

Operator swings end turret of master drill jig used on fuselage frame forgings. Page 108

# STEEL

The Magazine of Metalworking and Metalproducing

## DECEMBER 6, 1943

Volume 113—Number 23

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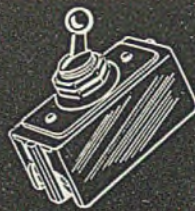
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# HOW A SWITCH

## FROM NAVY TO ARMY MET DELIVERY DATES FOR THEM BOTH!



When the delivery date on an important Army order was suddenly pushed ahead, the builder found himself in *immediate* need of 200 switches of a special type.

Factory shipments couldn't meet the deadline, and no one in the area stocked switches of this unusual design. Then a GRAYBAR "procurement advisor" recalled that another local firm used a similar type of switch on its line of meat-chopping machines.

A borrowed sample showed that these switches would fill the bill — but all on hand were needed for a Navy order for meat-choppers! Luckily, production

schedules at the latter plant left a little more leeway in time.

On Graybar's promise of prompt replacement, enough switches were "switched" to the Army's job to get it out on schedule. Then, fast work by GRAYBAR brought new switches to the Navy's supplier in time to avoid installation delay here!

If you build any ELECTRIFIED product . . . from a meat chopper to a 4-engined bomber . . . GRAYBAR can speed up and simplify the mobilization of electrical materials and parts to be built into it. A single call to a GRAYBAR "procurement advisor" ties you in to a network of over 80 warehouses, supplied from over 200 manufacturers.

(P. S. For your post-war distribution plans, keep GRAYBAR's facilities in mind.)

**MOBILIZED MATERIALS**  
No. 14 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and other war products.

# Graybar

## IN OVER 80 PRINCIPAL CITIES

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



## You Can't Kill "Know How"

This is being written when the big news of the week is less than 48 hours old. Last evening the official communique from Cairo announced that the heads of three great Allied Nations—United States, Great Britain and China—had agreed upon a program which calls for stripping Japan of all of the empire it has stolen or otherwise acquired in the last half-century.

Thus far practically all of the comment elicited by this history-making pronouncement has dealt with political and military repercussions. Practically nothing has been said about its effect upon private enterprise in the world's leading industrial nations.

The Roosevelt-Churchill-Chiang Kai-shek pact virtually spells complete liquidation of the Japanese empire. It envisions the reduction of Japan to a third-rate power, encircled by bands of steel in its congested island homelands. It presupposes that the Japs will be stripped of seapower, of sea-borne trading facilities and of industrial strength.

Considering Japan's behavior in recent decades, no one outside of Japan itself is likely to deplore this ultimatum. Industrialists in the United States, Great Britain and other industrial nations will have no regrets. The wily Japs long have abused the privileges of international business relationships. In America, particularly, manufacturers have shown courtesies to their Nipponese visitors only to learn that their willingness to help was repaid by treachery. Not soon to be forgotten will be the Japanese practice of buying a machine or two in America, copying it in Japan even to its minute defects and then manufacturing it in quantity without a qualm as to the ethics of the situation.

But regardless of how bitterly we may feel about Japanese integrity, we cannot dismiss the Cairo agreement as a fact accomplished. Industrialists in Japan have acquired a creditable amount of American "know how." They are familiar with many of our industrial methods. No degree of military defeat or political ostracism can completely erase from Japanese minds the production technique they have acquired from us.

Therefore, we can assume that Japan has something which cannot be killed by destruction of its outlying empire. Technicians of the Rising Sun will retain their western "know how", wherever they may be. In the recesses of the Japanese islands or as immigrants in a new China or elsewhere, Jap industrialists—implemented with the technique of western industrialism—will continue to be a factor in world trade.

---

**THEY THRIVE ON VOLUME:** Two machines described in this issue present interesting problems of national policy. One, dubbed by its sponsors a Rube Goldberg creation, is an elaborate master jig for handling milling, drilling and reaming operations on the welded steel tubular fuselage of basic training planes. The other is a rectangular, closed circuit, 16-station automatic machine for finishing valve holes in aluminum cylinder head castings for 14-cylinder radial airplane engines.

Both of these installations cut production time by

impressive percentages, thereby saving precious manpower hours. The last-mentioned machine costs approximately \$125,000 per unit.

Machines of this type are like mammoth, de luxe, transatlantic passenger liners. Assured of a sustained heavy volume of patronage, they are priceless assets; denied that volume they are white elephants.

Assuming that after the war peacetime demand will not provide sufficient volume to employ these special purpose machines economically, what is to be their fate? Shall they be stored for use in an-

other war 25 years hence, or shall they be scrapped on the score that they will be hopelessly obsolete in the next war?

Questions of this kind will be pertinent as V day approaches. —pp. 108, 118

**ACCENT ON TRANSPORT:** Noting that the army wants more heavy trucks, WPB has indicated its willingness to approve materials for a substantial increase in 10-ton truck output in 1944. This development has more than usual significance because it corroborates the growing conviction among informed authorities that adequate transport will be one of the big "musts" of the coming year.

Heavy trucks seem to fit into every possible conception of the needs of the war, transition and post-war periods. They are needed at home immediately to keep war production functioning effectively. They are essential to combat, supply, lend-lease, rehabilitation and reconstruction activities all over the globe. The same is true of railroad locomotives and cars.

From all present indications, industry can look for an increasing emphasis on the part of government agencies for early improvement in the world's land transportation facilities. —p. 87

**PLAN FOR RECONVERSION:** Now that the acute shortages of steel and some other materials are easing appreciably, minds in government and industry are turning to problems of reconversion. Automobile manufacturers, particularly, are pointing out that now is the time to be figuring ways to avoid bottlenecks in the transition from war to civilian production.

One bottleneck that is foreseen is the assembling of equipment for the manufacture of automobiles. When the automobile industry converted to war work, its machines, tools and dies were scattered to the four winds. Some of the equipment went to Russia and England. When the time comes to rebuild peacetime assembly lines, there will be a confused scramble to obtain the required machine tools, conveyors, accessories, etc. The automobile men seek government approval to start ordering some of the most critical equipment now, so as to avoid such confusion.

There is logic in this appeal. Smooth-running reconversion will be beneficial to every interest. It will ease the shocks of readjustment. Specifically, it will reduce unemployment. —p. 79

**ENGINEERING PROGRESS:** Aside from breaking all records for attendance, the sixty-fourth annual meeting of the American Society of Mechanical Engineers, held in New York last week, spotlighted the great contributions made by the mechanical engineering profession to the Allied war effort. Throughout the many sessions flowed a steady stream of testimony of high achievement—of engineering resourcefulness which has meant much to our military might and will mean even more to the world's standard of living in the years to come.

Retiring president Coes struck a prophetic keynote of the meeting when, referring to wartime engineering developments, he declared that they present rare opportunities for future progress. "They will necessitate changes. They will upset old methods. They will disrupt some industries and render some products obsolete. But in that direction lies the path of progress."

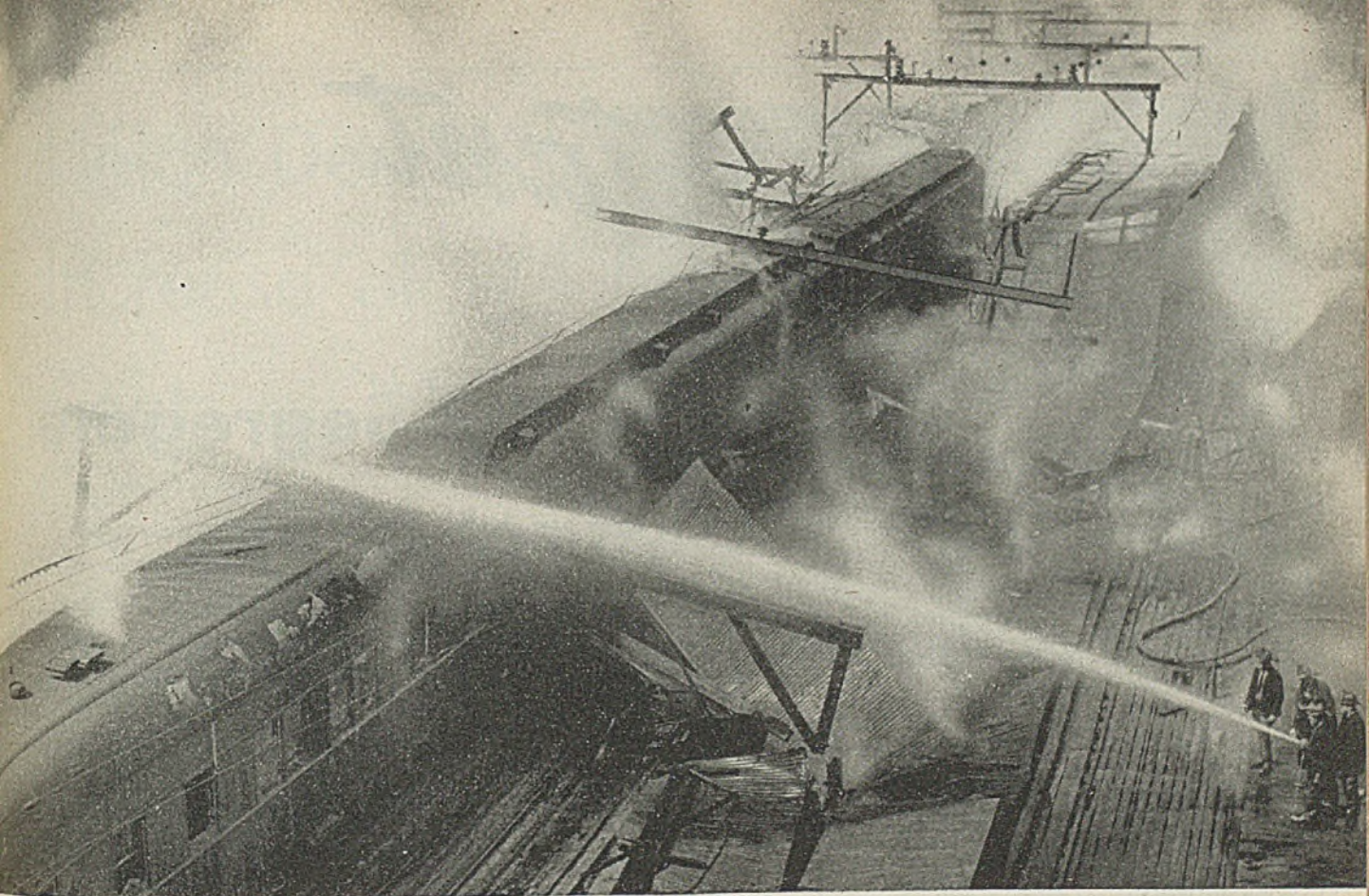
If proof were needed that the United States has outgrown its technical provincialism, the enthusiasm of the A.S.M.E. meeting supplied it in abundance. —p. 82

**TREASURY OUT OF STEP:** Progress of the 1943 revenue bill through Congress indicates how thoroughly the Treasury Department is out of step with public opinion as it is reflected in the attitude of senators and representatives. The House vote of 200 to 27 shows conclusively that members, regardless of political affiliation, practically ignored the administration's suggestions. The Senate vote also is expected to be a rebuff.

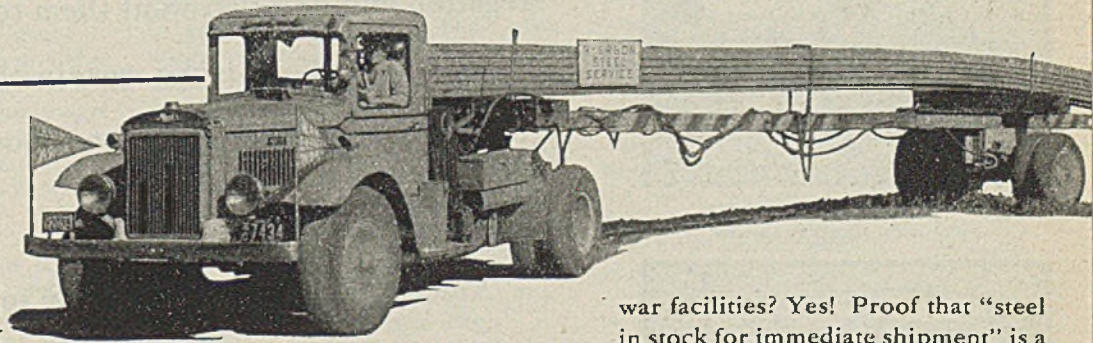
The reason for this almost unprecedented disregard for Treasury recommendations is that Secretary Morgenthau has not been frank. He insists upon asking for ten billion in additional taxes at the same time that he refuses to sanction tax measures which would raise that amount. He is dead set against increasing the taxes of a sector of the population which has enjoyed a substantial increase due to the war. He is against a general sales tax for the same reason. He is for a revenue bill aimed chiefly at alleged social reform.

Congress is making the best of a bad situation by refusing to be a party to the attempted discrimination. It is a pity that a little more of the tax burden cannot be placed where it rightfully belongs. —p. 86

  
EDITOR-IN-CHIEF



## Ryerson Steel Delivered While the Fire Still Burns



It is Sunday, September 12, 1943. . . . A disastrous fire is destroying the train sheds of the Pennsylvania Railroad's great Broad Street Station in Philadelphia, all important rail nerve-center, vital to the Nation's war effort!

This calls for action! One thought is in every Pennsylvania man's mind—rebuilding—restoring service—the quickest possible way. Construction materials are needed immediately—but how to get steel?

At 3:10 P.M., the fire still burns fiercely. The railroad's purchasing department 'phones a Ryerson man

at his home. The order is for 60-foot channels. Can Ryerson deliver?

Ryerson *can*—and *does*, in just one hour and twenty minutes! At 4:30 P.M., a Ryerson truck pulls up at the blazing station with the steel! Before the embers were cold, the rebuilding of Broad Street's train sheds was started.

Good service? Yes, say Pennsylvania officials! Co-operation in an emergency to avoid a tie-up of vital

war facilities? Yes! Proof that "steel in stock for immediate shipment" is a Ryerson reality. Proof that the Ryerson organization is ready and able to meet every steel-service requirement, however tough.

In any emergency—and in your everyday purchases—you can depend on Ryerson for steel. Call, wire or write the nearest of the ten well-stocked Ryerson plants.

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

# RYERSON STEEL-SERVICE

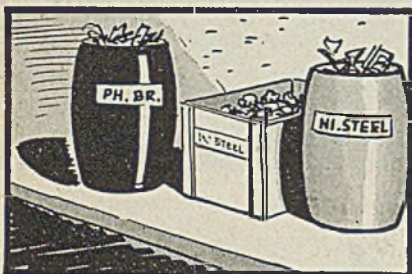
It Is Still

*Important*

## To Save and Segregate Critical Alloys



Segregate alloy scrap at the machines where it is made.



Label containers with metal grade names or numbers.



Always have at hand empty containers, properly labeled.



Keep alloy scrap segregated in the yard while waiting shipment to steel mills.

Tons of critical alloys can be saved for urgently needed weapons of war and tools if every shop working with alloy steels and different metals will adopt the simple practices pictured at the left.

Equipment need not be elaborate—only a few barrels or boxes properly labeled. Then spend a little time with workmen explaining the need for alloy scrap segregation and how you want them to do it. Finally check up occasionally to make certain that the plan is being followed and that new men know what you are trying to accomplish.

America is a "have not" nation in respect to many critical alloys. That is why it is *still important* to segregate scrap and ship it to steel mills where alloys can be reclaimed.



# INLAND STEEL COMPANY

38 S. Dearborn St. **50th ANNIVERSARY** Chicago 3, Illinois

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

# Union Demands Increase of 17 Cents an Hour



PHILIP MURRAY . . . . . Seeks contract changes

*Severance pay, guaranteed weekly minimum, meals in plant, more holidays, longer vacations, sick leaves, shift differentials, preferential treatment of union officials in promotions proposed by United Steelworkers*

## PITTSBURGH

WAGE increases of 17 cents an hour for all steelworkers and other concessions that would cost the industry many millions of dollars annually, if granted, are being demanded of 485 steel and metal-working companies having contracts with the United Steelworkers of America.

The demands of the union, of which Philip Murray is president, were formulated by the international executive board and approved by the wage and policy committee here last week. If granted, they would wipe out the last vestiges of the "Little Steel wage formula."

In addition to the 17-cent hourly increase, the union is asking for severance pay, a guaranteed minimum weekly wage, elimination of geographical wage differentials, sick leaves with pay, more liberal vacations, more holidays, in-plant feeding at cost, and premium wages for second and third shifts.

The demands are being presented simultaneously to all companies holding contracts with the union. The companies are expected to contest practically all points in the union's program. Under the government's stabilization program, the companies could not allow the union the wage increase demanded, even if they were so inclined. General expectation is that negotiations will go forward as provided in the contracts and at the end of the period allowed for negotiations the whole matter will be referred to the War Labor Board, of which W. H. Davis is chairman.

The wage increase asked by the union would raise the basic hiring rate to 95 cents from the present 78 cents. During September, latest month for which figures are available, average hourly earnings of steelworkers were \$1.16, compared with 86.6 cents in January, 1941, base month for the "Little Steel" formula.

Average weekly earnings in Septem-

ber were \$52.55, or \$18.60 more than the \$33.95 earned in January, 1941. Thus the average weekly steel wage increased 55 per cent during the war period. Labor Department indexes indicate living costs during the same period increased only 25 per cent.

The increase now asked would raise the steelworkers' basic hourly wages by 22 per cent.

Other demands included in the union's program are expected to meet as much opposition as the requested wage boost.

These include:

Guaranteed minimum weekly wage. Under this provision, each worker would be guaranteed pay for 40 hours every week, provided he had no unexcused absences. For each week of the contract that the worker for reasons beyond his control fails to receive a sum equal to 40 hours' pay at his straight-time rate, the company shall make up the difference. This means the lowest paid worker, if he has no unexcused absences, is guaranteed a minimum annual income of \$1976.

### Demand Severance Pay

Severance pay of four weeks' pay for all employes having one year and less than three years' continuous service and eight weeks' pay for all employes having three years or more is asked for all employes when a plant or portion of a plant is permanently closed down.

Vacations of one week for employes with one to three years' service and two weeks for employes with more than three years' service are demanded. The union asks that as long as the industry is on a 48-hour week, vacation pay shall not be less than 48 hours. When the 40-hour week is resumed, vacation pay shall be not less than 40 hours.

The provision in the present contract requiring consistent employment as a condition for receiving vacations, meaning the receipt of earnings in at least

60 per cent of the pay periods, would be eliminated under the union's program. Vacation pay for employes in the armed services also is asked.

Sick leaves with pay of seven days a year for employes with one to three years' service and 14 days for employes with more than three years' is provided.

Shift differential of 5 cents an hour for the afternoon shift and 10 cents an hour for the night shift is asked.

Union officers, grievance men and assistant grievance men are to be given preference in the case of promotions, increase or decrease of working force. This provision is designed to entice "old hands" to become active in union activities and to keep union officers in line. In many plants, the oldtimers, secure in their seniority, have refused to participate in union affairs, even though they were forced to join. If this provision were accepted, the union could force the older workers to take an active part in union business or risk being bypassed by union officials with fewer years of service.

Increased emphasis is given to seniority in the union's program.

"In the case of promotions and increase in forces, length of continuous service shall be the determining factor unless it is proved by way of a trial period on the job that the employe involved has not the ability to perform the work. In the case of a decrease in forces, length of continuous service shall be the determining factor," the program reads.

"For those contracts, as in the case of Carnegie-Illinois Steel Corp., which provide for a reference to the Carnegie Pension Fund Rules for determining continuity of service up to and including March 31, 1941, the contract should provide that within 60 days of the execution of the new contract, the company should either provide or make available to all employes the record of continuous

service up to and including March 31, 1941. Any employe who has a grievance with regard to such record may present the same within 30 days thereafter, which grievance shall be adjusted under the grievance machinery including arbitration. Unless a grievance is submitted, the record shall be final.

"The period for probationary employes shall be decreased from three months to 30 days."

Another new demand of the union is for in-plant feeding. "Each plant shall have adequate facilities for providing adequate food for one meal for each shift at prices not to exceed cost. The union shall have the right to participate with management in the establishment and maintenance of such facilities and the service and quality of the food furnished."

Six holidays a year instead of the present three are asked. These would include Thanksgiving, Jan. 1, July 4, Labor Day, Christmas and Memorial Day.

Elimination of geographical wage differentials is another provision of the program.

Demands pertaining to hours of work closely follow Executive Order 9240, which established the 48-hour week and other provisions for the duration.

### Time and One-Half Asked

"Time and one-half shall be paid for work performed on the sixth or seventh day of the regular established work-week of the employe and each of the first five days of the work-week shall be computed as days worked although the employe has not worked either because the company has advised him not to report, or due to illness, or because engaged in official union affairs, or because of other reasons beyond the control of the employe," the union proposes. "Provided that upon the elimination of Executive Order 9240 double time shall be paid for work performed on the seventh day of the work-week under the foregoing conditions.

"All employes should be scheduled on the normal work-week, and time and one-half shall be paid to those employes who are called out on their regularly scheduled days of rest."

Grievance procedure would be changed considerably under the new proposal, with all changes tending to speed up the procedure and by providing for the bypassing of foremen and taking the matter up to top-ranking executives.

Another departure which may have to do with future negotiations is the provision that the contract is for a two-year period. Previous contracts with steel producers have followed the indefinite contract pattern—remaining in force until either party served notice on the other. The two-year contract has been a favorite of John L. Lewis and the mine workers, because it automatically guarantees a change every two years, whether there is a reason for it or not. The new proposal continues the privilege of either party to open the contract upon demand, and in addition this procedure termi-



WILLIAM H. DAVIS . . . . . He may decide steel wage issue

nates it after two years automatically.

The present contract held by most companies provides for expiration of the agreement 30 days after notice has been given by either party. Since notice will be given by the union within the next few days, the present contracts will expire shortly after the first of the year.

### Number of Acute Labor Shortage Areas Declines

Number of areas in which labor shortages have become acute has decreased from 77 to 70 while the number of areas where shortages are expected to develop by the end of May, 1944, has increased to 123 from 108, according to the War Manpower Commission.

The following districts have been added since Nov. 1 to the list of those having a current acute labor shortage: Cleveland; Clinton, Iowa; Knoxville, Tenn.; and Richmond, Ind. The following have been dropped from group I to group II (those areas of labor stringency): Orlando and Tampa, Fla.; Allentown,

Pa.; Burlington, Iowa; Ogden and Salt Lake City, Utah; Savannah, Ga.; and Wilmington, Del. Butte, Mont., has been reclassified in group III which is composed of areas in which a slight labor surplus will remain after six months.

Jackson, Miss.; Lewiston, Me.; Lincoln, Neb.; Moline, Ill.; Talladega, Ala.; and Waukegan, Ill., have been added to group II.

### Steel Produced for Sale Increased in October

Steel products produced for sale in October totaled 5,785,294 tons, according to the American Iron and Steel Institute. This compares with 5,655,610 tons in September and brings the total for the 10 months of this year to 55,684,197 tons.

Plate mills in October operated at 143 per cent of capacity, producing 1,116,437 tons for sale, and heavy structural shape operations increased to 75 per cent with 345,064 tons. Bars totaled 1,080,175 tons.



# Small Tools Export Through Trade Channels Suggested in New Plan

EXPORTATION of small tools to South Africa through regular commercial channels instead of through lend-lease during the first quarter of 1944 appears a possibility.

It is understood a plan, worked out by a committee of exporters headed by

A. W. Peck, Stanley Tools Division, Stanley Works, was presented to and approved by representatives of the War Production Board, the lend-lease division of the Foreign Economic Administration and other interested agencies recently.

Under the plan South African require-

ments of small tools would be consolidated in a single list and sent to this country before the end of the year. Accompanying the list would be copies of the original orders as submitted by dealers to the controller in South Africa.

Details of the plan have not been learned, but it is said a permanent committee would administer the plan if it is made operative. This committee would see that orders for goods specified for each manufacturer by the South African purchaser would be sent to the producer, who would apply for the necessary priorities. After the priority was granted the manufacturer would proceed to handle the order as a commercial transaction and take care of all details himself, including arrangements for shipment. It is said the committee has been assured by WPB that priorities would be granted on the same basis as those given on orders handled by lend-lease.

Exporters view the plan as constructive and significant. They point out that if adopted it will put back into the hands of exporters a small segment of trade with the South African market which has been moving through government agencies. Further, they say if the arrangement works successfully in small tools it can be expanded to take in a wide variety of items and possibly can be expanded to other markets now being served through lend-lease.

## Present, Past and Pending

### ■ HUFF NAMED IRON AND STEEL PRICE EXECUTIVE, OPA

WASHINGTON—Resignation of Donald D. Kennedy as price executive in Office of Price Administration's Iron and Steel Branch and appointment of Warren M. Huff as his successor were announced last week, effective Dec. 20. Mr. Kennedy has accepted a position as assistant general manager for the Farrell Cheek Steel Foundry Co., Sandusky, O.

### ■ PERMITS USE OF HADFIELD MANGANESE STEEL IN CHAINS

WASHINGTON—Use of Hadfield manganese steel now is permitted in conveyor chains and sprockets and mechanics power transmission chains and sprockets under an amendment to war production order L-193.

### ■ EQUITABLE DISTRIBUTION OF CONSUMER GOODS PLANNED

WASHINGTON—War Production Board's forthcoming order on equitable distribution of consumer goods, other than food, will be discussed with the country's manufacturers and wholesalers during conferences in New York, Dec. 13-14, and in Cleveland and St. Louis on Dec. 16-17.

### ■ FABRICATED COPPER FINISHING HARDWARE RELEASED

WASHINGTON—War Production Board last week released three million pounds of fabricated copper and copper-base alloy parts for use in manufacture of builders' finishing hardware, cabinet locks, and padlocks.

### ■ HOOK APPOINTED MEMBER OF AIR FRAME PANEL, WLB

WASHINGTON—Charles Hook Jr., assistant to the president, Rustless Iron & Steel Corp., Baltimore, has been appointed an industry member of the Air Frame Panel, National War Labor Board.

### ■ BUDD CONTRACT REFUNDS TOTAL NEARLY \$15 MILLION

NEW YORK—Renegotiation of 1942 war contracts resulted in contract refunds amounting to nearly \$15,000,000 by Edward G. Budd Mfg. Co. and Budd Wheel Co., says E. G. Budd, president. He predicts tremendous expansion in railway passenger traffic after war ends.

### ■ RUSSELL MFG. PRODUCING STEEL ZIPPER TAPE

MIDDLETOWN, CONN.—Russell Mfg. Co. has resumed limited production of zipper tape for civilian use, but the zipper itself will be steel rather than brass. War Production Board has released some steel for zippers for the civilian market.

### ■ CANADIAN STEEL PRODUCTION INCREASES SHARPLY

TORONTO—Steel production in Canada rose sharply in October to 271,976 net tons of ingots and castings, or 92.2 per cent of capacity, from 241,255 tons, or 81.8 per cent in September. Pig iron production held steady at 146,794 tons, or 63.9 per cent of capacity. Production of ferroalloys declined to 16,843 from 17,007 tons.

### ■ DEVELOPS NEW HIGH-ALTITUDE AIRPLANE HEATER

NEW YORK—A new high-altitude combustion type airplane heater of revolutionary design has been developed by Surface Combustion, Toledo, O. This heater lights and burns almost instantly at any temperature down to 70 degrees below zero and at any altitude (57,000 feet in simulated pressure chamber). It operates on a unique "whirl-flame" principle.

### ■ TO PERMIT ELECTRIC RANGE MANUFACTURE

WASHINGTON—Permission to produce 64,000 domestic electric ranges of the 3-burner, apartment house type in 1944 is expected to be granted shortly in areas where labor and facilities are available.

## Cleveland Ordnance District Honors Machine Tool Panel

Members of the machine tool panel of the Cleveland Ordnance district last week were presented with citations and special letters of commendation for distinguished service in the program to conserve critical materials and machines by Col. H. M. Reedall, district ordnance chief.

Members of the machine tool panel receiving citations were: G. J. Zimmerman, panel chairman and president, Strong-Carlisle & Hammond Co.; Ray St. John, Heald Machine Co., and C. J. Hawkey, president, Cleveland Duplex Machinery Co. Receiving special letters of commendation were: Ray Knapp, Motch & Merryweather Co.; William Stewart, Brown & Sharpe Co.; James Allen, Pratt & Whitney Co.; Charles Scheihing, Ohio Crankshaft Co.; E. L. Mack, Strong-Carlisle & Hammond Co.; J. K. Fitzgerald, Niagara Machine & Tool Works, and Paul Zerkle, Michigan Machine Co., Detroit.

## Chicago Buyers To Hear Postwar Industry Talk

Dr. William J. Hale, director of organic chemical research for the Dow Chemical Co., will speak on "The Shape of Industries to Come," at the December meeting of the Purchasing Agents of Chicago, at Hotel Sherman, the evening of Dec. 9.

# Easier Situation Noted in Steel, Other Formerly Critical Metals

*Plates, sheets expected to become available for civilian use within four months. . . Order M-126 may be rescinded. . . High-cost producers jeopardized. . . Cutbacks in munitions programs releasing some workers*

RELATIONSHIP between supply and demand for steel and other materials is growing steadily easier, in spite of warnings by the War Production Board that the 1944 production job will be "at least 20 per cent bigger" than in 1943.

The easier situation is reflected in excess stocks of ingots at several producing centers, a surplus of alloy steels, by some cancellations by consumers who have bought too far ahead, and by a relaxing of restrictions on some materials by the WPB.

At Youngstown, O., a leading producer is operating only nine of 15 open hearths, one being down for repair and five for lack of business. In Washington, it was said that plates and sheets, the tightest of all steel products, should be available for civilian use within the next four months. All-steel railway cars are expected to be available in the second quarter, while a movement to rescind order M-126 and release steel for general civilian use was reported under way.

While the WPB estimates first quarter demands for steel by claimant agencies will exceed production by nearly 2,000,000 tons, it is believed these estimates do not take into consideration probable cutbacks in the munitions program.

In view of the favorable developments in the European phase of the war, consumers with comfortable inventories are not anxious to add to them, as they expect they will not be allowed compensation for stocks over the scale if their war contracts should be canceled.

An armistice in the European war would have immediate repercussions. Buyers would cancel orders in expectation of contract cancellations and mills booked for months ahead might find their backlogs vanishing overnight.

Already the easier supply is jeopardizing producers who have been granted prices above the ceilings. The Pencoyd plant of Carnegie-Illinois Steel Corp. near Philadelphia will close soon. This plant, which has been supplying ingots for lend-lease, is a high-cost unit and at one time was abandoned but was brought back into production by the pressure for war steel. It is permitted to charge a premium of \$7.25 a ton.

Pig iron melters who are being allocated premium-priced iron from high-cost units are approaching other furnaces with requests to supply them in case pig iron allocations are lifted, as has been rumored for the past several weeks.

Cutbacks in the munitions production

program recently not only have eased the materials supply situation, but also have relieved tight labor situations in a number of areas. Buick Motor Division of General Motors Corp. last week laid off approximately 3000 employees at Flint, Mich., plants producing aircraft engine parts and a like number at the company's engine assembly plant in Melrose Park, Ill. Reductions were attributed to Army Air Force cutbacks in schedules of production of engines and parts.

## Manpower Outlook Improves

Closing of a number of small arms ammunition plants has or soon will release several thousands of workers.

The War Manpower Commission announced that within the past month the areas in which acute labor shortages existed have decreased from 77 to 70. The situation is not uniform and WMC warned that shortages would continue in many areas and in many industries and that widespread unemployment due

to munitions program cutbacks was unlikely.

In announcing the 1944 production program would be 20 per cent greater than in the current year, Charles E. Wilson, WPB executive vice chairman, said the job would not only be bigger "but one which in many ways is more difficult since we are entering a phase in which changes in the program—changes that may be sudden and cannot be foreseen—produce problems requiring the greatest ingenuity and the most thorough application for their solution."

Mr. Wilson said that facilities for war production are practically in place and that raw materials are under control. Although there are some bad spots in manpower, he said this situation is in better shape than many are inclined to believe.

Mr. Wilson himself will take over the duties of Hiland G. Batcheller, formerly operations vice chairman whose resignation was formally announced last week.

Notwithstanding the increased munitions program, WPB last week relaxed restrictions on a number of materials. Approximately 3,000,000 pounds of fabricated copper and copper base alloy parts were released for the manufacture of builders' finishing hardware, cabinet locks and padlocks. Freer use of chromium is to be allowed in the production of stainless steel. Control of the manufacture of sugar processing machinery has been eased. Control over the manufacture and distribution of X-ray equipment have been revised. Controlled materials for repair parts may be obtained by repairmen in greater quantities.

# Plans Underway for Disposing of Government Plants and Surpluses

## WASHINGTON

JESSE JONES, as Reconstruction Finance Corp. head, told the House Public Grounds and Buildings Committee last week the corporation now is conducting a survey of plants financed by the Defense Plant Corp., looking toward disposing of the plants to private industry. RFC also is working on a program for disposal of strategic material.

"If anyone wanted to buy a plant today belonging to DPC, we are in a position to sell it to him," said Mr. Jones. "If anyone wanted to buy strategic materials, we are in a position to sell them also and are doing it every day."

In disposing of plants, he said, the government should not overlook the opportunity of preventing establishment of monopolies. For example, the government owns 55 per cent of the aluminum production capacity, the remainder being owned by the Aluminum Co. of America and Reynolds Metals Corp. He said he certainly would not favor selling the government plants to either of these large producers.

Whereas the Army and Navy are mov-

ing to prepare to liquidate large surpluses of numerous supply and equipment items at "bargain prices," Mr. Jones held that the public should not expect too many bargains and that the surplus goods should be sold at prices having some relation to the cost.

The Army already has distributed catalogs of surplus Air Corps materials and equipment and is perfecting an organization to handle surplus material and equipment in all branches of the service. The Navy is handling surplus sales through three materials distribution and disposal offices, in Chicago, New York and San Francisco.

## Inventory Restrictions on Electrode Users Removed

Inventory restrictions on consumers of graphite and carbon electrodes have been removed. Although production of electrodes has increased, the supply position at present does not warrant the discontinuance of form WPB-772, War Production Board said last week.

# Preparedness Now for Peacetime May Avert Wide Unemployment

## *Automotive spokesmen ask government for firm contract termination policy and permission to buy or order critical machine tools needed for civilian goods production*

FIRM government policy on contract termination and permission to industry to buy or build the important machine tools necessary for reconversion are necessary now if a long delay between the end of war production and resumption of civilian output is to be avoided.

This is the consensus of the testimony by spokesmen for the automotive industry, representing 20 per cent of war production, before two important congressional committees.

Such action must be taken now to prevent widespread unemployment during the period when plants cease making munitions and start on consumer goods. It need not affect war production until hostilities end, nor need it create in the public mind an impression that the war is in the bag and that we can coast to victory.

This is the thinking not only of the automotive and other industrialists, but also reflects to some extent the ideas taking shape in the minds of government officials concerned with the reconversion task.

Bernard M. Baruch, the administration's No. 1 postwar planner, is understood to favor a "cash-on-the-line" policy of terminating contracts.

A "cash-on-the-line" policy of cancellation would help solve one of the most complicated problems of terminations, that of settling the claims of sub and sub-subcontractors. Under present procedure, the lot of these lower contractors is not enviable, due to the fact that the contractors above them cannot make a definite settlement for fear it might be disallowed by the government procurement agency or a higher contractor.

Charles E. Wilson, president, General Motors Corp., in testimony before the Senate Truman Committee, advocated industry be permitted to manufacture or buy now the more important tools that will be needed for the resumption of peacetime goods manufacture.

Recommending that reconversion be planned now to cut down production lags when peace comes, Mr. Wilson said the steel shortage is just about over. He said GM would be able to resume partial production of automobiles within three months after the war ends and could attain a fair rate

of production within six months, provided no stumbling blocks were placed in the way.

"Before we get into production, however, we will have to have our plants cleared of machinery and inventory in them that cannot be used in our peacetime products," he said. "We would like to have the government decide now what it wants to do with its tools that are in our plants, and say which ones it will sell and at what price. We would also like to know what the government will want us to do with the machinery it proposes to keep.

"We do not expect to buy government-owned machine tools at bargain prices. We do not want any favors from the government. All we want is a chance to move in fast when the time for reconversion comes and get new automobiles into the hands of the public."

Mr. Wilson opined it will be necessary

to terminate contracts by negotiation. If everything has to be audited down to the last penny, he said, there will not be enough auditors in the world to do the job. He warned that "our people are not going to be very happy to sit around doing nothing while the auditors are at their task."

"We also would like to have the government permit us to start ordering machine tools and other equipment to replace similar units we distributed to other manufacturers by the thousands for installation in war production lines. Goodness only knows where many of them are; we know large numbers of the tools we used to manufacture automobiles went to Britain and Russia. When the time for reconversion comes there will be all sorts of complicated problems. We would like to take care of some of them now. It would be a big help if we could begin ordering bottleneck machine tools and equipment now. Indications are that the machine tool industry now is getting into a position to manufacture these tools if it were permitted to take our orders."

K. T. Keller, president, Chrysler Corp., told the Truman Committee much the same story. He said manufacturers should be permitted to buy—now—those government-owned tools and other equipment that they can use in automobile production and that the government should decide now what disposition is to be made of the equipment it wants to keep.

"It would be a great thing for industry to modernize with many of the newer and better tools which the government now has," he said. He emphasized the importance of shortening the reconversion period by permitting immediate changeover of war plants.

Concurrently, a complaint on the delay of the government in mapping a reconversion policy was lodged with the Senate Special Committee on Postwar Economic Policy and Planning by J. H. Parks, vice president of Packard Motor Car Co. and spokesman for the Automotive Council for War Production.

Several months ago the council completed an exhaustive report on factors involved in reconversion and sent copies to heads of all government procurement



CHARLES E. WILSON

GM president wants to start preparing for reconversion now

agencies, the comptroller general, the interested committees of Congress and to other government agencies. Nothing has been heard of the report since.

"The day after their contracts are terminated," said Mr. Marks, "we will have 350 subcontractors in our reception room all asking the question: 'How can I get my money—quick?' The answer depends on action to be taken by Congress.

"Our contracts with the Defense Plant Corp. stipulate that if we do not receive instructions within 90 days from the government as to what to do with government-owned machine tools and equipment, we may move it out of the plant into storage. That is, we would be sitting around 90 days before we would have our plant back.

"Our executives at Packard in a meeting a few days ago estimated the length of time it would take to get back into the automobile business and we agreed that four months would be the minimum period before we could get into production and six months would be the maximum. But we could not get started on reconversion until we had our plant back."

Mr. Marks said that the automotive industry has had much experience in contract termination and he mentioned specifically the big termination job done by the industry when it discontinued automobile production. All of that termination was negotiated. He recommended that termination of war contracts be by negotiation, that it be handled by the procurement agencies "who have experienced men, businessmen, who could be trusted to look after the country's interest while at the same time being fair to contractors."

He insisted settlements must be final and binding, not subject to review, excepting in cases of fraud.

"We need to know today the exact procedure that will be followed when the switches are pulled. If we have to wait until the war is over there will be disastrous delays in reconverting," he declared. "We ought to know now what is to be the disposition of every piece of government-owned machinery in our plants so that we will be able to move fast in a positive direction. We know what we are going to do but the government will not let us know what it is going to do."

When the automotive industry converted to war production, equipment was sold or leased by one company to another in accordance with needs. Mr. Marks proposed that the best way to dispose of government-owned equipment, at least in the case of the automotive industry, would be to allow the contractors to buy it and dispose of it within the industry, just as the industry redistributed the equipment formerly used to manufacture automobiles.

"Our industry has contracts coming to \$22,000,000,000," said Mr. Marks, "and I am told that represents about 20 per cent of all the war contracts. I do not pretend to make any recommendations



K. T. KELLER  
Chrysler Corp. president says changeover period can be shortened

to cover other industries, but if you establish a pattern for us you will be taking care of a large share of the total problem. Incidentally, of our 525 members, 81 per cent turn out war work coming to less than \$5,000,000 annually, and 61 per cent employ fewer than 500 people. We have a few large corporations but our industry is mostly small business.

### "We Need Answers Now"

"Everybody concerned is talking in too leisurely a way about disposition of government-owned plants and property," he reiterated. "In September, I was called to Washington to attend a Defense Plant Corp. meeting at which the Army and Navy were represented. We talked about what to do with government-owned machinery and equipment. I have heard nothing more—and we just have to have the answer now if we are not going to drag out the reconversion period indefinitely. Yes, I know that the Army and Navy have set up schools to teach procurement officers how to terminate contracts. The trouble is that everybody thinks of termination as something still ahead. It has been with us for more than a year and is getting more of a headache each day. We need the answers now."

Mr. Marks voiced the belief that when the automobile industry gets rolling after the war it will provide employment for all the people now in its employ who want to stay with the industry. "Many people are not working for us by choice and will leave us to go back into activities discontinued during the war."

A plea for the protection of the subcontractors was made to the committee

by George Terborgh, research director, Machinery and Allied Products Institute Inc., Chicago. Present contract termination procedure gives a better status to the prime than to the subcontractor he said, because things get pretty complicated as you go down the line to—the third, fourth, fifth, sixth, seventh and eighth sub-subcontractors.

"The third sub-sub, for example," he explained, "does not know whether his settlement with the fourth sub-sub will be approved further up the line, or by the government auditors. He cannot dispose of inventory without running the risk that a government auditor will find that he did not dispose of it properly.

"As a result, many of these sub-subs do not make claims; they sell the material or parts elsewhere. Some of these sub-subs handle as many as 1000 cancellation orders at one time. To make a claim effectively, they must segregate inventory in each case, which means 1000 separate inventories, so that the government officer can go out there and count the material and determine its value. Many of these suppliers do not wish to go through all this agony. They take a loss and get out of the mess. Many contractors pay claims out of pocket where the amounts are not too large rather than hand the claims on to the government and invite confusion and delay. They feel that after what the excess profits tax and renegotiation do to their gross income they can pay these claims at far less expense than might be supposed."

To cure this situation, said Mr. Terborgh, the prime contractor should have the right to make final decisions about disposing of inventories. The government should deal only with the primes and not review subcontracts except to find fraud. And, he said, the reviews of subcontract settlements that are made by the prime contractors should be office reviews.

"They should have the power to make payment for claims that, from the standpoint of normal business judgment, appear to be all right. They should not be forced to send out auditors to review the subcontractors' books. For one thing, this would not be ethical. A manufacturer does not like to have a customer, and possibly a future competitor, know all his secrets. The main objection is that such audits would not be physically feasible. The prime contractors would not be able to get enough auditors to review the books of companies scattered all over the land. This is hard enough today—it will be an impossible task when full termination arrives."

To prevent this method of review from tending to have claims settled on the high side, thus increasing the government's war costs, Mr. Terborgh would go further and assign every subcontractor to a government procurement man trained in termination procedure. Under such "horizontal" procedure, one officer would review hundreds of thousands of claims filed by the particular subcontractor. This would make quick action possible, so that

plants could be cleared of inventory and made ready for reconversion.

Another suggestion which Mr. Terborgh believed to have some merit was that all the claims of a single subcontractor be merged, with a final settlement by the procurement agency which supplied most of this subcontractor's business, and representing all of the procurement agencies for which the subcontractor worked.

The latter idea, said Mr. Terborgh, would be very helpful to machine tool builders, for example, who would have a difficult time in getting their claims approved by any of their subcontractors. "A machine tool builder," he explained, "very often gets a termination from some subcontractor but the claim cannot be identified with any certainty against an original procurement order."

Lou Holland, president, Holland Engraving Co., Kansas City, Mo., and formerly chairman of the Smaller War Plants Corp., and now a member of the Small Business Committee of the Committee for Economic Development, said that of 2,170,000 small business establishments before Pearl Harbor all but 7500 employed fewer than 100 people. Since Pearl Harbor many small businesses have passed out. In 1942 there were 67,000 more business deaths than there were births—and in the first six months of 1943 the excess of deaths was equal to the rate during all of 1942.

It is manifest, said Mr. Holland, that the impact of contract termination will fall on small business. It is essential, therefore, that contract termination be speedy, so that funds can be placed in the hands of small business to permit reconversion without undue delay.

In a preliminary report, the Senate Special Committee on Postwar Economic Policy and Planning expresses the following significant conclusions:

"(1) That it is urgently necessary that immediate steps be taken to set up machinery for the co-ordination of the problems of contract termination, reconversion and disposition of government-owned property and for the furnishing of overall direction.

"(2) That this should be done by a central agency whose function would be the promulgation and supervision of overall policies and the correlation of the activities of the various agencies handling the mechanics of the problems.

"(3) That the Congress should lay down the broad policies under which the problems should be handled.

"(4) That the various contracting and procurement agencies should be the operating agencies to accomplish termination of their respective contracts and to dispose of their respective surpluses according to policies established by Congress and by the policy-making central agency referred to.

"It is the opinion of this committee that these principles, to be enunciated by Congress, should make it perfectly plain that the speedy conversion from

## RELEASE OF TOOL STEEL NOW WOULD SPEED CHANGEOVER

LIMITED tonnages of tool steel, if made available to industry now, would facilitate the changeover from munitions to peace production, in the opinion of E. N. Hurley Jr., chairman, Electric Household Utilities Corp., Chicago.

In many instances, he says, an "insignificant amount" of the right kind of steel put to work at this time would prevent months of delay later and allow plants to reconvert without necessity of laying off workers.

"We could do wonders with 15 tons of tool steel. We could put toolmakers to work preparing the tools, dies, jigs and fixtures that will be needed when we return to the manufacture of washing machines and other equipment for civilian use.

"If these comparatively small amounts of steel and other raw materials are not available now, they should be released by the War Production Board as soon as the progress of the war permits. A little foresight now, with war production running in high gear, would be of great economic advantage to the country later.

"We are working at top speed on war orders, of course, but we must be prepared for peace. We want to keep all of our employes, and hire additional ones in an expanded program of civilian production."

