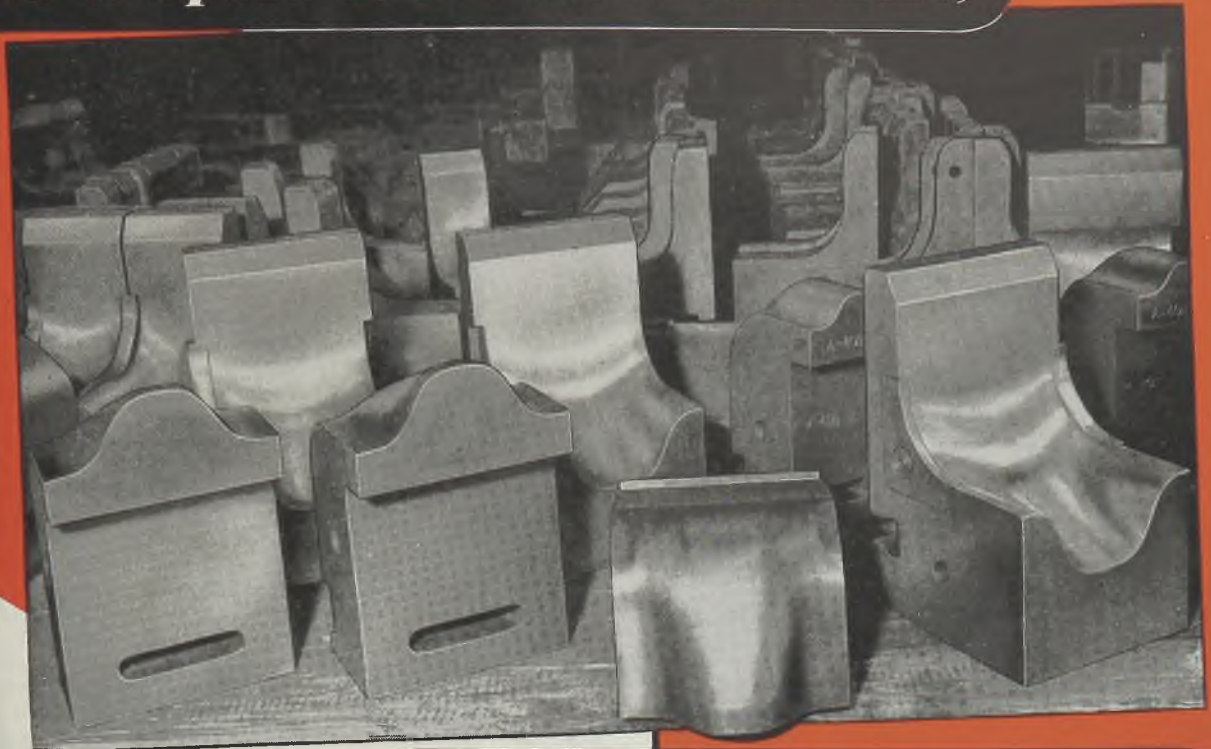
**PROTECTIVE PLATE:** Operators of power shears will escape injury if they use a protective plate which is easily attached to the power shears and designed to permit fingers to be placed within a fraction of an inch of the blade with complete security. This particular guard is constructed of 1/8-inch sheet steel which hangs behind a hold-down plate and is attached to the hold-down plate with flat-headed screws. This allows the sheet to be stationary while the hold-down plate moves.

To the sheet are attached 1/16-inch

skirts which enclose the parts of the hold-down plate coming in contact with the material being sheared. The skirts assembly is adjusted to the proper height to allow for thickness of material to be cut, but do not allow the fingers of the operator to pass through.

Thus a double protection is assured with the plate keeping the operator's fingers away from the blade and the skirts keeping the digits free of the hold-down plate. The device was invented by M. J. Telle of Goodyear Aircraft Corp., Akron, O.

## Die of *Speed Treat* Steel Cost Less;



### CASE STUDY

**User:** Standard Railway Equipment Mfg. Co.

**Application:** Corner flanging dies for forming patented Murphy ends and sides for railway cars.

**End Use:** Dies cold form  $\frac{3}{16}$ " and  $\frac{1}{4}$ " plate on 1,000-ton press. Abrasion is excessive because of scale on plate. Female die is approximately 15" high x 9" wide x 10" deep.

**Heat-Treatment:** Pack-hardened to 52-54 Rockwell "C" scale.

**Result:** Dies were formerly made of nickel cast iron and never produced in excess of 100,000 pieces. Dies made from *Speed Treat* open hearth medium carbon hot rolled plate have produced a minimum of 200,000 pieces per die.

Machining costs have been radically reduced with consequent lowering of tool costs. The satin finish on the impression surfaces was produced with far less grinding and polishing.

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### **SPEED TREAT** Plate Provides.....

**Better Finish**  
**Lower Machining and Tooling Cost**  
**Ideal Response to Heat Treatment**  
**Negligible Heat Treat Distortion**  
**Reduced Weight**  
**As Much As 66% Lower Material Cost**  
**Savings in Production Time**  
**Lowest Ultimate Cost**

*Speed Treat* plate, an open hearth medium carbon steel, affords greater economy to tool and die makers than most high carbon steels. It is readily machinable, has high tensile strength and constant uniformity and responds to all types of heat treatment including selective surface hardening.

Why not investigate this economical and practical steel for your own use? Send for name of your local *Speed Treat* plate distributor and a copy of Catalog No. 1243.