Mr. Hurley said the necessary manpower is available for the manufacture of tools and fixtures, since the expert toolmakers already have passed the peak of their war job.

war to peace, at the proper time, is a matter of almost as imperative necessity as was the speedy conversion from peace to war so that the problem of unemployment may be kept to the absolute minimum; so that goods to fill the gaps in the civilian economy made necessary by war be promptly produced; so that the system of private enterprise again be permitted to function freely and speedily; and so that the controls necessary in a war economy be relaxed with all practical rapidity.

### Suggests Conversion Plan

"To accomplish this end, the committee believes it necessary:

"(1) That in the determination of what contracts should be canceled, where there is a choice, consideration should be given to the employment situation, the convertibility of the contractor's plant to civilian production, the amount of surplus materials that would be created by the cancellation, or lack of it, and other factors that affect the civilian economy.

"(2) That the largest possible percentage of funds owing to a contractor as the result of contract cancellation should immediately be made available to him; that a speedy and fair final determination should be reached as to the total amount due, and that the power of final determination of the amount of such settlements, in the event of disagreement, should not remain in the hands of the contracting officers but should be placed in an independent tribunal.

"(3) That the government assume the same obligation of fair and speedy settlement to all war contractors whose contracts are canceled, whether they be

prime contractors, subcontractors, or in the various layers of contractors below subcontractors, and the formula to be followed in the settlement of their claims should be made perfectly clear and understandable to all such contractors, whether these claims legally are against the government or against another contractor, that such contractors may plan with the maximum certainty for postwar reconversion.

"(4) That the prime object in the disposal of war plants and equipment should be the return of these properties to our competitive economy under terms and conditions creating minimum disturbance to production and employment, and that the disposal should be handled in such a manner as to encourage competitive efficiency on the part of private industry.

"(5) That wherever possible plants and their machinery and equipment should be disposed of in a manner to discourage monopoly and encourage the promotion of small enterprise.

"(6) That government-owned machinery, tools, equipment, and inventories should immediately be removed from privately owned plants, to enable those plants to convert to peacetime industry with a minimum of delay.

"(7) That the prime object in the disposal of surplus war supplies and materials should be their economic use; that so far as possible they should be distributed through the usual channels of distribution, in quantities that will permit their acquisition by small as well as large purchasers, and that they should be disposed of with due regard to the ability of the civilian market to absorb them without unduly disturbing the economy."

# High-Speed Machining Techniques Stressed at Annual Convention

*Sixty-six sessions spread over week cover entire field of design, manufacture and industrial management. . . Record-breaking attendance reported. . . Robert M. Gates assumes presidency for 1943-44 term*

By GUY HUBBARD

Machine Tool Editor, STEEL

## NEW YORK

WHEN an engineering meeting taxes the facilities of the Pennsylvania hotel in New York for a solid week—as was true of the sixty-eighth annual meeting of the American Society of Mechanical Engineers from Nov. 29 through Dec. 4—it must be admitted that we here in the United States have outgrown our technical provincialism and have achieved unity in engineering research and industrial practice beyond anything that the world has ever seen.

There once was a tendency in this country to think of such nationwide co-operative action as being possible only in Germany. That country likewise believed in that as one phase of its supposed superiority and invincibility. Pride such as that inevitably goes before a fall when that kind of thinking gets channeled into the wrong direction and challenges the ingenuity of a country such as the United States.

The American way of getting things done was typified at the opening function of this great meeting by Charles F. Kettering, vice president and director of research, General Motors Corp. In an address styled, "Is It Possible To Develop Inventors?", he urged extension of the co-operative education plan (theory in the university, craftsmanship in the shop). He also emphasized the importance of repeated practical experiments—ignoring what he calls "bookish discouragements", and putting up cheerfully with ninety-nine failures for the sake of one success.

In the same vein, he advocated testing of actual parts under the exact conditions under which they will have to operate—thus catching incipient failures and applying common sense corrective measures. "After all," he said, "it is not what I think of a new piston ring, that counts. It's what the engine thinks of it as expressed in the performance record!"

That same variety of homely American philosophy constantly was cropping out in all the sessions which this writer attended. For example, in driving home the necessity of suiting the method of machining to the nature of the work, Arthur A. Schwartz, director of tool research, Bell Aircraft Corp., Buffalo, looked over the top of his glasses and remarked: "You peel a potato, but you scrape a carrot."

Incidentally, that remark was made during the symposium on high speed milling, a session which left no doubt in

the writer's mind that we are on the verge of certain startling developments in some varieties of milling machines and related machine tools as a result of practical discoveries in the action of super-speed cutters and saws—especially in the aircraft plants, testimony of men of the caliber of Mr. Schwartz; Wallace Brainard of Vultee; W. A. Dean, Aluminum Co. of America; Hans Ernst, Cincinnati Milling; H. A. Frommelt, Kearney & Trecker; Ben Graves, Brown & Sharpe; Ralph Hummer, Defiance Machine Works; and Fred Lucht, Carbology; leaves no doubt as to that.

In addition to many papers on tools which remove metal in the form of chips, attention was paid to the equally important subject of the plastic working of metals—specifically, the forging of steel shell cases. This session was under the chairmanship of Arthur F. Macconochie, professor of mechanical engineering at the University of Virginia, and contributing editor of STEEL.

## Papers Presented About Shells

Speakers at Dr. Macconochie's session included M. D. Stone, manager, development department, United Engineering & Foundry Co., Pittsburgh, on "Flow-of-Metal Problems in Shell Forging"; W. Trinks, Pittsburgh, on "Piercing of Steel Shells"; George Sachs, professor of physical metallurgy, and George Kasik, research assistant, Case School of Applied Science, Cleveland, on "Experimental Study of Shell Drawing"; and A. Nadai, consulting mechanical engineer, and R. K. Carlson, research engineer, Westinghouse Research Laboratory, East Pittsburgh, on "Plastic State of Stress in Curved Shells and Forces Required for Forging Noses of High Explosive Shells".

Among the management papers, one which aroused widespread comment was that by James F. Lincoln, president, Lincoln Electric Co., Cleveland, on "Wage Incentives". Mr. Lincoln said: "The next great forward step in our industrial system will be proper application of incentives which will make all workers equally interested in the success of the organization with which they are connected. Properly applied incentives already have increased production to an unbelievable extent. In those places where labor and management have arrived at an arrangement of complete co-operation, production rates of more than four times those in other comparable plants without such incentives, have been achieved.

"As far as the worker and manage-



ROBERT M. GATES

President, American Society of Mechanical Engineers, 1943-44 term

ment are concerned, there would be little difficulty in arriving at the goal of complete co-operation were it not for the fumbling of the government. So far it seems impossible for the government to accept the idea that a worker should be paid for what he produces, rather than on the basis of the class into which he was born."

The annual dinner, held Wednesday evening, Dec. 1, with Edward C. Elliot, president, Purdue University, as toastmaster, overflowed both the Manhattan Room and the Keystone Room of Hotel Pennsylvania, and many had to be turned away. On this occasion Harold V. Coes, president, Ford, Bacon & Davis Inc., New York, and retiring president, A.S.M.E., delivered an address on "Wartime Research and Development—A Molder of Engineering". He cited as examples, magnesium from brine; new alloy steels of 190,000 pounds per square inch tensile strength; beryllium, copper and nickel alloys of great strength; transparent armor, proof both against bullets and high altitude actinic rays; the Army jeep and its relatives; 15-pound airplane heaters capable of warming a 10-room house; molded plywood; and other achievements with post war possibilities.

In conclusion, Mr. Coes said: "I look upon these new developments as rare opportunities to progress, to develop, to raise the standard of living. True, they will necessitate changes. They will upset old methods. They will disrupt some industries and render some products obsolete. But in that direction lies the path of progress.

"It has ever been the American habit to want and to search for something better. No nation yet has been able to satisfy the needs of its nationals—to say nothing of their wants. So let us accept these developments as means for engineers to aid in supplying bases for better life.

"The only way it can be made a reality is by work, greater production, and thereby the creation of wealth. We have proved what we can do in wartime. Now let us turn our talents and the ap-

plication of these new developments to the peacetime economy when the time comes—but let us plan in advance of that time.”

Among those honored at the annual dinner were: Igor I. Sikorsky (Warner Medal); Dr. Vannevar Bush (Holley Medal); Lewis Silcox (A.S.M.E. Medal); Charles F. Kettering (Fritz Medal); Benjamin J. Lazan (Alfred Noble prize); and Dexter S. Kimball (Gantt Medal). Honorary memberships were conferred on Francis Blossom, New York; Ralph Budd, Chicago; Edward N. Trump, Syracuse; and Roy V. Wright, New York.

New officers of the society for 1943-44 were introduced. They are: President, Robert M. Gates (president, Air Preheater Corp., New York); vice presidents: Rudolph F. Gagg (Wright Aeronautical Corp., Paterson, N. J.); David W. R. Morgan (Westinghouse Electric & Mfg. Co., Philadelphia); Jonathan A. Noyes (Sullivan Machinery Co., Dallas, Tex.); Ford L. Wilkinson Jr., (Dean of Engineering, University of Louisville).

Managers: J. Calvin Brown (patent attorney, Los Angeles); Alton C. Chick

(Manufacturers Mutual Life Insurance Co., Providence, R. I.); Samuel H. Graf (Head of Department of Mechanical Engineering, Oregon State College, Corvallis, Oreg.); and James M. Robert (Dean of Engineering, Tulane University, New Orleans, La.).

## Alloy Steel Position in Postwar Era Seen Changed

Postwar demand for alloy steel will more closely approximate 7 per cent of total production rather than the current wartime 16 per cent, Charles M. Parker, American Iron and Steel Institute, said last week speaking before the Industrial Marketing Section, American Marketing Association meeting in New York.

There is but one direction in which the price of aluminum can go and that is downward, according to E. B. Wilburn, Aluminum Co. of America.

Plastics in postwar marketing will be in tandem with the use of other materials, including paper, metal and other type products, said Allan Brown, Bakelite division, Union Carbide & Carbon Corp.

## November Lake Ore Movement Disappointing

*Tonnage shipments for month below expectations. Season total likely to attain 84 million ton mark*

The 1943 Great Lakes shipping season is drawing to a close with old man weather slowing up vessel operations. Throughout the past month, a number of severe storms slowed up shipping schedules while for a brief period temperatures below zero hampered loading at upper lake ports. At one time recently, over 92 ore vessels were lying idle at Duluth-Superior docks with more ships arriving daily than were being loaded.

Loadings are scheduled to continue until about Dec. 10, which should enable the movement for the season to slightly exceed 84 million gross tons. The goal for the season was 96 million tons originally but has been progressively cut.

November ore loadings totaled 6,940,503 gross tons, compared with 7,582,425 in like 1942 month, the Lake Superior Iron Ore Association reports. For the season through to Dec. 1 shipments amounted to 83,655,340 gross tons, against 91,440,952 a year ago.

Lake ore shippers had to contend with heavier grain movement this year. The total movement may reach 140 million bushels compared with 111 million in the 1942 season.

Despite inability of shippers to reach the previously established goal set for this season, because of the late opening of navigation and unfavorable weather throughout the season, steel industry officials do not anticipate any serious shortage of ore through the winter and spring months.

Ore stocks at the close of this year are expected to be in the neighborhood of 42 million gross tons, which leaves a fairly safe operating margin until opening of navigation next year in spite of increased blast furnace capacity scheduled to be brought in.

Steady flow of adequate supplies of coking coal and steel scrap appears to be the chief problem facing steel interests at the moment. Steel producers' stocks of coking coals are unusually low.

Stocks of iron and steel scrap are above a year ago, but are not much higher than in January, 1940, when monthly consumption was considerably below the current level. One encouraging aspect of this latter situation is possibility of using a greater proportion of pig iron in the open hearth mix due to the easing in pig iron supplies. One steel interest, for example, is currently using 64 per cent pig iron and the balance scrap in its open hearth operations.

## POSTWAR PRELIMINARIES

**RECONVERSION:** Automotive leaders ask firm policy on contract termination, permission to buy government-owned machine tools now to shorten changeover period to civilian production. See page 79.

**PEACE PREPAREDNESS:** Release of small quantities of tool steel now for tools, dies, jigs and fixtures would facilitate swing to peacetime production, Chicago manufacturer believes. See page 81.

**WARTIME ENGINEERING:** New developments viewed as rare opportunities to progress in developing and raising the standard of living, though necessitating changes, upsetting old methods, disrupting some industries and rendering some products obsolete. See page 82.

**ALLOY STEEL:** Postwar demands expected to more closely approximate 7 per cent than the current wartime 16 per cent of total steel production. See page 83.

**ALUMINUM:** There is but one direction aluminum price can go and that is downward, says Aluminum Co. of America official. See page 83.

**PLASTICS:** In postwar marketing, plastics will be in tandem with the use of other materials including paper, metal and other types of products. See page 83.

**STATISTICS:** Formerly restricted information on production to be released to aid industry in planning future operations. See page 100.

**MATERIALS:** Corrosion and heat-resistant metals will become of increasing importance in postwar era. Light materials will influence design. See page 105.

**MULTIPLE MILLER:** Spectacular 16-station automatic machine for finishing valve holes in aircraft cylinder heads, a boon in era of short manpower, turning out with three operators a volume of work formerly handled by 22 men and 11 machines. Its peacetime future appears assured. See page 118.

**ELECTRIC FURNACE:** Useful tool in the war effort, the electric arc melting furnace gains recognition as time goes on for its capacity to complete the full cycle of melting, alloying and finishing duplicate heats of metals with uniform results. See page 124.

## Reducing the Guard

THE large number of uniformed, armed guards at many war plants will be reduced. Recently the Army Ordnance Department paved the way through reducing by approximately 14,000 the guard personnel at explosive plants. Other Army departments and the Navy now are launching a study to determine the extent to which they too can reduce employment of protective personnel. Recommendations for such reductions will be made to executives at war plants only after careful consideration has been given actual minimum needs. Use of the civilian Auxiliary Military Police will be discontinued in a number of plants. Persons freed of such duties will be reported to the United States Employment Service as available for essential productive work.

## To Speed Reconversion

On winding up his hearings on disposition of government-owned plants and surpluses and the related subjects of reconversion and contract termination, Chairman Walter F. George (Dem., Ga.) of the Senate Special Committee on Post-war Economic Policy and Planning, said he expects to make his final report to the Senate without delay and that he hoped, at the same time, to submit recommendations for needed legislation. He said time is of the essence, that speed is needed in order to get the reconversion processes under control.

## New Research Projects

The following new research projects have been authorized and assigned by committees of the National Academy of Sciences and other agencies under contracts with the War Production Board Office of Production Research and Development:

- 1—Hot forming of aluminum alloy parts;
- 2—Study of forming properties of aluminum alloy sheet at elevated temperatures;
- 3—Fluoroscopic methods of inspection of metallic materials;
- 4—Investigation of cast magnesium alloys and of existing foundry techniques and practices;
- 5—Removal of air inclusions from condenser mica.

## Army Bridge School

Construction of a 185-foot steel span, capable of supporting a freight train loaded 20 tons to the axle, comprises the final examination for soldiers attending a United States Army railroad bridge school "somewhere in Britain." The classroom is a windswept cow pasture through which winds a small river. Here the soldiers first learn to rig derricks to handle structural steel components; taught knots and lashings, and how to set up tripods, A-frames and small timber derricks. Thus they will not be dependent

upon machinery when building bridges under combat conditions. Structural members are joined by bolts and nuts.

The bridge is built on 4-wheeled dollies which ride on railroad tracks and is swung out over the river under control of a system of derrick and preventer gear. The derrick on the opposite bank gradually launches the span out over the river while a set of tackle on the other side checks the movement of the span, slowly paying out cable as the derrick draws the

## OUTPUT SOARS

Highest weekly production recorded in more than 16 years was established by the bituminous coal mines during the first full week of operation under the new wage contract between the government and the miners.

Production for the week ended Nov. 20 was estimated at 12,700,000 tons, highest since week of March 26, 1927, when the mines produced 13,320,000 tons on orders received in anticipation of a general coal strike. The all-time high weekly production record for bituminous coal is 14,551,000 tons, established in the week ended Dec. 4, 1926. Production for the week of Nov. 20 exceeded by 20,000 tons the year's previous high weekly mark of 12,680,000 tons, established during the week of Feb. 27 and topped production for the week of Nov. 13 by 1,430,000 tons.

bridge across. Because of their weight, the trestle piers, after their assembly, are moved out into the water a half at a time.

## Mission to Peru

The Peruvian government has entered into a contract with C. C. Morfit & Associates, 11 Broadway, New York city, to complete a study on the coal and iron situation in Peru. Mr. Morfit, Frank H. Wagner, Wilkesbarre, Pa., and Franklin G. Bardee, Lansing, Mich., were scheduled to leave Dec. 3 for Peru, to be gone 40 days. The Peruvian government anticipates a substantial development and is already installing modern piers and coal handling facilities at Chimbote, with construction having been started a year ago under contract with the Frederick H. Snare Corp., New York. Peru, according to American engineers, has rich iron ore deposits and large beds of anthracite.

## Lot of Steel

Army statisticians calculate that for each man in the armed forces 24,600 pounds of steel were poured last year. This went not only into guns and other battle weapons but into all essential military requirements.

## Union Appeal Denied

The Supreme Court recently denied, 4 to 3, a union appeal for action by the National Labor Mediation Board ordering an election to determine union representation between rival organizations in one craft. It held that Congress, under provisions of the National Railway Labor act, intended the jurisdictional disputes of railroad unions to be settled without recourse to the federal courts as final arbiter.

The Supreme Court also upheld the convictions of 18 Minnesota members of the Socialist Workers' Party who had been convicted on two counts in the Minnesota district court, for advocating overthrow of the government and for violating the Alien Registration act.

## Battle Casualties

The Army now has developed considerable information about equipment replacements due to destruction or damage in battle. In addition to the 100 rifles that go to the front in the hands of 100 soldiers the Ordnance Department must supply an additional 5 extra rifles each month. Machine gun mortality is still higher. For every 100 machine guns, 7 additional ones are necessary.

## Ickes in the Dark

Immediate discontinuance of construction work on the Canol project was recommended before the Truman Committee recently by Petroleum Administrator for War Ickes and by H. LeRoy Whitney, technical consultant of WPB.

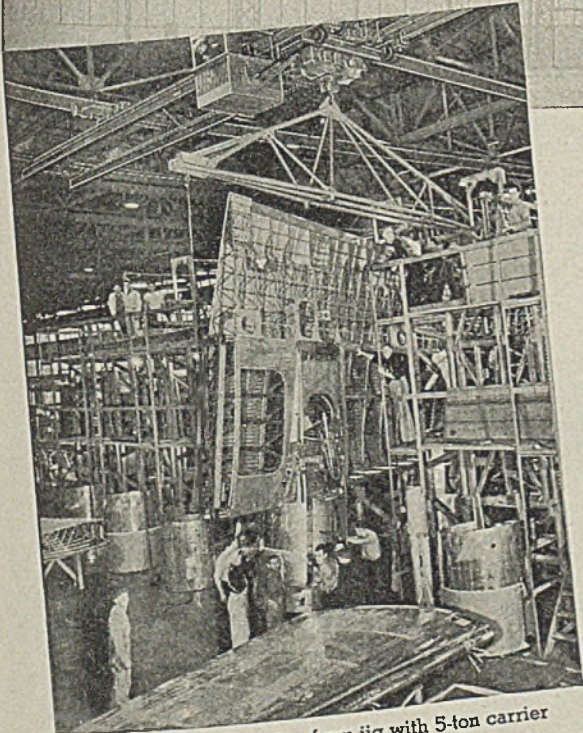
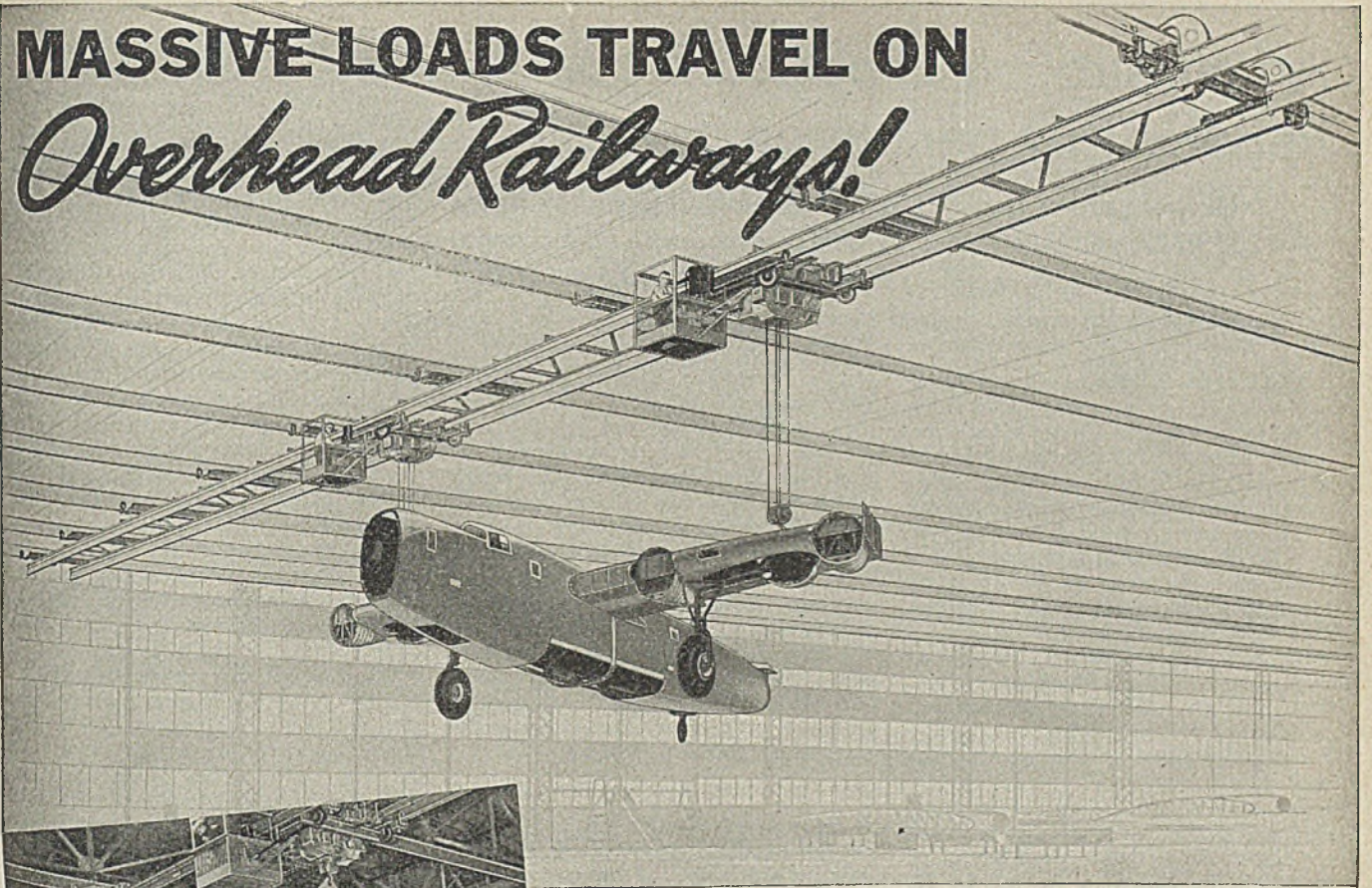
The project calls for a 500-mile pipeline to bring oil from Fort Norman in Canada to a refinery at White Horse, Alaska. Mr. Ickes told the committee the Army has continued to keep him dark about the project. Mr. Whitney declared the Army had undertaken this project under WPB protests. Both witnesses said that low temperatures in that area would make it impossible to operate the pipeline efficiently. Both said that under this project the United States is playing Santa Claus, since rights to the Canadian oil would revert, six months after the war, to the Imperial Oil Co. of Canada, subsidiary to Standard Oil Co. of New Jersey.

## Postwar Planning

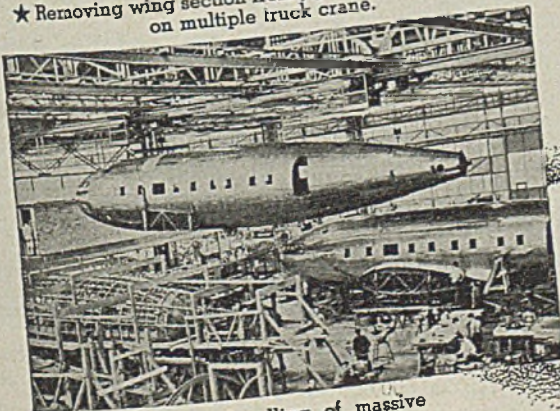
Among outstanding studies which are being made to provide data for more effective postwar planning by local groups are those by the Employment and Occupational Outlook Branch, Postwar Division, Bureau of Labor Statistics, Department of Labor. Six of these "working notebooks" so far have been published. They cover the "Impact of the War" on the Pittsburgh district, the Detroit area, the Bath shipbuilding area in Maine, the Las Vegas magnesium area in Clark county, Nevada, the Badger ordnance district in Sauk county, Wisconsin, and the Newport, R. I., area.



# MASSIVE LOADS TRAVEL ON *Overhead Railways!*



★ Removing wing section from jig with 5-ton carrier on multiple truck crane.



★ Up and Over handling of massive hull with Overhead Railway System.

**T**HE problem of "up and over" movement of massive loads in the mammoth bomber plants now turning out Flying Fortresses and Liberators was solved by American MonoRail engineers.

So efficient is the operation of these "Overhead Railways" that they have become standard equipment in the Boeing, Consolidated, Martin, Douglas and Ford bomber plants, in fact, wherever 4-motor bombers are built.

Nationally known architects who built these plants recognized early in their plans the advantage of calling upon American MonoRail engineers for highly specialized recommendations. This service is available in connection with war production now or for plant conversion in the future. Early consideration of handling problems often saves valuable time and needless building cost. Call your nearest American MonoRail representative or write us today.

**THE AMERICAN MONORAIL CO.**

13102 Athens Avenue

Cleveland 7, Ohio



# Administration Expected To Be Rebuffed by Senate on Tax Bill

*Indications are version of 1943 revenue act, adopted by House 200 to 27, will be adopted by Senate group with little change. . . . Secretary Morgenthau's second plea for \$10,500,000,000 additional taxes seen turned down*

LAST week the Senate Finance Committee listened to a second presentation of the administration's request for a tax bill to raise \$10,500,000,000 additional revenue, which request already has been turned down by the House in adopting a revenue measure which would produce only \$2,140,000,000 in new taxes.

Although Secretary of the Treasury Morgenthau made an earnest plea for consideration of the administration's request for \$10,500,000,000, indications were that the House Ways and Means Committee's version of the revenue act, which now is being considered by the Senate committee, would go through with little if any modification.

Senator Walter F. George, (Dem., Ga.) chairman of the Senate Finance Committee, served notice that it is unlikely much more will be added to the bill by his Senate group.

Thus, the administration, rebuffed in the House on the matter of taxes, stands to receive much similar treatment from the Senate. This despite the renewed pressure exerted by organized labor and other pressure groups for a revenue measure which would more closely fall in line with the ideas of the administration.

Following are the more important provisions of the 1943 revenue bill as passed by the House 200 to 27:

- 1—Retains existing corporate normal and surtax rates;
- 2—Increases the excess-profits tax to 95 per cent;
- 3—Retains the present 80 per cent overall ceiling with respect to corporate normal, surtax, and excess-profits taxes;
- 4—Reduces the invested capital credit with respect to invested capital in excess of \$5,000,000 as shown by the following table:

	Proposed Per Cent	Existing Law Per Cent
First \$5,000,000 invested capital . . .	8	8
\$5,000,000 to \$10,000,000 invested capital . . . . .	4	5
\$10,000,000 to \$200,000,000 invested capital . . . . .	5	6
Over \$200,000,000 invested capital . . . . .	4	5

"Under the invested capital method," the committee's report explained, "corporations are permitted to increase their invested capital by plowing back into the business earnings which have not been subject to taxation in the hands

of the individual shareholder. However, corporations using the average earnings method are not permitted to increase their earnings base by plowing back into the corporation profits which have not been subject to taxation in the hands of shareholders. In view of this obvious advantage of the invested capital method over the average earnings method, it does not seem unreasonable further to reduce the invested capital credit, particularly with respect to capital in excess of \$5,000,000."

- 5—Increases the specific exemption credit now allowed for excess-profits taxes from \$5000 to \$10,000;

### Blocks Stock-Purchase Loophole

- 6—Prevents litigation under the present law by affirmatively closing the loophole by which stock of defunct corporations is purchased, or other acquisitions made, for the purpose of avoiding federal income or excess-profits taxes;

- 7—Requires returns from certain tax-exempt organizations, including labor unions, to obtain information about the affairs of these organizations which will be studied with a view to its bearing

on the provisions of future tax laws. (See Page 87).

- 8—Retains the 10 per cent postwar credit;

9—Allows the commissioner of internal revenue to invalidate claims for deductions or credit where he finds that transfers were made for the purpose of avoiding payment of taxes;

10—Percentage depletion is extended to flake graphite, vermiculite, potash, beryl, feldspar, mica, lepidolite, and spodumene, in addition to those minerals previously receiving it, and discovery depletion is consequently terminated with respect to these minerals. The extension to flake graphite applies to years beginning after Dec. 31, 1942, but the extensions made in the new bill and the Revenue Act of 1942 are limited to the duration of the war;

11—Fluorspar, flake graphite, and vermiculite are added to the list of strategic minerals exempt from the excess-profits tax;

12—Extends the present excess-profits tax treatment given certain excess output and bonus income for mineral and timber property to lessors of mineral property or a timber block, new coal and iron mines and timber blocks not in operation during the base period, and certain natural gas companies. The amendments with respect to lessors of property in operation during the base period and with respect to natural gas companies are made retroactive to years beginning after Dec. 31, 1941;

13—An amendment to the estate tax provides that in instances where the value of stocks and securities of a corporation are not listed on the exchanges



*Secretary of Treasury Henry Morgenthau, left, voiced a plea to the Senate Finance Committee for a \$10,500,000,000 tax program. With him are Ray Blough, center, director of tax research, and Randolph E. Paul, the Treasury's general counsel. NEA photo*

and their value not established by sales, their value "shall be determined taking into consideration, in addition to all other factors, the value of stock or securities of comparable corporations which are listed on an exchange;"

14—Permits the Tax Court of the United States to use commissioners in particular cases;

15—Lifts the present restriction limiting the credit against federal unemployment tax for contributions made to a state unemployment fund to contributions made before June 30 next following the due date for the federal tax return, and makes provisions with respect to the operation of this credit for the years 1936 to 1942;

16—Revises the individual income tax as follows:

- a—Repeals the Victory tax;
- b—Increases the normal tax from 6 per cent to 10 per cent;
- c—Repeals the earned income credit;
- d—Requires married persons filing separate returns each to take a single person's exemption;
- e—Provides that the tax shall not be less than 3 per cent of the net income

in excess of a special exemption of \$500 for a single person, \$700 for married persons, and \$100 as a credit for each dependent;

f—Retains all other major provisions of the present law, including regular income tax exemptions of \$1200 for married persons and \$500 for single persons and credit for dependents of \$350 each, and the overall tax limitation of 90 per cent of net income;

g—Makes a few changes in the surtax rate schedule to effect the integration of the Victory tax with the income tax in such manner as to retain as nearly as possible the existing tax burden.

17—Drastically revises the Contracts Renegotiation Act, giving contractors the right to appeal to the Tax Court of the United States from decisions of price adjustment boards (STEEL, Nov. 29, p. 48).

The House tax bill also contains a provision for substantial increases in postal rates and in excise taxes on telephone calls, transportation, club dues and initiation fees; also on distilled spirits, wine, beer and luxury goods, as well as other items.

loophole and requiring the payment of tax, and the protection of legitimate companies against this unfair competitive situation".

The AFL weekly *News Service* called on the six and a half million of AFL union members all over the country to write their senators and tell them this:

"That you insist on defeat of the tax bill 'joker' which would require unions to disclose financial data for the benefit of labor-haters and anti-union employers."

## Army Ordering More Heavy Trucks for 1944

Based on its findings that a single 10-ton truck is better than two 5-tonners or five 2-tonners, the Army will receive approximately twice as many heavy trucks in 1944, as it did in 1943. The War Production Board has already indicated its approval of doubling this year's production of heavy trucks, at the same time authorizing a large increase in truck production for the home front.

Mack Trucks Inc., which is supplying the lion's share of the bigger vehicles to the Army in 1943, has had its next year's quota of heavy Army vehicles increased by two-thirds over this year's total. Mack executives explained that the bigger trucks offered the Army a number of advantages, among them: The heavy trucks require less personnel since one truck replaces several lighter ones; their fewer numbers demand less home and field service shops; but most important from the Army's point of view, a smaller number of units means less road congestion.

The switch in the Army program is the direct result of actual battle requirements. At first it was believed that light trucks were the answer to all around military transport needs, but as early as the war in North Africa the Army began shifting its emphasis to heavy trucks.

In changing the emphasis from light to heavy trucks, the Army also is making its first large scale purchase of 10-ton diesels, marking the Army's first departure from gasoline engine vehicles.

## Metals Reserve To Stockpile Secondary Aluminum Ingot

To assure the refinement of the segregation of aluminum scrap by providing a market for the ingot not otherwise readily consumed in the war effort, Metals Reserve Co. will stockpile aluminum ingot derived from scrap. The high-grade alloys to be purchased for this purpose are, based on War Production Board's specifications:

14S, 17S, 18S, 24S, 25S, 32S, A-51S, 52S, 53S, 61S, X-76S, 142, XA-142, 195, B-195, 355.

# Unions Must File Reports Under Provisions of 1943 Revenue Bill

WHAT labor leaders say is a "joker" in the 1943 revenue bill is an amendment that reads as follows:

"Every organization, except as hereunder section 101 shall file an annual return, which shall contain or be verified by a written declaration that it is made under the penalties of perjury, stating specifically the items of gross income, receipts, and disbursements, and such other information for the purpose of carrying out the provisions of this chapter as the commissioner (of internal revenue), with the approval of the secretary (of the Treasury), may by regulations prescribe, and shall keep such records, render under oath such statements, and make such other returns, and comply with such rules and regulations as the commissioner, with the approval of the secretary, may from time to time prescribe."

In effect, this provision is the one that was contained in the union accounting section of the Smith bill and incorporated in the original draft of the Connally-Smith Act. On both occasions it was killed off in the Senate after having been approved in the House.

That the unions' financial affairs were in the minds of members of the House Ways and Means Committee when it drafted the new bill is indicated clearly by the provision to exempt religious, educational and charitable institutions from compliance with this provision.

It also is indicated by the Ways and Means Committee's explanation in reporting the bill, as follows:

"Under existing law a large group of

corporations enjoys tax exemption and many of which are not required to file information returns. It has come to the attention of your committee that many of these exempt corporations and organizations are directly competing with companies required to pay income taxes, and that this practice is becoming more widespread and affording a loophole for tax evasion and avoidance.

"These organizations were originally given this tax exemption on the theory that they were not operated for profit, and that none of their proceeds inured to the benefit of shareholders. However, many of these organizations are now engaged in operation of apartment houses, office buildings, and other businesses which directly compete with individuals and corporations required to pay taxes on income derived from like operations.

"Your committee was without sufficient data to act intelligently, since many of these corporations and organizations are not now required to file reports, and in the absence of such information it was thought best to continue the present tax exemption, but to require them to file reports stating specifically the items of gross income, receipts and disbursements and such other information, and keep such records, as the commissioner of internal revenue may prescribe."

The report added that such reports would be required for 1943 and ensuing years, and that the committee proposes to make a thorough study of the information contained in such returns "with the view to closing this existing

# 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

**TRANSPORTATION EQUIPMENT:** If delivery of orders for transportation equipment MRO materials were placed and rated properly under P-88 (which order was revoked by P-142) but were not delivered, they may be rerated to the extent that similar materials are authorized on form WPB-2585, pursuant to P-142.

**HOT WATER GENERATORS:** Limited number of hot water generators, spare copper coils, storage tanks and high pressure steel boilers (100 pounds design pressure) have been made available for emergency replacement purposes from government surplus stockpiles. Form PD-1a should be filed at local WPB field offices where applications for items costing less than \$1000 will be considered; at local offices for transmittal to Washington where applications for items costing more than \$1000 will be considered.

**ALUMINUM:** Aluminum and Magnesium Division, WPB, now is issuing allotments of aluminum for deoxidizing and/or alloying of steel on form WPB-2360 to conform with the gradations employed by OPA in its price regulation No. 2. Allotment specifications have been changed from grade IV, maximum 90 per cent, to OPA grade 4; grade III, maximum 94 per cent, to OPA grade 2 or 3; grade II, maximum 96 per cent, to OPA grade I.

**COPPER WATER TUBING:** Brass mills no longer are prohibited from accepting orders for production of copper water tubing which have not been specifically authorized by WPB. Stocks of commonly used sizes and types of copper water tubing held by the WPB Copper Recovery Branch, have been largely redistributed.

**INVENTORIES:** Separate operating units of a single company are subject to WPB inventory restrictions individually, if each keeps its own inventory separately.

If one unit of a firm had exceeded its inventory limit, units that have not so exceeded their limits are not prevented from acquiring additional inventory within their own individual limits. If a WPB order or regulation provides exemption for small purchases, an operating unit that purchases separately need not consider purchases of other units in determining whether or not it comes within the exemption.

If a distributor purchases centrally for direct shipment to several outlets that keep separate inventories, the outlets are treated separately for purpose of inventory restrictions, but the central purchasing agency must consider all of its purchases in determining whether or not a purchase comes within the small order exemption.

**CONTAINER MATERIALS:** Allotments and preference ratings to get materials needed to manufacture containers or parts (which contain controlled materials) must be obtained generally by the manufacturer by filing form WPB-4B with the WPB. If controlled materials are not required, preference rating assistance to obtain production materials for such items may be obtained by the manufacturer by filing form WPB-2613 (formerly PD-870) or such other form as may be designed for that purpose.

Allotment symbols and preference ratings assigned for MRO supplies under CMP regulation Nos. 5 and 5a, or any order of the "P" and "U" series, may be used by persons to whom they are assigned, however, to buy materials, including controlled materials, for the manufacture of wooden crates and wooden shipping containers only where they will use the containers themselves and then only under either of the following conditions:

(1) Where no parts of the container are made in a captive plant; (2) where the containers or parts are made in a captive plant, but where no more than 50,000 board feet of lumber is bought in any one calendar quarter for making containers and parts in such plant.

MRO ratings and symbols may not be used, however, to buy: (1) Materials to make any containers other than wooden crates or outer wooden shipping containers; (2) material needed for making any containers (or parts of containers) for sale empty to others; (3) material needed for making in a captive plant wooden crates or outer wooden shipping containers or parts, where more than 50,000 board feet of lumber is bought in any one quarter for this purpose.

## INDEX OF ORDER REVISIONS

Subject	Designations
Aircraft Components	M-360
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Sugar Processing	L-292
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Umbrellas	L-36
Water Well Materials	P-148
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### Price Regulations

Boilers, Cast Iron	No. 188
Machines	No. 136

**MRO SUPPLIES:** Institutions or government agencies engaged in operation of sanitary sewage systems or storm sewage systems combined with sanitary sewage systems have been eliminated from using procedures outlined in CMP regulation No. 5A. Those maintaining central storage operations may apply to WPB for a blanket rating to cover all purchases made for the store, rather than attempt any apportionment of supplies among its various operations. Form WPB-837 (formerly PD-408) was discontinued as of Sept. 30 but orders placed before date to which ratings or MRO symbols were assigned on such form may be filled. Institutions and agencies eligible to use its procedures can obtain up to 500 pounds of aluminum per quarter rather than 100 pounds formerly allowed. (CMP No. 5A)

## L ORDERS

**UMBRELLAS:** Permitted quarterly output of umbrella frames has been raised to 9½ per cent of each manufacturer's 1941 production while the amount of steel that may be used exclusively for repair parts has been raised to 10 per cent. Quarterly consumption of steel is expected to be 283 tons for frames and about 28 tons for repair parts. Not more than 90 per cent of a manufacturer's quota of materials may be used to produce frames designed for women's umbrellas. Weight restrictions on frames have been eliminated. (L-36)

**ALUMINUM:** Use of aluminum in certain types of safety equipment have been eased as follows: Either primary or secondary aluminum may be used for safety hats; low grade aluminum sand castings may be used for spec-

ified types of machine guards as well as hazard measuring devices, inhalators and resuscitators, oxygen breathing apparatus reducing valve housings, and supplied-air masks and hoods. Use of nickel silver for core wire for plastic type industrial goggles also is prohibited. (L-114)

**BABY CARRIAGES:** Specific quotas, totaling 271,303, for production of strollers, walkers and sulkies during the fourth quarter of 1943 have been established in schedule III of order L-152. In general, each manufacturer is limited to his actual rate of production in the third quarter. (L-152)

**X-RAY EQUIPMENT:** Controls over manufacture and distribution of X-ray equipment have been relaxed. Shipments of medical X-ray equipment for civilian use are placed on a quota basis. Annual shipments of each manufacturer are limited to 75 per cent of the average annual shipments during the 1937-39 period. Quotas apply only to shipments to the United States and its possessions and territories and to Canada. Medical X-ray equipment for the United States and Canadian military services, for export under Lend-Lease and OEW and industrial X-ray equipment are outside of the quota.

Former restrictions on models and types of specified X-ray equipment have been removed. Production and shipping schedules (PD-774) and authorization applications (PD-556) need no longer be filed but monthly reports of shipments by dollar value must be made by letter.

The order does not cover parts, accessories or appliances, or rebuilt and second hand equipment. (L-206)

**SUGAR PROCESSING MACHINERY:** Manufacturers of sugar processing machinery now are permitted to build any machine for which they receive properly rated orders. They also may build up small inventories of centrifugals and sprayers. (L-292)

## M ORDERS

**COPPER SCREENING:** Copper screening which Copper Recovery Corp. has refused to accept and second hand insect screening have been released for unrestricted use. (M-9-c)

**KAYANITE:** Conservation order L-143, which determined the allocation of Indian kayanite, has been revoked. Present supplies are equivalent to two years' needs and present volume of supply is about equal to the maximum production capacity of all users. (M-143)

**AIRCRAFT COMPONENTS:** Scheduling procedures for aircraft components have been standardized. Scheduling is permitted of only those components, parts, and subassemblies for which responsibility is assigned by WPB to the Aircraft Resources Control Office. Purchasers will state requirements to Aircraft Scheduling Unit, Wright Field, Dayton, O., on form WPB-3362, giving detailed information relating to requirements and procurement schedules for each aircraft component. (M-360)

## P ORDERS

**OFFICERS' UNIFORMS:** Order P-131, which had assigned blanket priority assistance for procurement of materials needed in the manufacture of officers' uniforms, has been revoked. All unfilled orders now must be considered as unrated orders. Materials already obtained through use of the assigned rating can be used without restriction so long as they go into some form of apparel. (P-131)

## PRIORITIES REGULATIONS

**WOODWORKING MACHINERY:** Woodworking machinery as defined in order L-311 and costing no more than \$50 may be purchased through blanket MRO procedures. This action, taken by amending list B of priorities regulation No. 3, is designed to prevent an undue number of PD-1A preference rating assistance applications being filed for this type of equipment. (PR No. 3)

**CERTIFICATIONS:** Procedures involving the placement of certifications required by War Production Board's regulations on purchase orders have been simplified while various rec-

ord keeping requirements have been eliminated.

Form of standard certification has been provided in priorities regulation No. 7 and is the same as the one prescribed in CMP regulation No. 7. Use of the standard certification is optional, except that it may not be used (1) instead of a specific list of certifications set forth in priorities regulation No. 7, (2) instead of a certification required by a WPB regulation or order which specifically states that the standard form may not be used, (3) instead of any WPB or PD forms required by WPB regulations to accompany a purchase order, nor (4) by government procurement officers to rate deliveries for which a rating has not already been assigned by a separate preference rating certificate, regulation or order.

Additional information must be given if the standard form of certification is used under the following circumstances: (1) A preference rating, allotment number or symbol must be added when required by an applicable order or regulation; (2) where a regulation requires a specific statement of immediate end use, such statement must be added; (3) where an applicable order calls for a statement to show that a small order exemption under any L or M order is applicable, the words "in compliance with a small order exemption" shall be added; (4) Where the preference rating was obtained on a WPB 547 (PD-1X certificate), the identification "WPB-547" ("PD-1X") must be added.

Conditions are specified under which the buyer's certification may be waived, except where stated in list B. A form of one-time certification is established which may be used in place of certifications specified in list C.

Certifications may be made by telegraph, telephone, or verbally in some circumstances, and prescribes the procedures to be followed in doing so. (PR No. 7).

## PRICE REGULATIONS

**MACHINES:** Manufacturers of all types of lead acid storage batteries, automotive or otherwise, are permitted to add to their Oct. 1, 1941, prices an allowance of 1 cent per pound of lead in the battery. Manufacturers have the option of increasing their prices to their Feb. 1, 1942, prices or using the lead allowance in establishing their maximum prices.

Level of prices for all items of used electrical machinery and equipment priced by the depreciation method has been increased 5 per cent. This was done by reducing the specified depreciation rate of 10 per cent to 5 per cent in calculating the ceiling price for the machinery item being sold.

Provision of the order exempting from price control cost-plus contracts does not apply to machines and parts for which the seller had a published list price or established price in effect on the specified base date.

A collation of regulation No. 136 has been issued which gathers together all amendments since the issuance of the regulation. (No. 136)

**CAST IRON BOILERS:** Individual manufacturers of coal-fired cast iron water tank heaters, or supply boilers, now may apply for approval of an increase in maximum prices to cover manufacturing and selling costs. Application for adjustment may be filed if they are unable to expand or maintain production at their present maximum prices. (No. 188)

## WPB Permits Freer Use of Chromium in Making Steel

Freer use of chromium in the manufacture of stainless steel is now permitted under War Production Board's order M-21-a, as amended. A new formula has been provided for calculating all mixings of stainless steel, allowing slightly greater amounts of prepared chromium than heretofore. This change will give relief to small producers who have had difficulty meeting former instructions.

# New CMP Regulation Governs Material Purchases by Repairmen

*Persons engaged in repair work permitted to buy quarterly up to 20 tons of steel, 500 pounds of copper, and 200 pounds of aluminum. . . Orders must be certified. . . Special provisions made for industrial repair work. . . Inventories restricted*

PROCEDURE under which persons engaged in the business of making repairs may obtain controlled materials and other materials and parts have been established in a new CMP regulation, No. 9A, the Office of Civilian Requirements, War Production Board, has announced. At the same time, an amendment to CMP regulation No. 9, governing retailers' acquisitions of copper wire, was announced.

CMP regulation No. 9A permits persons operating farm machinery repair shops, blacksmith shops, radio repair shops, upholstery repair shops and electricians, plumbers, and others engaged in any type of repair work to buy quarterly up to 20 tons of carbon and alloy steel, 500 pounds of copper and copper-base alloy products, and 200 pounds of aluminum in specified forms and shapes.

Special provision is made in the regulation to permit refrigeration repairmen, electricians, domestic appliance repairmen, electrical contractors, and radio repairmen to buy \$150 worth of copper wire or one-eighth of what they used during 1941, whichever is more.

The regulation permits repairmen to buy as much other material as they need for maintenance and repair work.

To buy materials and parts under this regulation a repairman must put a prescribed certification on his orders.

Repairmen who do work for customers who have the right to use an AA-2X or higher preference rating to buy non-controlled materials and parts for their own maintenance and repair may use their customers' ratings to buy what they need for repair or maintenance work or to replace inventory used for such purposes.

Special provisions are made for repairmen whose work is primarily of an industrial nature. WPB may authorize such repairmen to buy up to 2000 pounds of copper wire and a total of 2000 pounds of copper and copper-base alloy products. They may also be authorized by WPB to use an AA-2 preference rating.

If repairmen require more controlled materials in a quarter than they got under regulation No. 9A, they should fill out and send to WPB a CMP-4B form. WPB then may allot additional controlled materials and assign him a preference rating. However, if a repairman gets an allotment, he may not use the provisions of CMP regulation No. 9A to purchase controlled materials, non-controlled materials, or parts.

The regulation specifically prohibits repairmen from fabricating repair parts which they intend to sell to others rather than use themselves with the materials which they obtain under the procedures it establishes.

Deliveries of materials may not be accepted if the inventory of the repairman would become, by accepting such deliveries, in excess of a 60-day supply, except in the case of copper wire, with respect to which the inventory limitation is 15 days.

Changes in CMP regulation No. 9 include the following: Elimination of provisions permitting repair men to obtain copper wire since they now operate under regulation No. 9A; reduction of amount of copper wire which retailers may obtain to \$50 worth per quarter or one-sixteenth of the amount sold during 1941; and provision that retailers may fill farmers' orders for copper wire upon receipt of a copper wire allotment certificate.

## Kerber Assumes Additional Duties in WPB Steel Division

William Kerber has been appointed deputy assistant director for facilities of the WPB Steel Division. In addition to his new duties, Mr. Kerber will continue to serve as chief of the Raw Materials Branch.

Harry W. Bryant has been appointed acting chief of the Plant Facilities Branch as well as acting vice chairman of the Facilities Clearance Commission. Julius A. Claus, who was formerly chief of the Plant Facilities Branch, has resigned his position to return to his duties with the Great Lakes Steel Corp., Detroit.

## Plans Redistribution of 1.2 Million New Valves

A program calling for redistribution of 1,200,000 new brass and bronze valves having a value of about \$3.5 million through normal trade channels has been announced by the War Production Board. Manufacturers will be called upon to review lists of surplus valves reported to WPB. Reports of surplus valves are being called for on WPB-3311.

Metals Reserve Co. will pay the holder of surplus valves his purchase price for them, plus 5 per cent for return of valves as required. Subsequent resale to manufacturers will be at a discount.



## Suggestions for steel casting design

*Information supplied by an Industrial Publication*

Not only the quality of steel castings, but their practicability and production cost under ordinary foundry conditions are influenced by design. The following suggestions are offered as an aid to proper design.

1. Whenever possible, all sections should be designed for uniform thickness.
2. Structural design involving abrupt changes in section should be avoided.
3. Sharp corners at adjoining sections should be eliminated whenever possible.
4. When the structure becomes very complicated,

it is better to break it into several components that can be cast separately and assembled by welding or bolting.

5. In designing unfed sections in "L" or "V" shapes, it is suggested that all sharp corners at the junction be replaced by radii so that this section becomes slightly smaller than that of the arms.

6. In designing sections that join to make an "X", it is suggested that two of the arms be offset considerably.

7. In the case of unfed "T" and "X" sections, the radii at the junctions should be relatively small.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING  
DATA ON MOLYBDENUM APPLICATIONS.



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

# Climax Molybdenum Company

500 Fifth Avenue • New York City

# MIRRORS of MOTORDOM

*Manufacturing economies will be stressed in postwar automobile. Heavier models may disappear from market as normal purchasers will be hit hardest by taxation. Jeeps are being tested for peacetime jobs*

## DETROIT

WITH engineers stressing manufacturing economies as one of their principal goals in the design of the near-term postwar automobiles, it is incumbent upon suppliers of materials, parts and equipment to examine the effect of this trend upon their respective positions. Pressure on costs is probably going to develop from a number of directions; what this can do to price structures still can be remembered clearly by steel suppliers, for example, who only a few short years ago were worrying about "special price concessions" offered automotive buyers.

While war production has inflated costs to a major degree, the principal rise has been in labor and not in materials. Comparing today's prices on semifinished steel with those prevailing in 1937, costs actually are lower by \$5-\$10 per ton, in spite of the fact that the steel industry's labor costs have gone up along with all other industry. However, the concessions to large tonnage buyers which were prevalent in 1937 have now disappeared, and the full card extras for various finishing treatments, once waived here and there, now are in force.

In view of this situation, it would appear more likely that the greater pressure will be on new manufacturing methods, rather than on material costs as such. This may prove a lifesaver for a while for the hundreds of tool shops, special machinery builders and engineering services which have sprung up throughout the Middle West since all-out war production became the word. Their collective ingenuity and mechanical skill are valuable assets which the motor industry, for a time at least, can put to good use. Many have seen the early demise of these war babies, but the pressure for manufacturing economy may be just the postwar adrenalin they will need.

It cannot be safely assumed the 1937 kind of pressure on material prices will be forgotten; automotive buyers generally are too smart not to make good use of it. However, granting a continuation of government-maintained controls on prices for a time after the war, the bargain-counter offerings may be deferred briefly.

Much will depend on whether materials suppliers, and the steel industry in particular, since 70 per cent of the weight of the average automobile is steel, modernize and reorient their overall price structure. There is a preponderance of opinion among representative steel users that such a reshuffling is in order. Advent of the NE steels and the bulwarking of supplies of ferroalloys will have their effects on alloy steel price structures, which in turn probably will be reflected in the carbon steels. Presupposing the continuation of the use of NE steels, or

lean-alloy steels as some prefer to call them, in peacetime products, there is reason to expect a lowering of the price extras charged for them, since present prices are not related to alloy content and in some cases approach the prices asked for comparable full-alloy steels.

Manufacturing economies, and to some extent operating economies, are based to a degree on the factor of material utilization. Thus the elimination of, say, a decorative molding both lowers the cost of the car and contributes in a minor way to operating economy by virtue of lighter weight. This may mean the more widespread policy of motor companies offering two models of their various lines—a deluxe model with full appointments, and a stripped model for minimum first cost and operating cost. Coupled with the economy model would be additional economy features such as lower rear axle ratio, a two-speed manually-shifted transmission, special wheel sizes, etc.

Another concomitant of economy in automotive manufacturing, foreseen by engineers, is the disappearance of the oversize superdeluxe car such as the big Cadillacs, Packards, Chryslers and Lincolns. They reason that the class of buyers who normally purchase such cars will be hit the hardest by taxation and inflation, hence will drop down to a

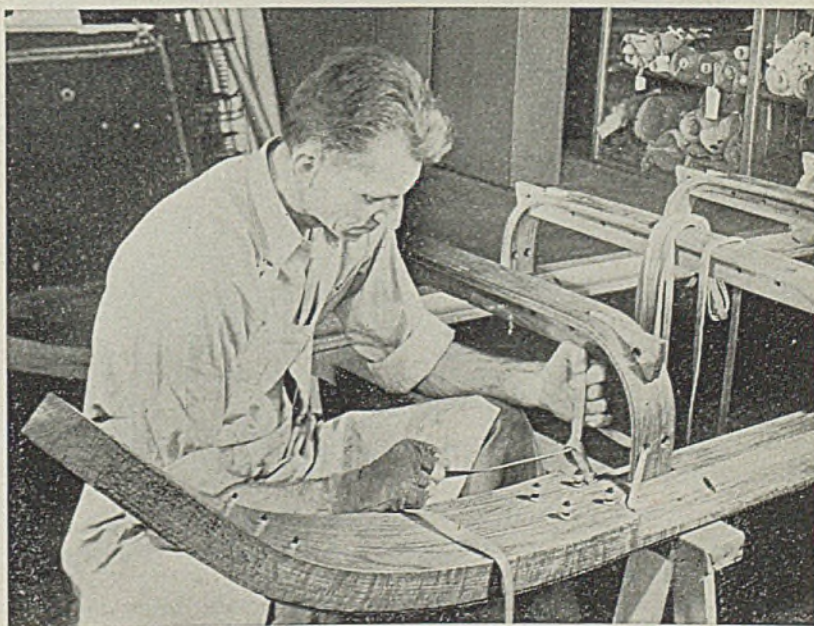
smaller car with greater operating economy and lower first cost and maintenance.

If the assumptions are correct, the impact will be considerable on the automotive industry. It would mean that the builders of these large cars would have to scramble to engineer a smaller, lighter and less expensive vehicle, and this immediately poses some nice problems. How to plan the reconversion of plants now? Where to find the engineering talent to effect such a major redesign? Whether or not to continue the name of the higher-priced model on a new economy car? Whether or not to plan on an eventual return to favor of the carriage-trade models? A wrong guess might mean loss of a big chunk of automotive market.

## Realignment In The Ranks

If the big car is definitely going to be "out," it is conceivable there could be some realignment in the ranks of the "big three." For example, Cadillac might throw in its lot with Buick in the interests of building larger quantities of the smaller Buick models. Chrysler might suspend its De Soto operations along with the larger Chrysler models, to concentrate on Plymouth, Dodge and the Chrysler six. Ford might abandon Lincoln to provide more capacity for Fords and Mercurys, plus possibly a new Ford entry in the ultra-low cost bracket. It must be emphasized these are pure suppositions, and no evidence now at hand suggests any such steps are imminent.

Tests are going forward on the new small-size jeeps which several automotive



**SLEDS FOR ARMY:** Rawhide lashings replace customary bolts and metal fixtures on the 150-inch Army sleds being constructed by Studebaker Corp., South Bend, Ind. Purpose is twofold: Subzero temperatures may snap bolt heads under strain; the leather bindings permit a certain flexibility, allowing the runners to follow curves behind a tow car

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contractors have built experimentally for the Army. Among others, two models built by engineering consultants for the Kaiser organization in Detroit are now on the proving grounds. One has a gross weight of only 1270-pounds; the other is still lighter. Numerous design innovations are embodied in them, and they should prove ideal for island operations in the Pacific, since they can be air-borne easily—perhaps half a dozen in a four-engine cargo transport—and are powered to carry the same payload as a full-size jeep. No manufacturing contracts have been disclosed as yet.

A few of the seamy sides of war production have been exposed to the public view in recent weeks following the publication of the "true confession of a woman war worker" in the *Detroit News*. Here revelations of widespread loafing on jobs, excessive numbers of workers, and other gross inefficiencies at two plants where she had worked were followed by a deluge of letters from other working people.

One of the reasons many of the letter writers claimed to be the cause of shocking inefficiency in labor utilization was the cost-plus government contract. Management representatives took issue with this stand, pointing out that no such contracts are now in force. To many, this appeared quibbling over terminol-

ogy, for while it is true that cost-plus-percentage contracts have been thrown out by service procurement officers, there still are plenty of cost-plus-fixed-fee contracts in effect. While the latter contract restrains the amount of profit a company can show on a specific contract, it appears to impose no serious restrictions on what can be included as cost items, nor upon the degree of overmanning of production jobs.

The only immediate alternative to the cost-plus-fixed-fee contract is the firm price bid. Early in the war this type of contracting was practiced, but since price bids were only rough estimates, and resultant costs usually were always well under estimates, declining steadily as the rhythm of production became established, firm price bids became inadvisable.

### People Deplore "Labor Hoarding"

The flood of letters from working people deploring so-called "labor hoarding" and operating inefficiencies seems to indicate that there are inescapable evils in the cost-plus-fixed-fee contract. The solution, however, is fortunately near. Requirements of the armed forces are approaching the completion stage. The bulk of them undoubtedly have cost the Army, Navy and Air Forces far more than comparable equipment would have

cost civilian buyers in peacetime, but that may be beside the point, since in war time is everything and money is nothing. Now, however, the day of retribution is at hand. New ordering is being scaled back sharply. High-cost producers more and more will be left without orders. The only way they can continue in the picture is to shave their costs, to undersell or underbid the present low-cost producers. The latter, in turn, once they see their present contracts in danger of being shifted to other plants, will start cleaning house.

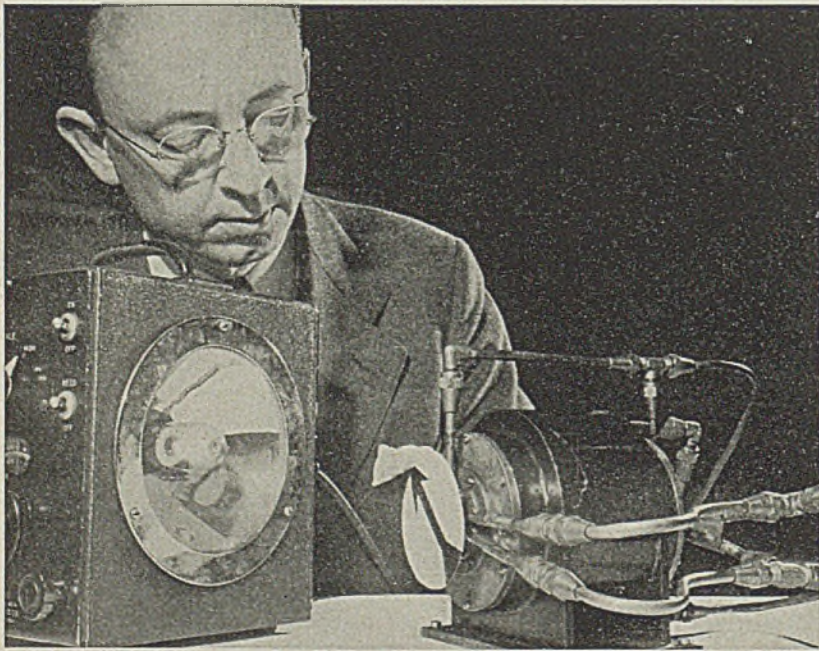
Unfortunately, many managements will have to take the rap for production inefficiencies. There is little use denying their existence; thousands of cases could be cited to prove their prevalence. Also, it appears futile to hide behind the inability to control working forces because of the inroads of unions and shop stewards, even though this too is undeniably true. The point now is that if a plant is to keep going, it will have to get out and scratch for Army and Navy business on a price basis, or else run the chance of obtaining permission to convert to civilian goods production.

Another sordid development is the conviction of two partners in a local engineering firm, accused of attempting a \$190,000 fraud against the government through payroll padding. Federal Judge Frank A. Picard assessed fines totaling \$50,000 and sentences of 12 and 7 years, respectively.

Serious though such penalties may appear, the case itself is just small potatoes in the overall war production picture around Detroit, yet its repercussions could be sensational. For example, Judge Picard said he was convinced by developments at the trial that there are "certain practices existing between prime contractors and subcontractors doing war work for the government which ought to receive the fullest publicity." Specifically, he told the defendants: "If the practices indulged in by your company with the three prime contractors—Ford, Chrysler and General Motors—are prevalent as you claim, then the amount of money the government is being defrauded out of on many of its war contracts will reach astronomical figures. What is more, the evidence convinces me that such tremendous fraud does exist . . ."

"When corporations as efficiently managed as Ford, Chrysler and General Motors can be hoodwinked, imposed upon, cheated, deceived and defrauded, as the facts show they were in this case, then it seems to me that no corporation is exempt from the possibility of being a participant, innocent or otherwise, in such activities."

The defendants are Austrians, and three years ago each contributed \$592 to the company's assets. One received \$191,518 as his share of profits in 1941, \$195,580 in 1942, the other \$95,759 in 1941 and \$97,790 in 1942. And this in an industrial area which is supposed to have the shrewdest buyers and best engineering brains in the country.



**"WHIRLING DERVISH" MOTOR:** Speeds up to 60,000 revolutions per minute have been obtained on this high-speed electric motor developed in the research laboratories of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. In the same laboratories another motor is being designed which will operate at speeds up to 120,000 revolutions per minute. These motors operate on high-frequency current. The present model uses 1000 cycle alternating current and develops 5 horsepower at 60,000 r.p.m., although it is only the size of a 1/16 horsepower motor operating on normal 60 cycle current. Immediate application of these motors is direct driving of small grinders used in attaining high finish on engine parts





*The*  
**DIGNITY OF SIMPLICITY**

★ When an individual or institution appeals to the MIND, he comes with the **DIGNITY OF SIMPLICITY**. For truth is dignified and all things are simple. This is as true in manufacturing as in any other pursuit. ☆ Dramatic shows with slogans and gymnastics, may sway the emotions but frequently becloud the mind. They constitute **SHOW-MANSHIP**—not **SALESMANSHIP**. ☆ Think of the time saved and losses avoided by the simple rule of putting castings under the X-ray for final inspection. Both the quality of the product and its performance may be enhanced by basing operations on factual truths and adhering to the **FUNDAMENTALS OF SIMPLICITY**. ☆ Those who perceive the true **DIGNITY OF SIMPLICITY** in the work of others, generally live and work in this manner themselves. And so we have faith in them. ★

*The* **ELECTRO ALLOYS** *Company*

ELYRIA · OHIO

*National Aeronautic Association recommends program for contract termination. . . Record production program for heavy transport planes launched by Curtiss-Wright Corp. and Higgins Aircraft Inc.*

FIRST National Clinic of Domestic Aviation Planning, sponsored by the National Aeronautic Association, was attended by 587 representatives of all interests in the aviation field, recently at Oklahoma City, Okla.

From an industry standpoint of principal interest was the adoption of a resolution urging the government to adopt a policy of contract termination embodying the following principles:

1. Accounting practices established in advance, with a central bureau to rule on doubtful cases.
2. Cancellation only after reasonable notice.
3. Payment by the government, within 15 days of demand, of 90 per cent of a termination claim.
4. The right for prime contractors to settle in full subcontractors' claims not exceeding \$25,000.
5. Subcontractors' claims of more than \$25,000 to be endorsed over to the government by the prime contractor.
6. Payment for liabilities incurred in good faith in the war effort which might not be specifically applicable to a single contract: Such items as prepaid local taxes, insurance, leases, service contracts, etc., which may extend for a period of time beyond the contract cancellation date.
7. Payment for certain overhead expenses incurred from time of cancellation until final settlement.
8. Reimbursement by the government

of amounts paid by contractors to employees as severance compensations under a canceled contract.

9. Unamortized portions of property acquired under certificates of necessity should be allowed as an expense in termination.

10. Renegotiation should not apply to terminated contracts, on the principle that the termination settlements in themselves prevent the earning of excessive profits.

11. Contracts should be renegotiated after taxes. Net profits after taxes, not exceeding 3 per cent of sales, should be exempt from renegotiation.

A second clinic resolution urged that surplus aviation equipment "be disposed of in such a manner as to protect, as far as possible, the taxpayers from unnecessary loss, the consumer from unreasonable prices, labor from unemployment and manufacturers and other interested business from destructive competition at home or abroad."

## Large-Scale Production of Transport Planes Planned

Production of transport airplanes on the largest scale ever projected in peace or in war has been launched by Curtiss-Wright Corp.'s airplane division and Higgins Aircraft Inc., in co-operation with the Army Air Forces. The plane selected for the project is the giant Curtiss (C-46) Commando.

The monthly production schedules established for the new project—which already is under way—are a carefully guarded military secret but they call for building Commandos in numbers far greater than any other transport type.

In addition to two Curtiss-Wright war-plane plants in Buffalo which already have produced scores of the huge Commandos for the Army Air Forces, Curtiss-Wright plants in St. Louis and Louisville, Ky., as well as a Higgins factory near New Orleans also will build the air leviathans.

As prime contractors, the Curtiss-Wright and Higgins plants will build complete airplanes. To assure specialization and thus achieve maximum output, Higgins (under separate license) also will supply outer wing panels for Commandos produced in Curtiss-Wright's Buffalo plants; and Curtiss-Wright's Louisville factory will manufacture outer panels for its St. Louis plant.

To insure the fullest co-operation in carrying out the new Commando expansion program, an executive committee has been appointed under the chairmanship of Col. Orval R. Cook of the Production Division, Material Command, at Wright Field, O. John J. Lee, manager of manufacturing developments for Curtiss-Wright Airplane Division, will serve on the committee, with R. G. Miller, Commando co-ordinator, as alternate. George A. Allward, chief aeronautical engineer for the Higgins company, also will be on the committee with F. O. Higgins, vice president in charge of production for the New Orleans company, as alternate. Subcommittees will report directly to the executive committee.

Selection of the giant Commando type for this record transport production program follows its successful performance in Army, Navy, Marine Corps and airline contract operations over domestic and international supply routes serving the fighting forces of the United Nations, and marks the culmination of more than five years of intensive development work.

Designed as a 36-passenger luxury airliner for operation by the commercial airlines of the United States, the Commando has become a wartime task force and cargo-troop carrier. The basic design of the huge transport was evolved in 1936 and the prototype, known as the CW-20 was flown for the first time on March 26, 1940 at St. Louis.

The prototype was purchased and flight tested by the Army Air Forces, transferred to Great Britain, was flown nonstop across the Atlantic in a little over 9 hours and is now in service with British Overseas Airways Corp.

After exhaustive flight tests with the Commando, the Army Air Forces placed a large order and announced it would enter military cargo service as the C-46. Subsequently named "Commando" by Curtiss-Wright with the approval of the Army, it has undergone many changes, most important of which has been the substitution of two 2000-horsepower en-



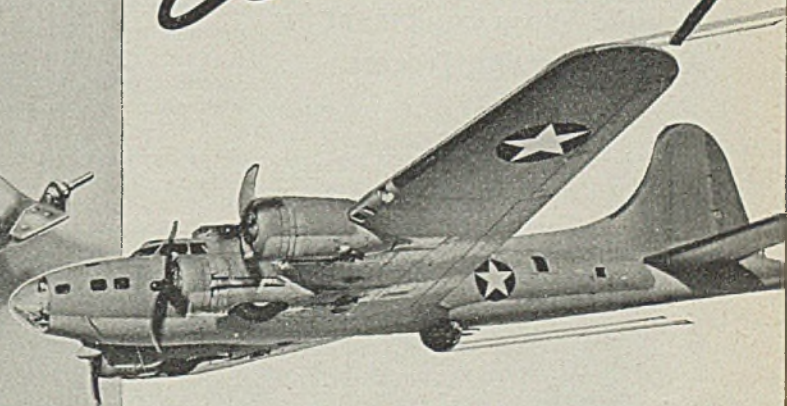
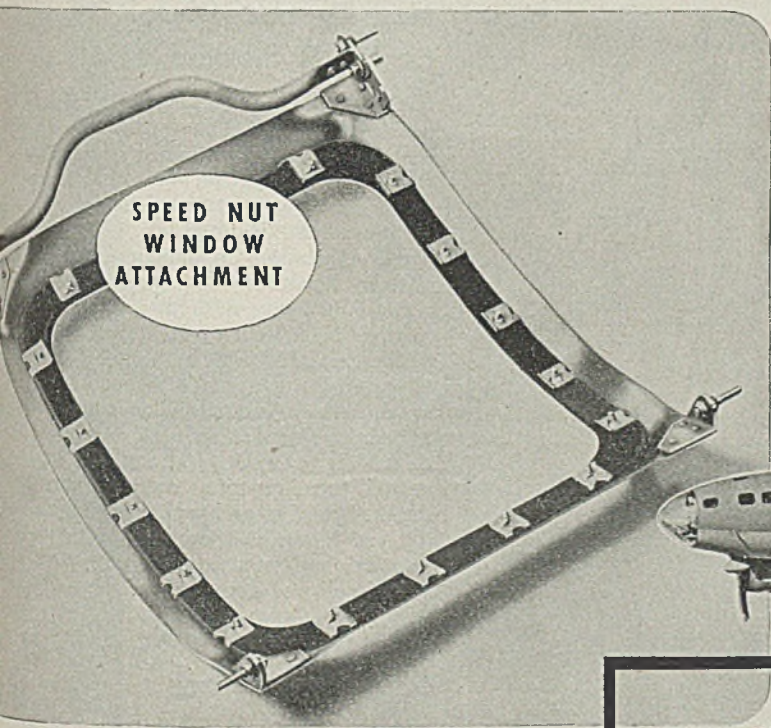
*Large-scale production of heavy C-46 Commando transport planes has been announced by Curtiss-Wright Corp. Above view taken in one of the company's Buffalo plants shows the giant craft being assembled*

# Speed Nuts

# IMPROVE

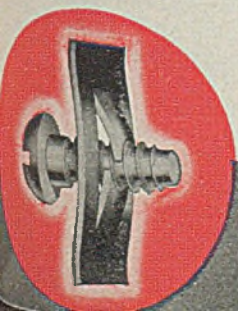
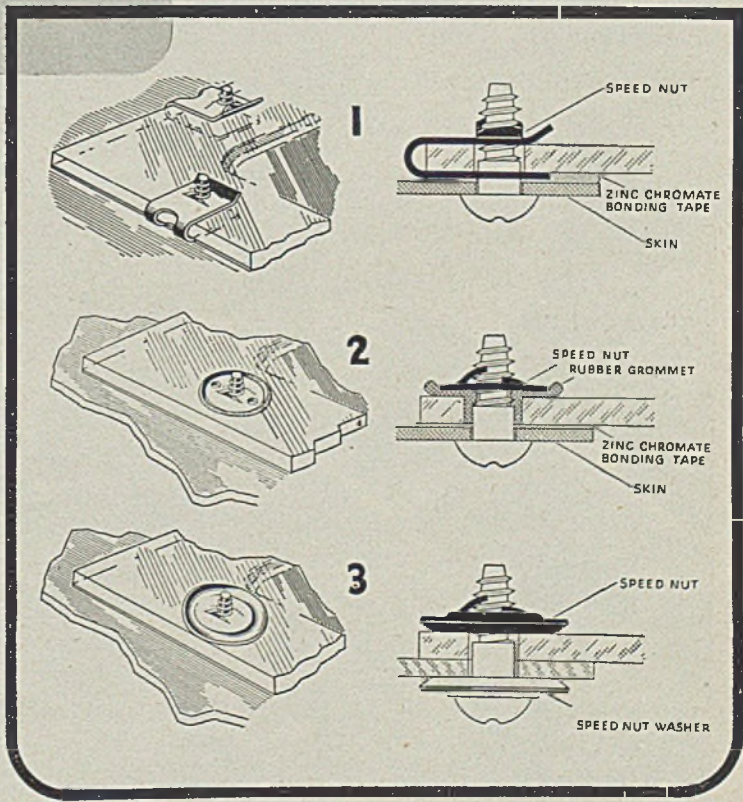
# Plastic Window

# Assembly



SPEED NUTS answer the problem of attaching plastic windows without danger of fracturing. They provide a spring-tension grip that frees the assembly from dead-tight fastening pressure. They also hold the plastic firmly in locked position under vibration and permit expansion and contraction of the plastic without damage. Washers are not needed as the wide bearing surface of the SPEED NUT spreads the load over a greater area and away from the screw hole. These SPEED NUTS are also applied faster—saving many manhour's time and reduce the net weight of the assembly. In the first case illustrated, a "U" type Speed Nut snaps over plastic edges in self-retaining position. A round type Speed Nut is used in the second installation with rubber grommets in larger screw holes for additional cushion and seal. In the third method, where 2 pieces of plastic overlap, a cup-shaped Speed Nut is used with a mated Speed Nut washer—both formed to extend the load farther from the screw hole.

In writing for samples kindly give engineering details.



TINNERMAN PRODUCTS INC., 2039 Fulton Road, Cleveland, Ohio  
IN CANADA: Wallace Barnes Co., Ltd., Hamilton, Ontario • IN ENGLAND: Simmonds Aerocessories, Ltd., London

## THE FASTEST THING IN FASTENINGS!

gines for the less powerful types in the prototype. Other modifications designed to prepare the Commando to operate efficiently in hot or cold climates also have been made.

The Commando has a wing span of 108 feet, equal to that of the 4-engine Flying Fortress, weighs 27,900 pounds empty, measures 76 feet 4 inches from nose to tail and is 28 feet 9 inches high. Its unobstructed main cargo compartment is 48 feet long, has a maximum width of 9 feet 10 inches, and a maximum height of 6 feet 8 inches. This with two smaller belly compartments give it a total cargo capacity of 2755 cubic feet which is greater than that of a standard 36-foot freight car.

### Rebuild Worn Equipment by Metal Spraying Process

By spraying molten metal on worn surfaces and then machining to original dimensions, hundreds of machine tools have been restored to vital service at

plants of the Douglas Aircraft Co., Santa Monica, Calif.

The reclaiming of worn drum shafts on drop hammers is an example of saving by metallizing. These shafts are held in a bearing fitted with a water jacket where they wear quickly due to rust and lack of rust-resistance in the original metal. Ordinarily a new shaft would be made by machining bar stock  $3\frac{1}{4}$  inches in diameter by 44 inches long. Now mechanics machine off the rusted surface, spray with stainless steel to build up the shaft, and turn to size.

Punch press dies are cushioned by a piston in an aluminum cylinder mounted below the lower die. This cylinder is subject to constant wear and scoring by tiny slugs of metal which fall on top of the piston. The delivery of a new cylinder would have taken 90 days, so it was decided to machine down the scored interior of the cylinder, spray with aluminum, and remachine to size. This operation kept the punch press out of production only 14 hours.

Lap rods used to ream hydraulic cylin-

ders of diameters varying from  $3/16$ -inch to 2 inches, which must hold tolerances of 0.0001-inch, are now made at Douglas by spraying aluminum on steel shafts. These lap rods were originally made entirely of aluminum, but the shanks were constantly breaking.

An unusual use of metallizing has been in building up wing sections of model airplanes used in wind tunnel tests.

### New Type of Diesel Engine Is Studied

New types of two-cycle diesel, in which each cylinder has two pistons and each piston delivers a power stroke with every revolution of the crankshaft, is being studied by the Airesearch Mfg. Co., division of the Garrett Corp. in Los Angeles. According to announcement by Walker Brownlee, vice president and general manager, a single-cylinder section has been built up for tests.

The design is doubtless a modification of an old German Junkers engine design in which each vertical cylinder had two pistons driving crankshafts above and below the cylinder. The shafts were geared together to a common output shaft. Ports in each cylinder provided for fuel intake and exhaust. It is understood the German design was not successful and was discarded.

### Ford Making Plastic Distributor Heads

Plastic distributor heads for the Allison aircraft engine are now being produced by the Ford Motor Co.

A similar type of head, developed by Ford engineers, has been used for some time in the 2000-horsepower Pratt & Whitney aircraft engine built by Ford.

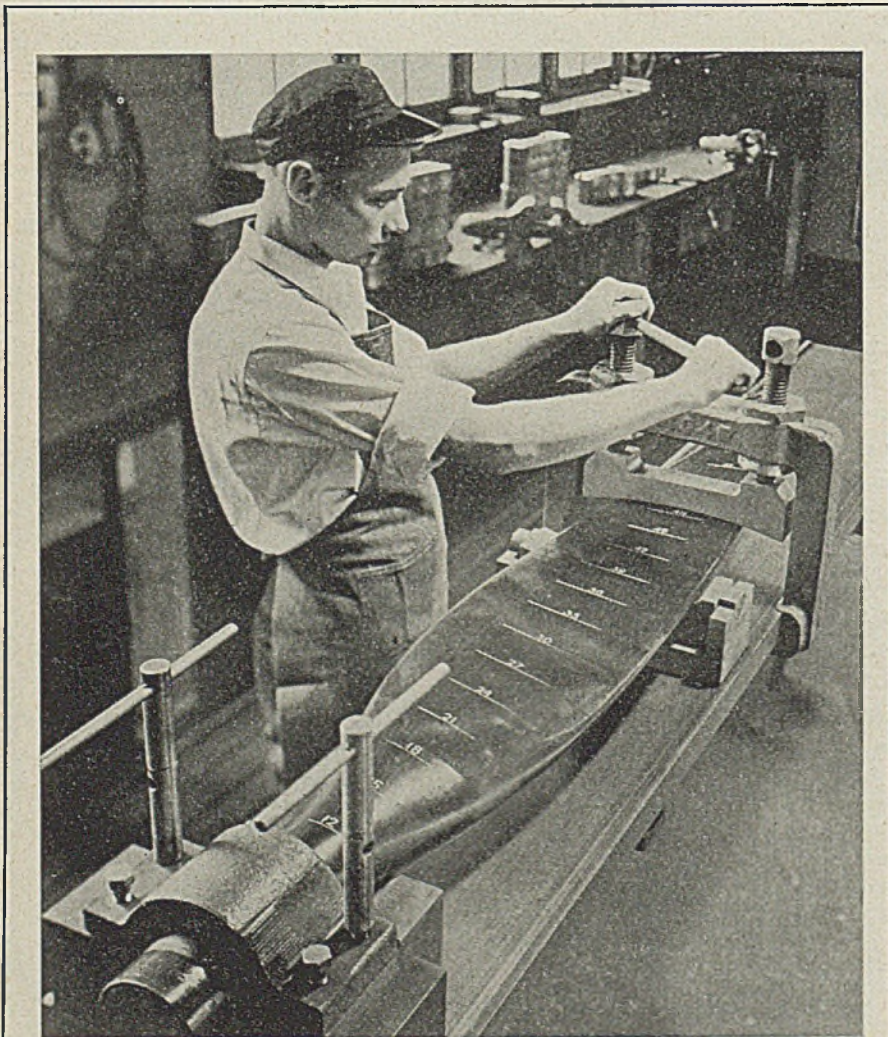
Principal advantage of the head, aside from its being moisture resistant and requiring fewer critical materials, is that it increases arc resistance, or resistance to "short circuiting" caused by loss of atmospheric pressure at high altitude.

The head also decreases weight, and by changes in design its strength has been increased 300 per cent.

### "Chin Turret" in Volume Production at Bendix Plant

The new "chin turret," which strengthens defense of B-17 Flying Fortresses against frontal attacks from enemy fighter planes, is now in volume production at the Bendix Aviation Corp., South Bend, Ind.

The new two-gun "chin turret" was developed by the corporation's engineers in conjunction with the Army Air Forces. The electrically powered turret mounts two 0.50-caliber machine guns which can be controlled through a wide arc from side to side and can be elevated or depressed by the operation of simple control handles. It is mounted at floor level in front of the bombardier's compartment.

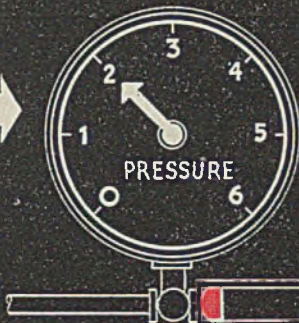


**STRAIGHTENS PROPELLERS IN FIELD:** Tools for the repair of bent and warped propellers in the field are being manufactured by the Thomas Machine Mfg. Co., Pittsburgh. Workman above shows how it is done, with a hollow blade held in a cradle and straightened against a metal block shaped to fit its contour at a station numbered on the blade

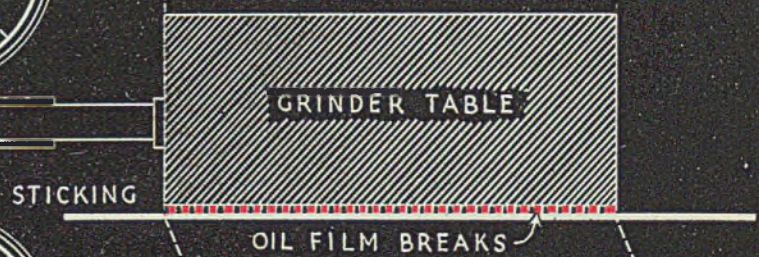
# HOW TO SOLVE

Operating Problems with *Correct Lubrication*

**1 SLIPPING**  
This diagrammatic drawing shows a grinder table moving ahead slowly under normal actuating pressure.



**2 STICKING**  
The oil film breaks. Friction stops the table. The actuating pressure builds up to overcome the increased friction.



**3 SLIPPING**  
The table jerks ahead. Pressure momentarily drops to normal. The table will immediately stick again.



## Prevent "Stick-Slip" Chatter on Precision Grinders

THERE IS a special oil—Gargoyle Vacuoline Oil 1409—made to prevent "chatter" in grinding operations.

This oil has a thin, strong film that provides a minimum of "break-away" friction. It is made to eliminate Step No. 2 in the diagram above.

It is also made to eliminate "over-run" of the cross-slide which results from the same cause as "chatter."

In addition, it is an efficient hydraulic fluid—an ideal oil for hydraulically driven precision grinders.

Use Gargoyle Vacuoline Oil 1409 for assurance of securing fine finishes and meeting exacting tolerances.



SOCONY-VACUUM OIL CO., INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Co. • General Petroleum Corporation of Calif.

# USE GARGOYLE VACUOLINE OIL 1409

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

# MEN of INDUSTRY



M. J. SMITH



W. G. THEISINGER



J. F. BECHTLE

M. J. Smith has been named controller of the Propeller division, Curtiss-Wright Corp., New York, succeeding George M. Ebert, who has been appointed director of finance for the corporation's Airplane division. Mr. Ebert's appointment to the Buffalo headquarters for the Airplane division is effective immediately, while Mr. Smith assumes his new duties at Caldwell, N. J., Jan. 1, 1944.

Wilbur H. Armacost has been elected a vice president of Combustion Engineering Co. Inc., New York, to succeed the late F. H. Rosencrants. Mr. Armacost will be in charge of the company's marine activities.

E. L. Huff, formerly electrical engineer, Brackenridge (Pa.) plant, Allegheny Ludlum Steel Corp., Pittsburgh, has been appointed chief engineer of all plants of the corporation.

Charles H. Reinert has been named manager of operations, Steel & Tubes division, Republic Steel Corp., Cleveland, succeeding Henry Wick, who has resigned to become associated with Plastic Manufacturers Inc., Stamford, Conn., as vice president.

Hamlin A. Caldwell has been named chief metallurgist, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., succeeding the late A. E. Kunze.

Willard T. Jones, secretary and formerly purchasing agent, Adirondack Foundries & Steel Inc., Watervliet, N. Y., has been appointed sales and production manager of the company's Steel Castings division.

Harry E. Warren has been appointed manager, Advertising division, Hotpoint Electric Appliances, Chicago, and F. F. Duggan has been named manager, Refrigerator Sales division of Hotpoint.

E. R. Baxter has been appointed assistant to Charles Knupfer, vice president in charge of sales, Carborundum Co., Niagara Falls, N. Y. John F. Clay-

don has been named district sales manager, Boston, succeeding Fred W. Bonacker, who has been appointed to special sales work at the company's main office in Niagara Falls. A. A. Murfey has been named district sales manager at Cleveland.

William G. Theisinger, director of welding research, Lukens Steel Co., Coatesville, Pa., since February, 1941, has been appointed assistant to D. S. Wolcott, vice president of the company.

J. F. Bechtle, formerly associated with the metallurgical and research department of M. W. Kellogg Co., New York, has joined Standard Steel Corp., Los Angeles, as assistant general manager.

Joseph T. Hartson, for eight years executive vice president of the Glenn L. Martin Co., Baltimore, has been elected president, Glenn L. Martin-Nebraska Co., Omaha, Nebr. For a number of years, Mr. Hartson was assistant to the president and secretary of Boeing Aircraft Co., Seattle.

Carl W. Noffke, tool designer, E. C. Atkins & Co., Indianapolis, has received an Army Ordnance citation for development work in the manufacture of armor plate for armored vehicles.

R. G. Adair, assistant director of personal relations, American Rolling Mill Co., Middletown, O., has been named to the staff of the industrial members of the War Labor Board, Washington.

A. E. Reinhard has resigned as superintendent of Youngstown Sheet & Tube Co.'s Campbell works, Youngstown, O., to become superintendent of steel production, Great Lakes Steel Corp., Ecorse, Mich.

Robert C. Berner has resigned from the War Production Board to become assistant to the president, Emerson Radio & Phonograph Corp., New York.

Frank W. Curtis, former president, American Society of Tool Engineers, has

become associated with Induction Heating Corp., New York, as a development engineer. Formerly, Mr. Curtis had been chief engineer of the Van Norman Co., Springfield, Mass.

Thomas H. Glaser has joined the staff of Gray-Mills Co., Chicago, as installation engineer and tooling consultant.

H. S. Rose has been appointed chief sales engineer, Progressive Welder Co., Detroit.

Joseph L. Dudley has joined the Cochran Steam Specialty Co., Boston.

J. Handy Wright has been appointed director of the department of industrial and public relations, Monsanto Chemical Co., St. Louis.

Arthur Smith Jr. has been appointed head of magnesium sales in the Southwest territory for Dow Chemical Co., Midland, Mich. Mr. Smith will assume his new duties about Jan. 1, making his headquarters in St. Louis.

Harold J. MacDonald has been appointed manager, jobbing sales, United States Rubber Co., New York, and Howard F. Johnson has been named manager of branch sales with offices in New York.

W. Earle Shumway has been appointed sales manager of the western region, Norton Co., Worcester, Mass., and will make his headquarters in Worcester. Raymond E. Taylor succeeds Mr. Shumway as Chicago district manager.

Benjamin J. Lazan, chief engineer and a vice president, Sonntag Scientific Corp., Greenwich, Conn., an affiliate of Baldwin



James E. Gleason, president of the Gleason Works, Rochester, N. Y., was honored by his associates with a 75th birthday celebration at the plant on Nov. 26. Mr. Gleason has developed numerous gear cutting machines and in 1940 received an award from the National Modern Pioneers Committee of the National Association of Manufacturers for his inventions in this line.



R. N. MATHEWS

Who has been appointed manager of the San Francisco office, Ross Heater & Mfg. Co. Inc., Buffalo, reported in STEEL, Nov. 29, p. 65.



HARRY S. TWEEDY

Who has been named manager, Field Service division, Detrex Corp., Detroit, as announced in STEEL, Nov. 29, p. 64.



HARRY G. BARR

Who has been named vice president in charge of purchasing, J. I. Case Co., Racine, Wis., noted in STEEL, Nov. 29, p. 65.

Locomotive Works, Philadelphia, has been awarded the Alfred Noble Prize for 1943, for the most outstanding research work in any field of engineering. The prize was presented Dec. 1 at the annual dinner of the American Society of Mechanical Engineers. Other societies participating in the award were: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Institute of Electrical Engineers, and Western Society of Engineers.

Vernon L. Haag has been appointed to the new position of engineering manager at the electronics plant of Sperry Gyroscope Co., Garden City, N. Y. R. T. Pearsall has been named personnel supervisor in electronics, and E. R. Barber, recreation supervisor for all Sperry plants.

W. I. Rodgers Jr., has been named assistant to the chief engineer, Mack Mfg.

Corp., Long Island City, N. Y.

Robert A. Bartley, formerly zone manager in Kansas City for Nash-Kelvinator division, Nash-Kelvinator Corp., Detroit, has been appointed Buffalo zone manager of the Nash-Kelvinator division.

Eugene B. Steele, former production executive for the War Production Board in Washington and Syracuse, has been appointed manager of production engineering, Bell Aircraft Corp., Buffalo.

G. Herbert Marcy, former sales manager, Gillette Safety Razor Co., Boston, has returned to Gillette to assume the position of assistant to the president, following 15 months with the War Production Board, where he served as assistant director, Consumer Durable Goods Division.

A. J. Sanford, president, Cleveland Hardware & Forging Co., Cleveland,

has been elected vice president, American Die Casting Institute.

James T. Buckley, chairman of the executive committee, Philco Corp., Philadelphia, has been elected a director of the Federal Reserve Bank of Philadelphia.

F. R. Fishback has been elected chairman of the board, Electric Controller & Mfg. Co., Cleveland. R. G. Widdows, formerly vice president, was elected president, and N. R. Richardson and A. C. Dyer were elected vice presidents. Mr. Richardson continues as sales manager for the company, and Mr. Dyer will continue in his capacity as production manager.

Henry R. Michel, purchasing agent for the East Pittsburgh (Pa.) works, Westinghouse Electric & Mfg. Co., has received the company's award, the Order of Merit.

OBITUARIES . . .

James H. Pierce, 79, founder, Pierce-Budd Co., Bay City, Mich., died there Nov. 20.

Paul J. Driscoll, 60, affiliated with the sales department, Central Iron & Steel Co., Harrisburg, Pa., died recently in that city.

E. Fred Gieselmann, 58, retired division sales manager in St. Louis for John Deere Plow Works, Moline, Ill., died in St. Louis Nov. 24.

Cornelius Brennan, 74, former partner in the Brennan Iron Works, Buffalo, died there Nov. 23.

David W. McNaugher, 84, vice president and treasurer, Robert W. Hunt Co., Chicago, died Nov. 24 in Pittsburgh.