## W. J. HOLLIDAY & CO.

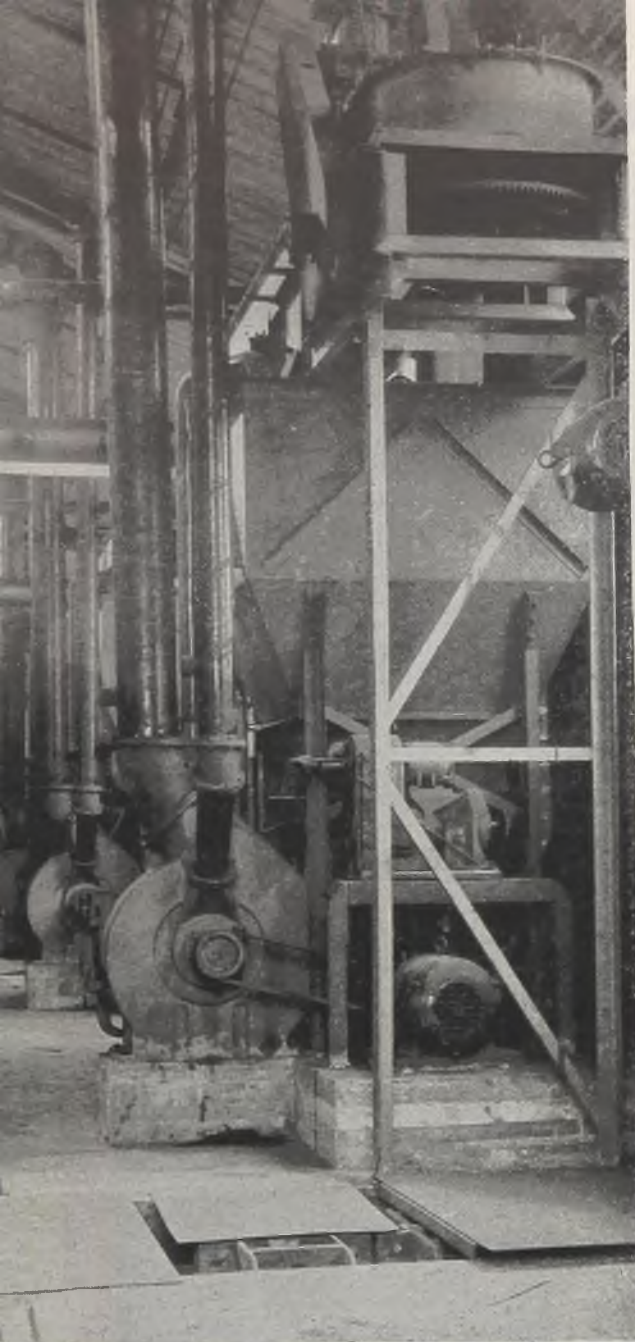
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# Fires Forging and Heat Treating Furnaces with PULVERIZED COAL



(Left) — Battery of six unit pulverizers installed at rear of forge furnaces

(Below) — Two car-annealing automatically controlled furnaces. Pulverizers are shown in background

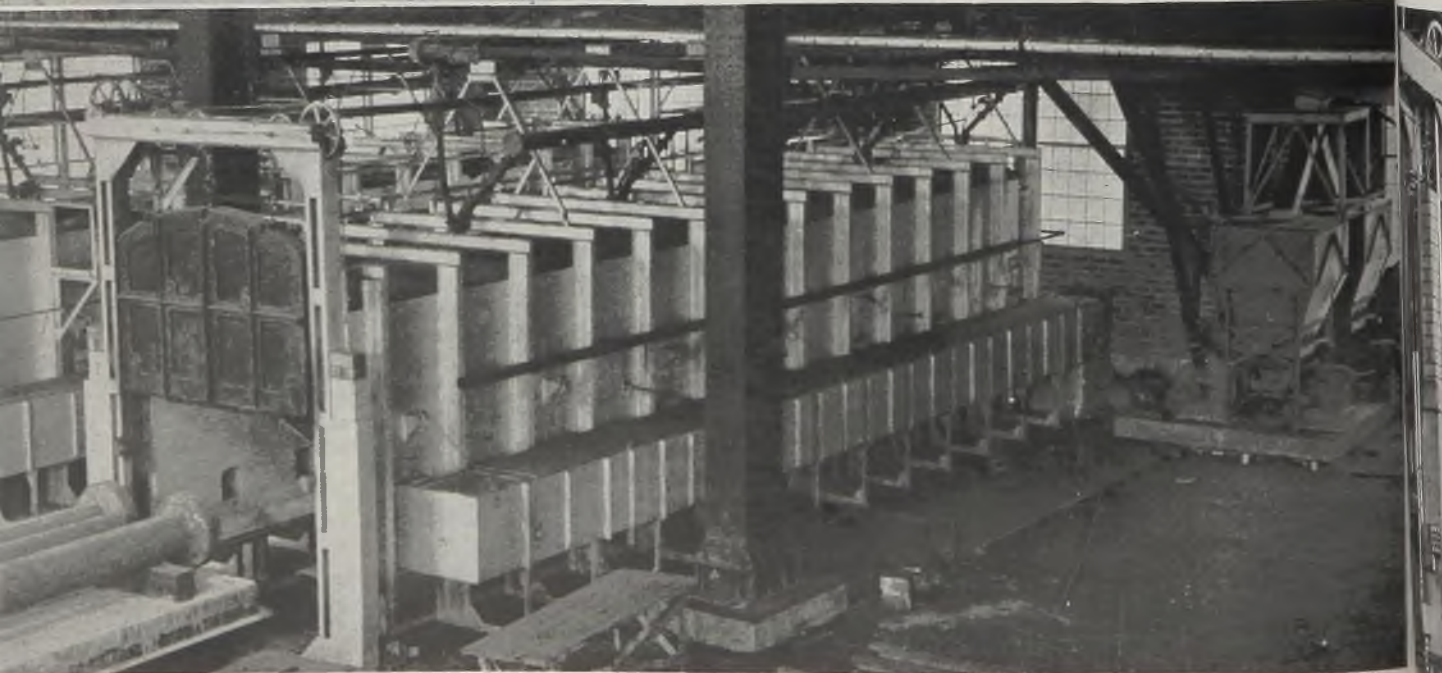
(Below, opposite page) — Battery of six pulverized coal-fired forge furnaces

PULVERIZED coal has been successfully applied to the production and heat treatment of steel forgings at Trenton Steel Works, Trenton, Nova Scotia, a subsidiary of Nova Scotia Steel & Coal Co. All types of heavy marine forgings, as well as a variety of smaller forgings for heavy industrial equipment are produced; facilities recently have been completed to increase production of heavy marine forgings.