Charles H. Hasner, 81, one of the founders of Geller, Ward & Hasner Hardware Co., St. Louis, which was liquidated in 1938, died Nov. 26 in St. Louis.

Fred P. Auxer, 67, founder and president, National Telephone Supply Co., Cleveland, died Nov. 25.

Glen G. Holt Sr., 47, vice president, Perfex Corp., Milwaukee, died Nov. 26 near Eagle River, Wis.

John W. Wilbur, 61, founder and former president of John W. Wilbur Co., Cleveland, died Nov. 27 in Los Angeles.

Carl A. Miller, 44, vice president and general manager, Capital Castings Co., Lansing, Mich., and proprietor of the Michigan Brass & Aluminum Casting

Co., Lansing, died recently in that city.

Floyd A. Day, superintendent, Johnstown (Pa.) works of Bethlehem Steel Co., Bethlehem, Pa., died recently in Pittsburgh.

Albert H. Meyer, 56, development engineer, Donora (Pa.) works, American Steel & Wire Co., Cleveland, died recently in Pittsburgh.

G. Russell Palmer, 50, secretary-controller, Standard Register Co., Dayton, O., died recently.

D. J. Shelton, president and general manager, Marion Steam Shovel Co., Marion, O., died Nov. 27.

David B. Pierson, 63, chairman, Stephens-Adamson Mfg. Co., Aurora, Ill., died Nov. 29 in that city.

# WPB Plans Early Release of Vital Data on Business and Industry

*Considerable restricted war information to be made available. . . . Will include figures on production, shipments, consumption, inventories, resources, fabricating capacity, utilization, new materials, general trends, etc.*

MUCH of the statistical material on industry, heretofore treated as restricted war information, will soon be made available to business for planning present and future operations, Donald M. Nelson, chairman, War Production Board, announced last week.

This action, he said, will release a large amount of past and current data originally collected for confidential use of war agencies. The facts will include figures on production or shipments, material consumption, inventories and resources, fabricating capacity and utilization, employment, impending bottlenecks, new materials, substitutions, and general trends.

The figures will be concerned with lines of industry and types of products, but not operations of individual companies or plants.

In announcing the decision to liberalize the board's former policy on publication of current industrial statistics, the WPB chairman remarked that prosecution of the war had reached the point where some of the rigid restrictions may safely be removed.

"Our production position is now so strong that information concerning it will be of no aid or comfort to the enemy—quite the contrary," said Mr. Nelson.

The statistical material will be based on reports and studies originating in operations of the War Production Board, information collected and tabulated by the Bureau of the Census for WPB, minerals production figures assembled in cooperation with the Bureau of Mines, and data from additional sources. When another agency collaborates in its preparation, the material will be published jointly by the War Production Board and the other agency.

First releases will be issued in a few days and, insofar as dependable facts are available, will cover the period from the beginning of the wartime restrictions on information to the present. Frequent reports will then be made until most of the major lines of industry have been reported. After business and the country have thus been brought up to date, subsequent releases will be issued monthly or quarterly for each line of industry or each product.

The data will be channeled through key groups representing American business and industry; namely, trade magazines, trade associations, the Department of Commerce, the United States Chamber of Commerce, and the Committee on Economic Development. These or-

ganizations will be free to disseminate the information to their members and readers. Other government agencies that have need for the facts also will be supplied.

## Will Correct Inconsistencies

Mr. Nelson said the new policy will help to correct some inconsistencies and other complications that have arisen from the rigid control kept over industrial information. He cited the anomaly of a manufacturer of blankets, heating stoves or valves being unable to learn the total production of his industry, yet frequently reading in the newspapers how many guns, rounds of am-

munition, planes and ships were produced last month or year.

There have been duplications of effort, such as the Lead Industries Association's and WPB's necessity for gathering data from the industry at the same time and on the same commodities, and some misunderstandings and misconceptions of the war effort arising from the lack of public information on industrial matters.

Summing up the value of the data to business, Dr. Vergil D. Reed, chief of WPB's General Statistics Staff, said:

"Industry's war and postwar needs for facts are its commonly recognized peacetime needs greatly intensified. Conditions change more rapidly, and are extreme in character. The chances for error in judgment are greater. Judgment can never be better than the facts upon which it is based. Bad decisions are always more costly and dangerous during war or reconstruction than in peacetime."

Dr. Reed said that not all the details of how the material will be released have been determined. The program will be worked out as it proceeds, and will be fitted to a considerable extent to the needs of business as these are learned from requests and results.

## Standardization of Government Specifications Progresses

GOVERNMENT specifications must be continually revised and new requirements established in order to keep pace with rapidly shifting stockpiles of critical war materials.

Working closely with the Army, Navy and other interested government departments, the Conservation Division, War Production Board, has been tackling the problems of conserving materials in limited supply, finding substitutes for the most critical materials, and bringing specifications in line with the changing supply picture. Their recommendations and actions are being watched closely for indications of possible trends in the use of materials in the postwar period.

### Revisions Pass 750 Mark

The number of government department specifications already revised or under development is mounting well past the 800 mark, according to C. L. Warwick, consultant to Howard Coonley, director of the Conservation Division.

Some 750 emergency alternate federal specifications and conservation amendments have been completed and more than 200 are now being prepared by the specifications committee. Many new projects are scheduled for future development.

Specifications play a vital part in the conservation of critical materials and products, Mr. Warwick emphasized, and substantial savings can frequently be effected by changing requirements in government specifications. Wherever prac-

ticable, a single federal specification is established to replace the varying specifications of the government agencies.

Some of the projects now under way are:

**55 Gallon Steel Drums for Gasoline:** A single specification, to be issued as a federal specification, has been developed and approved by the armed services to replace the varying requirements of each of the services. Further work is being carried on to improve gaskets and to



HOWARD COONLEY  
Director, Conservation Division, WPB





C. L. WARWICK  
Consultant, Conservation Division, WPB

consider lighter gages of steel.

**Brass and Bronze Castings and Ingots:** Substantial agreement has been reached on the standardization of federal specifications of the various government departments, the American Society for Testing Materials, the Association of American Railroads, and the Society of Automotive Engineers for brass and bronze castings and ingots. It remains to determine how fully to specify impurities, how best to relate the specifications for castings and ingot metal, and to decide whether physical properties should be specified for ingot metal as well as castings.

**Aluminum Alloy Castings:** A standardization program similar to that for brass and bronze has been started for aluminum alloys, which are widely used now and will have still broader application in the future.

Some of the materials and products for which federal specifications have been completed or for which conservation amendments have been issued are listed below:

Specification Symbol	Title
E-QQ-I-666	Iron; malleable, castings
E-QQ-B-71a	Bars; reinforcement (for concrete
QQ-S-741-Am. 1	Steel, structural (including welding), and rivets; for bridges, buildings
E-QQ-I-706a	Iron and steel; sheet, tinned (tin plate)
E-QQ-T-191	Terne plate (long termes)
E-QQ-T-201	Terne plate (roofing tin)
E-QQ-W-311	Wire; bale-tie, single-loop
E-QQ-W-321	Wire; brass
E-QQ-W-414	Wire; steel, bookbinders
E-QQ-W-432	Wire; steel, market
E-QQ-W-446	Wire; steel, zinc-coated (for wirebound boxes)
E-QQ-W-461	Wire; steel (carbon); bare and zinc-coated
E-RR-C-596	Cord; picture-wire
E-RR-F-191	Fencing; chain-link or welded
E-RR-F-221	Fencing; wire (barbed, netting, woven), black and galvanized
E-RR-C-451a	Cloth; wire, screen
E-RR-R-571	Rope; wire
E-FF-N-101	Nails; spikes; staples; tacks
E-FF-P-386	Pins; cotter, split

\*These two specifications should be voided, or modified to conform to schedule 7 of War Production Board's order L-211.

QQ-S-781-Am. 1	Strapping, flat steel
E-QQ-A-601	Aluminum-base-alloy; sand-castings (Emergency alternates which were straight substitutions have been canceled. Those adding grades or liberalizing requirements are incorporated into amendments or revisions.)
E-QQ-M-161	Metals, antifriction; castings, ingots
QQ-B-611a-Am. 3	Brass, commercial; bars, plates, rods, shapes, sheets, strip
QQ-B-621-Am. 3	Brass, commercial and naval; castings
QQ-B-691a	Bronze castings
E-QQ-S-571a	Solders, tin-lead
QQ-N-281a	Nickel-copper-alloy; forgings, plates, rods, shapes, sheets, strips, wire
QQ-N-286a	Nickel-copper-aluminum-alloy; forgings, rods, strips, wire
QQ-S-763	Steel, corrosion-resisting; bars, forgings
QQ-S-766	Steel, corrosion-resisting; plates, sheets, strips, structural shapes
QQ-P-406	*Plates, tie; railroad
QQ-R-91	*Rails, track; carbon steel, open hearth

Federal specifications and amendments are in preparation on the following:

Specification Symbol	Title
QQ-S-741-Am. 2	Steel, structural (including welding), and rivet (for bridges, buildings)
QQ-W-401-Am. 4	Wire; phosphor-bronze, spring
QQ-W-461-Am. 1	Wire; steel (carbon); bare and zinc-coated
RR-R-571-Am. 5	Rope; wire
V-F-106	Fasteners, slide, interlocking
FF-N-101-Am. 3	Nails; spikes; staples; tacks
FF-P-386	Pins, cotter, split
QQ-A-591-Am. 2	Aluminum-base-alloy; die castings
QQ-B-701	Bronze; ingots
QQ-B-731a	Bronze, manganese; ingots (for remelting)
QQ-M-161	Metal, antifriction; castings, ingots
QQ-T-371a	Tin; pig
QQ-B-611a	Brass, commercial; bars, plates, rods, shapes, sheets, strips
QQ-B-621a	Brass, commercial and naval, castings
QQ-B-636a	Brass, naval; bars, plates, rods, shapes, sheets, strips
QQ-B-691a-Am. 3	Bronze castings
QQ-B-721a	Bronze, manganese; bars, forgings, plates, rods, shapes
QQ-B-726b-Am. 1	Bronze manganese; castings (including manganese-aluminum-bronze)
QQ-C-501a	Copper; bars, plates, rods, shapes, sheets, strips
QQ-C-591a	Copper-silicon-alloy; bars, plates, rods, shapes, sheets, strips
E-QQ-S-571a	Solder; tin-lead
QQ-M-151a	Metals; general specifications for inspection of

### U. S. Maintains 100,000-Ton Stockpile of "Scarce" Tin

A stockpile of about 100,000 long tons of tin has been accumulated in the United States through various measures, including purchases by the Metals Reserve Co. and construction of the first important tin smelter in the Western Hemisphere. At the present rate of consumption, this

is sufficient to cover two years' requirements.

Conservation of supplies is imperative, despite the large reserves, inasmuch as the metal is now scarcer in relation to demand than even steel, copper, or nickel. Through conservation, total tin consumption has been cut to about 50 per cent of the pre-war figure. But the demand, decreased as it is, is still far greater than the incoming supply.

Equitable distribution of the tin available from Bolivia, Australia, Africa, Cornwall, Alaska and a few remote areas is assured through allocation by the Combined Raw Materials Board to the various United Nations. The United States has, as its share, a major part of the output of the Bolivian tin mines; output of the Belgian Congo, amounting to over 15,000 tons a year; and small amounts of ore from other sources.

The new \$6,300,000 Longhorn tin smelter at Texas City, Tex., with a capacity to produce more than 50,000 long tons of refined tin annually, is large enough to smelt not only all the ores now available to the United States, but also a large proportion of the ores available to the rest of the United Nations. However, for lack of enough ore it is currently running at only half capacity.

Research is being conducted in an effort to improve Bolivian tin milling operations so that a higher percentage of the fine ore particles can be recovered.

### Strip Mills Supply Half of Plate Tonnage

Strip mills converted to roll plates have supplied nearly half the total plate tonnage since the middle of 1943 when the conversion of such mills was completed. Sheared mill has accounted for around 40 per cent of the total output while universal mills supplied approximately 11 per cent.

Following table shows plate shipments by type of mills since the fourth quarter of 1941. All figures are net tons:

	PLATE SHIPMENTS—BY TYPE OF MILL			
	1941	(Net tons)		
		Total	Strip Mill	Sheared Universal Mill
Oct.	593,152	152,440	346,401	94,311
Nov.	620,007	169,311	350,868	98,828
Dec.	654,344	182,604	358,273	113,467
1942				
Jan.	754,522	250,396	381,899	122,227
Feb.	758,723	268,988	377,770	111,965
Mar.	878,726	306,195	449,379	123,152
April	895,971	337,519	436,614	121,838
May	1,012,194	425,211	461,375	125,606
June	1,050,962	489,704	438,144	123,114
July	1,124,118	550,537	447,481	126,100
Aug.	1,097,866	551,959	430,197	115,710
Sept.	1,061,836	511,959	434,555	115,372
Oct.	1,101,362	536,981	449,895	114,506
Nov.	1,013,599	474,136	424,708	114,755
Dec.	1,060,039	490,487	454,902	114,650
1943				
Jan.	1,135,413	565,893	448,481	121,039
Feb.	1,072,001	529,315	424,167	118,519
Mar.	1,167,679	563,302	465,572	138,805
April	1,121,647	535,548	454,827	131,272
May	1,114,920	535,528	460,060	119,332
June	1,056,085	508,534	431,565	115,986
July	1,089,677	530,552	438,066	121,059
Aug.	1,060,936	497,263	439,358	124,315
Sept.	1,106,351	540,337	444,565	121,929
Oct.	1,146,845	555,844	463,250	127,751



## Business Management's Assistance to Government, Military Wins WPB Tribute

By L. B. FLAWS  
Principal Industry Advisor  
War Production Board

IT IS well established that no plan, program or policy can be any stronger than the practical mechanics established for administering its effectiveness. This applies equally in the operation of a business, a government or a war.

When this country found itself the victim of the sneak attack by the Japanese at Pearl Harbor on Dec. 7, 1941, when Germany and Italy subsequently declared war upon us and almost before the man in the street had recovered from the shocking impact of the news of the opening of hostilities, our administrative agencies in the nation's capital began to gear for the biggest production job in world's history.

Fortunately, the pattern for the establishment of the various administrative war agencies already had been worked out under the principles of the Industrial Mobilization Plan which was designed, following World War I, through the collaboration of industry with the government and military forces.

The President was given almost unlimited power in the initiation of an administrative program designed to protect the American security coincidental with the start of the race against time to harness the country's great industrial capacity and resources into an organized total-war effort, and the government immediately was faced with the necessity of the abrupt restriction of a well-established free-enterprise system and the rapid conversion from a peacetime economy to the planning and controlling of production on a wartime basis.

It was obvious, also, that in the projection of a modern, mobile, mechanical type of warfare, the effective superiority of our armed forces in the field necessarily would be determined ultimately by the superiority, quantitatively and qualitatively, of our arms, supplies and equipment, a challenge to the highest type of American industrial ingenuity.

It was a case of more planes, more tanks, more ships, and more of everything in a race against the clock. The enormity of the task was immediately apparent.

The President expressed this in his statement: "Never before have we had so little time in which to do so much!"

It was at this time that the need for businessmen for assignment to the War Production Board in Washington to assist in the formulation of production plans and programs became extremely imperative.

### Industry Lends Technical Advisors

Industry, recognizing its responsibility, immediately responded with a generous loan of production experts, engineers, technicians, and specialists to augment the permanent government supervisory forces in the war agencies. The military forces, recognizing the necessity for an informed liaison between the military and industry on matters of production and procurement, also drew a large percentage of its commissioned personnel from the administrative ranks of business, mostly for these specialized assignments.

However, it became apparent that neither the War Production Board nor the military forces could be staffed sufficiently with business personnel required to control all phases of this huge industrial program.

The need, likewise, was emphasized for some means of effectively channeling industry's direct participation in the war program and some means of drawing upon the practical experience and advice of the industrial leaders of the coun-

try in the determination and co-ordination of WPB policies and programs.

Thus, the need for a more direct relationship between the government agencies and private industry at the administrative or "decision" level was recognized as a vital key-link between war needs and getting the job done.

After examining the experiences of WIB, NRA, and OPM (the latter the predecessor to the WPB) it was decided to adopt the Industry Advisory Committee formula as an approved vehicle for creating and maintaining this all-important working relationship between government and industry in the war emergency. While the practicability and vital need for the adoption of this committee-arrangement was readily apparent, it also was foreseen that the antitrust laws, not having been suspended for the WPB as they were for the WIB and NRA, presented somewhat of a legal problem for the moment.

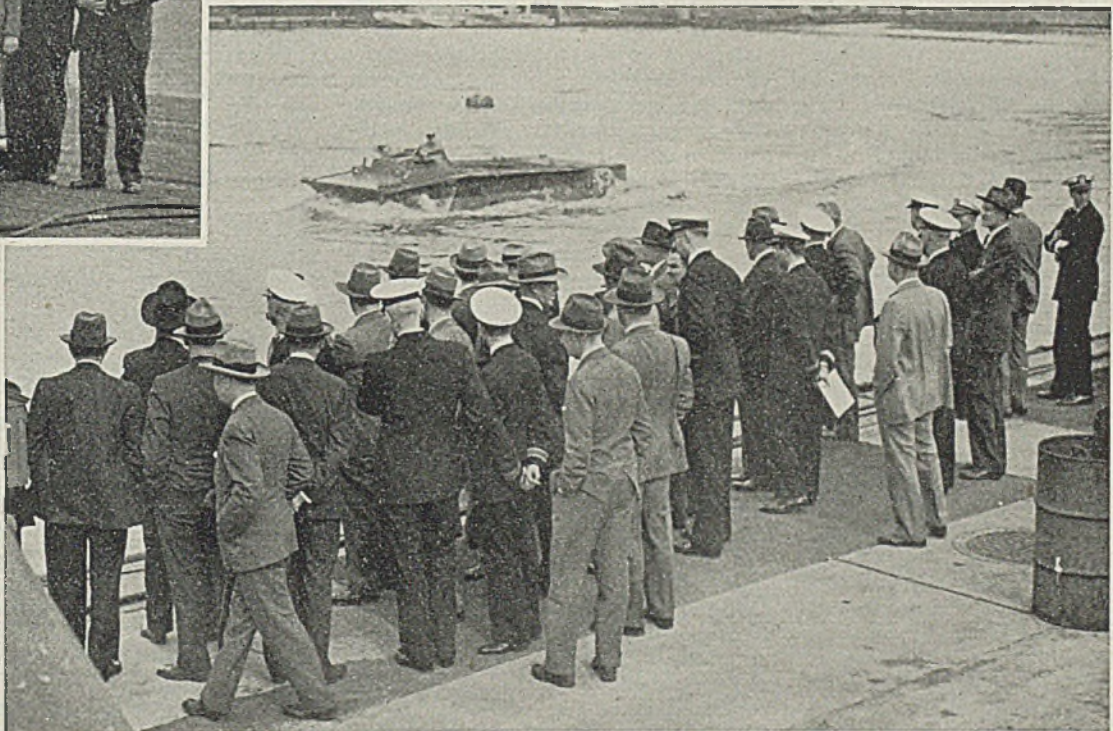
Hence, it was necessary for the general counsel of OPM (later WPB) to seek preliminary opinion and assistance of the attorney general on the determination of the legality of this vitally necessary working arrangement. Accordingly, on Dec. 12, 1941, the general counsel, referring to a previous exchange of correspondence of April 8 and April 9, 1941, addressed the attorney general, making certain recommendations for approval of a formalized procedure for the creation of an independent Office of Industry Committees to control the operation of committees under certain regulations and without the necessity of legal clearance of each individual request for the formation of a committee. In this, the attorney general concurred, and thus established the temporary validity of the committee system.

With this correspondence as a basis of opinion, the OPM issued its Regulation No. 12, Jan. 14, 1942, signed by



Left, the Iron and Steel Industry Advisory Committee, War Production Board, accompanied by naval officials, inspects an unfinished converted aircraft carrier at the Philadelphia Navy Yard

Members of the Iron and Steel Industry Advisory Committee watch, below, a "water buffalo" perform at the Philadelphia Navy Yard



William S. Knudsen, director general; Sidney Hillman, associate director general; Robert P. Patterson, Under Secretary of War; and James V. Forrestal, the Under Secretary of the Navy, and concurred in by John Lord O'Brian, general counsel, which served to merge prior and proposed regulations designed to define the basic formation and conduct of Industry Advisory Committees.

It is to the distinct credit of American industrial leadership that more than 5000 business executives are now serving their government on approximately 650 committees organized and functioning regularly under these regulations for the purpose of aiding in the direction and implementation of the war program. These men serve without remuneration and pay their own expenses.

The Iron and Steel Industry Advisory Committee which meets monthly under the chairmanship of John T. Whiting, director of the Steel Division, is one of the War Production Board's most important advisory committees, primarily because of the nation's total dependency upon steel in the war effort and, incidentally, because of its top-ranking composition.

Members of the committee are: W. F. Detwiler, chairman, Allegheny Ludlum Steel Corp.; B. F. Fairless, president, United States Steel Corp.; Frank R. Frost, president, Superior Steel Corp.; E. G. Grace, president, Bethlehem Steel Co.; Charles R. Hook, president, The American Rolling Mill Co.; Walter R.

Howell, president, Bliss & Laughlin Inc.; Elton Hoyt II, president, Pickands Mather & Co.; H. Edgar Lewis, chairman, Jones & Laughlin Steel Corp.; Hayward Niedringhaus, president, Granite City Steel Co.; Frank Purnell, president, Youngstown Sheet & Tube Co.; Henry A. Roemer, chairman, Pittsburgh Steel Co.; E. L. Ryerson Jr., chairman, Inland Steel Co.; W. S. Tower, president, American Iron and Steel Institute; Ernest T. Weir, chairman, National Steel Corp.; R. J. Wysor, president, Republic Steel Corp.

#### Contributions Officially Recognized

The many vital contributions of this particular committee received official recognition recently by the compliment of an invitation extended by Mr. Forrestal to hold its October meeting in the Philadelphia Navy Yard. The invitation was presented on behalf of the Under Secretary by Capt. Ralph S. McDowell, deputy production officer of the Office of Procurement and Material, Navy Department, and the committee was received at the navy yard by Rear Adm. Milo F. Draamel, commandant of the Fourth Naval District and navy yard, Philadelphia. Following the meeting, the committee was conducted by Rear Adm. Allen J. Chantry, manager of the navy yard, on a tour of inspection of the battlecraft under construction and repair. The committee was present at the ceremonies attendant to the launching of two destroyer escorts.

An outstanding example of the operating effectiveness of the Iron and Steel Industry Advisory Committee is the fact that many of its suggestions are incorporated in the basic structure of Controlled Materials Plan which now is working so effectively in the steel, copper, and brass divisions of the War Production Board.

Another important committee in the Steel Division is the Metallurgical and Operations Industry Advisory Committee, whose most outstanding contribution to the war effort, perhaps, was the suggestion of a joint metallurgical commission subsequently formed of British, Canadians, and Americans to study the alloy situation, in order that these Allied Nations might be kept informed currently of all the outstanding achievements and developments being instituted by each other. For example, the wider use of alloy scrap in the production of steel, in which the British apparently were far ahead of us, was a British contribution, whereas they in return were enabled to benefit by current knowledge of American methods and innovations in the development and improvement of American armor, guns, and other fabricated products, and by which they were able to speed up British production.

In addition to the undeniable benefit derived by the War Production Board as a direct result of this close working association between the Steel Division and its 45 Industry Advisory Committees, there was developed a keener in-

terest throughout the entire industry in the improvement of products and methods, with the resultant increase of production from existing facilities and a general swapping of these ideas and innovations among the various operating companies in the interest of promoting the war effort.

In reference to the Steel Division by these illustrations, there is no intent to minimize the relative importance of hundreds of other committees formed to counsel and work with the War Production Board in the industry divisions which control the production of wool, cotton, leather, lumber, radio and radar, shipbuilding, machine tools, office equipment, newsprint, and all the other industries and services among which it is so difficult to differentiate on the strict basis of essentiality to the successful prosecution of the war effort. All members of all committees have been willing to submerge their private interests in representing their respective industries' conversion to winning the war.

Some of us have been privileged to observe this marshalling of our country's industrial might and the tapping of the nation's resources and productive-engineering capacities by this simple expedient of government and industry, each taking the other into its complete confidence and working harmoniously under this committee formula.

We have demonstrated a practical formula by which a nation, acknowledged to be the world's foremost exponent of democracy in its political concept and the world's leading industrial power in its commercial aspect, has found its destiny not by a divergence of these basic viewpoints, but by a fusion of their common objectives.

Perhaps the war administration has made mistakes. Perhaps industry too has made its share, but one significant fact remains. Fewer mistakes have been made under the co-operative system than would have been made had the balance of control rested with either the

one or the other with each acting entirely on its own initiative. Incidentally, it is not too difficult to analyze the motives of the pressure groups who offer nothing but criticism of the job that already has been done and contrast their activities with the motives and action of the public spirited business leaders who come to Washington to help make things happen.

Some of us who are living temporarily in this Washington atmosphere some day may have the temerity to propose that, perhaps, somewhere in this established unity of thought and action which has existed between the government and most private industries under the impelling impetus of the exigencies of war, there may exist the germ of a formula for weaving the permanent pattern of a democratic nation at peace.

Certainly, viewed in the light of its contribution to the progress of the war, industry has before it probably the greatest opportunity. In the domestic field, the scientific developments of the present war should open up entire new vistas of commercial adaptation.

Furthermore, it would seem that in the settlement of the immediate post-war problems commencing with contract terminations and running the entire gamut of reconversion of war plants, re-employment, restoration of peacetime enterprise, labor-management relationships, rehabilitation and particularly, the consideration of the future commercial interdependency of nations, there should exist as great an opportunity for industry as for diplomats.

### Lockheed To Open New P-38 Subassembly Plant Soon

The Lockheed-Vega Corp. is preparing to open a new airplane subassembly plant at Fresno, Calif., in addition to the present plant in that city which operates at Fresno and Olive avenues.

The new plant will produce tail sec-

tions, including fins and rudders for the P-38 Lightning. It is expected to be in operation by the middle of December. Fresno is the only city, with the exception of Burbank, Calif., where plants for the production of subassemblies for both the P-38 and the B-17 have been established.

### Anticipate Heavy Demand For Steel Tubing in 1944

About 10,600 tons of alloy steel tubing and 2000 to 3000 tons of carbon steel tubing will be required each month in 1944 by the aircraft industry, according to Lieut. C. E. Jones, Aircraft Scheduling Unit, at a meeting of the Tubing Industry Advisory Committee in Washington recently.

A comparison of tube mill shipments with Dayton allocations for landing gear, propeller, and engine tubing in light and heavier material for the three month period ended September, 1943, revealed that shipments of light material in July were more than 25 per cent below allocations. August shipments were still appreciably lower than allocations, but September shipments were slightly above allocations.

Dayton allocations of heavier material were equal for July and September with production about 1,000,000 pounds below in both months. August allocations were 2,000,000 pounds greater than July and September and production was somewhat short of allocation. While the net result is a backlog of shipment in both feet and pounds, shipments of aircraft tubing have run fairly close to requirements except in special situations.

The trend is toward heavier-walled tubing for production of bombers and fighters. A serious situation may develop in production of lighter sizes up to 1.5 inches, 14-20 gage, from an order standpoint. The decrease in requirements for aircraft tubing of lighter gages is not expected to be substantial.

## They Say:

"Give your people the facts about your company. Take them into your confidence, and they will help you to do the job better than you can do it alone. And when they have done this, give them tangible recognition for the job well done."—Herman W. Steinkraus, president and general manager of the Bridgeport Brass Co., Bridgeport, Conn.

"More and more in later years we have been engaged in the silly undertaking of trying to build a federal organization to function as a general governmental agency of all the people. By the very nature of that sort of government, it is inevitable that there shall be extravagance, wastefulness, and tyranny. It is inevitable that there shall be more and more government by directives, issued by appointed, not elected, personnel working without supervision. We have all but reduced the states to government

vassals."—Hatton W. Summers, representative from Texas.

"You can't run business without capital. The government is taking earnings of business away at such a rate that business is not being allowed to save capital to convert its plants back. If that trend continues as it is going now it will have serious effects on re-employment of the 11 million men who are in the armed services."—Edwin G. Booz, president Association of Consulting Management Engineers.

"For the long pull after the immediate problem of demobilization is over all those who are interested in the welfare of workers recognize that industrial practices must be developed by private industry consciously to prevent business decline and unemployment."—Frances Perkins, secretary of labor.

# Predicts Light Materials To Influence Design

*Westinghouse executive believes metals able to withstand high temperatures to be increasingly important*

METALS that will withstand high temperatures without corroding or flowing like molasses under the influence of stress are going to become of increasing importance as time goes on, R. C. Bergvall, assistant to vice president in charge of engineering, Westinghouse Electric & Mfg. Co., told a meeting of the American Institute of Electrical Engineers at Roanoke, Va., recently.

He said that as more and more synthetic materials are used, manufacturing problems naturally should be expected to become simpler and would except for one factor—that we properly demand more service from these new materials which means holding them to exceedingly close control limits. The trend is toward manufacturing operations, and instead of being controlled by old type foremen, these operations will be controlled by Phd's working mass spectrometers, he added.

"The expansion of our airplane industry has emphasized the possibilities inherent in the use of light-weight materials and construction," Mr. Bergvall said, "and this influence is bound to be reflected in our ordinary products and we may look forward to what might be called a 'light weight age.' This may influence the design of everything, from beds which are now too heavy for the housewife to lift up when straightening the carpet to turbine generators."

Mr. Bergvall said that much has already been done in the direction of reducing weight and that results obtained from high permeability silicon iron, have been impressive. This material is finding great use in military electronic equipment of all kinds, ranging from pack sets to airborne devices.

## BRIEFS . . .

Western Electric Co., New York city, disclosed that 50 per cent of the company's total sales of war materials since Pearl Harbor had been produced by subcontractors. The company does business with 6500 subcontractors and suppliers.

Ohio Crankshaft Co., Cleveland, announces the appointment of the Welker Machinery Co. Inc., Detroit, as special distributor for its induction equipment.

George P. Reintjes Co., Kansas City,

Mo., has developed a sectionally-supported wall for the upper side wall areas of bent-tube boilers.

Mack Mfg. Corp., New York city, recently was presented the National Security Award by the Office of Civilian Defense.

Oakite Products Inc., New York city, has published a manual relating to the effective descaling of water-cooled and water-circulating equipment.

Yost Superior Co. and the Airetool Mfg. Co., Springfield, O., have purchased the Shuey Factories building, 312 South Center street, Springfield, O.

Chicago Bridge & Iron Co., Seneca, Ill., has been made the "lead" yard in the Navy's new LST construction program. The ships are being launched at the rate of one each week and production will be increased.

Footo Bros. Gear & Machine Corp., Chicago, is conducting an active program to stimulate workers to increased effort by the use of posters.

Zell Corp., Baltimore, is equipping the third floor of the building it occupies at 1300-04 Lovegrove street for additional production.

Mar-Del Inc., Baltimore, has occupied and equipped a building at 1305 Cathedral street for machine shop work and for tool, die and fixture designing.

Mine Safety Appliance Co., Pittsburgh, recently acquired the building at 6101 Falls road, Baltimore, and is enlarging and equipping it as its main experimental laboratory.

Glenn L. Martin Co., Baltimore, has completed plans for erection of a hydraulic testing laboratory and also a laboratory for testing vibration of fuels.

Bethlehem-Sparrows Point Shipyard Inc., Baltimore, contemplates erection of a two-story storage building.

Toughard Metals Inc., Baltimore, now is engaged in the manufacture of special metal rods and plans to extend its facilities, including an electric furnace.

Davison Chemical Corp., Baltimore, is erecting a \$30,000 plant addition.

National Bureau of Standards, Washington, reports that a simplified practice recommendation for air compressors for automotive service stations and garages has been approved for promulgation, effective Dec. 1. It is known as R202-43.

National Malleable & Steel Castings Co., Cleveland, has completed contract renegotiation proceedings whereby the company is to make a gross refund of \$812,000. After credit for income and

excess profits taxes, the net cost to the company is \$154,280.

H. K. Porter Co. Inc., Pittsburgh, is executing a contract for locomotives for South America's first complete steel mill.

Wheelco Instruments Co., Chicago, has issued bulletin A2-3 describing its line of potentiometers.

Metal & Thermit Corp., New York city, has produced a color film, with sound, showing the fabrication of ship stern frames by its welding process.

Metallizing Engineering Co. Inc., Long Island, N. Y., recently awarded cash prizes in the first of its new series of contests relating to the conservation of critical metals and time in production and maintenance.

Wheelco Instruments Co., Chicago, recently appointed the Cochrane Steam Specialty Co., Boston, to serve with George W. Hall, the company's present New England representative. The Lang Co., Salt Lake City, Utah, is the sales and service representative in Utah, Idaho, Wyoming and Nevada.

Brown Instrument Co., Philadelphia, announces that W. H. Steinkamp, assistant general sales manager, plans to discuss the practical aspects of automatic control in a series of talks to be delivered before various groups this winter. He spoke before the Engineers Club, Detroit, Nov. 19.

## Warm Air Heating Group To Meet in Cincinnati, Dec. 8

Postwar planning, application of war-learned techniques to postwar markets and the industry's wartime problems will be discussed at the Dec. 8 meeting of the National Warm Air Heating and Air Conditioning Association in Cincinnati.

A meeting of the association board on Dec. 7 will precede the general conference. There will be a number of prominent government and industry officials present to speak at the wartime convention.

## Two Western Mining Groups To Meet Jointly in January

Wartime problems of the mining industry will be discussed at a joint meeting of the western division, American Mining Congress, and the Colorado Mining Association at Denver, Jan. 27-29.

Some of the subjects which will be featured prominently at the meeting are the current policies of the WPB and other agencies, anticipated requirements for various minerals, metal prices and quotas, manpower supply, machinery and equipment for the mines, stockpiling policies and legislation, and questions of mine taxation.

## Tension Increased by Latest War Rumors

CONFRONTED by rumors of impending sensational developments in the war so persistent and widespread they cannot be disregarded, industry shows signs of increasing tension as it contemplates the multitude of reconversion and other postwar problems which would engulf it almost overnight in event of a sudden cessation of the European war.

Can industry outmaneuver postwar difficulties as ably as it outproduced the enemy? Prompt establishment of firm government policy with respect to these postwar problems is needed to clear the air.

In the meantime present output levels must be maintained, and in most respects industry continues to hold production at or near the high levels reached this fall. Chances of raising output rates for certain types of war goods are favored by easier supply of materials and availability of additional manpower from plants suffering cut-backs or cancellations.

**RESERVE BOARD INDEX**—Federal Reserve Board's production index, recently revised to insure accurate reflection of industrial output rates, records a new high for October at 245 per cent of the 1935-39 average. Aside from two slight declines—April of 1941 and June of this year—overall production rate of the index has climbed steadily every month since April, 1940. Figures for the three months of this year preceding October are: July, 240; August, 242; September, 243.

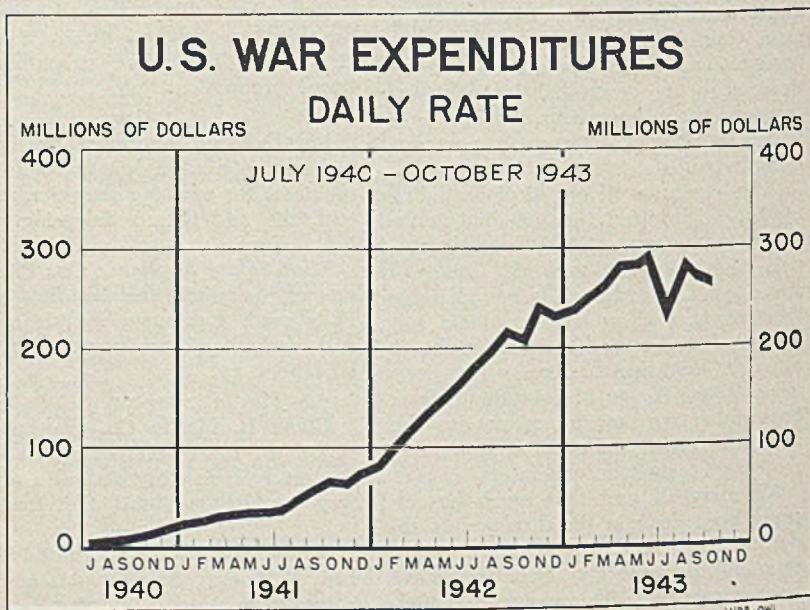
**RAILROAD EFFICIENCY**—Railroads are handling two and a half times as much freight and four times as much passenger traffic as before the war with but slightly more equipment, states an Association of American Railroads executive. If the lines had been operating on the basis of 1929 car and locomotive performance averages, half of this year's traffic would not have moved at all. Today's average freight car carries 5.7 tons more and goes 18.7 miles farther per day than it did five years ago. Ratio of unserviceable cars to total cars owned has been cut from almost 14 per

cent in 1938 to less than 3 per cent in 1943, although 5 to 6 per cent was considered lowest minimum obtainable before the war.

**WAR EXPENDITURES**—Recording the third consecutive reduction in monthly totals, the October figure stands at \$7,105,000,000, or 1.5 per cent less than the September total, and fourth lowest for the year thus far. June, at \$7,688,000,000, shows highest monthly amount of war expenses for the ten months; February shows lowest figure, \$6,081,000,000. For September the total was \$7,212,000,000; for August, \$7,529,000,000.

**AUTOMOTIVE PLANT OUTPUT**—Current production rate of automotive factories turning out war goods is estimated as 160 per cent of the rate during 1941's most active manufacturing period. On the same basis the output rate was 130 per cent for October, 1942, busiest month of that year for automotive plants.

**LIVING COSTS**—As compared with costs of living during the first World War, present living expenses are not extremely high. Conference Board index shows all living costs for the first 50 months of the present conflict have risen 23.5 per cent, whereas in the same period of World War I the increase was 59.5 per cent. Food costs in World War II have risen 49.5 per cent, but in the corresponding period of the last war they increased 79.4 per cent. All other major items were three to four times higher.



### FIGURES THIS WEEK

#### INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity).....	99.0	99.0	99.5	99.0
Electric Power Distributed (million kilowatt hours).....	4,403	4,513	4,415	3,766
Bituminous Coal Production (daily av.—1000 tons).....	2,117	1,878	1,912	1,954
Petroleum Production (daily av.—1000 bbls.).....	4,413	4,414	4,383	3,878
Construction Volume (ENR—unit \$1,000,000).....	\$36.5	\$68.9	\$32.0	\$65.9
Automobile and Truck Output (Ward's—number units).....	17,875	18,440	19,135	14,345

\*Dates on request.

#### TRADE

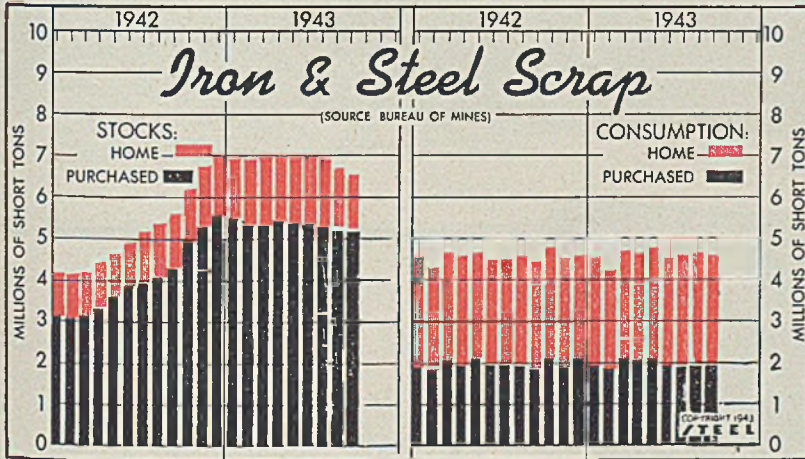
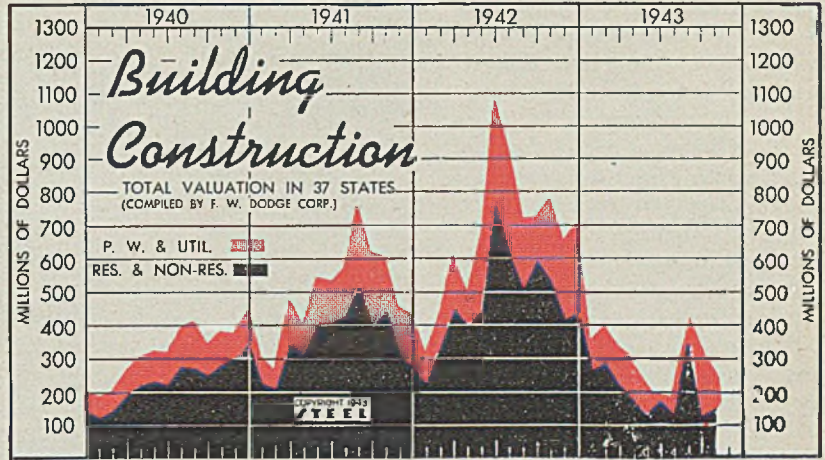
	Latest	Prior	Month	Year
Freight Carloadings (unit—1000 cars).....	856†	882	755	837
Business Failures (Dun & Bradstreet, number).....	43	29	49	107
Money in Circulation (in millions of dollars)†.....	\$19,796	\$19,559	\$19,090	\$14,648
Department Store Sales (change from like week a year ago)†.....	+14%	+10%	+13%	+13%

†Preliminary. †Federal Reserve Board.

**Construction Valuation  
In 37 States**

(Unit—\$1,000,000)

	Public Works- Utilities		Residential- Non-Res.	
	1943	1942	1943	1942
Jan.	350.7	85.8	90.8	264.8
Feb.	393.5	112.9	95.9	280.5
Mar.	339.7	123.0	159.7	216.7
April	303.3	127.7	101.7	175.6
May	234.4	95.8	227.7	138.6
June	229.6	73.3	438.4	156.3
July	183.7	50.0	327.3	133.7
Aug.	413.7	73.4	213.1	340.3
Sept.	300.1	175.1	129.6	125.0
Oct.	213.6	63.5	246.2	150.0
Nov.	.....	.....	241.0	.....
Dec.	.....	.....	271.0	.....
<b>Total</b>	<b>.....</b>	<b>.....</b>	<b>2,540.4</b>	<b>.....</b>
				<b>5,714.3</b>



**Iron and Steel Scrap  
Bureau of Mines**

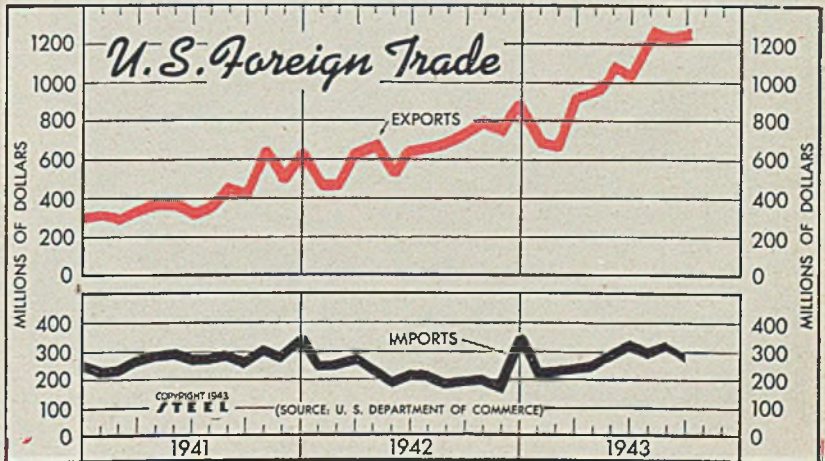
(Gross tons—000 omitted)

	Consumers' Stocks		Total Consumption	
	1943	1942	1943	1942
Jan.	6,877	3,508	4,492	4,956
Feb.	6,871	3,455	4,178	4,708
Mar.	6,850	3,460	4,787	5,221
Apr.	6,918	3,582	4,642	5,156
May	6,905	3,972	4,723	5,225
June	6,916	4,297	4,493	5,000
July	6,880	4,579	4,670	5,006
Aug.	6,778	5,279	4,686	4,478
Sept.	6,613	4,993	4,657	4,955
Oct.	.....	5,530	.....	5,342
Nov.	.....	6,078	.....	4,830
Dec.	.....	6,274	.....	5,067
<b>Total</b>	<b>.....</b>	<b>54,503</b>	<b>.....</b>	<b>60,551</b>

**Foreign Trade  
Bureau of Foreign and Domestic  
Commerce**

(Unit Value—\$1,000,000)

	Exports			Imports		
	1943	1942	1941	1943	1942	1941
Jan.	751	479	325	228	253	229
Feb.	732	478	303	234	253	234
Mar.	984	611	357	248	272	268
Apr.	963	695	385	257	234	287
May	1,069	525	385	281	191	297
June	1,004	618	330	302	215	279
July	1,251	627	359	300	214	278
Aug.	1,205	694	455	315	184	282
Sept.	1,233	718	417	280	196	263
Oct.	.....	776	666	.....	199	304
Nov.	.....	750	492	.....	174	280
Dec.	.....	853	651	.....	356	344
<b>Total</b>	<b>.....</b>	<b>7826</b>	<b>5126</b>	<b>.....</b>	<b>2743</b>	<b>3345</b>



**FINANCE**

	Latest Period°	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$8,718	\$8,330	\$8,897	\$7,237
Federal Gross Debt (billions)	\$169.9	\$169.8	\$168.9	\$99.3
Bond Volume, NYSE (millions)	\$32.9	\$42.5	\$51.8	\$33.7
Stocks Sales, NYSE (thousands)	2,799	4,141	4,144	2,642
Loans and Investments (millions)†	\$51,989	\$52,051	\$53,477	\$37,905
United States Government Obligations Held (millions)†	\$37,857	\$37,732	\$38,682	\$24,423

†Member banks, Federal Reserve System.

**PRICES**

	Latest Period°	Prior Week	Month Ago	Year Ago
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	243.6	244.4	247.2	230.2
Industrial Raw Materials (Bureau of Labor index)†	111.3	111.7	112.2	103.8
Manufactured Products (Bureau of Labor index)†	100.3	100.3	100.3	99.7

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

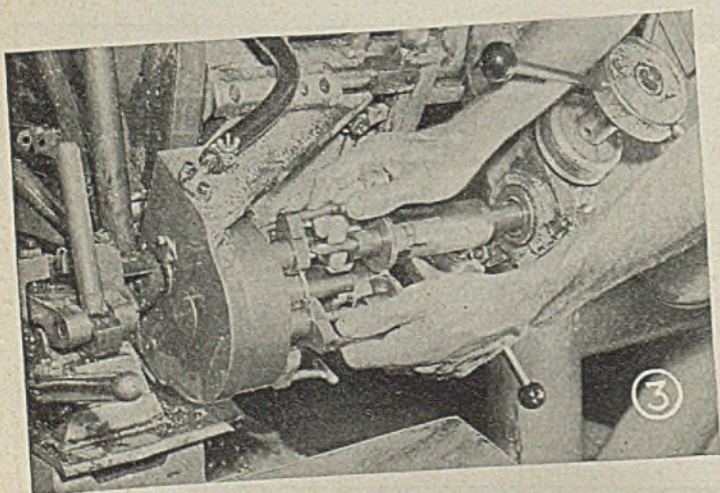
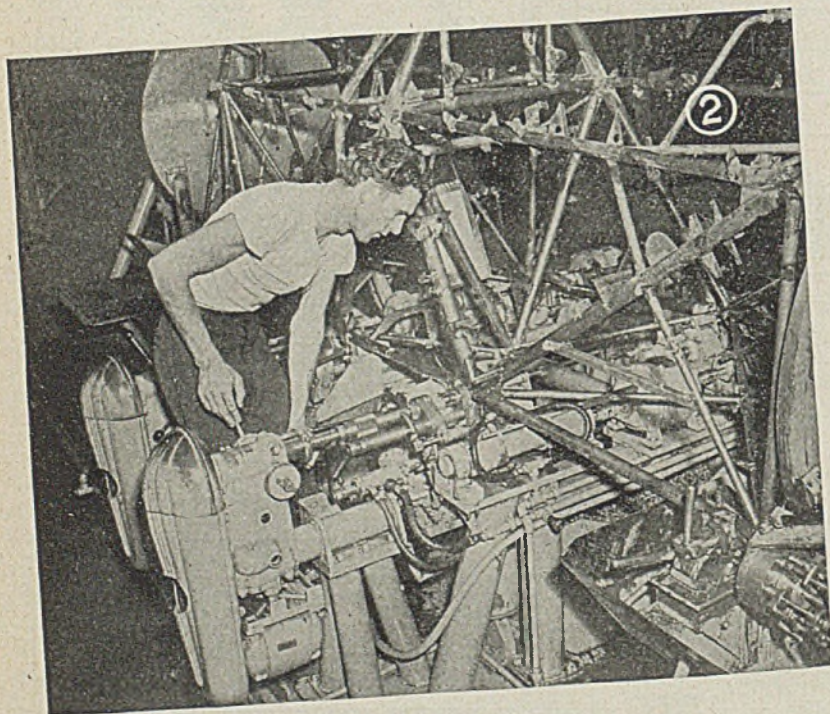
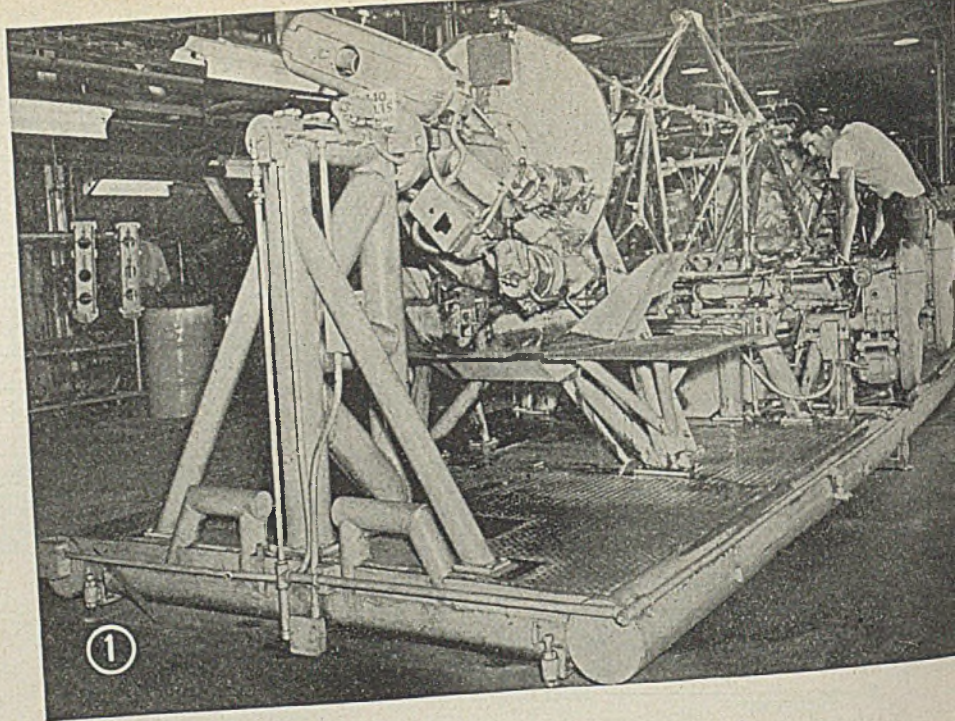
Fig. 1—General view of the master drill jig with a fuselage in position and the side turrets drilling two wing fittings on each side of the frame

Fig. 2—Closeup of one of the side turrets which carries tools for milling, drilling and reaming wing fitting

Fig. 3—Closeup of the operator setting the tool for drilling the engine mount forging at the front end of the frame

Fig. 4—Closeup of end turret shown in foreground in Fig. 1, with drilling tool in operation on the monocoque. End turret comprises two drills, a reamer and back spot facer

Fig. 5—Operator swings the end turret, changing milling tool from one forging to another. Fuselage frame has four forgings at front end, three at the rear



## MASTER

ENGINEERS at Consolidated Vultee Aircraft Corp., Vultee Field, Calif., call the unit shown in accompanying illustrations the "Rube Goldberg machine" because of its unorthodox appearance and operation. Actually it is a master milling and drilling jig for handling milling, drilling and reaming operations on the welded steel tubular fuselage and monocoque for a Vultee Valiant BT-15 basic training plane.

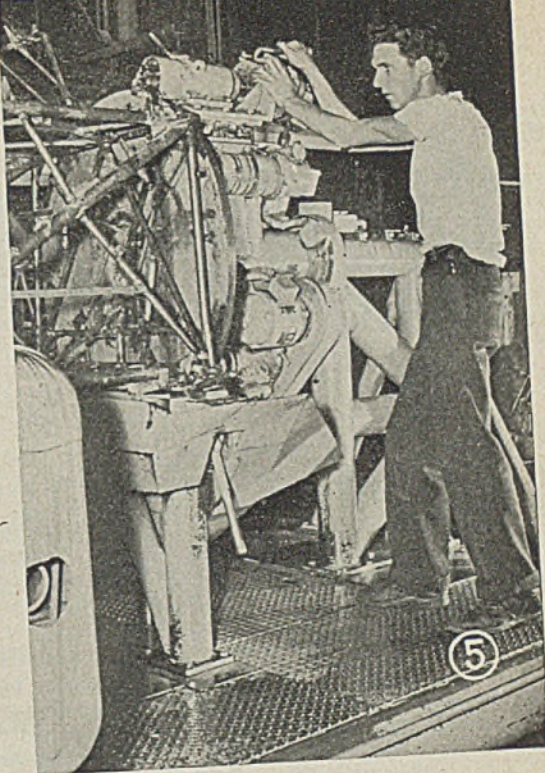
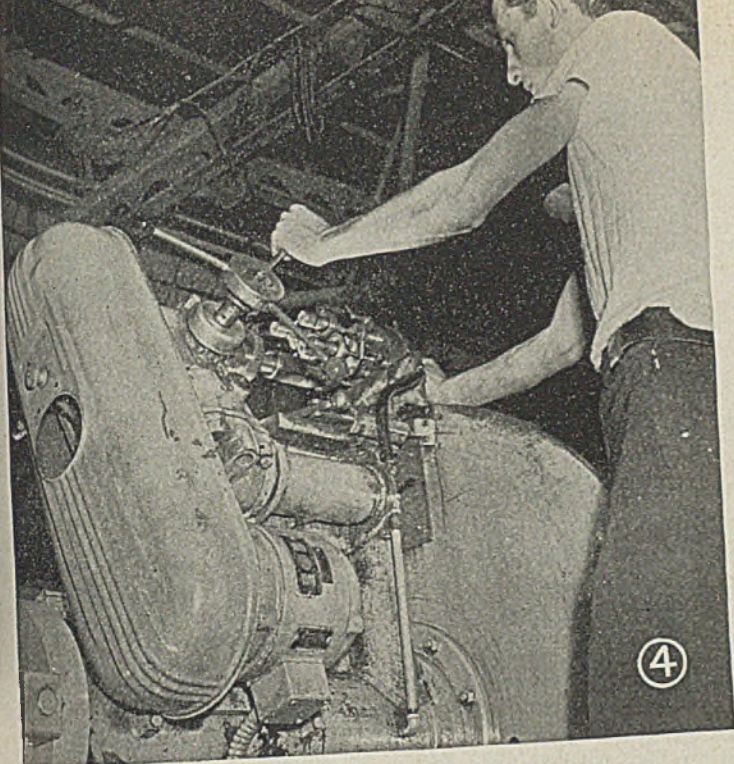
With the master jig, one operator now accomplishes in 45 minutes what formerly required three men and a total of 3 $\frac{3}{4}$  hours. The machine takes care of drilling 11 holes, reaming 11 holes, milling 15 surfaces and back spot-facing 11 forgings, all to rigid specifications.

It was in operation at the beginning of 1942, and it is estimated that 16,800 man-hours were saved by it in a year through whittling down volume of rejections and rework.

Soundness of the basic idea is evident since the unit stands virtually as it was first developed, with only minor changes, such as substituting hydraulic for pneumatic power to insure a smoother feed on the mills for the wing fittings.

To accomplish the multiple operations, 12 motors were adapted to the needs of the jig. Of these, four are standard drill press heads, see Fig. 4, mounted horizontally at each wing fitting station. These are manually controlled, but are arranged so that one operator, standing between them, handles two at a time. A turret





## DRILLING JIG

... cuts production time from 675 to only 45 man-minutes

head holds the drill and reamer, while the spindle is fitted with a quick change chuck.

Upon the completion of this drilling and reaming operation through 2 inches of steel, two hydraulic straddle mills rise automatically to position and mill the surfaces parallel and to thickness specifications. One motor for the aft fittings and one for the fore provide the power for the opposed sides. Thus each motor accomplishes the milling of two sides on the righthand fitting and two on the left.

Four engine mount and three monocoque forgings are milled, drilled, reamed and back spot-faced by tooling units mounted on the periphery of a freely revolving disk at each end of the jig, see Fig. 5. These disks are actually turret heads in their own right, with smaller turrets attached. The arc through which the tools move lines up with the forgings so that the necessary stations can be reached simply by rotating the disk.

The milling operation on the face of the forging is done automatically with a simple gear and slip clutch arrangement regulating the cutter feed. Due to slight variations in the position of the forgings, an adjusting mechanism was incorporated in the milling unit by means of which a plus or minus adjustment of 0.030-inch is possible. Fittings which cannot be cleaned up to the required 80 per cent, or which are milled below the tolerance, must be reworked by the welding section, involving the setting

in of a new forging. The clamping-up operation acts to compensate for slighter variations due to weld distortion, with fixtures to make the adjustments fore and aft, as well as up and down, without the forcing that might throw the holes off tolerance in springback.

Tools for the drilling, reaming and back spot-facing of these engine mount and monocoque forgings are, as in the case of the wing fittings, mounted in a turret attachment to the rotating disk. The operator indexes the turret, slips on the chuck and regulates the feed with a standard drill press lever.

The jig is open and provides easy access. The engine mount to be machined can be fitted in from above or either side, thus facilitating the flow from

welding to this station, through cadmium plating and toward the final assembly line.

A scheduled routine is followed by the operator. First the holes are drilled and reamed on the wing fittings on one side. Then, while the milling on these forgings is being performed automatically, the operator drills and reams the forgings in action on these fittings and proceeds in this manner to complete the circuit of the jig. Five minutes for the drilling and reaming of the wing fittings is the maximum time consumed on any one average operation.

This master drill jig is definitely not a toy. It holds to accuracies of 0.008-inch, and so rigid is the adherence to specifications that inspection time has been reduced considerably in addition to the decrease in operator time. It follows, however, that it still takes a full-fledged mechanic to complete the operations, a precision worker who has the feel of machinery.

### Car Engine Made from Scrap Parts by Welding

To eliminate the necessity for using gaskets and to reduce weight, F. H. Andrews, welding superintendent, Paterson Boiler & Tank Inc., 150 Railroad avenue, Paterson, N. J., reports successful manufacture of an engine fabricated entirely from scrap metal by welding.

The 4-cylinder engine has a displacement of 212 cubic inches. Cylinders are made from 3 $\frac{3}{8}$ -inch inside diameter tubing 7 $\frac{1}{4}$  inches long fitted with a head made from a solid piece of shaft 4 inches in diameter by 1 $\frac{1}{2}$  inches long welded to one end of tubing after having been machined

to 7-inch radius on outside and 5-inch radius on inside of combustion chambers and also drilled and tapped for spark plugs.

Total welding time was 15 hours. Actual machining time was about 150 hours. Motor weight is only 250 pounds.

While cost of this motor was high due to hand building, Mr. Andrews feels a similar design could be set up for mass production at a very reasonable cost, according to his paper entered in the \$200,000 contest sponsored by the James F. Lincoln Arc Welding Foundation.

By H. W. GILLET

Prepared for the War Metallurgy Committee of the National Academy of Sciences and the National Research Council, advisory to the National Defense Research Committee of the Office of Scientific Research and Development and the War Production Board

## Specification of

(Continued from last week)

Fig. 10 is plotted from "standard end-quenched hardenability test" data. This test consists of quenching one end only of a 1-inch diameter bar and noting the hardness on the outside of this bar (lightly ground to a flat for hardness measurement) at varying distances from the quenched end. The standard, or "Jominy" end-quench hardenability test is described in detail in the Society of Automotive Engineers Handbook, 1942, pages 315-324, and in References 6, 9, 10b, 11, 12, 13, 14<sup>18</sup>. The relation between the distance-hardness curve and the quenched hardness of rounds of different diameters is shown in Figs. 11 and 12a. Fig. 12a shows hardenability curves for high and low hardenability heats of manganese chromium-molybdenum steel. The dotted curve at the right shows that, in a 4-inch section, water instead of oil-quenching brought up the surface hardness of the low hardenability heat, but its center was still soft. Fig. 12b shows a method of plotting used by B. F. Shepherd which brings out the difference in hardenable diameter met in steels made to one of the NE chemical specifications.

This difference in hardenability between different heats points the same moral as does Fig. 10; that is hardenability needs to be determined for each heat and not be assumed on the basis of chemical composition.

Ultimately we may expect all steel mills to develop rapid methods of hardenability testing that will evaluate the behavior of the steel while it is still molten, so that corrections can be made while there is still opportunity to do something about it. When that day comes, steel of precisely controlled hardenability will be assured, just as steel

In the Third Installment of this important report prepared for the war metallurgy committee, the author predicts that steel of precisely controlled hardenability may be available in the future just as material of controlled grain coarsening propensity now may be had—selection of suitable material to withstand service stresses also is discussed

of controlled grain coarsening propensity is now obtained with scarcely a miss. Misses in hardenability are not yet always avoided and it is necessary to test the finished steel to find whether the bull's-eye was hit.

### Use of Hardenability Data

The application of the hardenability curve to the selection of a substitute steel is clearly brought out by the Republic Steel Corp's. discussion<sup>19</sup>.

"Speaking in the simplest terms, to develop a new steel analysis to replace an old one requires that end quenched tests be run from both analyses quenched from their optimum temperatures. The ideal condition would be attained if the end quenched curve from the new analysis coincided exactly with that produced by the old one throughout the length of the specimen.

"To substitute one steel for another in a given part, the following steps are necessary:

"First—Determine the cross section hardness of satisfactory finished and quenched parts, preferably undrawn.

"Second—Develop an end quench curve from the original steel and mark the points on this curve at which hardness equals that obtained from cross section of parts. In other words, find where the surface hardness of parts falls on the end quench curve, also midway and core or other critical locations, and mark them plainly as key points.

"Third—Select a substitute grade

which has an end quench curve that matches very closely the key points marked on the original curve as representing cross section hardness of original parts. To do this it is only necessary to determine what hardness is wanted, translate this into terms of the end quench curve and then compare it with like curves obtained from those steels being considered as substitutes. All end quench tests should be quenched from their optimum temperatures.

"Take a simple example of a 2-inch round shaft made of SAE-3145 oil quenched with a minimum surface and a center hardness requirement of 50 and 40 rockwell C respectively before drawing.

"First—Cross section hardness was checked on the shaft and revealed 53 rockwell C on the surface and 45 rockwell C in the center.

"Second—An end quenched test was made from this material and 54 and 44 rockwell C fell at 5/16-inch and 3/4-inch from quenched end, respectively. The points 5/16-inch and 3/4-inch from quenched end were chosen as key positions because hardness at these locations most closely matches the surface and center hardness found in the original shaft, and, considering the 50 and 40 rockwell C minimum requirement, this seems to be satisfactory. This hardness will be increased if the finished shaft is subjected to an agitated instead of a still quench.

"The distances of 5/16-inch and 3/4-inch from quenched end are now established as being the points on the end quenched specimen that correspond to the surface and center of a 2-inch round. Any analysis that matches the hardness obtained from the original steel

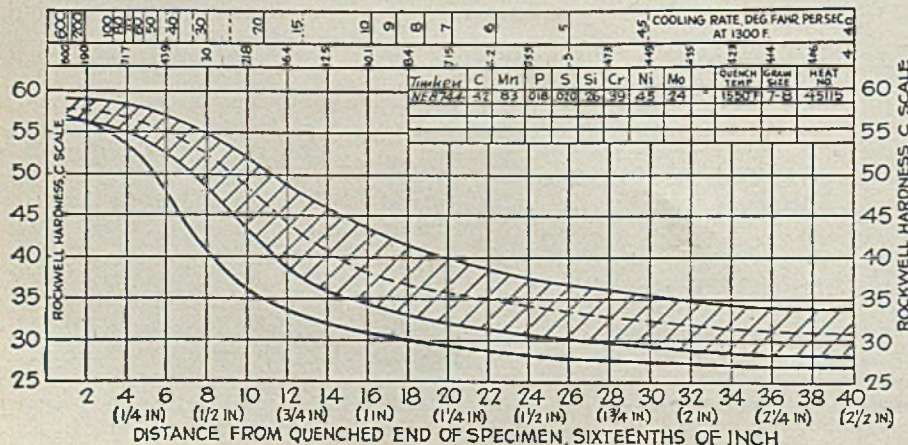


Fig. 10—The dashed line indicates the average hardenability usually met for steels within the NE-8744 range of chemical composition. The hatched area indicates the range of scatter commonly met. The lower, solid, line shows the actual hardenability of one heat that was expected to fall within the hatched area

the Selection, Evaluation and

# METALLIC MATERIALS

at these locations is acceptable as a substitute, so far as hardenability is considered.

“Third—In reviewing several end quenched curves produced from various analyses, one was found that gave 55 and 43 rockwell C at 5/16-inch and 3/4-inch, respectively. This hardness is within one point rockwell C of that obtained from the original steel and is therefore considered satisfactory from a hardenability standpoint.

“Many other examples of the end quenched test could be cited, but they would only confuse the preceding outline which contains all the information necessary to make any ordinary substitution up to the point of making and testing actual parts.”

Other similar explanations are found in References 10-14 and elsewhere<sup>20</sup>.

If one compares hardenability data for SAE-3140 and NE-8339, 9440, and 9640 as in Fig. 13 (Data from Reference 10b and STEEL, March 15, 1943, pp 94-95, 117-120) it is seen that, for the particular heats tested, and on the criterion that 50 rockwell C denotes sufficiently complete hardenability, the 8339 and 9440 steels will water quench to that center hardness in about 2 1/4-inch and 2 1/2-inch diameter, respectively, 3140 and 9640 in 1 3/8-inch diameter. When oil quenched in 2-inch diameter bars, a ring will quench fully in all four, but the center core will be about 48 rockwell C in 8339 and 9440, and only about 40 rockwell C in 3140 and 9640, and the soft core will be larger in the latter two.

Thus, if 3140 was adequate in oil quenched, 2-inch diameter section for a given use, any of the other three should be adequate.

The intensifying action of suitable hardenability agents is brought out in Fig. 13a and likewise in Fig. 13b<sup>21</sup>. The 9422 is a low-carbon steel, with 0.25 per cent carbon, 1.03 per cent manganese, 0.47 per cent silicon, 0.30 per cent nickel, 0.28 per cent chromium, 0.13-0.16 per cent molybdenum, handled as a split heat, i.e. part was poured without adding the intensifier, the rest with the boron-containing addition. The heat was fine grained, size 7 to 8 in the part with-

out the addition, 7 in the part with it.

As would be expected from Fig. 3, the maximum hardness of this low-carbon steel is less than that of the higher carbon steels of Fig. 13a, yet a similar increase in hardenability is shown.

An exhaustive study of hardenability agents, with special reference to the savings they made possible in the alloying elements, is given by Schenck<sup>22</sup> and referred to in less technical phrasing in Fortune<sup>23</sup>.

### Limitations of Lists of Substitutes

On the basis of the hardenability normally expected from the SAE and NE ranges of composition, steels of approximately equal hardenability are listed in the descriptions of the NE steels (References 10-14 appended), and a slide-rule type “Selector” accompanies Reference 14. Analogous charts are available.

Such lists indicate the promising candidates among possible substitutes. They do not and cannot tell whether the steel previously used had unnecessary hardenability for the section concerned, nor whether a drop below the expected hardenability of a given substitute will be fatal for the projected service. That appraisal has to be made on the basis of the service, not on classes of materials. That is, the width of the permissible scatter band of hardenability curves is set by the service involved.

The “expected” average line within the

hardenability scatter band normally obtained in everyday steel-mill practice for different chemical compositions, with the past finishing practice, is all that the lists or the slide-rule “Selector” can indicate. No list or chart will tell whether an individual heat lies within the permissible scatter band. But a hardenability test will tell.

Some general conclusions as to this point are:

The scatter of properties resulting from differences in grain-coarsening characteristics and in hardenability on successive heats fully meeting the SAE or NE chemical composition specifications, is likely to be too great to be endured in good selection of engineering materials. *The heat number is quite as, perhaps more, important than the SAE or NE number.*

The maximum hardness attainable upon quenching a steel depends on its carbon content. The maximum hardness is predictable from the carbon content, and is determinable from the maximum reading obtained at the quenched end of the hardenability specimen.

If grain-coarsening and hardenability behaviors are specified and tested for, it is immaterial, from the point of view of tensile test results, by what alloying and addition elements or combinations thereof, the final mechanical properties are produced.

One may heartily echo the conclusions of Orton and Carter<sup>24</sup>, who say, “It is

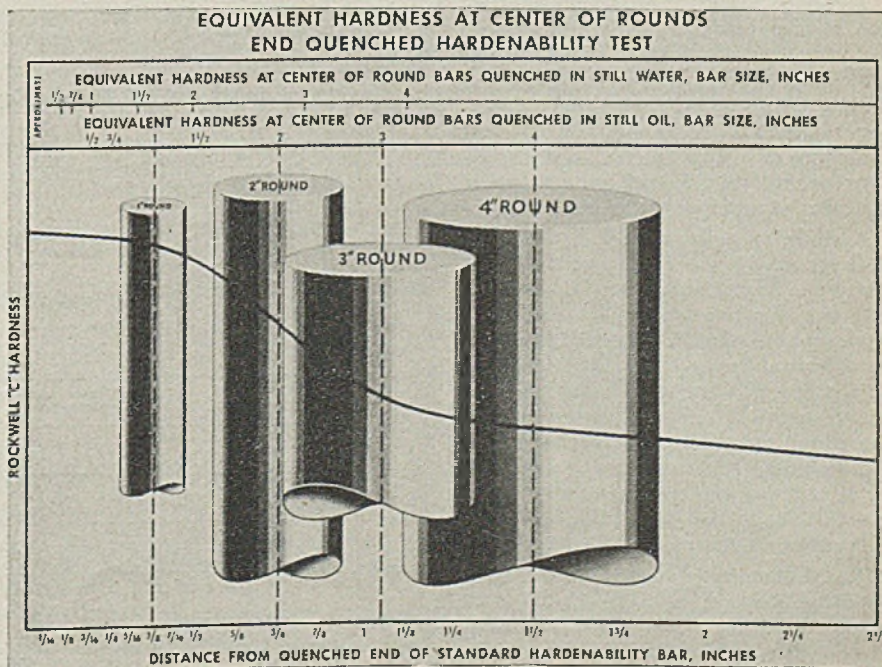


Fig. 11—Equivalent hardness, relation between hardness along quench bar, and center hardness, of rounds of different sizes, quenched in water or oil. See reference 12 appended

regrettable that the NE steels were not drawn up around hardenability and grain size requirements rather than analysis. Such a practice would permit full flexibility to the mills, with the maximum of efficient employment of our alloying resources. It is difficult to understand how, in the face of modern knowledge of the functions of the alloying elements, it can be maintained that it is necessary to know the exact chemicals on 90 per cent of the applications, even with today's severe war requirements. Such a practice would greatly facilitate warehouse stocking, a neglect of which has contributed today to shortages of many components. NE steels should be reviewed and reconstructed with the aid of the most advanced metallurgical knowledge."

That the advantages to be gained by working on a hardenability, rather than a chemical basis, and the lack of logic in the present specification system, are so obvious as to call for comment in a business journal<sup>23</sup>, as well as in engineering and metallurgical journals, is a sign that the present system is unlikely to survive. The American Society for Metals held a special session at its 1943 meeting to discuss "Purchase of Steels on Performance Rather Than Analysis".

#### Minimum Additive Effective

Grossman<sup>20</sup> has clearly proven what was becoming fairly well understood; i.e., that the effect of alloying elements on hardenability is not merely additive, but is multiplicative. The cumulative effect of small amounts of several hardening elements is much greater than a corresponding larger amount of one only. The "residual" alloying elements in scrap thus need only a small amount to intensify their action enough to produce steels whose hardenabilities are on a par with those of the old, much more highly alloyed SAE steels. Application of this principle, in the NE steels, has made it possible to produce the necessary tonnage of hardenable steel for munitions despite the need for still more alloying metals.

The opportunity for increased application of the principle will be widened, the more the user forgets about the old chemical requirements for any steel, including the present NE steels, and specifies in terms of suitability for quench hardening in a given section, a specification that brings the heat number rather than the NE number to the fore.

A study of replaceability of one alloy steel by others was carried out in England by a Technical Advisory Committee, as a war conservation problem, and was reported by Hatfield<sup>21</sup>. He points out that no one would use a Rolls Royce in wartime when a Ford would do. In producing a truck, airplane, destroyer, etc., everything turns on the understanding of the designer's brain concerning availability of materials and the properties of what is available, so that obtainable and suitable materials can be specified.

The Committee found that for parts requiring steel of 120,000-145,000 p.s.i. tensile strength, there were in use—MnMo, CCr, CrMo, 3/2 NiCrMo, 3 NiCr,

3 NiCrMo, and 3 CrMo; all those steels being used to provide the same mechanical result. "The designer might safely use any of these steels for the same purpose".

Moreover, for quite a wide range of dimensions, none of these steels, he says, is necessary at all, for, from an ordinary carbon-manganese steel, suitably hardened and tempered, the same results can be achieved. He suggests dividing steels into classes according to the diameter in which they harden fully. Thus, he groups them as, up to 1 1/8-inch; 1 1/8—2 1/2 inches; 2 1/2—4 inches; and 4—6 + inches in diameter. As Fig. 11 shows, this grouping can be made on the basis of the standard hardenability test. For brevity then, we might speak of such groups as, e.g., "1-inch oil, 1-inch water, 3-inch oil, 3-inch water" etc. steels, without any reference to chemical composition. This is the basic thought of the lists of "equivalent steels" in the SAE-NE comparisons of References 11-14. But these listed comparisons are based on chemical composition and on the "expected average" of hardenability from that composition, which may or may not be achieved in an individual heat.

Another factor is of interest to the production engineer. Successive shipments of steel will doubtless be capable of quenching and tempering to the required mechanical properties when heat-treatment temperatures are juggled, but production needs may require that they be capable of giving those properties under a definite heat-treatment program, without juggling. Among the old, highly alloyed SAE steels, there was a considerable difference in optimum quenching temperatures and also in optimum drawing temperatures and times. Steels

high in nickel take lower quenching temperatures than do those low in nickel. Steels high in molybdenum require higher tempering temperatures or longer times to soften them to the correct hardness and strength than those low in molybdenum. The sluggishness conferred by alloying elements on the propensity toward avoiding the normalized structure and producing full hardness on quenching is often reflected in a sluggishness in the drawing operation.

However, the NE and other substitute steels are forced, by scarcity of nickel and molybdenum, to contain lower levels of these elements than were used in the deep hardening SAE steels, so that these differences are minimized, and quenching and tempering temperatures are not likely to need much variation.

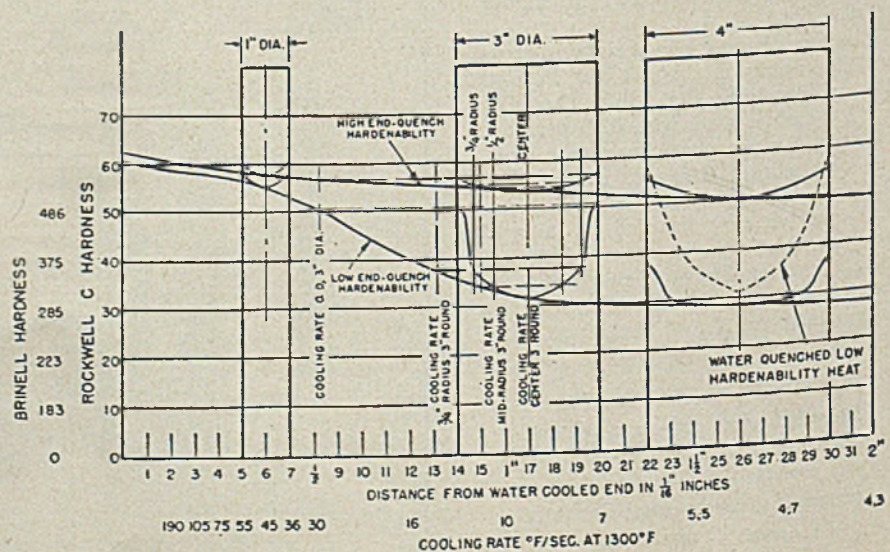
#### Excess Hardenability Undesirable

The user can, if production requirements render it imperative, specify the quenching temperature for the hardenability test as the one he will use in treating the steel, and can further specify that the hardened steel shall temper to a desired range of softness under a definite drawing temperature and time. Each heat can readily be tested for conformity with this requirement. Usually the heat-treater can alter his drawing time more readily than his drawing temperature, so that some adjustments as to drawing time might be made to the idiosyncracies of an individual heat.

Freedom from excess hardenability, as the American Society for Metals points out (Reference 13), is beneficial to the user, since excess hardenability increases the propensity toward cracking and warping in quenching. What SAE steels were previously employed for a particular use

Fig. 12a (Below)—Hardenability curves for high and low hardenability heats of manganese chromium-molybdenum steel. See Reference 14 appended, page 34; solid curves for oil quenching; Wellauer

Fig. 12b (Right, opposite page)—Intersection of carbon line and critical hardness curve indicates hardness of 50 per cent martensitic structure. From this intersection horizontal line drawn intersecting end-quench curve indicates cooling rate necessary to obtain critical hardness. From this intersection vertical line is drawn intersecting quenching media curves. These intersections indicate diameter of round that will just develop critical hardness in center as quenched



is nothing more than the roughest sort of indication as to what degree of hardenability is needed, because of the wide scatter of hardenability in different heats of SAE steels prior to hardenability control, and because prior practice may have called for greater hardenability than the section requires.

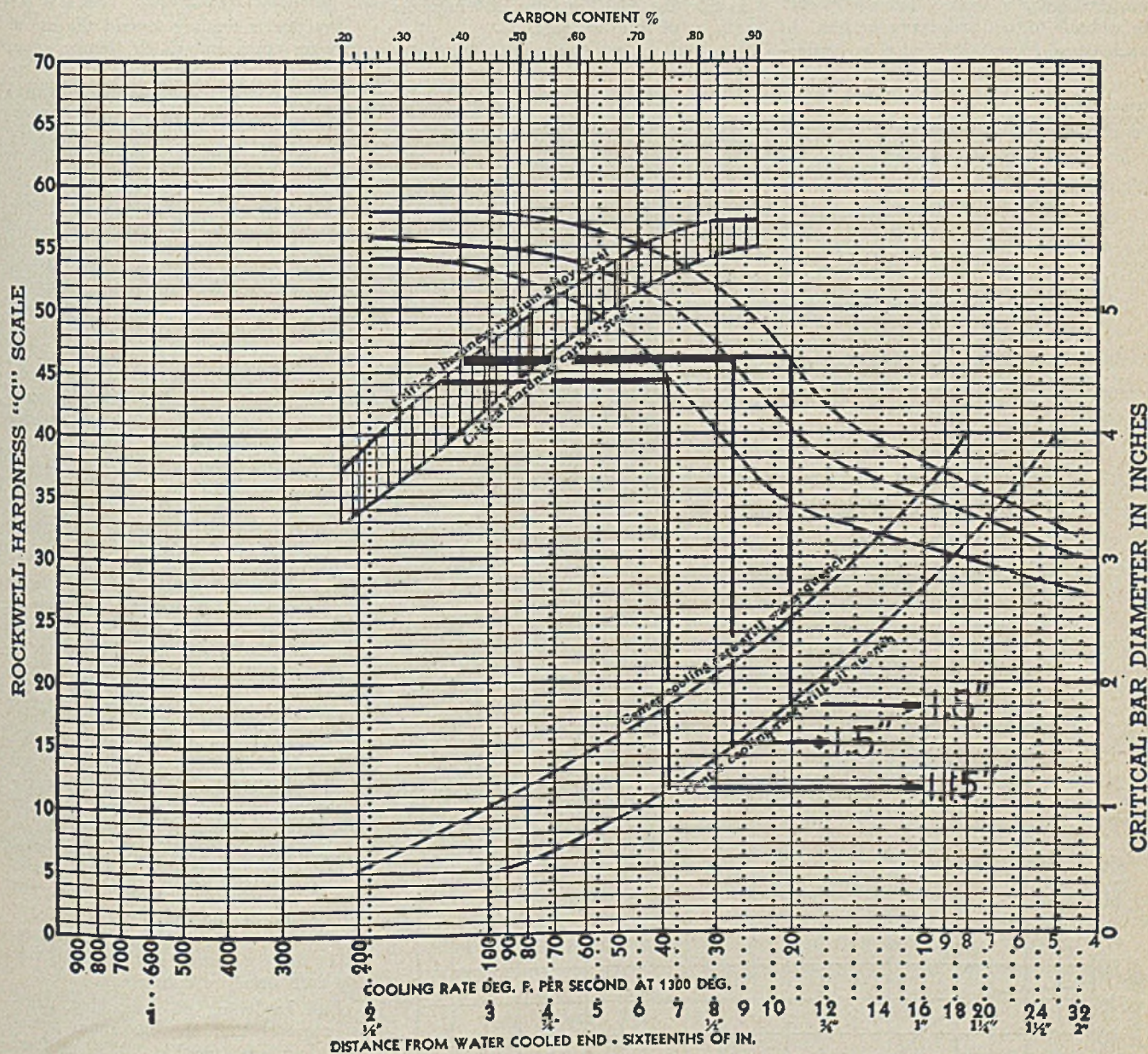
Very often, an unalloyed carbon steel will prove exactly as good in the smaller sections, or where only the surface needs to be hardened, as the alloy steel that has crept into a particular use. Re-exam-

ination of such cases will often bring out unsuspected opportunities for saving alloys.

Another matter of interest to the user is the machinability of the steel. The structure of a substitute steel at the desired final hardness is necessarily the same as that of the steel formerly used, so no marked differences in machinability should occur. Boston<sup>28</sup> has reported that the NE steels are proving equally machinable with the ones they replace, so no trouble need be anticipated

on that score. Roush (Reference 14, page 62) remarks that large lots of NE steels have gone through the machine shop without the operators being aware that a change had been made from SAE steels.

So far we have been dealing with properties closely related to hardness. The heat treatments are varied to obtain equal hardness with various combinations of alloying elements. The great mass of uses of these steels depends on their hardness and related properties, rather



STEEL	HEAT NO.	C	MN	P	S	SI	NI	CR	MO	GRAIN SIZE	TEMPERATURE NORMALIZE	TEMPERATURE QUENCH	
NE 8739		.42	.99				.68	.58	.26	6		1575°	HIGH
"		.37	.81				.46	.46	.22	8		1500°	LOW
"		.41	.88				.53	.51	.24	7		1550°	AVE.

TENTATIVE HARDENABILITY BAND 10 HEATS-13 TESTS

A.I.S.I. SEC. 10 SHEET 135

than on any one or several of the many other properties sometimes required. It is not contended that these various steels, merely because they have the same hardenability, are *exactly* alike in all respects. A steel using molybdenum to gain hardenability, may require a higher tempering temperature to reach a given hardness than if certain other alloy additions had been used. Also, if 0.002 per cent boron imparts the same hardenability as 0.20 per cent molybdenum, the specific gravities of the two steels will not be *exactly* the same, though the difference is about 1 in 1500. In special cases users may require control of one or more properties in addition to the hardness properties. In such cases, mere equivalence in harden-

ability may not be enough. The metallurgist is accustomed to wrestle with such problems, and the answers to some of them are available. Some of these special problems will be discussed in later chapters.

### Incompletely Hardened Steels

Steels heat-treated in sections too large to harden completely to the center, although practically identical in the hardened zones, may be different in the unhardened center. This may or may not be material. The purpose of the core may be primarily to support the strong surface, and if the core is able to do this, the core ductility and toughness may be of little moment.

In earlier days, much importance was

placed on toughness in the core of carburized or nitrided steels with hard, brittle, cases. But when such a case is deformed enough to crack, the crack propagates rapidly through even tough cores, so the piece *as a whole* is brittle. Moreover, even if the piece would stand a little bending without snapping, the bending would ruin most hard-surfaced parts. A rather hard core is needed to support a very thin case and when the fetish of core toughness was accepted, the case upon a soft core has to be made thick enough to support itself, involving a waste in the long time required to produce the thick case.

Practice is tending toward the use of stronger cores and much thinner cases, as well as to flame or induction hardening of a surface skin, which hardening can be done in a jiffy, and for which plain carbon or very low alloy steels not only suffice, but are preferred.

The principle of giving the surface the properties wanted there, without worrying much about the core, is applicable to most wear-resistant services. It is applicable to some, but not all, fatigue-resistant services. In rotary bending, as in the loading of a shaft, the maximum stress is at the surface, the stress decreases so rapidly as the distance from the surface increases, that if you "save the surface, you save all". But in axial loading, as in a connecting rod, where the whole cross section ostensibly carries uniform loading, weakness of the core does weaken the rod.

### Loading Peak on Surface Point

It is generally true, that in spite of ostensible axial loading, the actual loading is not axial but is a maximum at some point on the surface, and that, even here, strengthening the surface is far more effective than strengthening the core.

On this basis, a heat-treated, shallow-hardening carbon or low alloy steel that that gives only a thin, fully hardened shell and a "normalized" core on quenching, when tempered back to the proper structure of the shell, may be quite as good for engineering service as a steel that hardens throughout and tempers to the same structure in both shell and core. But if the behavior of the part depends on getting strength in the core, as in the connecting rod example, then the core structure does count.

Full hardening on quenching, strictly requires that the maximum attainable hardness (see Fig. 3) be obtained *throughout the section*, at the center as  
(Please turn to Page 142)

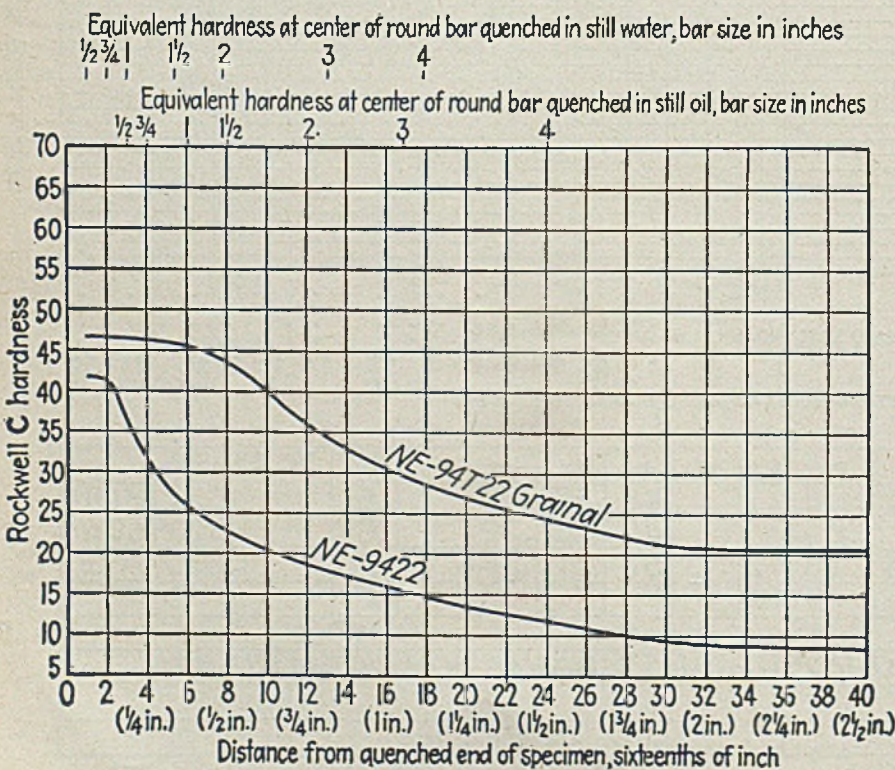
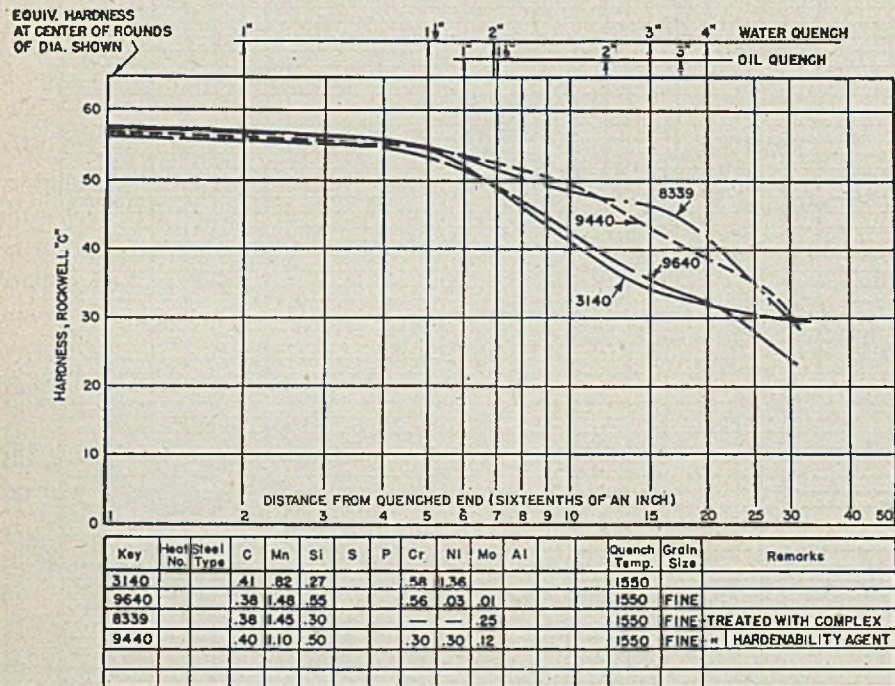
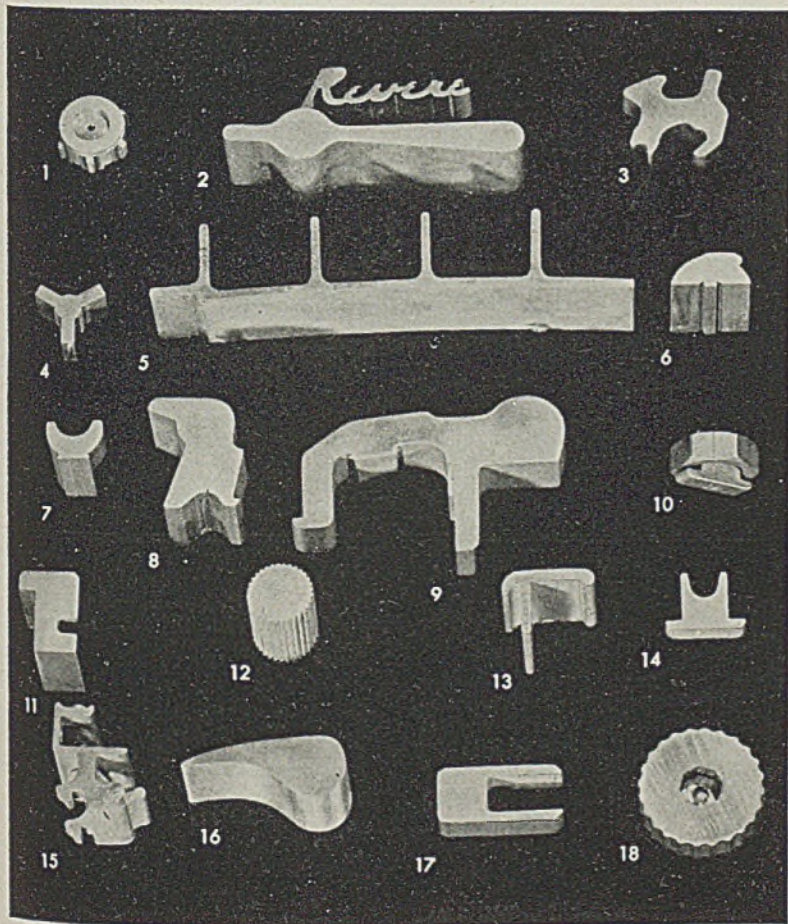


Fig. 13a (Above, left) — End-quench hardenability curves for four steels

Fig. 13b<sup>1</sup> (Left) — Jominy hardenability curves for NE-9422 and NE-94T22 (Grainal treated) steels, quenched at 1550 degrees Fahr.