When plans for this installation were being drawn up an extensive survey was made as to the most suitable fuel. Heavy fuel oil and tar were first considered but due to cost and the uncertain supply as compared with the low-cost available in quantity, the former fuels were eliminated. Once coal had been decided on, consideration had to be made as to the most suitable pulverizing systems for present and future needs.

It was decided to install unit pulverizers with individual circulating systems instead of one large central coal plant. Factors influencing this decision were the lower initial cost of unit pulverizers and the fact that in periods of low production a large central plant would have to be operated below capacity with consequent increase in pulverizing cost.

The unit circulating system consists of a unit pulverizer connected to a distributing line which conveys pulverized coal





# COAL

By R. A. CAMPBELL  
Salem Engineering (Canada) Ltd.  
and  
J. H. LOUX  
Salem Engineering Co.  
Salem, O.

*Circulating load of about 60 per cent of pulverized capacity is carried constantly in distributing line thus affording an interrupted supply of coal at burners. Each burner can be adjusted without affecting feed to other burners. Zone temperatures of heat treating furnaces controlled automatically to give uniform annealing and drawing operations*

of automatic control on the heat-treating furnaces has reduced labor costs and resulted in exceptionally close temperature control on the annealing and drawing operations.

The installation of pulverized coal at this plant has resulted in decreased forging and heat-treating costs as compared with a similar plant using fuel oil. One of the most noticeable advantages found in using pulverized coal for heating forgings is the greater penetration of the heat due largely to radiation in the furnace from the fly ash particles. This is an advantage that pulverized coal has over producer gas as well as over oil. There are also inherent losses in a gas producer plant that are eliminated in a pulverized coal installation. There is only one combustion when burning pulverized coal and it is complete, leaving the ash free from residual carbon. Compared with oil or producer gas, forgings can be heated in shorter time and it is rarely ever found that forgings have to be returned to the furnaces for reheating due to insufficient penetration of heat. In addition, there is considerable less scale loss with pulverized coal as compared with oil.

The raw coal handling system includes crushing, storage, drying, and conveying systems. Ingot heating is done in six pulverized coal-fired forge furnaces serving a 2000-ton press. Ingots are handled by a 75-ton and a 35-ton overhead crane. Heat treating is done in two pulverized coal-fired furnaces.

The complete plant, including all fur-

naces, was designed and installed by Salem Engineering (Canada) Ltd.

An ample supply of coal is available at the nearby mines of the Acadia Coal Co., Stellarton, N. S., also a subsidiary of Nova Scotia Steel & Coal Co. The coal has a volatile content under 30 per cent, an ash content of 14 per cent with a calorific value of 12,500 to 13,000 B.t.u. per pound. The fusion point of the ash is 2400 degrees Fahr., and the Hardgrove grindability is 65.

### Preparation of Raw Coal

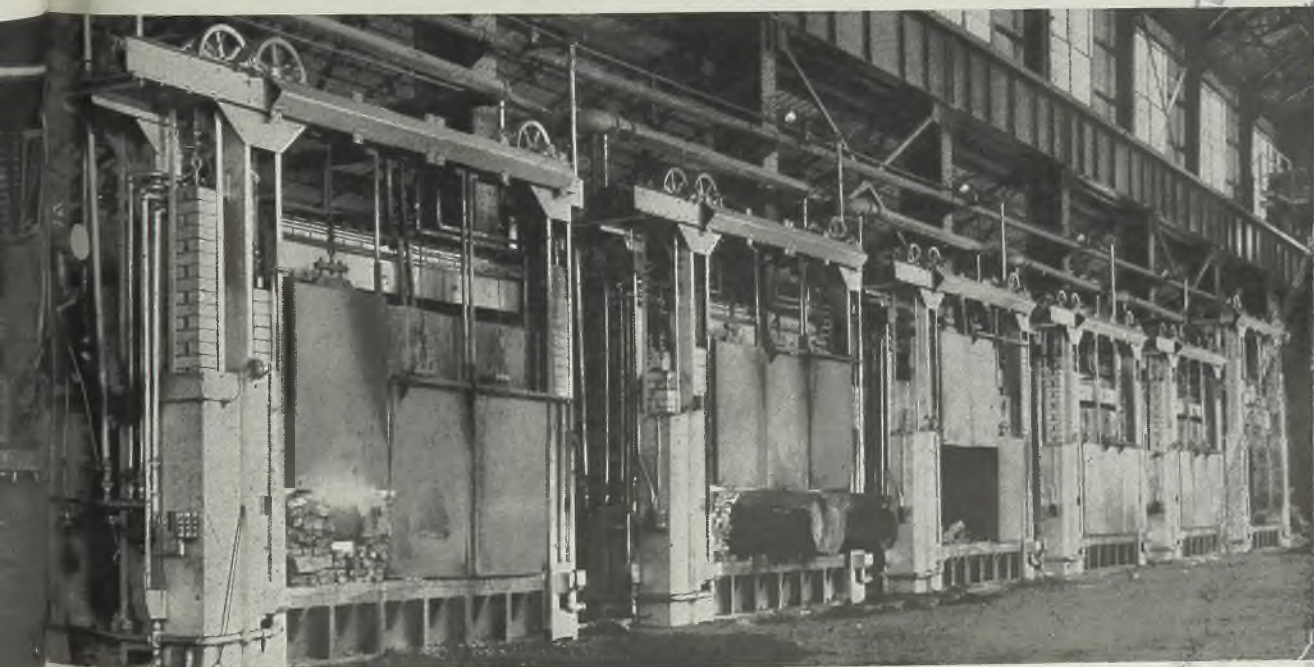
Run of mine coal is delivered from the mine to the forge plant in 45-ton hopper bottom railroad cars and unloaded to a track hopper equipped with grizzly bars. From the track hopper the coal flows to a 30-inch wide apron conveyor; the flow of coal to the apron conveyor is controlled by swing hammers on the hopper discharge chute. Coal from the pan conveyor is discharged to a 30-inch belt conveyor equipped with a magnetic pulley for the removal of tramp iron. After passing over the magnetic pulley the coal is discharged to an 18 x 18-inch ring-type crusher, where it is reduced to minus ½-inch. The discharge from the crusher flows by gravity to the boot of an enclosed type elevating conveyor and is elevated 60 feet to the top of the coal silo. Coal from the elevating conveyor is discharged to an 18-inch belt conveyor which distributes coal to the silo center.

A suction hood located over the crusher removes fine dust from the crush-

to a number of burners and returns excess coal, not drawn off by the burners, to the pulverizer. A constant circulating load is thus carried in the distributing line at all times. The unit circulating system has the following advantages:

1. Any number of burners, up to the capacity of the machine, can be installed on a furnace or group of furnaces.
2. Due to the circulating load a constant and uninterrupted supply of coal can be supplied to the burners at all times.
3. Adjustment of individual burners can be made without affecting the feed to the remaining burners.
4. Automatic control can be used for maintaining constant temperatures at each zone.
5. Combustion air in the form of secondary air can be controlled without affecting the primary air-coal ratio. This tends for accurate fuel air mixture.
6. Lower initial cost.

Due to the scarcity of skilled labor, the plant was designed so that no manual handling of raw coal was required. Automatic control equipment was used wherever it was practical. As a result, the use



ing operation by drawing this material through the dryer exhaust fan. Material thus collected is separated in a standard cyclone.

Crushed raw coal is stored in a 500-ton cement stove storage silo, 32 feet diameter by 50 feet high, equipped with bottom and discharge gates. The floor of the silo is supported by steel members which allow 18 feet of headroom between the silo bottom and the foundation. In this space is located the coal dryer, the feeder ends of the distributing conveyors, and the electrical control panels for the conveying, drying and crushing equipment.

Raw coal from the silo flows by gravity to a constant weight feeder which controls the coal flow to the dryer. A bypass chute located ahead of the constant weight feeder allows raw coal to be fed direct to the distributing conveyors with-

In a dry coal mine an air current sometimes carries enough dust to explode. When such an explosion of fire-damp occurs, the thick layer of coal dust covering the walls and timbers is swept into suspension by the terrific blast and a secondary explosion may occur in the fuel cloud. This second explosion may prove more disastrous than the first. However, practically all cement produced in the United States is burned either with natural gas or pulverized coal, and explosions in this industry are rare.

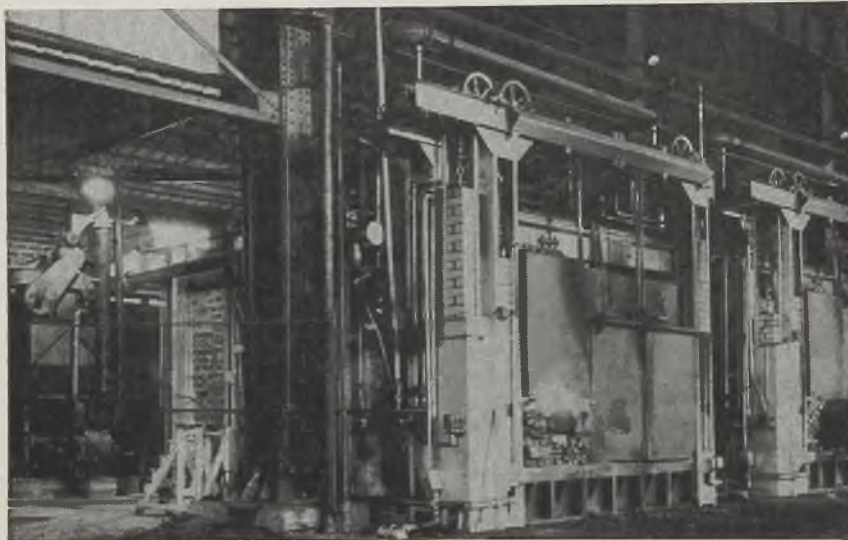
Dry coal from the surge bin is fed by gravity to two enclosed-type conveyors which deliver it to the forge furnace and heat-treating furnace pulverizers. Coal for the six forge furnace pulverizers is charged from a 7-inch conveyor to a 7-inch enclosed-type run around conveyor serving six 2-ton hoppers located at each pulverizer. The hoppers are equipped

by an underground flue to a separate stack, 90 feet high by 4 feet inside diameter, lined with firebrick.

Pulverized coal for the furnace is fired through four single inlet burners located on the two sidewalls. The burners are located 2 feet from the arch and burners on one side are staggered from those on the opposite wall, to insure uniform distribution of heat.

Unit pulverizers connected to a 2-ton hopper are located at the back of each furnace. Coal feed from the hopper is fed to the pulverizer by a small screw conveyor driven by a variable-speed drive which enables the feed rate to be varied from 250 to 1500 pounds per hour. A revolution counter operated by a cam from the screw conveyor shaft records the tonnage of coal pulverized by each machine.