# ➔ SPEED PRODUCTION CUT DOWN COSTS ←

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# WELDING SPEED

## INCREASED 75%

*. . . . in vital bearing production by changing to larger size of arc welding electrodes*

A STRIKING example of how the use of larger electrodes is cutting time and production cost was noted recently at Cleveland Graphite Bronze Co., one of the largest producers of bearings and bushings for war equipment. An increase of approximately 50 per cent in welding speed since changing from  $\frac{3}{16}$  and  $\frac{5}{32}$ -inch electrodes to  $\frac{3}{16}$  and  $\frac{1}{4}$ -inch sizes was reported. A 75 per cent increase was obtained in one instance.

According to welding experts, this is typical of many similar instances where industrial concerns are obtaining higher welding speeds by applying larger diameter electrodes, a move in war production that is strongly in the interest of greater efficiency advocated by Lincoln Electric Co., Cleveland, a prominent manufacturer of arc welding equipment.

Fabrication of bearing shell cases at Cleveland Graphite Bronze furnishes an excellent illustration of the valuable contributions being made by modern arc welding methods in meeting today's unprecedented output schedules.

At this large Cleveland plant, whose products go into such vital equipment as aircraft and diesel engines, fabrication by welding plays an important part in the production of bearing shells which are made in a wide variety of sizes and shapes. The output of these parts has been greatly increased by effectively adapting the process of arc welding. And recently an even greater efficiency has been added by a step-up in electrode sizes.

The following procedure reveals why arc welding is considered one of the most prominent factors in the production of two types of bearing shells, one for diesel engines and one for aircraft engines. The weld-fabricating methods used are typical of the advances made in this modern process.

**Diesel Engine Bearing Shell Production:** On the centrifugal-type casting job for diesel engines, the bearing shell is made of SAE-1010 or SAE-1020 mild steel. Inside diameter of the shell is approximately 8 inches and the length of the part is  $7\frac{3}{4}$  inches.

In preparing the shell prior to casting the bearing, the solid disk shown at right

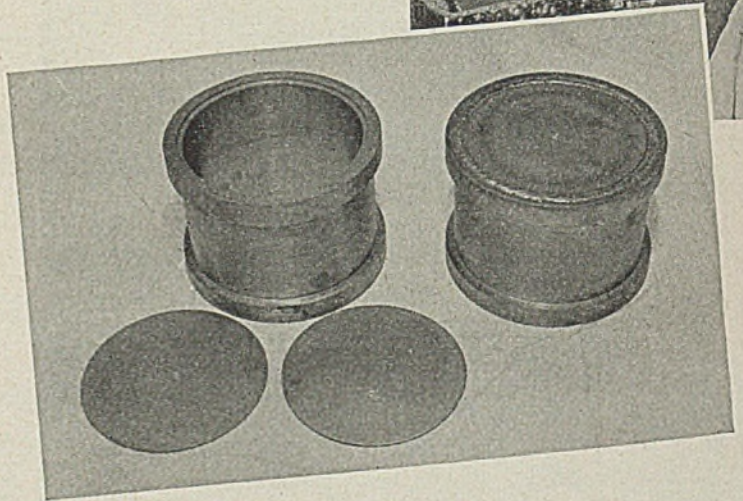
foreground, Fig. 2, is fitted into the recess shown at the top of the machined forging at the left, and is then arc welded around the entire joint.

The welding operation centers around a unique fixture, Fig. 1, especially designed by the company to handle this work. The bearing shell is mounted on a circular plate which is located at the top of a heavy spindle as shown. Seven small lugs extending upward around the edge of the plate hold the work in place.

The work is tilted at an angle by loosening a bolt at the left side of the fixture and tilting the block to a position best suited for the application which, in this instance, is about 15 degrees.

An electric motor with a friction-type drive applies power through a reduction gear hook-up to rotate the spindle and work piece at a predetermined value to give the proper welding speed.

By changing from the former  $\frac{5}{32}$ -inch all-purpose electrode to the present  $\frac{1}{4}$ -



*Fig. 1 (Upper view)—Unique power driven welding fixture shown here rotates work at correct angle. Photos from Lincoln Electric Co., Cleveland*

*Fig. 2 (Lower view)—Shell prior to casting the bearing by centrifugal method is shown at left with sealing disks to seal both ends after bearing material has been placed inside. Shell sealed by welding the disks on its seen at extreme right*

inch size and increasing the welding current to 270 amperes, *welding speed was increased 75 per cent.*

In addition to this faster production, a notable increase in quality of the welds was obtained by a reduction in number of electrode changes. With the smaller  $\frac{5}{32}$  and  $\frac{1}{8}$ -inch sizes, each complete weld required three rods necessitating two electrode changes. With the  $\frac{1}{4}$ -inch size, a complete weld requires about 11 inches of the 18-inch electrode length. The remaining 5 inches of rod is used for the next weld. Hence, two rods are required for making three welds, and electrodes must be changed only once.

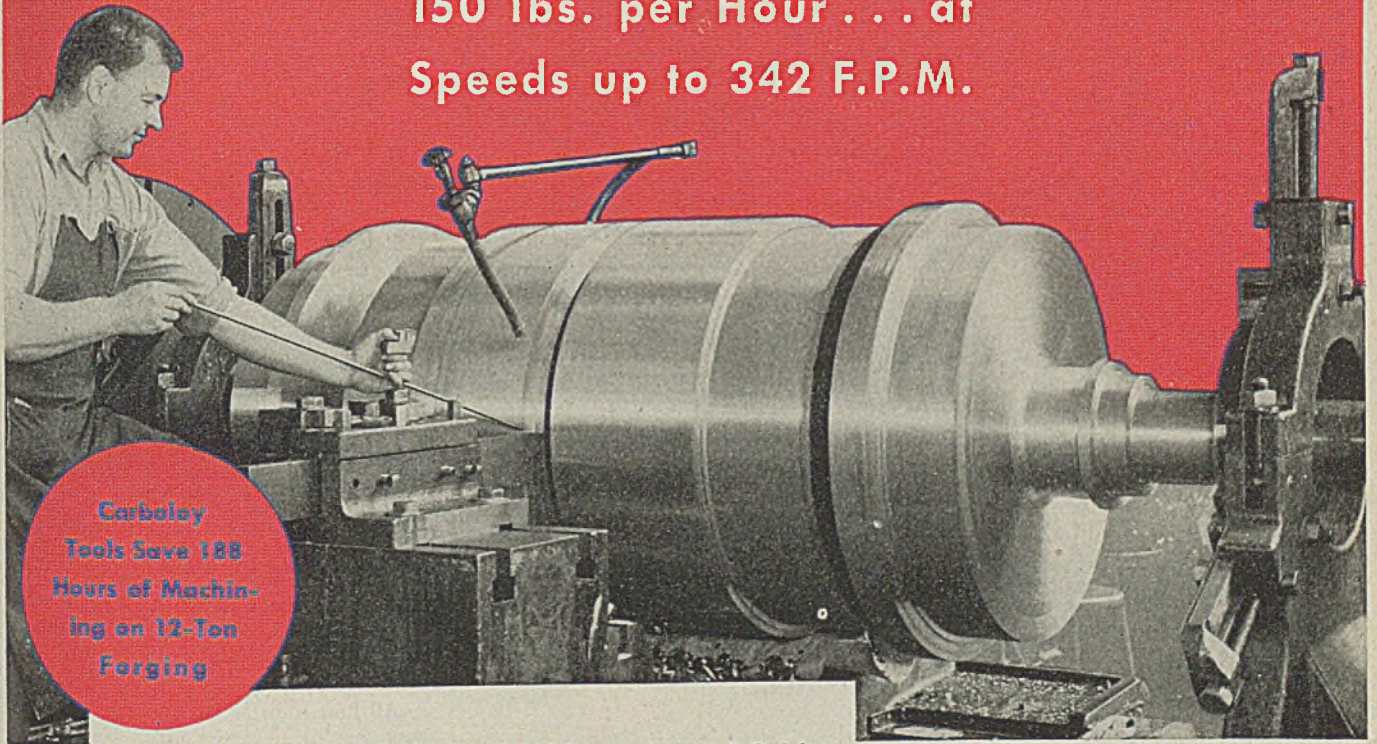
Too, the higher speed permits better quality welds by confining the heat zone to the upper part of the shell flange. With smaller rods, control of penetration and a minimum of slag holes was not possible.

The electrode is held at about the 4:00 o'clock point as shown in Fig. 1 and as the work rotates counter-clockwise, (Please turn to Page 153)



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Speeds up to 342 F.P.M.



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Hours of Machin-  
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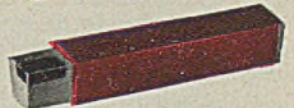


### 10 Standard Stock Styles for Steel Cutting

Style 1



Style 4  
(Style 7—  
left hand)



Style 5  
(Style 9—  
left hand)



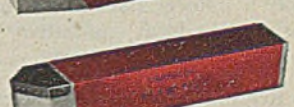
Style 10  
(Style 11—  
left hand)



Style 13  
(Style 14—  
left hand)



Style 12



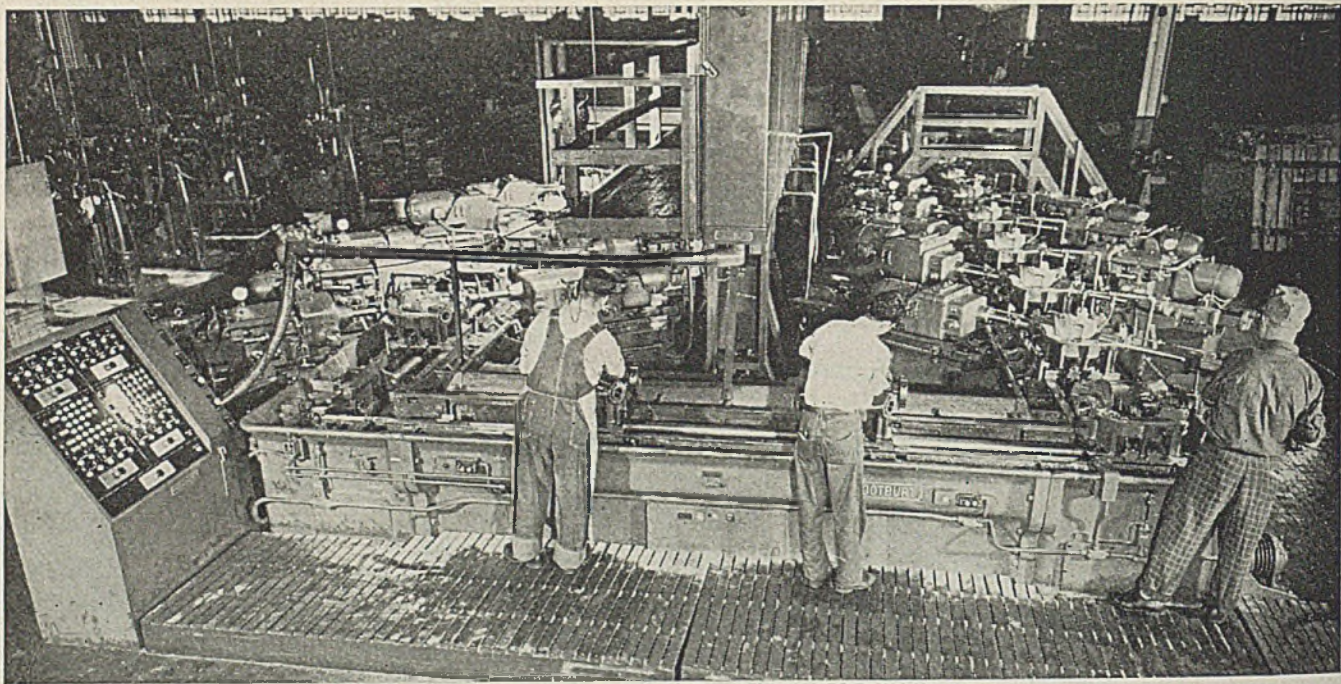
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## 16-STATION AUTOMATIC

### For Boring and Drilling Cylinder Heads

NOVEL type of rectangular closed-circuit 16-station machine for finishing valve holes in aluminum cylinder head castings for aircraft engines is being operated in the Melrose Park, Ill., plant of Buick Motor Division where 14-cylinder Pratt & Whitney radial engines are built. The arrangement is in contrast to earlier practice whereby these operations were carried out on separate groups of machines.

The Buick installation was designed in co-operation with Foote-Burt Co., Cleveland. Essentially it comprises a bed and ways set in the shape of a large rectangle, with the parts mounted in fixtures moving intermittently along these ways, making one complete circuit during the various operations. Machining heads are individual spindle units disposed horizontally both inside and outside the two sides of the rectangle. At one end of the rectangle, the pieces are loaded and unloaded. The other end is simply a transfer track which moves fixtures coming from one battery of heads across to the other battery.

#### Requires Only Three Operators

There are 16 individually motorized but interconnected heads positioned at an angle corresponding to the angle of the valve bosses with the base of the head. Three work stations on each side have cutters coming in from each side. At the fourth and fifth stations the cutters are only on the inside, but pilot bushings advance from the outside to guide the cutting tools.

The following operations are handled

by the various heads, being duplicated on each side of the machine.

- Drill and ream valve guide holes.
- Hollow mill spring pilot, bore spring clearance, face spring seat and face top of valve guide bosses.
- Rough and finish intake and exhaust valve seat chambers.
- Face top of exhaust valve guide holes.

Only three operators are required to man the complete installation, their work being to load and unload the heads and observe the sequence of operations, all other operations such as indexing the fixtures, advancing and retracting the cutting spindles being hydraulically powered and under automatic control. Eighteen fixtures are provided on the unit and during the cycle are positioned six on each side at the work stations with three across each end.

#### Work Travels in Timed Sequence

The head castings are clamped in the fixtures on their sides, the base fitting against a locating ring at the left side of the fixture as it is loaded. Hydraulically powered transfer bars are provided with dogs which engage the fixtures and move them along the ways. The fixture remains in the same relative position throughout the cycle, not being rotated as it passes around the corners of the machine. In the illustration, the fixtures move from the foreground around the rectangle clockwise, presenting the intake valve boss to the cutting spindles as they move down the left side of the machine and the exhaust valve boss as

they come back down the right side. Each fixture is equipped with bushings to steady the spindles as they engage the work.

All four transfer bars operate in timed sequence to move the fixtures ahead one station. After this, the spindles quickly traverse to the work, complete the operations at the various stations and then rapidly traverse backward before the next indexing movement.

#### All Operations Synchronized

By means of a network of relays and switches mounted in the electric control house in the center of the machine, all operations are synchronized and interconnected. A control panel at the left of the operators in the illustration is provided with pushbuttons which permit certain parts of the machine to be operated independently of the rest if necessary. This panel also carries a battery of signal lights to show that each fixture is indexed properly and that each cutting head is in proper position. Each spindle with its drive mechanism is mounted on its own bed and ways, bolted to the main bed of the machine. Coolant and chips drop into the side beds, where access doors permit easy removal of accumulated borings and turnings. After the fixtures traverse the series of operations on the intake side, they pass through a spray washer hood which removes any turnings which may still be clinging to the parts.

Buick now has two of these \$125,000 installations in operation and is planning ultimately on four. One unit of the new system releases 22 men over the former method on a three-shift basis and saves the equivalent of 176 man-hours per day. The two present units replace 21 machines formerly required for a lower production schedule.



# "Coming in on a Wing... and some great instruments"

## ... aided by work well- done by These Men of the Cutting Tool Industry

It happens every day. Roaring through dirty weather, his ship peppered with bullets and shells, a plucky American pilot coasts safely into his home base. Good flying and *good instruments!*

The mass-production of good instruments for America's gigantic air forces—as well as all branches of the armed services—brought forth plenty of problems of special seriousness to the cutting tool industry.

For example, the mass-production of certain types of aviation instruments, shell fuses, time fuses and other materiel demanded the creation and big-volume output of fine pitch hobs—of an accuracy and fineness that would have been termed impossible just a few years ago.

Typical of the way problems like that were solved is shown in the on-the-job meeting of



the cutting tool field engineers pictured above. And in the face of many other obstacles (manpower shortages and material scarcities, for instance) equally tough problems were dispatched with similar skill and efficiency.

When victory is won, war-proved Barber-Colman engineering will then be working to help solve peacetime production problems. When that great day comes, we'll be glad to be of service to you!

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Hobs • Milling Cutters • Reamers • Special Tools • Sharpening Machines

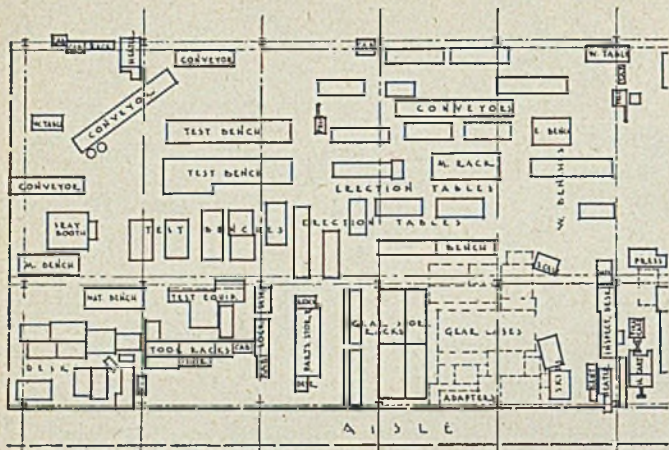


Fig. 1—Original layout used for production of a certain product in a department of a large plant looked like this as formerly worked out

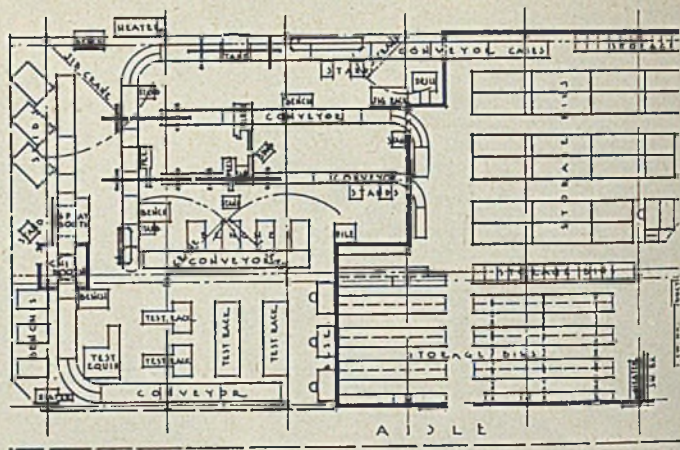


Fig. 2—Revised layout utilizes conveyors. Work stations arranged to permit men to perform only a few specialized functions. Estimated production increase is 47 per cent

## 47% MORE OUTPUT

... obtained merely by more efficient plant layout emphasizes importance of assuring proper flow of material by effective handling methods. Special handling devices form indispensable aid

EXCEPTIONAL value of an effective plant layout in facilitating flow of material through production is something not always fully appreciated. The reason perhaps lies in the fact that improper plant layout cannot be detected very easily. Everyone has had the experience of entering a pleasant office or assembly room with great eye and comfort appeal. However, after sitting in the room for some short time a feeling of discomfort and listlessness was experienced for no apparent reason. To an experienced engineer, however, poor ventilation or im-

By R. W. MALICK

Section Engineer  
Headquarters Mfg. Engineering  
Westinghouse Electric & Mfg. Co.  
East Pittsburgh, Pa.

proper lighting or both were the cause.

Improper plant layout, too, may not always be obvious. In many a plant that appears neat and clean and where the operators seem to be putting forth good effort, production schedules and shipping reports reveal a story entirely out of line with that picture. The causes

may be hidden in improper plant layout.

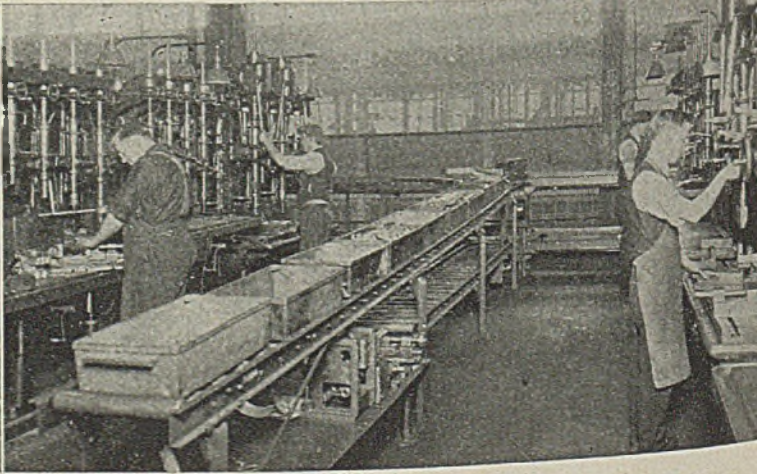
The statement has been made that no factor in industrial engineering causes as great losses and still remains undetected as does improper physical layout of a plant. One of the reasons is that relatively few people are qualified to evaluate properly the effectiveness of a plant layout.

Today production machines are available with almost incomprehensible achievement possibilities. Without proper plant layout however—that is, proper sequential arrangement in relation to other machines and operations—no effective plant pattern can be achieved and a full measure of effectiveness of

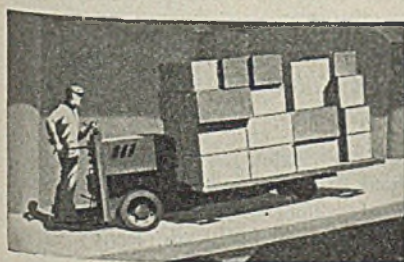
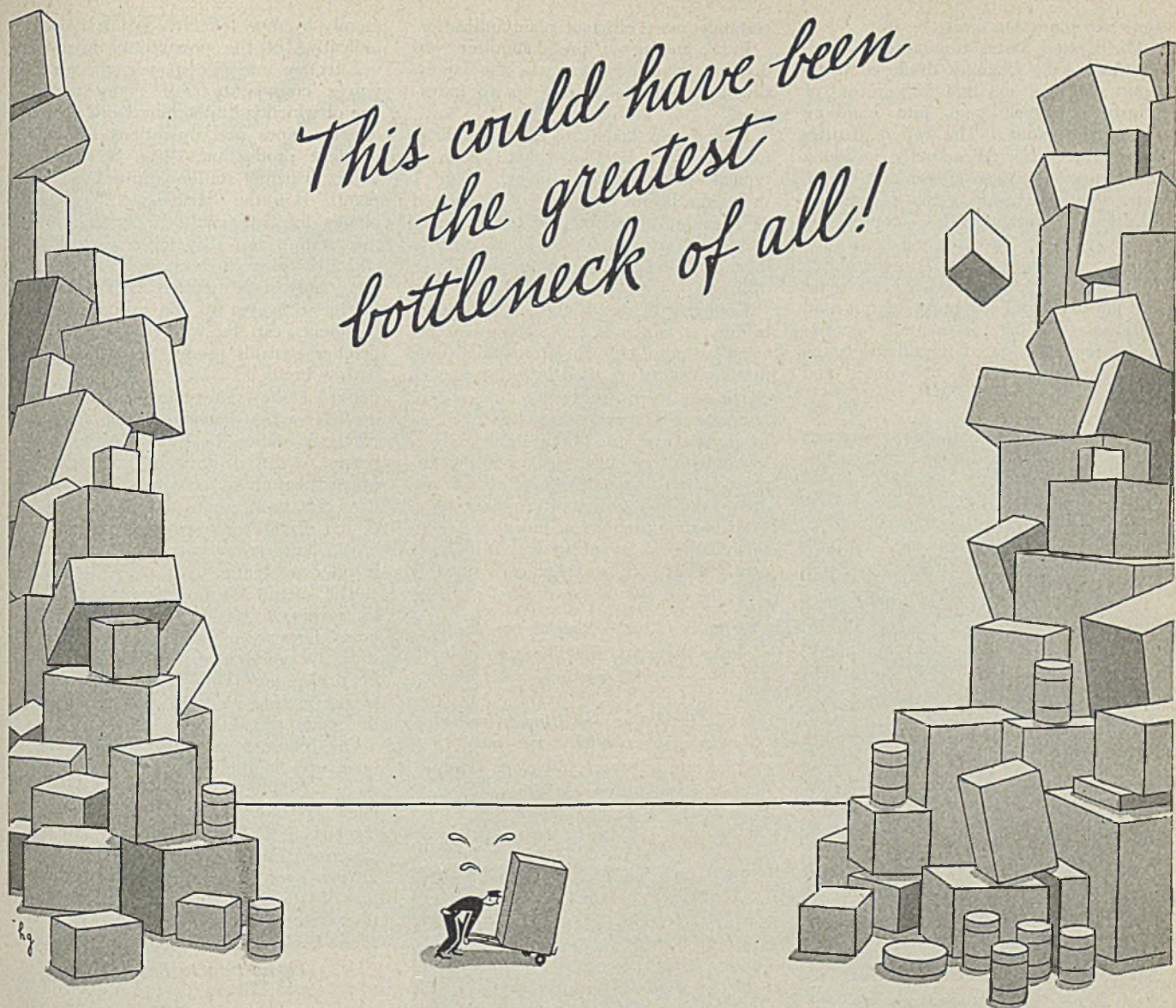
Fig. 3 (Below)—Centralized work dispatch station allows dispatcher to control work in all departments

Fig. 4 (Right below)—Work comes to this drill press group on upper level of conveyors, is returned to central station when completed by placing on lower conveyor level. Fully automatic

From a paper presented before American Society of Tool Engineers, Indianapolis, Ind., Oct. 11, 1943.



*This could have been  
the greatest  
bottleneck of all!*



**M**aterials-handling is no longer a mere matter of "carry and dump" but, an efficient modernized streamlined system . . . contributing heavily to the sharp increase in industrial production. In War Industries and Civilian Production the battle of producing has developed into a "war of movement."

Right in the vanguard of this movement are those fast-moving, powerful, battery-powered electric industrial trucks . . . driven by sturdy Exide-Ironclads. Faster loading, un-

loading, and load shifting can now be done with less waste of manpower. Women can handle jobs that called for husky men under the old procedure. Exides have long been known for their dependability, durability, and ease of maintenance . . . and by helping to shorten the training periods of new workers . . . saving materials through long life . . . they are doing a big job and doing it well.

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these machines can easily be lost.

The United States Committee on Recent Economic Changes disclosed in its report not long ago that 22 per cent of industry's payroll goes into handling within the plant. The report further stated that material actually is being worked on only 35 to 40 per cent of the time, the remainder being devoted to handling operations. In some plants the percentage of actual productive time drops to as low as 15 to 20 per cent.

These figures indicate that no plant can afford to take factory layout and materials handling for granted. As has been previously stated it perhaps is the most fertile field for economies and

certainly more efficient plant utilization.

Final finding of the committee was that materials handling was the largest single item of labor cost in all industries.

Figs. 1 and 2 indicate the possibilities for improved handling that lie in a typical manufacturing plant. Fig. 1 shows the layout used for the production of a certain product. Each operator more or less worked individually. Little mechanical handling equipment was utilized.

Compare this with the layout shown in Fig. 2 which is the same plant revised for more efficient production. Note that conveyors are used to transport materials between successive operations. Here work stations are so arranged as to permit operators to perform only a few specialized functions, thereby improving both the efficiency of the operator and quality of the product.

Estimated production increase due to this change in layout amounts to 47 per cent. That such an increase is possible

merely by more effective plant layout is indicative of the possibilities involved.

Effective use of conveyor systems involves consideration of many factors, one of which is dispatching work to various machines and operations for most efficient production. Fig. 3 shows a work dispatch station utilized at one plant. It is the "business end" of that plant's intricate conveyor system. At this station the dispatcher controls all will all work in the various departments. Since only such material as is delivered by the conveyor to the processing departments can be worked on, the dispatcher controls production within very narrow limits.

Fig. 4 shows a typical work station served by the conveyors from the dispatcher's station in Fig. 3. The work comes to this drill press group on the upper level of the conveyor. When the work has been completed, it is returned to the dispatcher's station by placing it on the lower conveyor level. Operation is fully automatic.

The longest distance any operator has to traverse to get new work or to dispose of work he has completed is the short distance between the conveyor and his drill press. Thus practically no time is lost getting work to and away from the work station.

One plant department which always involves a handling problem is the storeroom. In Fig. 5 is shown an arrangement that has proved particularly advantageous, at least in this plant. In this storeroom the storage bins are arranged in rows over 60 feet in length. Walking this distance would be out of the question. A girl operator, however, can speed back and forth collecting and de-

(Please turn to Page 159)



Fig. 5 (Left)—Special car facilitates storeroom operations in aisles 60 feet long

Fig. 6 (Below)—Tilting roller bed and winches allow one man to pick up, transport and place heavy machine tools and other equipment

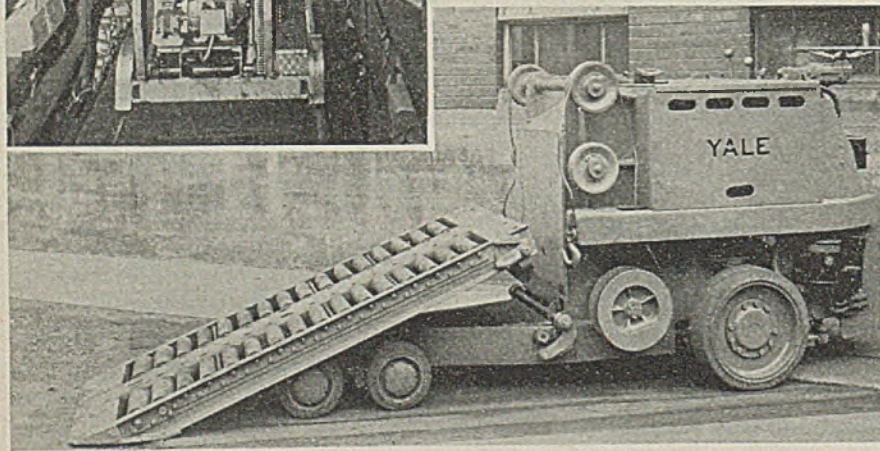
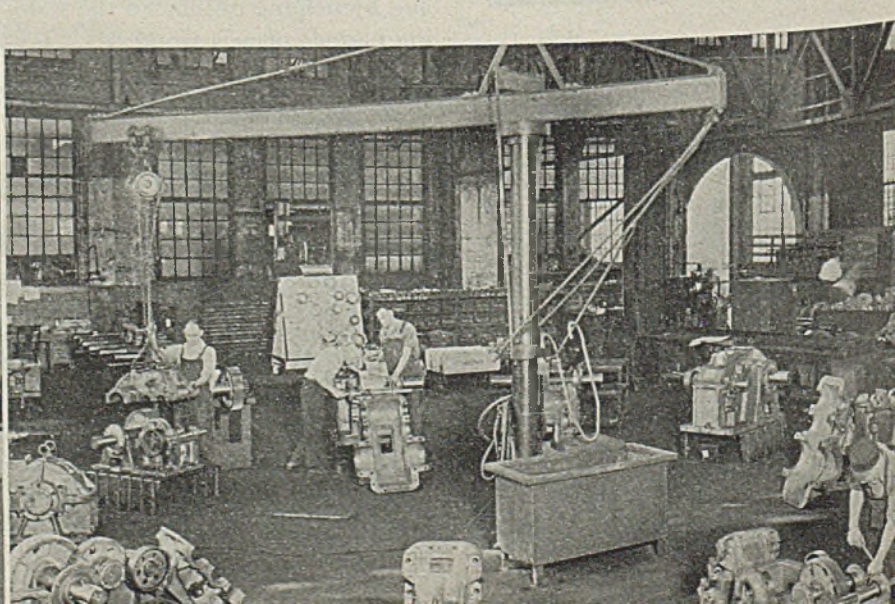
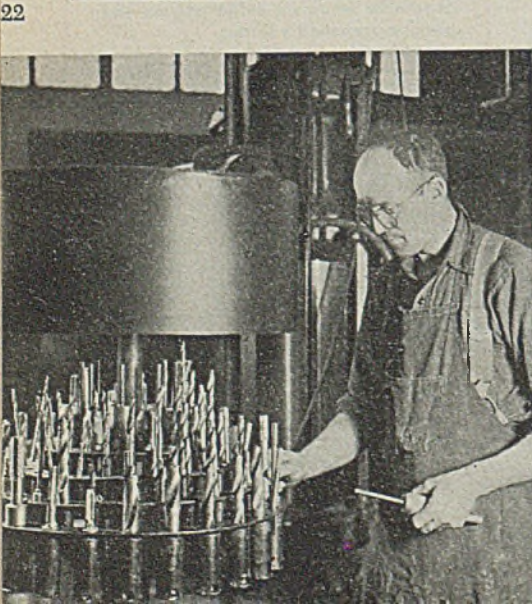


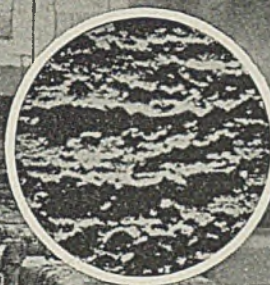
Fig. 7 (Left below)—This tool holder alongside radial drill press allows operator to select tools at will without leaving his work station

Fig. 8 (Below)—Nine work stations arranged radially on this assembly floor are served by single full swiveling jib crane



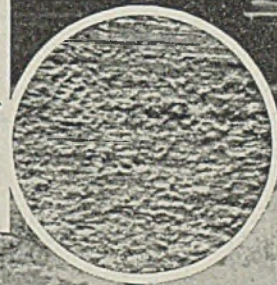
# Rodine

## Makes Pickling Efficient



▲ This steel surface photograph (magnified) was pickled in an uninhibited acid bath. Note the deep pits, and that the surface is visibly crystalline.

This surface pictured was pickled exactly like the other except that RODINE was added to the acid solution. Only scale pockets and roll marks are visible; no pitting occurred.



All steel requires pickling to remove scale whether the fabrication is for steel plates for battleships, airplane parts, motor vehicle or ordnance parts.

RODINE in the pickling bath confines the acid action to removing the scale and inhibits acid action on the clean metal. This controlling action of Rodine in preventing the acid from dissolving clean steel, saves acid by eliminating a needless waste. The life of the pickle bath is increased and better pickling is accomplished.

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CHEMICALS  
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PROCESSES

# Evaluation of ELECTRIC ARC MELTING FURNACES

By W. HARVEY PAYNE  
President  
Hydro-Arc Furnace Corp.  
LaGrange, Ill.

*Units for positioning electrodes are hydraulically operated. Counterbalancing system affords use of small horsepower reversing pump motor for moving fluid during electrode adjustment. Cylinders protected from radiant heat and break-outs by steel-covered insulating plate*

ELECTRIC arc melting furnaces have proved a most useful tool in our war effort in making all kinds of steels in large quantities, for rolling mill products, for manufacture of malleable iron in the duplexing process and particularly for steel castings in the cold melting and triplexing process. Outstanding records show low-cost production of many types of iron castings, notably in making high-grade individual sand cast piston rings.

An electric melting furnace is made up of several different components each of which must be designed and co-ordinated properly to make a tool which is most useful in the production of ingots and castings in the metal industries.

In the past, emphasis has been placed on the use of the electric arc furnace for melting purposes only; today, the emphasis is placed on this type of furnace for *making* all kinds of metals. That is to say, the electric furnace, properly made, not only melts material, but serves the complete function of melting, alloying, and completing duplicate heats of identical analyses with maximum uniformity. Furnaces of the past have been hard and hot to operate, making it difficult to obtain suitable men to handle them. Today, an effective electric furnace will allow the foregoing functions to be carried out with the least hot work on the part of the operator. The modern electric arc melting furnaces, with time-saving and convenient features, will place the operator in a position to make duplicate heats of steel with greatest uniformity and of lowest conversion cost.

The several different component parts which make an effective electric melting furnace are as follows:

**Electrode Positioning Equipment:** This part of an electric arc melting furnace is rightly divided into two other parts, namely, the electrical electrode regulating equipment and the mechanical electrode positioning equipment. Together they are responsible for the automatic movement of the electrode arm to maintain an arc and current flow desired by the furnace operator.

Electrical electrode regulating apparatus on an arc furnace may consist of current or current voltage contacting units, or rotary regulating controls or newest electronic regulators.

**Contactor Regulators:** These are the oldest type now used, but have some disadvantages. They are easily over-damped by maintenance men and are hard on electrode motor service, since they present full voltage across the motor armature for each contactor impulse. This is an important point, particularly for furnace operations which surge a lot, and which have closely loaded motors. Some still argue that a full voltage impulse across a motor from contactor type regulators operating a nonbalanced electrode drive will move the motor for each even slight impulse. This is true but is hard on the motor. The use of contactor type regulators is on the decline.

**Rotary Type Electrode Regulator:** This unit now built by three electrical companies, is a simple generator amplifying combination, in which rectified electrode arc current is balanced against rectified arc potential in the fields of a special small generator for each phase. If arc current flow is too high, this generator puts out electrode motor current in one direction; if arc voltage is too high, this generator puts out current in reverse

direction to the electrode motor. This current output is in some cases amplified by a second much larger generator for each phase, if electrode motors larger than  $\frac{3}{4}$ -horsepower are used. This current output is always in proportion to the degree of arc offbalance for either raising or lowering. Therefore, this electrical rotary control is easier on overloaded motors and saves valuable furnace time, and is used largely today.

**Electronic Control:** This type has no moving parts and can respond electrically in a fraction of a cycle if the furnace mechanical parts can handle this fast response without hunting and overheating. All makes of electrical regulators have to be damped in proportion to the inertia of their furnace electrode mechanical moving parts. It follows, therefore, that the furnace with the lowest inertia (low weight) mechanical electrode positioning equipment, can work best with electrical regulators having correspondingly low dampening characteristics.

**Mechanical Electrode Positioning Apparatus:** In this country this equipment may involve two classes: first a motor winch steel cable drive wherein a steel cable is directly attached to a motor winch drum, or steel cable weight counterbalanced drive; second, a hydraulic system.

**Electric Control:** In a good electric arc melting furnace electrode positioning combination, the mechanical units should be designed to co-operate with the electrical units with low dampening for best electrode operating results. It is important to keep in mind that "good" electric furnace design, in the opinion of operators, is one that produces a rugged furnace with the fewest number of parts and which will do the most tricks as a tool.

The most accurate electrical regulator of an arc furnace control cannot eliminate "hunting" in a poor mechanical drive. This is a case where the electrical equipment reverses so much



faster than the poor mechanical equipment that the latter cannot catch up. It follows that a poor mechanical electrode drive can take some, but not full advantage of the best electrical regulating equipment.

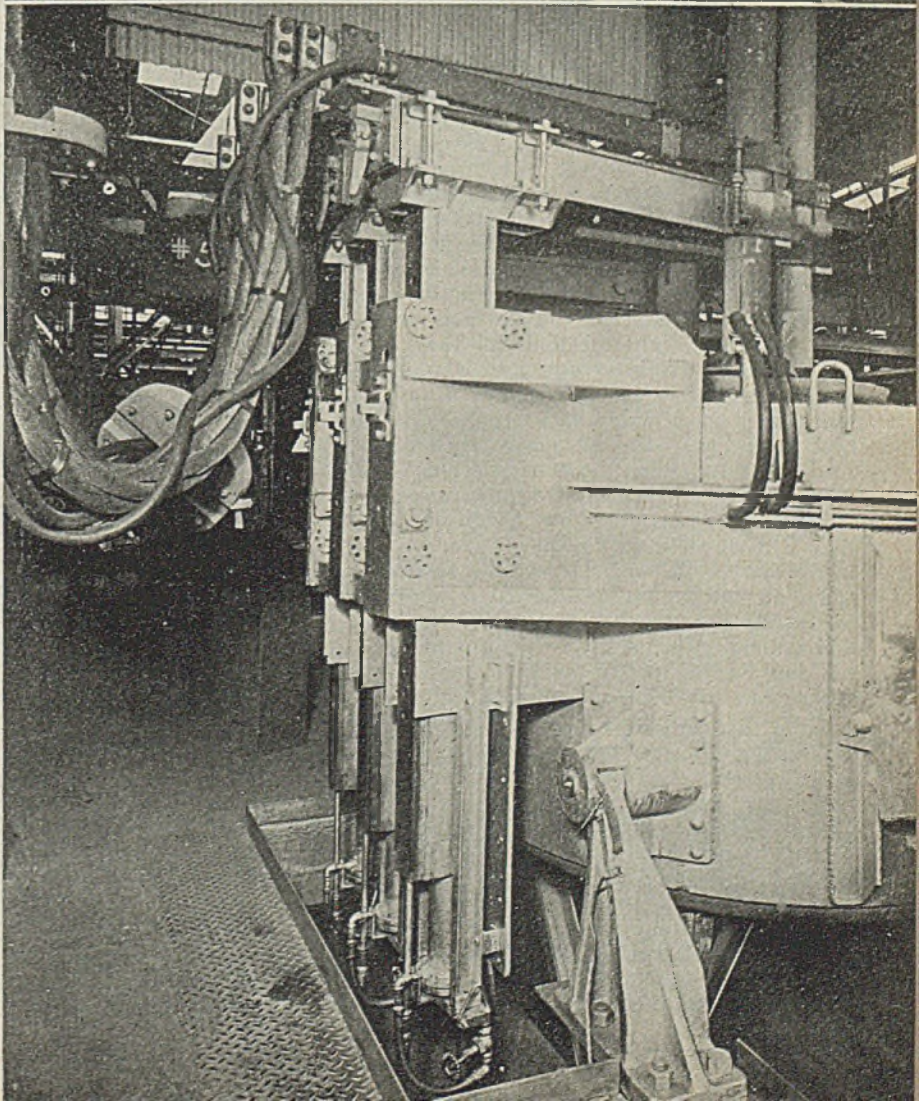
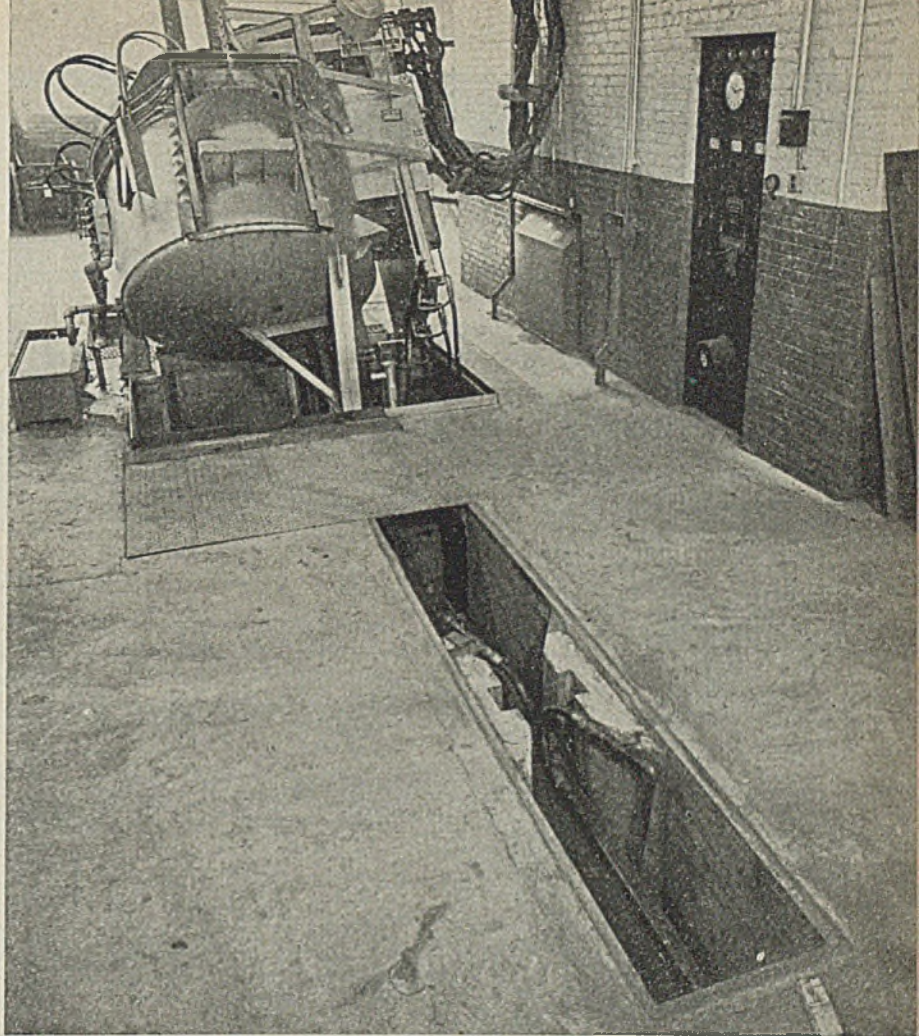
Therefore, in the evaluation of electric furnace controls, the best job is that combination of low inertia, easiest reversible mechanical parts, plus low dampened electrical regulating units. With this combination of accurate mechanical plus electrical units, fraction of a second saved per each reversal will mean several minutes saved per heat because of the many reversals during each heat. To this time saved, which means lower power consumption, there is also less electrode usage, less carbon pickup and less transformer heating from lingering dead short circuit surges. Reduction of surges greatly improves average power factor. These points add up to lower furnace operating costs and give one a more accurate metal making tool.