The pulverizers are of the attrition type and have a capacity of 1500 pounds of coal per hour. Pulverized coal is withdrawn from the grinding chamber by means of a fan built integrally with the pulverizer and pumped to a distributing pipe line. The distributing pipe line, located over the furnace, is tapped at the four burner locations by a vertical branch line to each burner. After the fourth



*Unit pulverizer and circulating line for forge furnace*

out going through the dryer. This bypass chute is, however, only used in case of a breakdown in the dryer. Drying is done in a standard rotary-type dryer equipped with inner shell, and fired with coal from a small furnace. Hot gases at 1400 degrees Fahr. from the furnace pass through the dryer counter-current to the flow of coal and are discharged at 150 degrees Fahr. to a cyclone where entrained coal dust is separated and discharged to the distributing conveyors. Dry coal discharged from the dryer is elevated to a 5-ton surge bin by an enclosed-type conveyor. The surge bin is equipped with a level control mechanism which stops the dryer and elevating conveyor when the bin fills.

Raw coal enters the dryer with 5 to 6 per cent moisture and is discharged with 1 per cent moisture. The drying capacity for this rate of moisture removal is 3.5 tons per hour. When dry and fine the coal will flow like a liquid with little danger of clogging pipes or hanging in hoppers. The dangers of an explosion when firing with pulverized coal have been exaggerated. The main precaution is to provide plenty of ventilation and to avoid any confined space where coal dust may become well mixed with air.

with a level control mechanism which shuts off both the distributing conveyor and run around when hoppers are full.

The heat-treating car furnaces are served by one 7-inch enclosed-type conveyor running direct from the dry coal surge bin to two adjacent pulverizer hoppers. The hoppers also are equipped with a level control mechanism which stops the conveyor when both are full.

The forge plant heating equipment consists of five 18 x 16 x 8-foot forge furnaces with a capacity of three 30-ton ingots and one furnace 18 x 16 x 10 feet with a capacity of two 60-ton ingots. The furnaces are constructed of super-quality firebrick throughout, using a suspended-type arch roof. The furnaces are equipped with electrically operated continuous water-cooled doors, constructed in three sections, each of which can be raised or lowered independently of the other. When all three doors are raised a continuous opening 13 feet wide by 5½ feet high across the furnace front allows ingots to be charged and withdrawn with little danger of smashing the furnace doors. A manually operated brick lined water-cooled damper, located in the back wall of the furnace is used to control the furnace draft. Each furnace is connected

burner the pulverized coal distributing line is connected to the pulverizer fan housing. In this way pulverized coal is continually circulated through the system. A circulating load of approximately 60 per cent of the pulverizer capacity is maintained in the circulating line, assuring a constant coal feed to each burner.

At each burner take-off in the main circulating line are located adjustable baffles connected to shut-off valve and a worm-operated pulverized coal valve. The baffles are adjusted so that each burner receives an equal distribution of the coal feed and once set remains without further adjustment. The flow of coal to each burner is adjusted by the worm-driven pulverized coal valve, which is operated from floor level by extension handles.

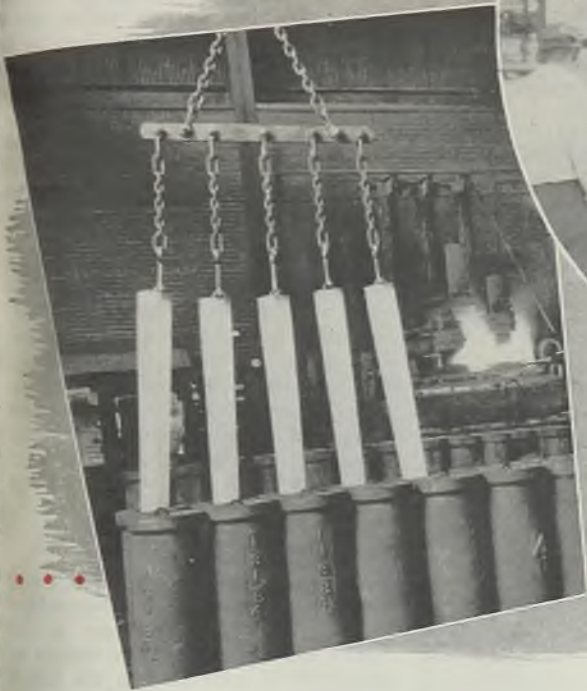
Secondary air at 4 ounces pressure is supplied to each furnace by a fan of 2000 cubic feet per minute capacity and distributed to each burner by pipeline. A secondary air valve located on a mixing "Y" at each burner, controls the amount of secondary air supplied to each burner.

Four thermocouples connected to 4-point indicating and recording potentiometer record the temperatures in each zone of the furnace.

Gases leave the furnace at 2400 degrees Fahr. and have an average analysis of 14 per cent carbon dioxide. The coal is burned with 25 per cent excess air. The temperatures at each zone in the furnaces are uniform and seldom vary more than 25 degrees between the four different zones.

Little trouble is experienced with fly

# Lectromelt



**FOR BILLET  
SIZE INGOTS**

★Within the past few years several Lectromelts, with a range of capacities from 500 lb. to 10 tons per heat, have been installed for billet-size ingot work. This simplified method affords greater tonnages in the steel industry's increasing use of direct arc type furnaces for the production of plain carbon steels for rolling into merchant and reinforcing bars, sheets and other similar products.

In most instances, billet-size ingots are poured so that they can be rolled with one heating. Some of these ingots are as small as 2-inch square by 4 feet long.

Billet-size ingots for rolling into bar stock are ordinarily top cast with a slight taper so as to facilitate ready stripping. Just before the tops solidify, a staple is inserted in the small ingot, and the stripping is usually done by a bar suspended on a hook of a crane, so as to pull out four to six ingots from their moulds at a time.

The billet-size ingots solidify rapidly with practically no pipe. These ingots are noted for their uniformity and fine grain structure. Coarse structure, which fre-

quently characterizes large ingots, is avoided by the rapidity of solidification.

It is customary to quickly transfer the plain carbon billet-size ingot to a continuous type heating furnace for bringing the ingot up to uniform rolling temperature so that it may be rolled direct with one heating. Any required cropping is done after the rolling. In the plain carbon billet-size ingot process, it is customary to obtain highest yields of merchantable bars. The end crops can be returned to the furnace for remelting.