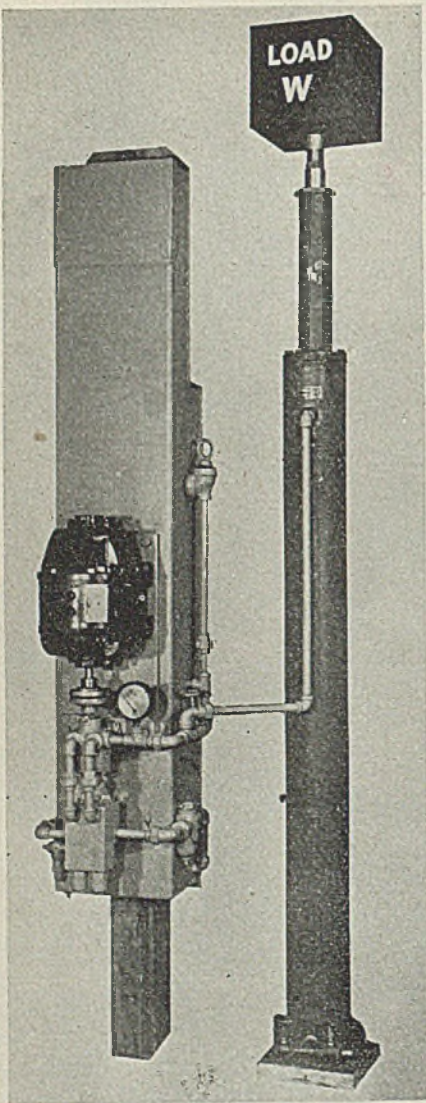
**Hydraulic Control:** In a studious effort to overcome slow mechanical response of electrode moving systems, years of experience was used to design the hydraulic electrode positioning units applicable to the electric arc furnace. Hydraulic controls are known to be extremely fast and accurate. By counterbalancing the weight of the electrode arm and moving parts with low inertia means, the smallest possible reversing metering pump motors can be used to do the actual fluid moving in adjusting electrodes. These small reversing motors are low in inertia and yet large enough to handle the job without surging above their normal full load current rating. When the electrodes are operated from 4 to 6 feet per minute on automatic with these new hydraulic units, the unit can almost pull away from under an electrode arm weight faster than the arm can drop by its free weight because of the unavoidable inertia of the arm and electrode.

The hydraulic unit is designed and built around standard motors and pumps and other equipment in order to get the quickest and easiest service when needed. This is in rather substantial distinction from some European hydraulic designs which use specially-made torque motors and combinations in their arrangement. Originally, the hydraulic unit was located on the back end of the electrode arm supports. It is now placed on an accessible frame in the opening of the transformer room wall immediately adjacent to the furnace. Here it takes up no useful space, is kept clean under cover, and is away from the furnace dirt and heat. Standard oil filters, valves and fittings are used throughout

(Upper right) — Electric melting furnace tilted over 45 degrees. Tilting cylinder is shown in pit in foreground

(Right) — Rear of electric melting furnace with inside shell diameter of 5 feet 8 inches. Hydraulic cylinders for operating electrodes are shown above pit





Shop test setup of single hydraulic electrode operator cylinder. Small reversing pump motor, pump and valve cluster at left; electrode arm weight represented as W at right

normal course of electrode movement. The chevron packing in this unit is at the top of the cylinder and is easily accessible through the removable plate on the side of each vertical extension which entirely covers and protects the operator cylinder. Large-diameter ground piston rods of seamless tubing are used. The counterbalancing means in this case is in the intake side of each metering pump only. This also simplifies the entire mechanism and reduces the number of pipes immediately at the furnace.

The oil metering pump is a standard reversible rotary pump operated at approximately one-half of its high-pressure specification. The motor driving this pump is smaller than that used on any other furnace of like size because it does no more than necessary to overcome the inertia and friction of the arm alone. The small motors do this with ease, without surging above normal current rating. They are of the totally enclosed, ball bearing type. The flexible coupling between the motor and pump is standard and selected according to its low rotational resistance and close fit.

#### System Is Unidirectional

A unique valve arrangement that is combined into a small unit called a valve cluster makes up the rest of the hydraulic equipment. This valve cluster is a standard piece of equipment with the manufacturer. Its use eliminates limit switches on the arm entirely and it makes the hydraulic system unidirectional; that is, it supplies the reversing pump, however short the reversing cycle may be, constantly with cool filtered oil and returns the oil that made one cycle through the pump back to the tank. The design of the details within the valve cluster is interesting in itself in that it prevents "water hammer" and the resulting chatter that is common in valves of this type.

The hydraulic operator cylinders are totally surrounded by a "vertical extension", which is a rectangular box-type structure. The electrode arm sits on top, and is attached to, and electrically insulated from, this structure. To protect the vertical extension and the operator cylinders within the extensions, a steel-covered heat insulating plate is mounted between them and the furnace shell to form draft ducts. This protects them not only from the radiant heat from the shell but also from metal "cut throughs". Each electrode arm on its vertical extension is guided by four sets of rollers. The rollers are specially easy to adjust. They are equipped with tapered roller bearings; four standard roller bearings are used for each set of rollers, and these arm rollers are designed for both radial and side thrust. The radial

thrust adjustment can be conveniently made without disturbing the side thrust, and vice versa. This is much better than the earlier design where adjustment was made with shims against a straight bearing type roller. The tapered roller bearings have large enclosed grease pockets and are lubricated with a deflocculated graphite grease. All rollers have accessible external pressure gun fittings.

(Concluded in Next Issue)

## Girdler and Keenan Recount Steel History

*Boot Straps*, by Tom M. Girdler; cloth, 469 pages, 5 $\frac{3}{4}$  x 8 $\frac{1}{4}$  inches; published by Charles Scribner's Sons, New York. *A Steel Man in India*, by John L. Keenan; cloth, 224 pages, 5 $\frac{1}{2}$  x 8 inches; published by Duell, Sloan & Pearce, New York, for \$2.50.

Valuable additions to the history of the world's steel industry are these two autobiographies of men who have had a leading part in the building up of important units, one in the United States and the other in India. They mirror development of one of the most significant phases of steelmaking and in treating of the part played by each a great deal of historical matter is covered, development of processes, growth of other leaders, economic and social implications that are part and parcel of the industry.

Tom Girdler's story touches a period in which far-reaching developments in labor relations were in the making and he recounts his reaction to the forces that were pressing to the front. From his father's cement mill in Indiana to head of the Republic Steel Corp. and then to leadership in an important unit in the airplane industry he sets forth his labor ideals and staunchly defends the right to work regardless of organizations which he feels tend to enslave the wage earner.

John L. Keenan does a similar job in recounting his experience in the growth of the great Tata Iron & Steel Co. Ltd., Jamshedpur, India, largest in the British Commonwealth and twelfth largest in the world. In the telling Mr. Keenan reveals the high ideals of the Tata family, its founders, and the great contribution to its success of Charles Page Perin, Julian Kennedy and other American leaders in steel and blast furnace development. Sidelights are presented in the political and labor situation in India as well as the social structure of a diverse assemblage of peoples with widely differing religious and ethnological heritages.

Both books are written in an easy style and neither goes deeply into technical explanations, the result being highly readable and entertaining, bearing the marks of honesty in every line. Everybody in the steel industry can gain much information from their pages.

Boyden Sparkes collaborated with Mr. Girdler in the preparation of his autobiography and Lenore Sorsby in the Keenan volume. The latter also has a foreword by Louis Bromfield. The Girdler volume has a valuable index, which adds much to its value.

and one high-grade oil is used in all operations on a furnace for simplicity.

Where it is necessary to use a flexible connection in the oil lines, high-pressure oil-resistant rubber hose is used. High-pressure hose is used for this low-pressure unit to avoid "breathing". The only oil supply tank is vertical to conserve floor space, and is located in the transformer room where it is relatively cool and clean. The oil supply tanks hold about four times the amount of oil needed for operation as a reserve, so that they will run for a great length of time without attention. Sediment space is allowed in the tanks below the fittings, and all oil is cross-flowed about 30 inches between baffles for cooling and settling. The oil always returns to the tank on one side of the baffles and always goes out of the tank at the other.

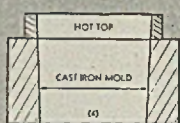
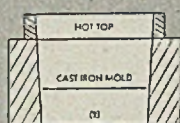
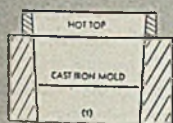
In a hydraulically-operated electric arc melting furnace, the electrodes are moved or positioned by hydraulic cylinders. Air up-push may be applied against a double-packed piston with oil in the top end of the cylinder for actual positioning. However, on certain furnace sizes a much simpler cylinder with one set of chevron packing at the top end only now is used. In this case oil is at the bottom end of the operator cylinder, and is pumped in and out in the

# Where Severe Thermal Shock is a Factor

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Standard tapered carbon mold plug.

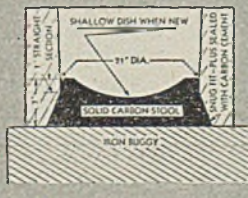
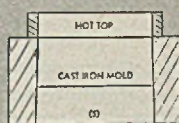
Mushroom type carbon mold plug.

Replacing metal and ceramic plugs.

Carbon or graphite slab as stool insert. Replacing cast iron.

Carbon or graphite stool insert with dish surface. Replacing copper.

"National" Carbon, Graphite and "Karbate" products are successfully meeting many mechanical, electrical and chemical requirements in the metallurgical and process industries. They are available in many sizes and shapes, such as brick — beams — blocks — pipe, fittings and valves — for the fabrication of tanks — tank linings — pipe systems — heat exchangers — towers and other equipment for handling or processing corrosive materials. Write for complete information.

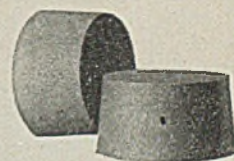


Graphite pouring block. Replacing cast iron and steel.

Solid carbon stool. Replacing cast iron and steel.

are important advantages offered by these materials in such applications as ingot mold plugs, stool inserts, stools and pouring blocks (see sketches of typical applications). Mold and stool life have been prolonged and other economies made possible.

### STANDARD TAPERED MOLD PLUGS



Standard tapered mold plugs are available in two sizes:

$5\frac{13}{16}$ " x  $5\frac{1}{4}$ " x 3"  $\phi$   
 $5\frac{15}{16}$ " x  $5\frac{9}{16}$ " x 3"

Other sizes and shapes of mold plugs, as well as stool inserts, stools and pouring blocks can be supplied to meet any desired specification.

The words "National" and "Karbate" are trade-marks of National Carbon Company, Inc.

## NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

CARBON PRODUCTS DIVISION, CLEVELAND 1, OHIO  
 General Offices: 30 East 42nd St., New York, N. Y.

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Chicago

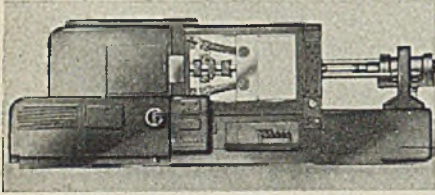
San Francisco

# INDUSTRIAL EQUIPMENT

## Die Casting Machine

A large capacity model 3G high-pressure cold-chamber die-casting machine, equipped with a Vickers 2000-pound pressure hydraulic pump system, has recently been developed by the Reed-Prentice Corp., Worcester, Mass.

Die plates measure 30 x 30 inches. The machine has a clearance between



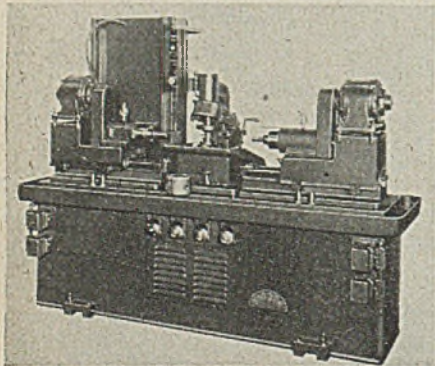
top and bottom frame members of 29 inches. Mold opens 16 inches, and maximum die thickness is 24 inches; minimum, 12 inches. It has a mold closing pressure of 600 pounds. The machine is 203 inches long, 64 inches wide, 72 inches high and weighs 14 tons. A 1200-revolutions per minute 40-horsepower motor is required.

The movable die-plate mechanism can be adjusted through electric motor and screws for different thicknesses of dies. The machine can be operated either manually or semiautomatically.

## Hydraulic Counterbore

To expedite production in the counterboring operation on the ends of aircraft piston wrist-pin holes, the Snyder Tool & Engineering Co., 3400 East Lafayette avenue, Detroit, has developed a new two-way hydraulic machine.

Loading is manual, and the work is located by a pilot entering the piston. Center line of the wrist pin holes is squared up by two manually operated locating fingers. Clamping mechanism is hydraulic, operated by electrically con-



trolled valves. The control buttons of the clamping mechanism are inoperative while the machine is in the work cycle. Spindles are Parker precision with direct V-belt drive and are equipped with single point tools, tungsten carbide tipped.

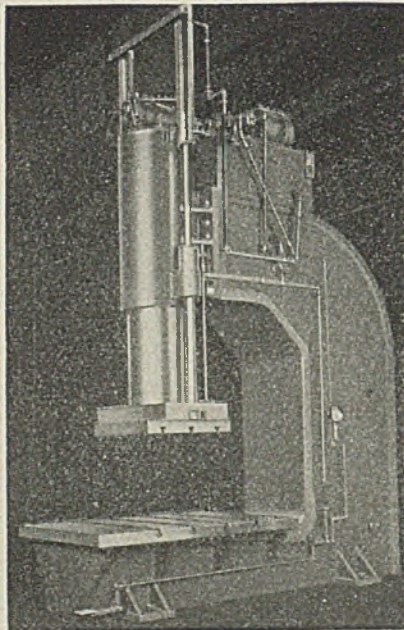
In the work cycle, tools make a rapid approach and feed to the required depth against solid stops, feed return for the

depth of the counterbore and then rapidly retract to the rear of the slide to allow ample loading clearance. Two-way feed is used to assure high quality finish on the work, without tool marks.

Coolant tank is in the rear of the machine and coolant is fed to the work through the fixture to the inside of the piston. All hydraulic equipment is housed in the base.

## Jogging Press

A new, self-contained, integrally built hydraulic press for joggling plates and shapes, heavy forming and bending in shipyards, car shops and tanks shops, and for bridge and structural jobs, has been developed recently. It has a stroke of 36 inches. Its advance speed



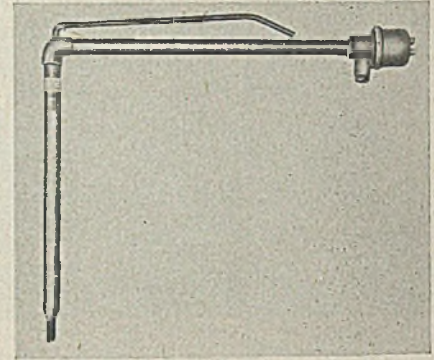
is 130 inches per minute; pressing speed, 12 inches per minute; return speed, 175 inches per minute. Maximum operating pressure of the press is 2000 pounds per square inch. It has a daylight or maximum opening of 69 inches and a minimum die space of 33 inches. Table measures 54 x 84 inches; top platen, 36 x 36 inches; and gap, 54 inches.

This type of machine is arranged for hand or foot control of the ram movement, and is built in capacities from 5 to 350 tons by Beatty Machine & Mfg. Co., Hammond, Ind.

## Thermocouple for Use in Liquid Bath Furnaces

One of the chief difficulties experienced in obtaining satisfactory life of tubes and thermocouples used in liquid baths such as cyanide and salts is contamination of the thermocouple by gases which collect in the protecting tube. To eliminate this condition, the Claud S.

Gordon Co., 3000 South Wallace street Chicago, has developed a vent-type thermocouple which increases the life

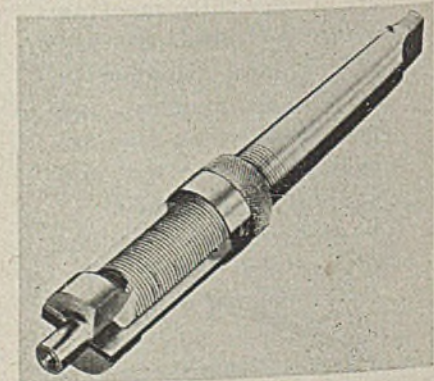


and efficiency of the thermocouple by two or three times. The vent at the top permits the gas to escape and, by artificial circulation, admits the right amount of pure air to take its place. When convenient, an air connection is made with the blower and a very small amount of air is circulated through the tubes. Too much air may make a slight error in reading of the thermocouple. However a small amount will remove the contaminating gases without affecting the thermocouple reading.

## Spot Facer and Counterboring Tool

A new spot facer and counterboring tool featuring a cutter that can be quickly removed for sharpening is reported by Nash-Zempel Tool Division, J. M. Nash Co., 2354 North Thirtieth street, Milwaukee. The cutter is removed by simply loosening a knurled nut and cone nut, and slipping the cutter back out of the bar.

After resharpening, the cutter may be replaced in the bar of the tool where it centers itself when tightening down



the cone and locking the knurled nut. Exact location is obtained by the web in the body which locates the cutter fingers, and the cone nut which centers the rear of the cutter on a straight line with the bar.

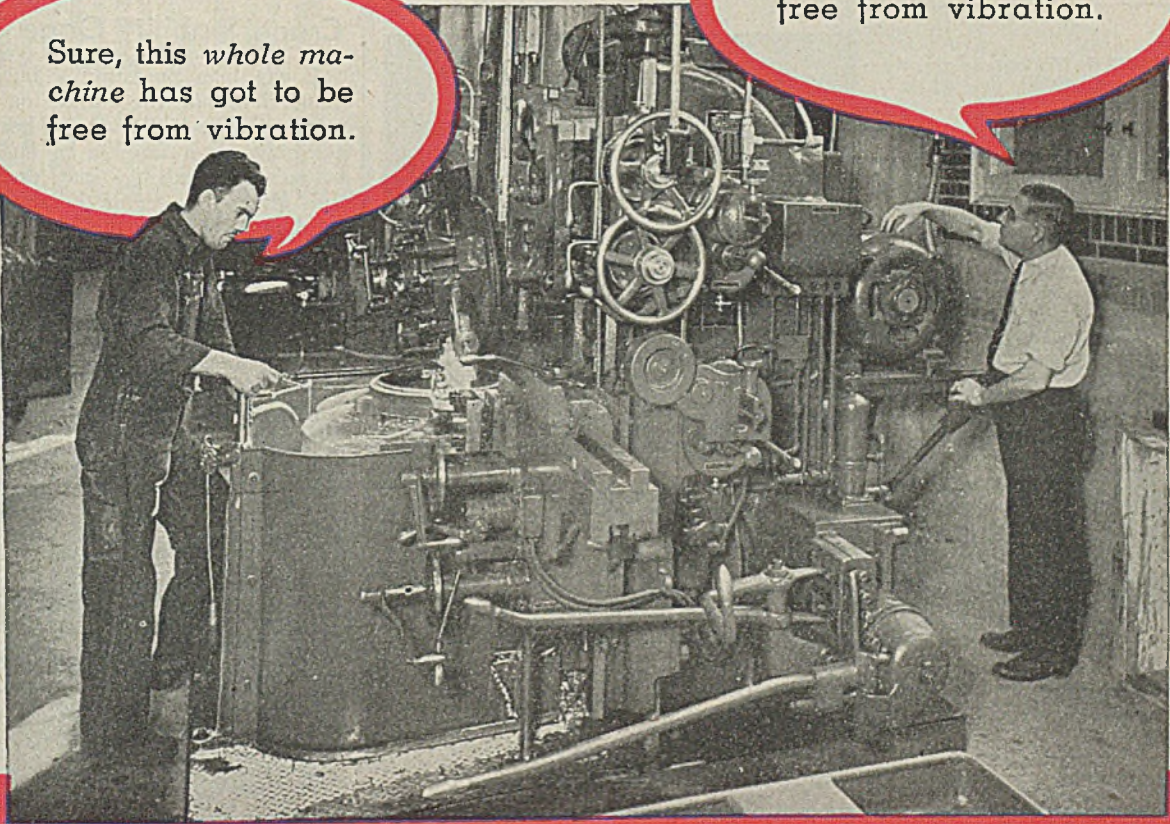
The pilot of the tool is tapped for a screw which holds bushings for various

(All claims are those of the manufacturer of the equipment being described.)

Take a Look at  
**TOMORROW—** *Today!*

Sure, this *whole machine* has got to be free from vibration.

This Century Motor is certainly unusually free from vibration.



**CENTURY MOTORS' Unusual Freedom From Vibration Contributes to More Accurate Machine Tool Performance**

The unusual freedom from vibration of Century Motors matches the precision and accuracy of the thousands of machine tools they drive.

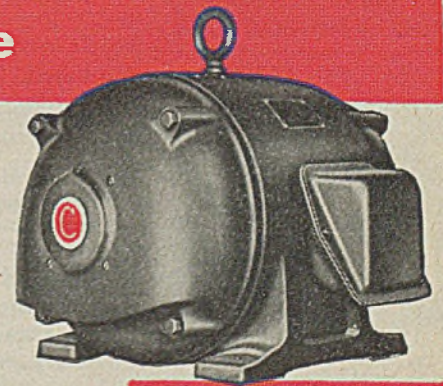
Determine for yourself — put your fingertips on a Century Motor and you'll hardly realize it's running — because of its quiet operation and solid feel.

When tolerances must be held to the closest limits, the rotational balance of Century Motors is all-important, including:

- Magnetic Balance
- Mechanical Balance
- End Bumpers
- Rugged Frames
- Accurately Machined Feet
- Extreme Rigidity

Every contribution to precision workmanship, to increasing the speed of production and decreasing the number of rejected pieces is particularly important today under the demands of War. It is important, too, in peacetime production, as tolerances grow finer and advanced engineering demands extreme precision work.

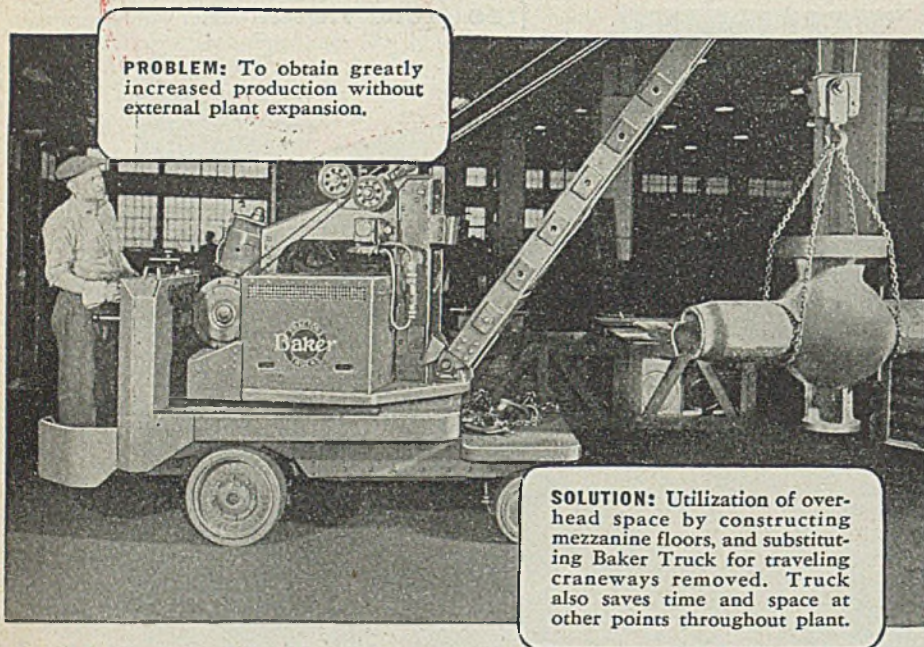
Today and tomorrow, the unusual freedom from vibration of Century Motors grows increasingly important. It will pay you to remember Century for practically all your future motor applications — from fractional to 600 horsepower.



345

**CENTURY ELECTRIC CO., 1806 Pine St., St. Louis 3, Mo.**  
*Offices and Stock Points in Principal Cities*

# How a BAKER CRANE TRUCK solved a tough problem for Bailey Meter Co.



**PROBLEM:** To obtain greatly increased production without external plant expansion.

**SOLUTION:** Utilization of overhead space by constructing mezzanine floors, and substituting Baker Truck for traveling craneways removed. Truck also saves time and space at other points throughout plant.

Bailey products range from small instruments weighing less than 10 lbs. to complete control panels weighing more than a ton. In their manufacture, a wide variety of castings, bar stock and other materials require handling—from incoming carriers, in plant and warehouse, and to shipping. Besides substituting for removed overhead cranes, truck is used to relieve congestion on others, to handle material beyond their limits, to assist in the erection of control panels, to tier material for conserving space in storage, and for a wide variety of operations which were not anticipated when truck was purchased. Thus the company was enabled to attain increased production without increasing plant size.



In erection of control panels, Baker releases overhead cranes for other work.



Small parts in standard boxes are tiered by Baker Truck to conserve space.



Transferring bar stock from incoming cars to storage with Baker Crane Truck.



Baker Crane Truck spotting a large valve in position for crating.



Handling panels boxed for shipment—an awkward job made easy by Baker Truck.

*A Baker Material Handling Engineer may solve similar problems for you. Check with him now for current or post-war needs, or write us direct.*

**BAKER INDUSTRIAL TRUCK DIVISION**  
**of the Baker-Raulang Company**  
 2167 West 25th Street • Cleveland, Ohio  
*In Canada: Railway and Power Engineering Corporation, Ltd.*

size drilled holes. The body and cone nut are always smaller than the outside diameter position no matter how often the cutter is sharpened. The tools are offered in 41 standard sizes, and special sizes to suit requirements.

## Crane Stability Gage

If the man operating a huge boom crane does not concentrate on his job at all times when lifting a heavy sub-assembly for a warship in one of the nation's shipyards, he may easily overturn the whole crane because of the overhanging weight of the load.

To eliminate such danger, H. P. Kuehni of General Electric Co.'s general engineering laboratory, Schenectady, N. Y.,



has developed a crane stability gage that gives the operator a continuous picture of his margin of safety and automatically stops the crane if it takes on too heavy a load or if the boom moves out too far. In the illustration, Mr. Kuehni indicates the danger point on the dial which keeps the operator posted on the stability of his crane at all times.

## Diamond File

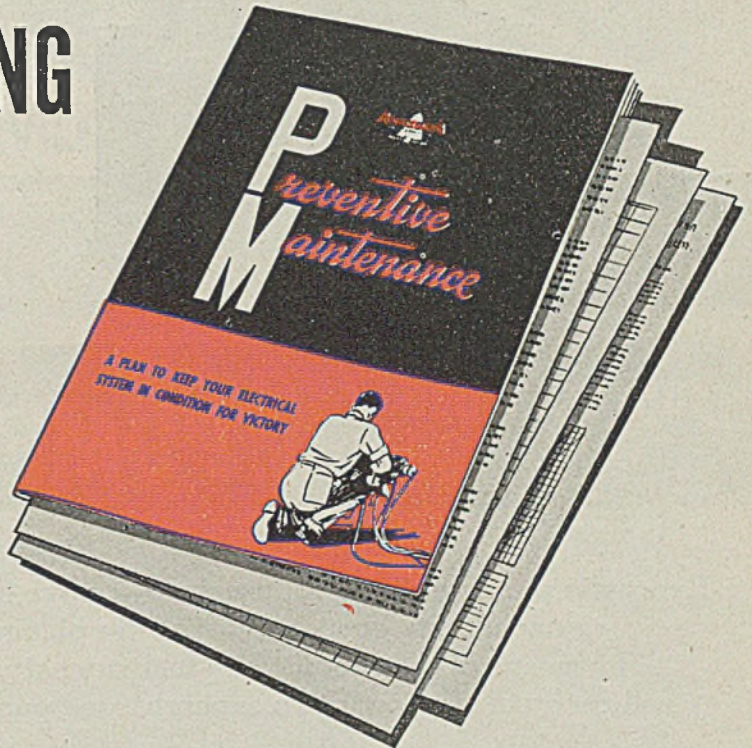
A metal bonded diamond file or hone with 100 concentration is now being offered by Diamond R Agencies, Pasadena 17, Calif. The Diamond R file has wearing qualities comparable to those obtained from a metal bonded wheel over a resinoid bonded wheel. This new metal bonded file will outwear five ordinary resinoid bonded hones and retain a flat filing surface at all times.

The small size of the file (6 x 1/4 x 3/16-inch) permits it to be used on the job, reaching formerly inaccessible places and eliminating costly setups. For exceptionally close work, the complete tool (except the diamond impregnated surface) may be machined to the desired size. The file is used to sharpen all tungsten carbide and high-speed steel tools; stone small radii on carbide tools without grinding or large radii after grinding; dress short angles or small radii on abrasive wheels; take down high spots on dies after they have been hardened; or

**Baker** INDUSTRIAL TRUCKS

# INDUSTRY USING OVER 12,000 PM MANUALS

—because helps  
maintain continuous  
peak production



Though introduced only recently, Anaconda's Preventive Maintenance Plan is already helping many plants maintain continuous production by keeping their electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

To date, over 12,000 Plan Manuals have been sent to industrial concerns alone. Plant management is using them to protect the electric wire and cable on hand . . . to see that these vital copper products are being properly used . . . to detect hidden electrical weaknesses that can be corrected.

## WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop*.

## HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment.

Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

## HOW UTILITIES BENEFIT

The PM plan helps utilities maintain

close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details.

43237A

**"Tomorrow may be too late . . . do it today!"**

ANACONDA'S **PREVENTIVE**  
**MAINTENANCE PLAN**

Anaconda Wire & Cable Company  
25 Broadway, New York City 4

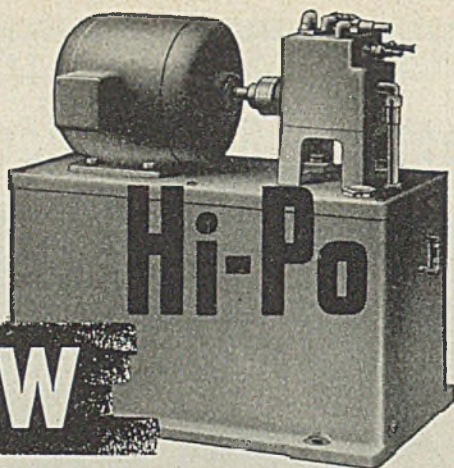
Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding wartime production.

Individual .....

Company .....

Address.....City.....

12 P



the **NEW**

## supercharged 3000 lb. PUMP

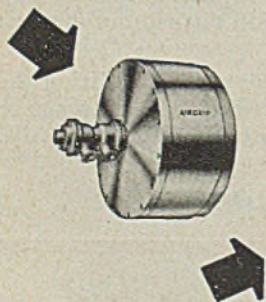
Hydraulic power at 3000 lb. pressure—power that is smooth and chatter free—power obtained by means of a 1/2-hp. motor—that is what you will get from the new Hi-Po supercharged pump.

It is adaptable to the efficient operation of machine tools, arbor presses, hydraulic cylinders for many types of equipment and for many purposes, such as in the plastic arts, die casting, etc.

This new Hi-Po pump is designed for highest efficiency. It consists of a low-pressure section which supercharges a high pressure section.

It is compact, yet all parts are easily accessible. Every material, and every part, used in this pump is selected to give long unfailing service.

Anker-Holth engineers are ready to help with your hydraulic and pneumatic problems—and with no obligation to you.



**"Airgrip" Holding Devices will increase the output of your machines more than 25%—and at the same time greatly reduce operator fatigue.**

# Anker-Holth Mfg. Co.

332 S. Michigan Ave.

Chicago 4, Ill.

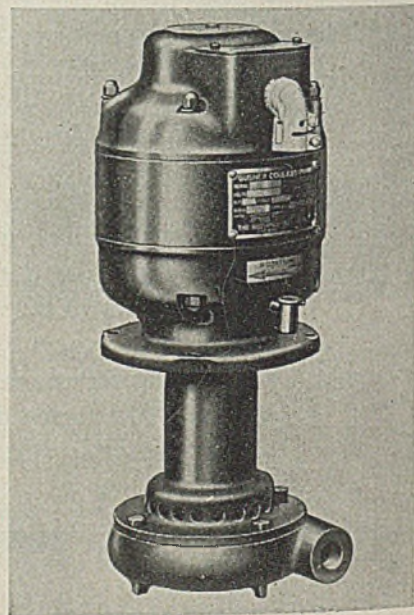
hone lathe tools and remove chip build-up while in the machine.

The diamond grit in the Diamond R file is impregnated in metal to a depth of 0.010-inch on a surface 1 1/2 x 1/4-inch. Three grit sizes are available—coarse (240), medium (420) and fine (400). The 100 concentration, metal bonded impregnation makes the file extremely fast cutting, long lived and difficult to harm under normal usage. The file is resharpened with the same type dresser stick used on metal bonded diamond wheels. A 1-minute application will grind out a small amount of the metal binder and re-expose the diamond particles.

## Gusher Pump

The new immersed type motor-driven gusher pump recently developed by Ruthman Machinery Co., 1819 Reading road, Cincinnati, is equipped with integral flange bracket for reservoir cover or bed-plate mounting.

Known as model No. 9040, it is available in any current characteristics, including 25 cycle; 1, 2 or 3 phase. Its



1/4-horsepower ball bearing motor is totally enclosed, a one-piece rigid shaft extending to the pump impeller. The pump is manufactured in two lengths, the dimensions from the mounting flange to the bottom of the pump being 6 7/16 and 8 7/16 inches respectively.

## Improved Underwater Cutting Torch

Adjustments on the improved underwater cutting torch recently placed on the market by Victor Equipment Co., 844 Folsom street, San Francisco, can be readily made under water without losing parts. In addition, the air mantle is designed so that it limits slagging of the tip.

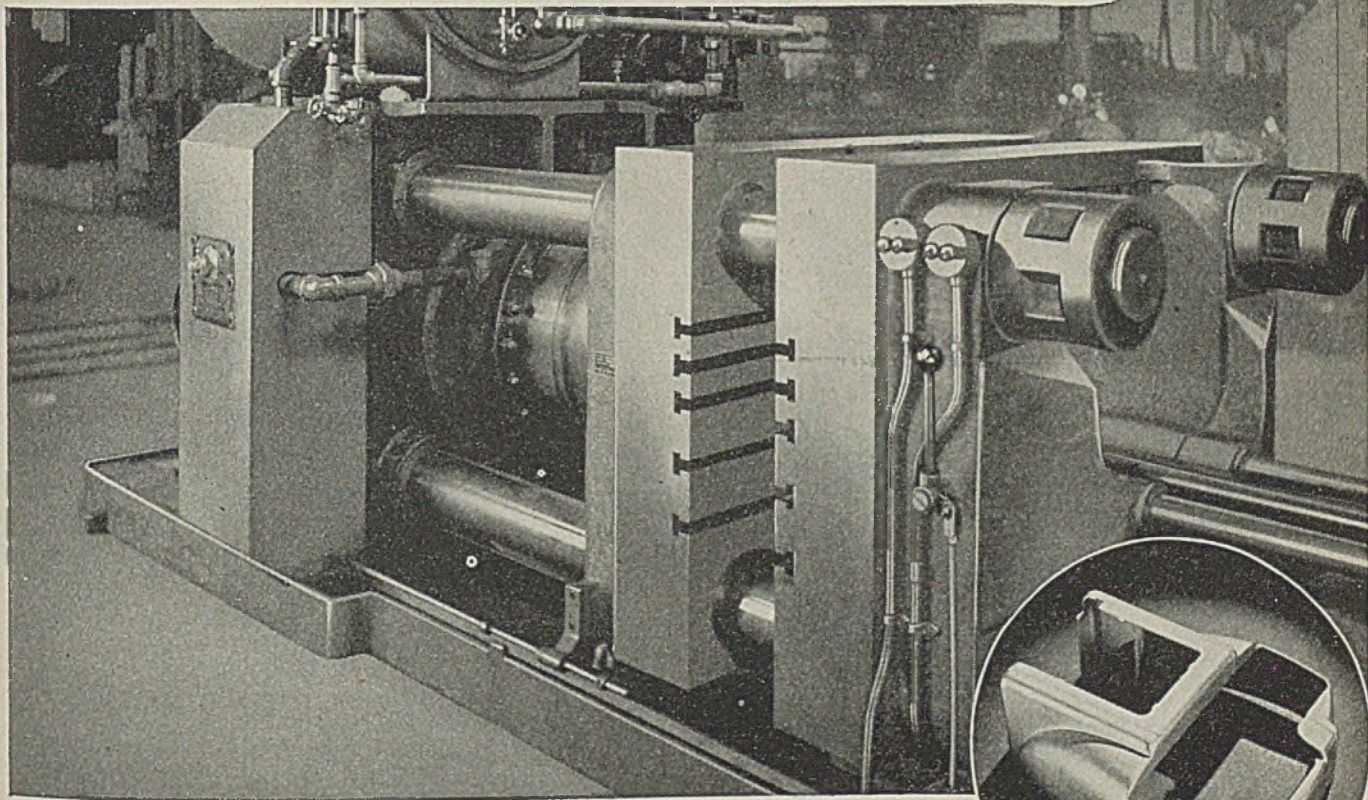
The gas control valves of this model 3900 torch are located so they can be more easily manipulated when the diver

STEEL





## A DOW MAGNESIUM SERVICE — DIE CASTINGS



### Experience — Technique — Equipment



Advancements in the techniques of die casting Dowmetal Magnesium alloys are an integral part of Dow's long and intimate association with magnesium.

Magnesium Die Castings made by Dow offer such advantages as low cost in quantity production, dimensional accuracy, weight saving by ability to cast thin sections and decrease in machining.

Long experience has made Dow the recognized source of authentic information on magnesium—covering a range from ingots to finished products. Regardless of the form of fabrication, if this weight-saving metal is to be used, consult Dow.

**THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN**

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# MAGNESIUM

PRODUCER SINCE 1916



INGOTS • CASTINGS • FORGINGS • SHEET • STRIP • PLATE • EXTRUSIONS



**A Good Place  
to Start  
in Your  
POST WAR  
PLANNING!**

*Install  
or Convert to*  
**STAINLESS  
EQUIPMENT**

**Costs less than you may think if you  
recommend this Borg-Warner Product**

One of the first considerations in planning new construction or rehabilitating present plants and equipment should be to provide protection against corrosion. One of the most economical and satisfactory ways of doing this is to use Ingaclad Stainless-Clad Steel . . . the Borg-Warner Product with a record of more than 10 years of satisfactory service.

**Users of Ingaclad include these and many others:**  
American Cyanamid Co.  
Armour & Co.  
Corn Products Refining Co.  
Dow Chemical Co.  
Fleischmann Co.  
General Foods Corp.  
Graver Tank & Mfg. Co., Inc.  
Hercules Powder Co.  
Leader Iron Works  
Eli Lilly & Co.  
Monsanto Chemical Co.  
Procter & Gamble Co.  
Sherwin-Williams Co.  
United States Potash Co.

**Sharply Reduces Material  
Cost yet Gives Perfect Protec-  
tion on the side that is used**

As producers of both Ingersoll Solid Stainless Steels and Ingaclad Stainless-Clad Steels, our engineers are able to give you unbiased recommendations, based on practical experience in serving America's leaders in the Chemical, Food, Paper, Soap, Textile and other Process Fields.

*Prepare now for the competitive days ahead by offering your customers improvement of product, lowering of production and maintenance costs through the use of non-corrosive equipment. It will pay you to investigate Ingaclad NOW! Fabricators should write for Free copy of "Ingaclad Welding and Fabricating Procedures."*

**INGERSOLL STEEL & DISC DIVISION**  
**BORG-WARNER CORPORATION**

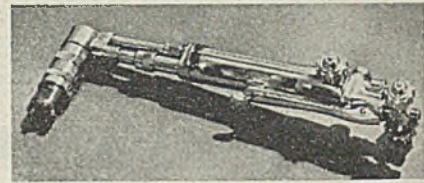
310 South Michigan Avenue • Chicago, Illinois  
Plants: New Castle, Indiana; Chicago, Illinois; Kalamazoo, Michigan

**INGACLAD**  
**STAINLESS-CLAD STEEL**

**"Back the Attack  
with  
WAR BONDS"**

*"A  
Borg-Warner  
Product"*

wears heavy gloves and operates in murky water. The torch will start the cut and will do the actual cutting with



greater speed. It also is easy to maintain in service, and occasional reconditioning can be undertaken with a minimum of skill or special tools.

**Commutator Cleaner**

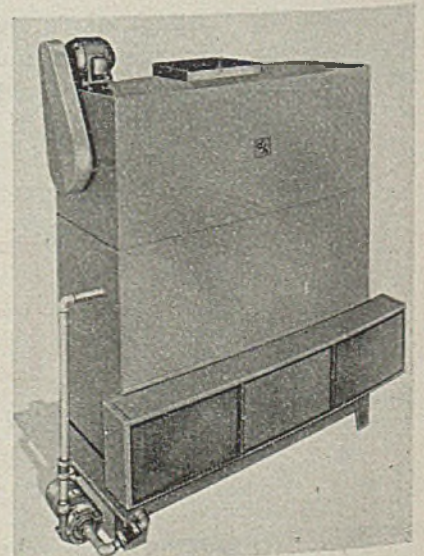
The industrial commutator cleaner—scientifically designed for practical use by Industrial Power & Equipment Co., 405 Millbridge street, Pittsburgh 10—consists of a pulverized non-conducting abrasive, bonded by a proven process into a uniform flexible material and securely fastened to an all-wood holder. It will not scratch or score the commutator or collector (slip) rings of an electric motor but will remove high resistance film and leave a clean polished surface. This promotes better commutation, reduced sparking and increased brush and commutator life. Also, it will not fill commutator slots on undercut armatures but it removes all burrs after undercutting.

The tool eliminates selectivity, resulting in more uniform distribution of current and lower brush temperatures. It is a safe, easy tool to hold, resulting in fewer burned fingers and also reduces the hazard from flying particles to a minimum.

**Filter—Condensers**

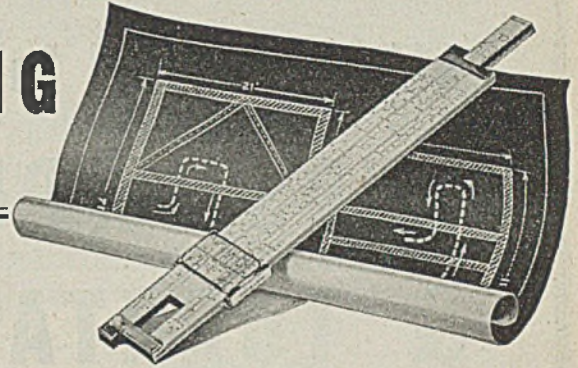
A built-in air filter is the feature of the evaporative condensers now manufactured by Drayer & Hanson Inc., 738 East Pico street, Los Angeles 21.

The new air filter feature is standard equipment on all models. Model designs

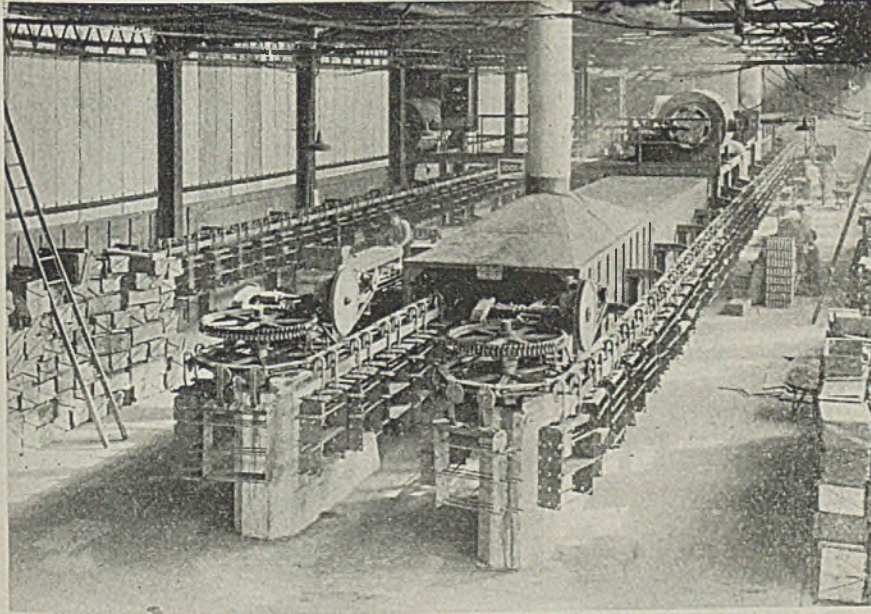


**STEEL**

# OVEN ENGINEERING NEWS



## Oven-Conveyer System Speeds Core Making; Cuts Reject Rate; Saves Fuel, Equipment and Labor



● When the Pittsburgh Valve and Fitting Company decided to streamline core production in its Barberton, Ohio plant, it started by rearranging the entire core department around the three-zone automatic double conveyer oven shown above. That this move was sound has since been proved by the following facts:

1. *Baking times* have been reduced 30 to 40 percent. The cycle is 60 minutes, regardless of core size, due to controlled temperature variation.
2. *Cores* have greater impact resistance and show a tensile strength increase of 15 percent, with rejects cut to less than half of 1 percent of total production.
3. *Preheating* of cores in initial oven zone use of cooling zone exhaust as make-up air for the heating system, and careful oven engineering of the entire project result in approximately 32 percent saving over cost of previous methods.
4. *Conveyers* travel past coremakers' benches, eliminating use of auxiliary

trucking and cutting loading time and labor materially.

5. *The oven* comes to temperature in 20 minutes, and is started when core-makers come to work, thus eliminating the need for a watchman or fireman to start oven in the early morning.