MOORE RAPID  
*Lectromelt*  
FURNACES

**PITTSBURGH LECTROMELT  
FURNACE CORP.**

PITTSBURGH 30, PENNA.



★ ★ ★

ash as the flues and stack were designed to give ample draft. As a result, approximately 90 per cent of the fly ash is removed with the flue gases and discharges via the stack. Some slagging of the ash occurs when the temperatures reach 2450 degrees Fahr. Slag builds up to some extent on the ingots, but does not cause any trouble as it spalls off when placed in the press. Slag formed on the hearth and walls is removed every 10 days.

#### Each Furnace Has Coal Pulverizer

Heat treating is done in two pulverized coal-fired car type annealing furnaces, each with a capacity of three forgings up to 50 feet long and 18 inches in diameter with 39 inch collars.

The heating chamber in each furnace is 54¾ feet long, 8 feet wide and 6 feet high, constructed of 8-inch insulating firebrick enclosed on the sides and end by a steel shell. The arch of the furnace is a sawtooth design 9 inches thick, constructed of insulating firebrick. On the center-line of each of the saw teeth, at 10-foot intervals, are located five pulverized coal burners.

The furnaces are served with cars 54¾ x 7 feet lined with 10 inches of first-quality firebrick. The cars are mounted on rails and are removed from the furnace by a motor-driven rack and pinion gear mechanism.

There are 12 flue openings in the furnace chamber, six on each side, approximately 12 x 12 inches, supplied with individual refractory dampers. Two collector flues, one running down each side of the furnace, carry the gases to a main

underground flue connected to a brick-lined steel stack 90 feet high and 4 feet inside diameter. Each furnace is equipped with a separate stack.

One unit pulverizer exactly similar to the pulverizers on the forge furnace serve each furnace. Pulverized coal from the pulverizers is distributed to five burners by a circulating line as in the case of the forge furnaces. The burners and burner control valves are similar to those on the forge furnaces but are one size smaller. The burner is of the single inlet type good for a capacity of 300 pounds coal per hour. A secondary air fan with capacity of 2000 cubic feet per minute at 4 ounces pressure supplies air by means of a pipe with branch connections equipped with adjustable valves at each burner.

#### Oil Pilot Flame Ignites Coal

Each furnace is equipped with an oil system burning light fuel oil. An oil pilot flame is installed at each of the five pulverized coal burners to insure ignition of the coal during the start up period or when drawing operations at low temperature are in progress.

The car furnaces are divided into five zones, each independently and automatically controlled. Each zone is equipped with an indicating controlling millivoltmeter using on-off control. The millivolts are accentuated by thermocouples in each zone. A 5-point temperature recorder records the temperature in each zone.

At each burner are two, 2-position control motors connected to butterfly valves,

on the pulverized coal line and on the secondary air line leading to the burner. The butterfly valves are connected to the control motors by an adjustable linkage. The 2-position control motors are in turn connected through a resistor box to a proportioning-type control motor located at the pulverizer, which accentuates a feed control lever on the variable-speed reducer driving the screw conveyor which delivers coal to the pulverizer.

When the temperature of one zone goes above the point set on the temperature controller, the 2-position control motors close the butterfly valves which stops the coal feed and secondary air to the burner. When this action takes place, the coal feed to the pulverizer is automatically dropped 20 per cent. When the temperature goes above the desired point on all five zones, the feed to the pulverizer automatically stops. As soon as the temperature in any one zone drops below the set temperature, the feed on the pulverizer starts up at 20 per cent capacity and the butterfly valves on the coal and secondary air lines open, allowing coal and secondary air to flow to the burner. As each zone calls for more heat, the pulverized coal and secondary air valves are opened by the position control motors and the proportioning motor at the pulverizer steps up the coal feed by 20 per cent as each zone starts firing until all burners are again firing.

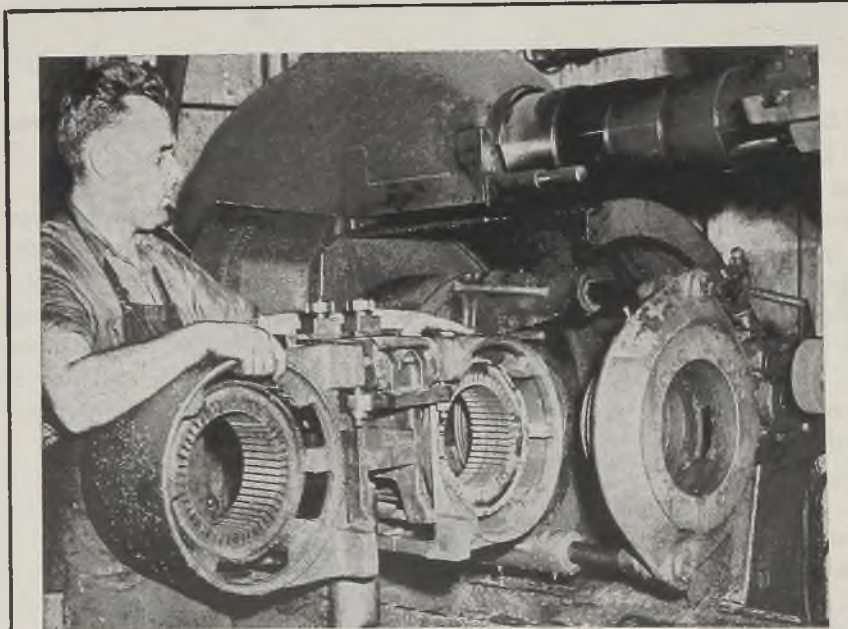
#### Recuperation Not Tried in Canada

In starting up a cold furnace, the oil burners are placed in the pulverized coal burner port. The pulverizer is then started and three of the five burners are ignited. Until such time as the furnace temperature reaches 700 to 800 degrees Fahr., the coal and secondary air is controlled manually. When those temperatures are reached, the remaining two oil pilot burners are placed in the pulverized coal burners and coal is fed to the burners. The furnace then is put on automatic control. When the temperature reaches 1300 degrees Fahr., the oil pilots are removed from the burners as there is enough heat for ignition of the coal.

Fly ash is easily removed from the work and car in the matter of a few minutes before the car is withdrawn from the furnace.

To date recuperation in connection with coal-fired furnaces has not been tried in Canada. With the use of metallic recuperators and proper soot blowers for the removal of fly ash the possibilities appear interesting. By preheating all secondary air to temperatures around 600 degrees Fahr. and primary air to temperatures of 200 to 300 degrees Fahr., important savings in fuel and costs can be made.

Recuperation has not received much consideration due to the low prices at which coal has been purchased in recent years. In view of the fact that coal prices are steadily rising, the field of recuperation, as applicable to pulverized coal fired furnaces, offers attractive possibilities for reducing costs.



**GRINDING AID:** This special pivot-type fixture greatly reduces time and effort in handling motor stator cores to and from the internal bore grinder at General Electric's Lynn River Works. It can be loaded and unloaded during the grinding cycle. Here operator has just pivoted fixture. Core on left is completed, and the one at right is being swung in between the machine clamping rings. When secured in machine, fixture bearing core will be swung back and grinding operation started

# Putting the screws to the Axis

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SALES OFFICES IN PRINCIPAL CITIES



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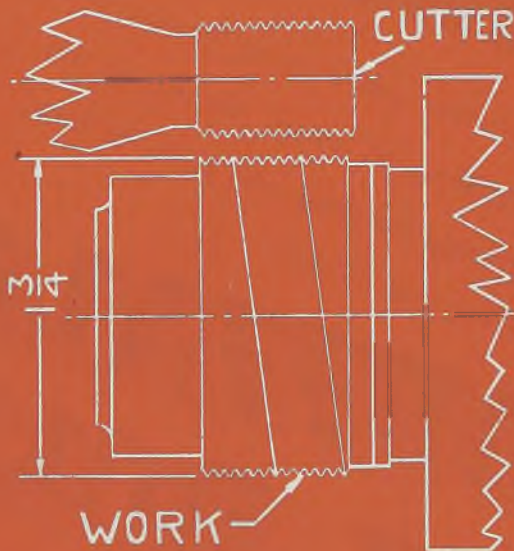
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# Coffin Jacks

## solve problem in fitting bronze liners and collars on steel shafts

THE USE of coffin jacks rigged to two split clamps has provided a way in which the shrinkage gap between bronze liners and collars on certain types of marine line shafts can be completely eliminated, leaving no necessity for welding or filling after the liners have been shrunk in position.

The process was developed at the Joshua Hendy Iron Works, Sunnyvale, Calif., in preparing a number of special 5-inch 4-unit propeller shafts, each set of which required three bronze liners up to 37½ inches in length. Gaps developed because the liners were put into position while expanded by heat to about ¼-inch more in length than their normal measurement when cool. Thus, gaps of from 1/6 to 1/8-inch were left between the liners and their collars, since shrinkage was from both ends to the middle.

First step in solving the problem was the construction of a vertical hot-air oven for the controlled heating of the liners and collars, a method already in use for the much larger tailshafts required in much more powerful vessels. But whereas the tailshafts are dropped into the heated liners, a different system had to be adopted to enable handling that would prevent gaps.

While the liner, with the collar set on top of it, is heating in the vertical oven that reaches 16 feet below floor level, the shaft is set up vertically on its flange on the floor of the oven pit. At the end of an hour, the 3-inch collar is removed and slipped into place on the cold shaft. The male joint of the collar (which corresponds with the counter-

*Shrinkage between bronze liners and collars on shafts is prevented by Joshua Hendy with this novel setup. Split clamps are fixed to the shaft below the steel collar and above the liner and pressure is applied to coffin jacks hooked to cross bolts on both sides of the shaft. A circular shower with one hinged jaw is placed around the bottom of the liner and moved slowly upward while the liner is forced downward to take up any gap caused by shrinkage between it and the collar*



bored female joint of the liner) fits flush against the shaft and faces upward. To hasten the cooling of the collar, it is sprayed with a ring-like shower device, one of whose semicircular arms has a flexible hinge to permit quick adjustment around the shaft.

When the collar is permanently frozen into place, the really speedy work is ready to begin. Over the top of the tubular liner, still in the oven, is slipped a specially designed cam-action clamp, lifting of which by its two ring-end arms presses slip-proof jaws against the liner. Hoisted by crane, the liner is quickly lowered over the shaft. When it is almost in the proper position, two fixed wings on the clamp rest on transverse beams, the weight of the arms releases the jaws, and the liner drops into place.

Split-second timing is necessary from now on, for shrinkage is so rapid that not more than half a minute remains for the rest of the job. Two workmen apply steel split clamps just above and below the liner, hook them together with the link chains of two coffin jacks, one on each side, and apply pressure by working the jack handles. The circular spray is applied to the bottom of the liner and moved slowly upward, while the pressure from the frequently tightened jacks keeps the liner tight against the collar joint so that effective vertical contraction can take place only in one direction. An hour and 15 minutes after the liner has been placed in the oven, the lined shaft is complete and ready to be machined except for a brief period of cooling.

## Pyrometer Catalog Out

A portable instrument to measure temperatures of glowing objects is described in a recent catalog, "Optical Pyrometer (Potentiometer Type)". The potentiometer type instrument made by Leeds & Northrup Co., Philadelphia 44, is stated to be precise, dependable, and convenient. It is lightweight, compact, and provides easy readings directly in degrees. Readings are made with precision simply by tightening the telescope on a

hot surface, adjusting two knobs, and reading the temperature scale. Measurements can be made in a few seconds.

For an efficient arrangement of open-hearth checkers, the thickness of the brick should not exceed the requirement for structural strength at operating temperature (2½ to 3 inches). The openings should not be greater than necessary to insure flow during the later stages of the campaign when the surfaces become

laden with slag and dust. An opening of 6 x 6 inches appears to be best suited for open hearths though this varies in different shops.

A fire extinguisher locator sign 10 inches in diameter, with white letters on a red background, visible for 75 feet, is made in decal transfer by Randolph Laboratories, Inc., Eight East Kenzie, Chicago 11.

# METALLIC

## ARC WELDING

# ELECTRODES

By HAROLD LAWRENCE  
Metallurgist and  
Welding Engineer

Metallic arc welding is readily applied to pure nickel and high nickel alloys. In fact, techniques involved are much like those for fabricating mild and stainless steels. Next article (STEEL, Oct. 9) in current series will cover copper and copper alloy electrodes

PURE NICKEL and the high nickel alloys are readily joined by metallic arc welding. In fact the techniques involved are akin to those found in the fabrication of the mild and stainless steels. Therefore it is not at all surprising that many welding plants have been eminently successful with the first nickel equipment they have built and, of course, this same success carried through all subsequent jobs.

Before undertaking an analysis of the electrodes available and the conditions under which they may be applied, a review of the nickel types that may be arc welded will be presented. For convenience three major groupings suggest themselves: Nickel, nickel-copper alloys and high nickel alloys. High nickel alloys contain at least 50 per cent nickel.

### Two Forms of Nickel

In the nickel group, as Table I indicates, are two forms of nickel: Pure nickel and "Z" nickel. Pure nickel is 99.4 per cent pure and if the analogy with Ivory soap is kept in mind, it should be easy to remember the analysis of this metal. Since nickel and the nickel alloys shine in the field of corrosion and oxidation resistance, either or both of these attributes lead to the choice of one or another standard analyses. Pure nickel possesses high resistance to corrosion. It is magnetic and quite malleable lending itself well to the several bending and forming operations common to present day construction by welding. "Z" nickel is slightly lower in nickel content than pure nickel but exhibits great strength and hardness because of its response to age hardening. Used largely for springs, diaphragms and other flexing parts in corrosive environments, it is welded only occasionally and may not belong in this discussion as all of the other types are extensively welded.

Nickel-copper alloys make up the second group. First comes Monel which is approximately two-thirds nickel and one-third copper. Monel is stronger, tougher and harder than pure nickel with good resistance to corrosion. "K" Monel is similar to Monel in analysis except for the

presence of 3 per cent aluminum, making it an age-hardening material with strength and hardness in large sections comparable to that of alloy constructional steels. "K" Monel displays corrosion resistance of about the same order as that found with Monel.

In the third group, that comprising the

high nickel alloys, a further subdivision into heat resisting and corrosion resisting materials is indicated. Heat resisting materials are Inconel, Heat Resisting Alloy HX and Heat Resisting Alloy HW. Corrosion resisting materials are Illium, Hastelloy A, Hastelloy B and Hastelloy C.

Inconel is a nickel-chromium-iron alloy

TABLE I  
CHEMICAL COMPOSITION OF NICKEL MATERIALS THAT MAY BE ARC WELDED

Material	Ni	Cu	Fe	Mn	Si	C	S	Al	Cr	Mo	W
<b>Nickel</b>											
1. Rolled Nickel	99.4	0.1	0.15	0.2	0.05	0.1	0.005				
2. "Z" Nickel	98										
<b>Nickel-Copper Alloys</b>											
1. Monel	67	30	1.4		1	0.1	0.15	0.01			
2. "K" Monel	66	29	0.9		0.4	0.50	0.15	0.005	2.75		
<b>High Nickel Alloys</b>											
1. Inconel	79.5	0.2	6.5	0.25	0.25	0.08	0.015		13		
2. Heat Resisting Alloy-HX	65-68									15-19	
3. Heat Resisting Alloy-HW	59-62									10-14	
4. Illium	54-58	5-7	5-7	0.75-1.5	0.65	Max.	0.2	Max.	22-24	5-7	2
5. Hastelloy A	58		20		2						20
6. Hastelloy B	62		4								29
7. Hastelloy C	58		6						14	17	5

TABLE II  
PHYSICAL PROPERTIES OF NICKEL MATERIALS FOR ARC WELDING

Material	Condition	Yield Strength	Elastic Limit	Tensile Strength	Elong. in 2 in.	Rockwell B	Rockwell C	Brinell
	(Hot-rolled unless otherwise noted)	Kips	Kips	Kips	%			
Nickel	Annealed Plate	15-30		60-80	35-50	40-65		90-120
	As-rolled Plate	20-75		70-100	30-45	50-100		100-200
	Cold-rolled Sheet	15-30		60-80	35-50	40-65		
Monel	Annealed Plate	25-45		70-85	30-50	60-75		110-140
	As-rolled Plate	40-90		80-110	20-45	75-98		
	Cold-rolled Sheet	25-45		65-85	20-50	61-73		
"K" Monel	Cold-rolled Strip - Soft	50-65		90-105	30-45	75-85		
	Cold-rolled Strip - Soft, Heat Treated	90-110		130-150	10-25		20-30	
	Cold-rolled Strip - Full hard	105-120		145-165	2-8		25-32	
	Cold-rolled Strip - Full Hard, Heat Treated	125-145		170-200	2-10		33-40	
Inconel	Cold-rolled Sheet - Soft	30-45		80-100	35-50	65-85		
Heat-resisting Alloy-HW		60		110	35			200
Illium	Annealed		45-55	95-105	30-45			175-240
Hastelloy A	Annealed	47-52		110-120	40-48	94-97		200-215
Hastelloy B	Annealed	60-65		130-140	40-45	96-100		210-235
Hastelloy C	Annealed	55-75		115-128	25-50	84-95		160-210