### 7500 Pounds of Cores Per Hour

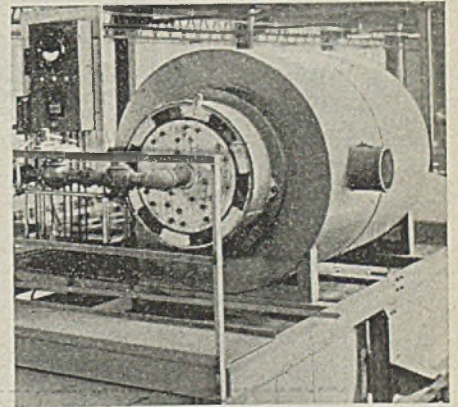
In addition to the double conveyer oven, a single conveyer oven of the same type is included in this installation. Both ovens are 120 feet long, carrying work directly into the core storage room. Capacities are 5000 and 2500 pounds of cores per hour, respectively—plus weight of plates, conveyer, chain and racks.

Cores treated in this plant vary from a few ounces to 30 pounds each, and are dried together without overbaking small ones or underbaking large ones. Maximum temperature is 600° F., controlled at two points within the system, and heat input is automatically proportioned according to the temperature drop in primary zone and baking zone proper.

The primary oxidation zone, which pre-heats cores with exhaust air from the baking zone, is a new departure in core oven design. In the baking zone, the distance from supply duct to recirculation duct is nowhere greater than 2 feet, assuring a very low temperature drop.

### Standard Air Heater

This is the air heater for the double-conveyer oven. Its gas capacity is 4000 cubic feet per hour. Heating equipment is housed in a steel plate casing insulated with magnesium blocks and 1600° insulating brick. The main recirculating fan is built to withstand 1000° F. The burner



is of the multi-jet, forced inspirator type, arranged for 12-1 turn-down ratio for minimum and maximum heat loads in the handling of small or large cores.

This heater is the largest of a standard size range for installations of this type.

### Blueprint for Industry Part II

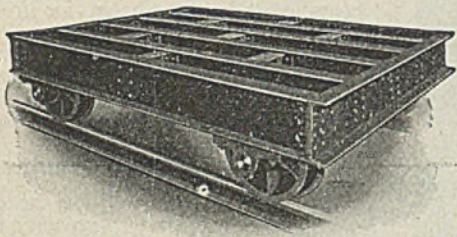
Send now for this unusual engineering book on high - production convection heated ovens for batch and continuous heating processes. In addition to detailed descriptions and blueprints of many interesting oven-materials-handling systems, it contains two pages of engineering data on gases and other materials, along with various fan law problems. FREE while it lasts.



(This is No. 6 of a series. Feel free to ask for additional information on any fact presented here.)

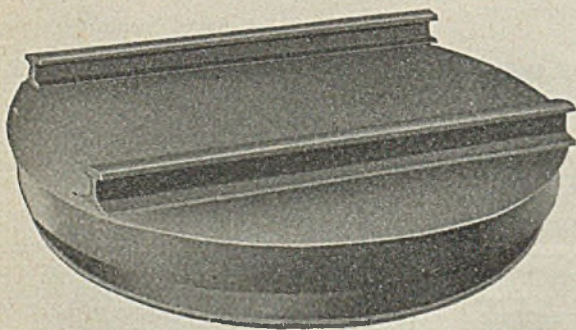
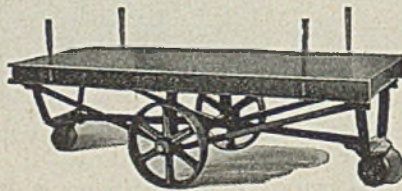
THE INDUSTRIAL *Oven Engineering* COMPANY  
11621 Detroit Avenue  
Cleveland, Ohio

# All types of Industrial CARS, TRUCKS & TURNTABLES



We give **PROMPT ACTION**  
to your specifications

CALL, WIRE  
OR WRITE  
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Ask us for  
**Suggestions**

on any car or truck  
problem . . . or send  
your specifications  
in any form, notes,  
drawings, etc.

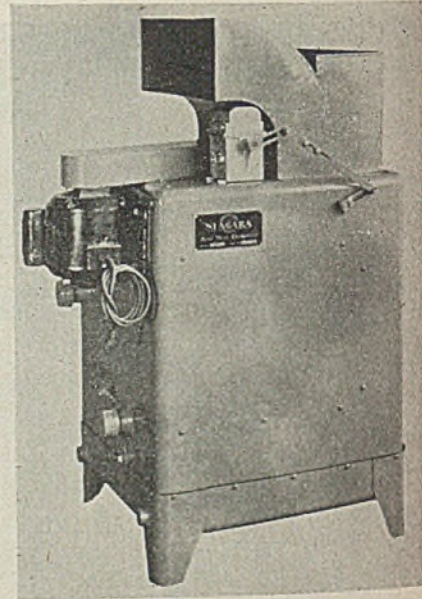
**INDUSTRIAL CAR BUILDERS FOR 40 YEARS**

**CHASE** Foundry & Mfg. Co.  
COLUMBUS, OHIO

are modernized to incorporate the new development and to provide improvements in compactness and efficiency. The filter is of metal, yet rust proof. It is incorporated so it may be removed easily and washed or cleaned when necessary.

## Compressed Air Cooler

Improved equipment for the cooling of compressed air which results in drier air and prevents water damage to pneumatic equipment has been developed by the Niagara Blower Co., 6 East Forty-fifth street, New York 17. The new Niagara Aero after-cooler for compressed



air uses the evaporative cooling principle to obtain the lower temperature. This new design gives greatly increased capacity in compact apparatus.

Air, drawn by a fan through a water spray across coils containing the compressed air, is the cooling medium. Temperatures within 10 degrees of the wet bulb air temperature can be maintained. This permits lower temperatures by 10 to 25 degrees, and produces compressed air that contains only one-half to three-fourths the amount of water formerly experienced with best practices.

## Drop-Bottom Dump Skid Box for Fork Trucks

In answer to widespread demands for a skid box that could be dumped satisfactorily with standard fork or high-lift power trucks, engineers of Union Metal Mfg. Co., Canton, O., have developed the drop-bottom dump skid box. It consists of an all-steel box attached to a skid platform with a continuous hinge at one end. Steel plates are welded to the skid at a point equal to the length of the fork or platform on the power trucks to hold the skid in position at the end of the forks and prevent it from sliding back as the forks are lowered. Attached to the top rear of the box are latch rings which are

**STEEL**

# "Stanco"

## ELECTRIC WELDED STEEL TUBING

and Fabricated Tubular Parts for Mechanical, Pressure and Structural Applications

### SIZE AND THICKNESS CHART

* TUBE DIAMETER * O.D. SIZE	* MAXIMUM WALL *		* MINIMUM WALL *	
	DECIMAL	GAUGE	DECIMAL	B.W. GAUGE
5/8"	.065"	16	.028"	22
3/4"	.065"	16	.028"	22
7/8"	.065"	16	.028"	22
1"	.095"	14	.028"	22
1-1/8"	.083"	13	.035"	20
1-1/4"	.095"	13	.035"	20
1-3/8"	.095"	12	.035"	20
1-1/2"	.109"	11	.035"	20
1-5/8"	.120"	11	.035"	20
1-3/4"	.120"	11	.035"	20
1-7/8"	.120"	8	.035"	20
2"	.165"	7	.035"	20
2-1/4"	.180"	6	.035"	20
2-1/2"	.203"	6	.035"	19
2-3/4"	.203"	5	.042"	18
3"	.220"	5	.049"	17
3-1/4"	.220"	4	.058"	16
3-1/2"	.238"	4	.065"	14
3-3/4"	.238"	3	.083"	14
4"	.250"	3	.095"	13
4-1/4"	.250"	3		
4-1/2"	.250"	3		

\*Intermediate sizes within the range indicated can also be manufactured. Please consult us for sizes not listed.

IN the construction of war products calling for the use of ELECTRIC WELDED STEEL TUBING, more and more manufacturers have discovered the advantages of specifying the "Stanco" brand.

They've found that our wide variety of shapes and sizes gives them the kind of tubing they want. And they've found that our facilities for high speed production of both standard and special types enables them to get specified tubing delivered when they want it. Beyond these highly important considerations, they've discovered that our interested and willing cooperation in the solving of special tubing problems has helped them make their war products quicker, better and at lower cost.

These same advantages will be available when Victory is won. If you need a source of ELECTRIC WELDED STEEL TUBING now, or are planning a postwar product that will

use it, let our experience and facilities help you do a better job.

BUY MORE WAR BONDS!

THE STANDARD TUBE CO.

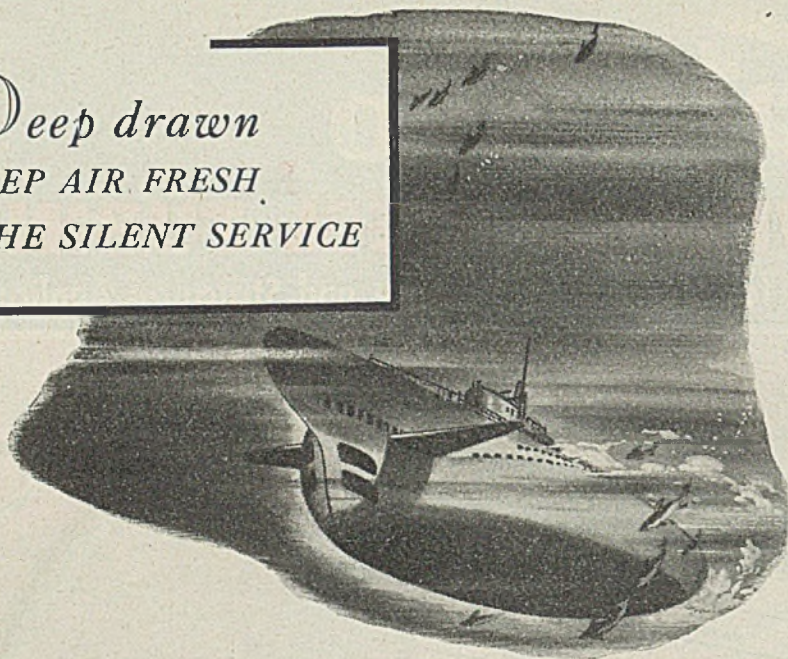
Detroit Michigan

Welded Tubing

Steel Forgings

★ Complete Tube Stocks Maintained by ★  
STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N. Y.  
LAPHAM-HICKEY COMPANY, 3333 West 47th Place, Chicago, Ill.  
UNION HARDWARE & METAL CO., 411 East First Street, Los Angeles, Calif.

## Deep drawn TO KEEP AIR FRESH FOR THE SILENT SERVICE



When men of the silent service take their submarines down beneath the surface—their "pig-boats" are air-conditioned. The air is kept fresh and healthful. The refrigerant gas is frequently stored and transported in Hackney Cylinders . . . deep drawn to specifications. They meet all requirements as to strength, weight and safety. This cylinder (at lower right) is only one of the many Pressed Steel Tank Company products being produced for the war effort.

In addition to submarine service, Hackney Cylinders are being used for the storage and transportation of many refrigerant gases which are being employed in vital applications, both war and civilian. In airplane factories, rivets are cooled in order to speed production. In locker plants, refrigeration is meeting important uses in the preservation of food. Pressed Steel Cylinders and refrigerant gases are used in the storage of blood plasma—and for refrigerated test compartments simulating weather conditions in the stratosphere.

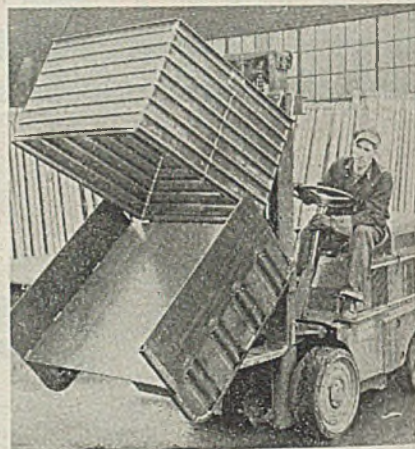
For successful performance in these vital functions, the cylinder must meet a wide variety of strength, weight, safety and handling requirements. To assure the physical properties required for the various types of gases, the cylinders are made from flat, circular plates of steel—and

they are formed into seamless cylinders by a series of cupping and forming operations. This Hackney Deep Drawing Process permits their being made to exacting specifications with uniform side-wall thickness. To further improve their physical properties, the cylinder is subjected to precision-controlled heat treatment. The result is a cylinder that is light in weight—and yet has adequate strength.

It may be that your war and postwar problems can be solved by Hackney designs and the production of deep drawn shapes and shells. Many manufacturers, through the use of Hackney Deep Drawn Shapes, have been able to conserve material, man-hours and equipment—assure adequate strength while reducing weight. Be sure to write for full details.

looked over a plate welded to the truck mast when the unit is being used.

In operation, the skid portion is entered with forks or platform of trucks, the box elevated and the latch rings attached. As the forks are lowered, the skid portion goes down while the box portion goes (or stays) up, dumping con-



tents of the box in front of the unit. Spot dumping of materials is accomplished by the side plates which form a chute to keep the contents from spilling out the sides when dumping. These side plates may be extended up to the box top and a crane loop welded to each plate, allowing the unit to be handled by crane for transporting or tiering.

This unit may also be used as a standard skid box for unit-load transportation, or handled by hand lift trucks for short operational spotting.

## Drum Opening Tool

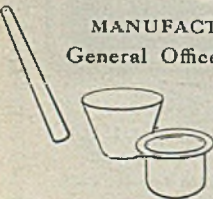
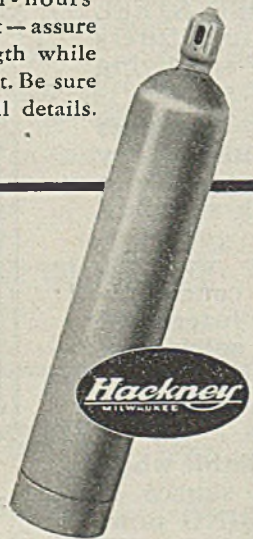
When using the drum opening tool—developed by Merrill Brothers, 36 Caspian street, Maspeth, Brooklyn, N. Y.—usual risks (such as hand injuries) involved in opening and handling medium and light weight drums are almost completely eliminated. The device operates on the principle of a household can



## Pressed Steel Tank Company

MANUFACTURERS OF HACKNEY PRODUCTS  
General Offices and Factory: 1461 South 66th Street  
Milwaukee 14, Wisconsin

DEEP DRAWN  
SHAPES AND SHELLS



# "My Choice for High Strength Steels"



"My choice for butt or fillet welding high strength steels having tensile strengths of 90,000 to 100,000 pounds is one of the Murex rods especially developed for this work. You take Type 90, for example. It operates just like any fast downhand, mild steel electrode, and when you are through, you know the weld is clean and sound and has a ductility that's way up there around 20%.

"When it comes to working in awkward places, there's nothing handier than Murex Cromansil. You see, this electrode has a spiral winding of asbestos yarn which anchors the

coating to the core wire to permit bending the electrode. It's a downhand rod for either A.C. or D.C., similar in characteristics and applications to Type 90.

"And for building up defects, or repairing flaws in really high strength castings, there is that new Murex No. 2 Chrome. You can use this rod in any position with no trouble at all and get welds in air-hardenable steels that run up to 124,000 lbs. per square inch in strength.

"All in all, when there is a special job to be done on one of these new special steels, give me a Murex rod every time."

MUREX ELECTRODE	AWS-ASTM Class	IDENTIFICATION		Current	POLARITY		TENSILE STRENGTH OF DEPOSIT		ELONGATION OF DEPOSIT IN 2"	
		Color Of Coating	Color-Marking		Groove Welds	Fillet Welds	As Welded (p.s.i.)	Stress Relieved (p.s.i.)	As Welded %	Stress Relieved %
Type 90	E-9020 and E-9030 or E-10020 E-10030	Dark Brown	End: Orange Secondary: Black	A. C. or D. C.	Reverse	Straight		90,000 to 100,000		18 to 21 (400° preheat)
Cromansil	E-9020 and E-9030 or E-10020 E-10030	Brown (Wound)	End: Orange Secondary: Black	A. C. or D. C.	Reverse	Straight		90,000 to 100,000		18 to 21 (400° preheat)
No. 2 Chrome	None	White	End: Gray Secondary: None	A. C. or D. C.	Straight	Straight		123,000 to 124,000		16.5 to 18

o Write to Metal & Thermit or your own Murex distributor for a free copy of the Murex Electrode chart. It describes applications of Murex Electrodes and lists their physical characteristics.

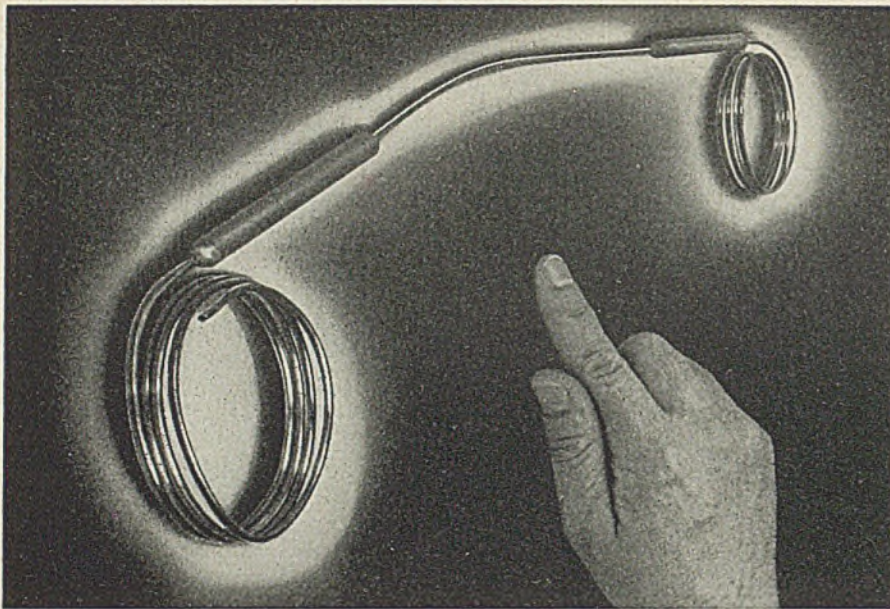
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Specialists in welding for nearly 40 years. Manufacturers of Murex Electrodes for arc welding and of Thermit for repair and fabrication of heavy parts.



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## Anything like this IN YOUR PLANT?

This copper tubular part, when cut in two, is used as a control bulb in the manufacture of essential refrigeration equipment.

By making bulbs in pairs, Wolverine now saves time and manpower and also enables the user to eliminate one cutting operation.

The ends of the bulbs are reduced by the Wolverine Patented Tube-spinning Process\* and the pig tails of capillary tube are brazed into them.

Required for a definite purpose, this assembly was designed by the user in collaboration with Wolverine tube-fabricating engineers. All specifications are being met and the job is in production.

If this piece reminds you of a similar problem of yours involving tube or tubular parts, call Wolverine Tube Division for consultation and quotation. We have hundreds of standard tools already on hand for making parts and assemblies similar to the part shown here, along with a wealth of experience in handling seamless tube.

Or if you prefer to make the part yourself, call on Wolverine anyway as a source for tube that will be uniformly high in quality and possess the right properties for fabricating. Also consult our engineers regarding types of tools, methods, and techniques. Their talents and services are yours for no cost.

\*Send for illustrated Catalog E-2 which describes many interesting applications of this new process.

• Our new address is Detroit 9, Mich.

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CALUMET AND HECLA CONSOLIDATED COPPER COMPANY

**WOLVERINE TUBE DIVISION**

Seamless Copper—Brass

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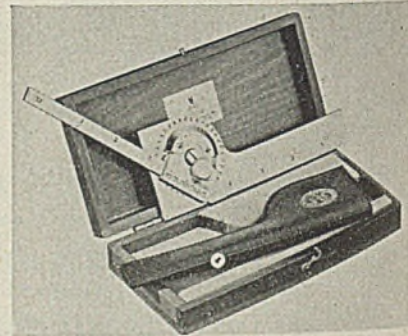
opener. As it firmly grips the outside of the barrel, it cuts smoothly and evenly, folding the cut edges in close to the barrel. This permits the reuse of barrels and drums.

It is especially adapted to opening drums used for shipping chemicals, corrosives and other materials. Made of steel drop forgings, hardened and tempered, it can be resharpened when necessary.

### Lock-Type Protractor

A new pocket-size lock-type protractor is designed for accurately measuring angles of drill points, tool bits, machine ways, depths of deep holes; for sketching and laying out tools and machine parts, dies and jigs; and inspection of manufactured parts.

Manufactured by Industrial Engineering Co. Inc., 141 West Jackson boulevard, Chicago 4, and marketed under



the name Xactor, its adjustable lock-type sliding scale pivots the full 360 degrees, assuring measurement of any angle instantly to an accuracy of  $\frac{1}{2}$  to 1 degree. Deeply etched graduations afford easy reading—even in poor light.

It also has the added advantage of a quick acting and compact locking feature on the vernier turret which rigidly secures any specific measurement or angle by locking both the vernier turret and the sliding scale. This speeds accurate mass gaging where many items of the same size or angle must be checked.

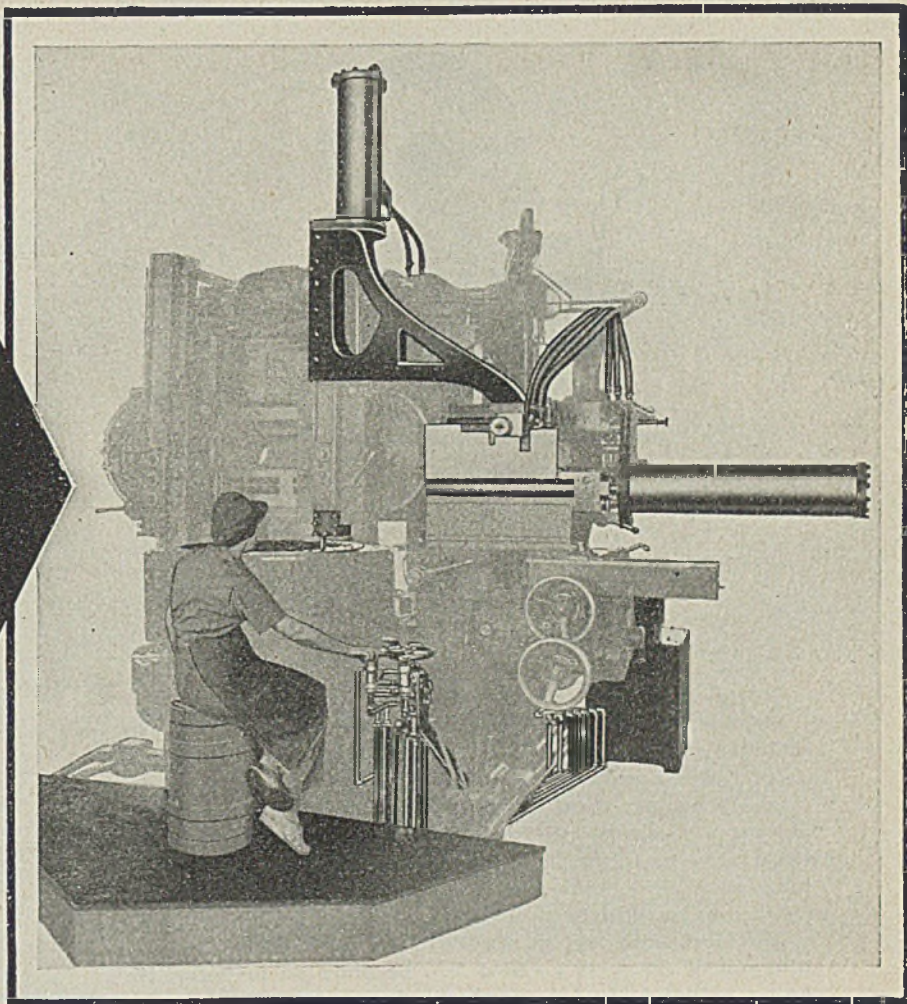
### Magnifying Mirror

In order to watch an operation or a dial which is at a point otherwise not visible, the Larrimore Sales Co., P. O. Box 1234, St. Louis 1, has developed a No. 7-11 magnifying mirror. This magnifying mirror considerably enlarges the part, operation or action, making it easier to see. Like any magnifying lens, the mirror must be focused—that is, the mirror must be placed close to the object to be reflected (about 10 to 12 inches) but the mirror may be observed from any reasonable distance. The mirror cannot be used when the subject to be reflected is more than 12 inches from the lens.

The fine silvered plate glass mirror is  $5\frac{1}{8}$  inches. Overall size is  $7\frac{1}{2}$  inches. The bracket is of 15-inch tube, flexible full length. Mounting is at back of the mirror on an L-arm. Base mounting has three screw holes for attaching by bolts, machine or wood screws.



THE HAND THAT ROCKS  
THE CRADLE CAN ALSO  
SINK THESE DIES



Turchan Followers attach easily to any standard lathe, planer, shaper, grinder or mill.

**T**IME was when die sinking demanded extreme skill and only experts were permitted to tackle the job. Today, however, ingenious mechanical devices such as the Turchan Follower have decreased the possibility of human error and lessened the necessity for such rare skill.

Take, for example, the sinking of drop forge dies — dies of almost every conceivable contour, designed to take a merciless pounding. That used to be a man's job. But today, thanks to Turchan Followers, the hand that rocks the cradle can sink such dies. And do it well!

The accompanying photograph shows a woman in a large forge plant operating a Turchan-equipped vertical turret lathe. She's sinking a die for drop forging an airplane engine part. Notice the easy, all-hydraulic, single valve control. Notice the cutting tool following every movement of the tracer mechanism. Above all, observe that the Turchan is merely an attachment — a relatively inexpensive attachment — to the die sinking machine.

The owners of this machine *Turned to Turchan* for faster, better, more inexpensive die sinking. Why don't you *Turn to Turchan?* Inquire today.



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*Turchan*

Originators

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*It Creates . . . It Produces*

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We've always leaned upon industry and always will . . . for industry provides the goods, the jobs, the wages that give us everything we have.

Less than one-third of gainfully employed people are in industry. Their wages provide work for the more than two-thirds remaining. This group, including professional men, such as doctors, lawyers, preachers, as well as service people of every type, can only be as prosperous as is industry.

How does industry get started? It is very simple. A man, like you or me, gets an idea . . . becomes an inventor. He knows a friend who has saved up a few dollars. They go into business together. They produce something the public wants, something the public buys.

The business grows. New plants are built. Thousands of men get wages. People have money. They buy. The snowball starts rolling and keeps rolling.

This is Free Enterprise. It is based upon a willingness to run the risk of investing money; the urge to find new and better methods and products; and a hope of profit.

Wealth cannot be created by any other system. That's the way we start the enterprises that lead to prosperity—and, what is far more important in the postwar period—to the creation of JOBS.

A community cannot exist without Industry. Industry does have a big job to shoulder . . . and we all should help.

*Geo. P. Trundle Jr.*  
President

## THE TRUNDLE ENGINEERING COMPANY

*Consulting Management Engineering*

GENERAL OFFICES • CLEVELAND • BULKLEY BLDG.

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## Metallic Materials

(Continued from Page 114)

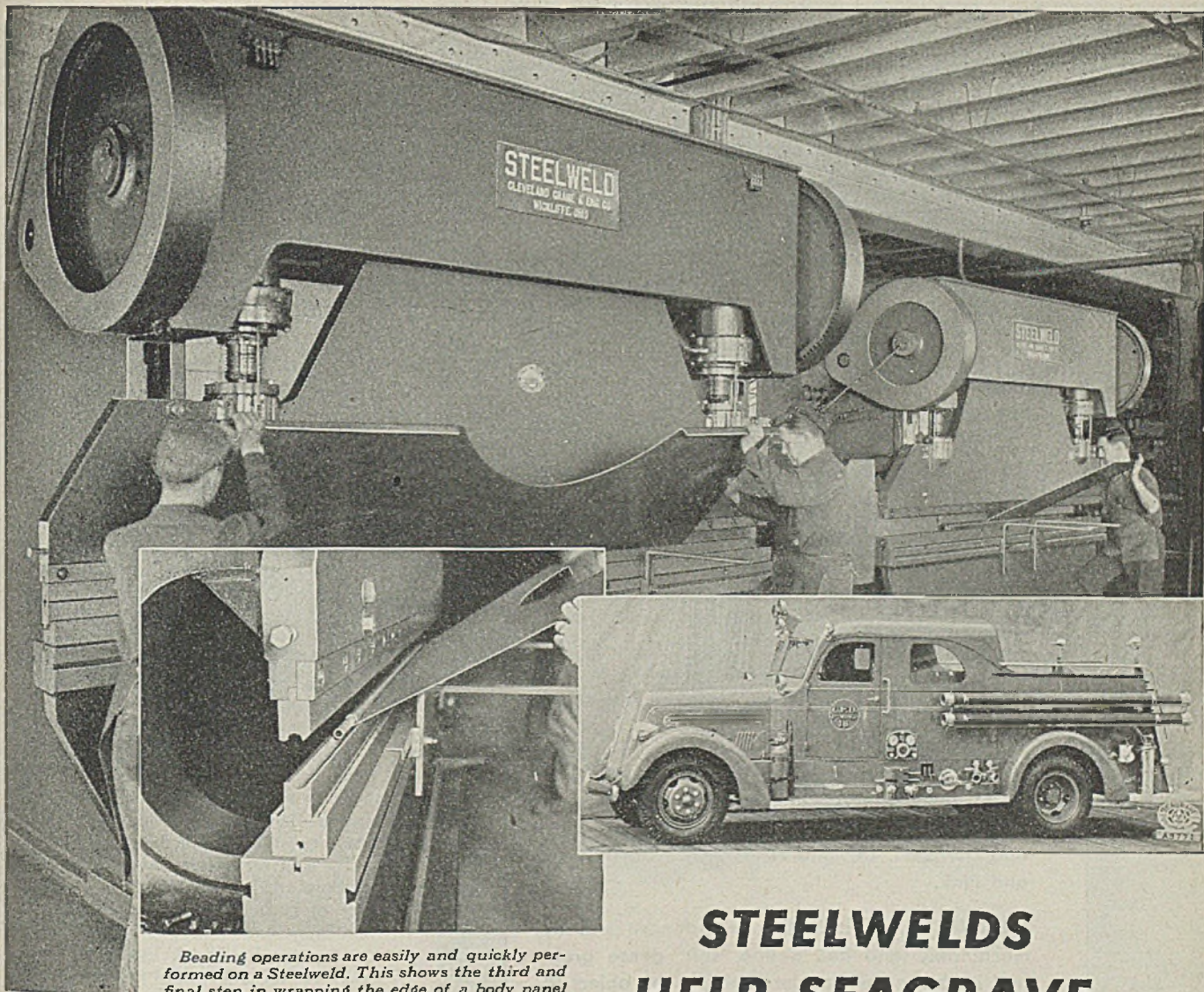
well as at the surface. Actually, this has not often been demanded. If a steel that will quench harden to 60 or 65 rockwell C on the surface, hardens to 50 rockwell C at the center, it is ordinarily considered sufficiently well hardened, even though the center is not 100 per cent the file-hard material that results from a full quench, but instead is a mixture of that and of another structure. As the metallurgist puts it, the center is not pure "martensite" but is mixed "martensite" and "bainite". Martensite is the name given to the fully-quenched, file-hard structure. Bainite is a name given to what we may here consider as a "normalized" structure obtained at a relatively fast rate of cooling, but one short of the "successful quench" of Fig. 2. The bainite structure, and the structures resulting from tempering it, have virtue when the structure is under control. Very good shovels and other thin sections result when steel of proper composition is "quenched" into a hot bath held at a selected temperature toward the bottom of the normalizing range and held there for a long time, usually hours. The maintenance of exactly the right temperature is vital to control of the structure and if the piece is much over ¼-inch thick, the center refuses to cool down to the bath temperature without transforming to a too coarse, normalized structure.

### Tests Prove Core Properties

Neither the normalized structure nor the bainite structure tempers back to the structure shown by tempered martensite, even though the hardness of the center, after tempering, is but little below that of the tempered martensite at the surface.

In using standard end-quench hardenability curves as criteria of equivalence in an old and a substitute steel, there is indeed a great degree of equivalence in such sections that both become fully martensitic on quenching. The high and low hardenability heats of Fig. 11 are probably very closely equivalent in 1-inch diameter, since the centers of each are 55 rockwell C or above, indicating essentially martensitic structures in each. In 3-inch diameter, the high hardenability heat is likewise essentially martensitic throughout, but the low hardenability heat is martensitic only at the very surface, and none too completely so there. One of these might be just as good as the other, in a heat-treated shaft, after tempering back to 30 rockwell C, i.e., where fatigue resistance at the surface is the requirement. But in a heavy connecting rod where core strength is involved, they would not be equivalent.

One need not speculate on these core properties, they can be tested for. The two steels or two heats of the same SAE or NE steel can be quenched in large sections, tempered, and test specimens taken from the core. Differences in dimensional changes on quenching and



Beading operations are easily and quickly performed on a Steelweld. This shows the third and final step in wrapping the edge of a body panel around a pipe to secure the rigidity necessary.

## STEELWELDS HELP SEAGRAVE BUILD MODERN FIRE APPARATUS

Body panels, hoods, fender aprons, dashes, running boards, gas tanks, and other parts for the pumpers, ladder trucks and fire-fighting equipment made by The Seagrave Corporation, Columbus, Ohio, are fabricated on their two Steelweld Bending Presses.

These parts requiring bending, forming, louvering, beading, punching and notching, are formed a few at the time in production runs as the demand requires. It is easy to switch from one operation to another because it is a quick, simple matter to change the dies.

The satisfactory performance of the first press, a model I-10 installed in 1936, led to the purchase of a second machine in 1941, a model F3-8. The older press handles plate up to  $\frac{1}{4}$ -inch by 13 feet and the newer machine up to  $\frac{3}{16}$ -inch by 11 feet.

By replacing sharp welded or riveted corners wherever possible by quickly made, smooth, round, bended ones, the Steelwelds are proving an important factor in providing the modern, sleek appearance characteristic of Seagrave fire apparatus.



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**WELDING  
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**SHEET METAL AND FILLET WELD ELECTRODES:** Electrodes for light gauge sheet metal welding. AGILE Blue-Grey is a semi-automatic fillet weld electrode that is the easiest handling rod on the market. Inexperienced welders can lay professional welds with less than an hour's training with it.

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WELDING ELECTRODES**

Covering an unusual hardness range, these electrodes are designed for building tool steel cutting edges, chisel tips, dies of all kinds, etc. Applied with usual welding technique. Complete literature now available.

tempering may also crop up, especially when the sections dealt with do not harden fully throughout. Information on such features of the NE steels is still scanty, especially for large sections. The user of heavy sections will need to get it for the particular cases he is up against. The user of small sections, whose hardenability curves show that the center of the small section will quench out essentially martensitic, say to within 5 points rockwell C of the maximum attainable for the carbon content (Fig. 3), has much more assurance that the new steel, properly tempered, is the equivalent of the old.

The way a steel responds to cooling rates between those of normalizing and of quenching is closely related to its behavior when "quenched" into a molten salt or analogous baths held at different temperatures within the 900-400 degree Fahr. range, which as Fig. 2 shows, lies between the temperatures at which the change occurs to the normalized or to the quenched structure. Data so obtained are plotted in "S curves", so called from their shape. The interpretation of S curves takes metallurgical experience. The designer may, however, be interested in the comments of Orton and Carter<sup>2</sup> on S curves.

#### User Must Make Own Tests

All discussions of the selection of NE steels as substitutes for SAE steels emphasize that the user must, by some means or other, supplement the hardenability data by specific tests of his own to insure adequacy for his use. Equivalence of hardenability merely nominates candidates for scrutiny. It is for this reason that no handbook listing or "cross index" of "NE substitutes for SAE steels" can be made with any degree of finality. Moreover, all the discussions of the NE steels further point out that shifts in the list of NE steels have already had to be made and further shifts are expected in the future, as availability of the alloying elements varies.

It thus becomes necessary that the engineer become ready to evaluate, not only the present substitute steels but the *future* substitute steels as well.

The evidence is very complete that, insofar as properties are measured by the standard tensile test, one *completely* hardenable constructional steel, of a given carbon level, gives tensile properties practically identical with those of another completely hardenable steel of comparable carbon level, irrespective of chemical composition.

Information is being accumulated<sup>30</sup> on fatigue, notched-fatigue, and notched-impact, on the NE steels being used as replacements for SAE steels in aircraft, and such evidence again indicates that, in fully hardened steels drawn back to the same tensile strength, these properties are thoroughly normal. But these evaluations by purely laboratory tests, though indicative, are not so completely convincing as evaluations through service.

Many case histories of attempted, usually successful, replacements of SAE by NE steels are accumulating. Several of



## **“Now they tell me—**

***I shouldn't have used it on an oil fire!”***

● This man thought he was doing his duty when he ran for an extinguisher and turned it on a little fire. But nobody had told him that different classes of fire call for different fire-fighting methods. So he used a good extinguisher against the wrong fire—and the blaze soon got out of hand.

The way to make trained fire

fighters out of your men is to stage demonstrations. Put your own extinguishers into action against real fires. Explain the different classes of fire and the right way to fight each. A booklet prepared by Walter Kidde & Company tells how to make the demonstration interesting and instructive. Write today for free copy of “How to Teach Fire Fighting.”



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## The Sky's His Limit Under the Best Postwar Plan

Freedom is not given a people by a benevolent Government—it is something we must work to *get* and work to *keep*. Freedom of Enterprise has made America the world's most powerful and prosperous nation in both peace and war. Here we have the highest wages paid in the world, here we have developed the highest standard of living. Here we have not been subject to the repressions of a state-controlled economy, but have been free to develop individualism and self-reliance. Let's keep it that way.

We believe our returning soldiers will prefer a job with private industry where the "Sky Is the Limit" for their advancement—in direct proportion to their individual initiative, skill, and ability. Our system of Free Enterprise makes this possible, for it creates the vast volume of American production so necessary to attain and maintain high levels of employment.

In planning for the future, what can be more vital than to combat many plans that seek to abandon the system that has made this possible—Free Enterprise. Continuance of Free Enterprise, plus native American industrial skill and ability, will avoid the gaunt spectre of mass unemployment after the War.

But—unless we are willing to trade the time-proven Free Enterprise system for some substitute which will nullify individual initiative, progress, and freedom, we must speak up. We must explain its principles and advantages to those who may not understand them, because appreciation comes only from knowledge and understanding. If we fail to do this, the failure will be ours.

# CURTIS

**CURTIS PNEUMATIC MACHINERY DIVISION**  
of Curtis Manufacturing Company  
1996 Kienlen Avenue St. Louis, Mo.  
Air Compressors • Air Hoists • Air Cylinders



these are given in Reference 14. Particularly interesting is the work of Widrig<sup>14</sup>, who studied chipping of clash gears on full-sized gears in a special simulated service clash test and, with this test equipment available, put it to use in evaluation of some heats of NE steels of approximately equal hardenability with the previously used SAE-4320, since it was felt that the fatigue resistance and "toughness" required in clash gear service might be different, though it was concluded that "as to shafts and parts of that nature where gear teeth are not involved, hardenability tests are sufficient for proper selection of steels". He found, by the simulated service test, as well as by service, that "ordinary Charpy and Izod tests gave no indication whatever of actual resistance to impact caused by shifting gears in field tests". After adjustment to compensate for the different distortions of the NE-8600 and 8700 series, these NE steels are found closely comparable to SAE 4320, for clash gears.

### Study Resistance to Overstress

Wood and Sanders<sup>32</sup> developed an apparatus for studying the resistance of steering knuckles to repeated over-stress, using actual full-size knuckles rather than endurance specimens, and applying measured stresses of the magnitude and direction met in service. They first determined the range of lives at the selected stress, given by several lots of knuckles made from the steel X3140 that had previously been used in production, and then by those made from several other steels. In this comparison SAE-4140 gave knuckles that tested slightly better than X3140, but the supply situation was shifting so that 4140 would not be available. A third steel was then tried and gave a wide scatter in results at first, but after engineering modification of fillet radii, the scatter was reduced to normal and the average life increased.

In turn this third steel became unavailable, so NE-8744 was tried. The average and high values were satisfactory, but some low results were obtained. Shot-blasting the area of stress concentration was then resorted to. The low fatigue-life figure for this one selected stress rose to 639,000 against a *maximum*, with the X3140 knuckles, of 241,000!

The search for a metallurgical substitute developed the fact that feasible engineering modifications were so much more potent than steel composition that the final results, using a mildly alloyed steel plus some mechanical engineering attention, far surpassed the original highly alloyed steel without that attention.

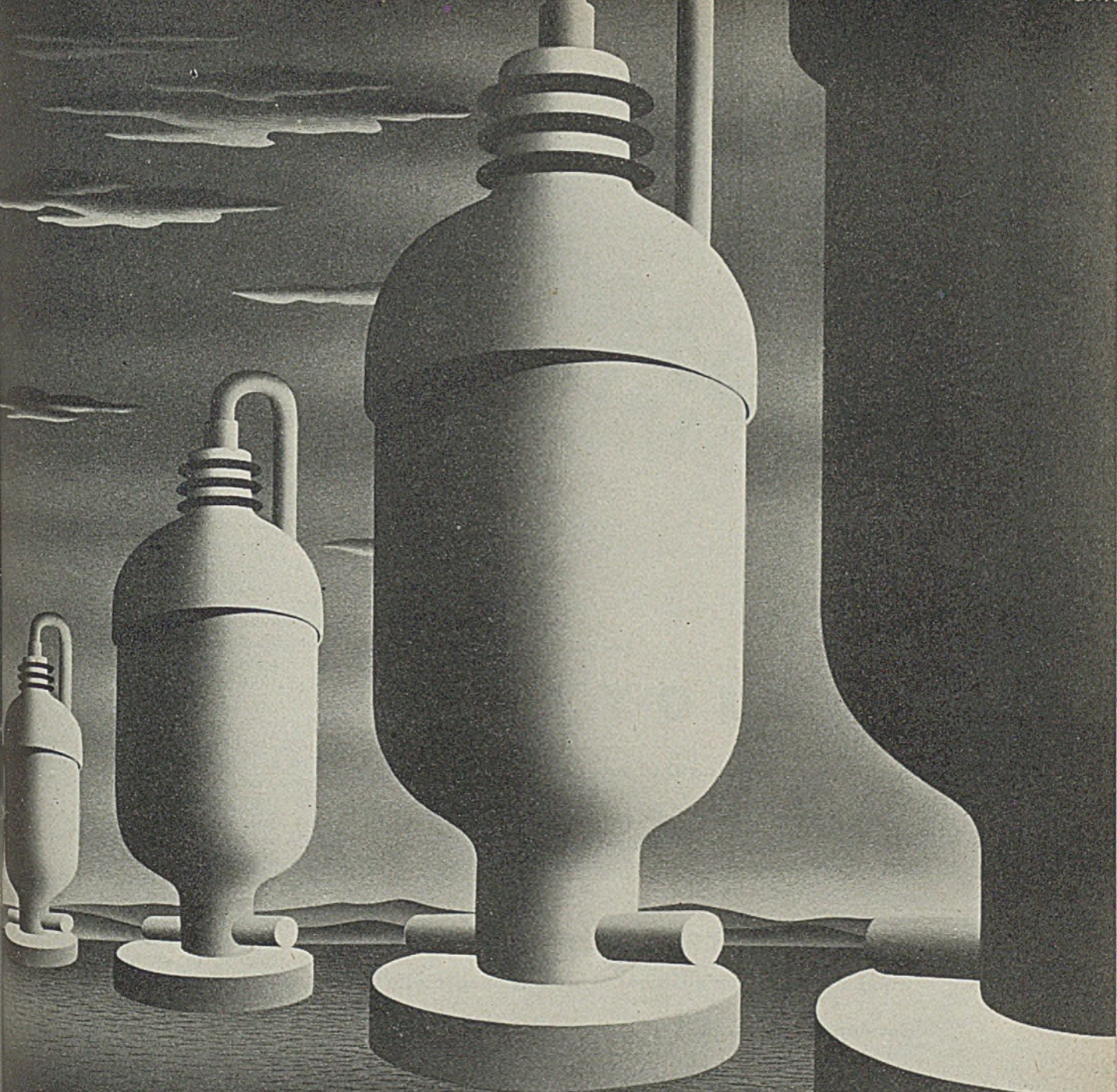
These cases of simulated service testing produced acceptable proof of suitability of substitute steels. When is it necessary to resort to such modes of testing for the evaluation of metallic materials?

### CHAPTER III

#### "Pounds Per Square Inch"

Design engineering consists in making each part of suitable dimensions and of

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Creative steel-making at Midvale is a partnership of imagination and science. Together they have perfected the most valuable alloys known to the industry. Together they look forward to challenges of the future. Whenever the question arises: "Can this be made of steel successfully?" Midvale welcomes the opportunity to look at the blue prints.

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# Koroseal

## TANK LININGS

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## BY UDYLITE

Here is a tank lining that has everything. Koroseal is a synthetic elastic material which is unusually resistant to oxidizing acids and corrosives.

Koroseal is quickly and easily applied directly to wood, steel or other surfaces by means of specially developed adhesives. No vulcanizing. Approximately 100 lbs. per square inch bonding strength.

This material allows practically no absorption of chemical solutions and it does not contaminate plating bath.

Koroseal is unaffected by oils or grease. Resists abrasion well and it is easily and quickly repaired.

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Cleveland 3  
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suitable material to withstand the service stresses. To do this by true engineering rather than by guess work requires knowledge of (a) the stresses to be imposed, and (b) the properties of the material in resisting those stresses. If both (a) and (b) are known, the dimensions can be calculated.

Knowing the permissible weight of the part and the available space into which it must go, its dimensions can be altered, as well as the dimensions of its mating parts. The properties of the available material must be such that the part made from it will not only bear the stresses safely but will also fit the space that can be assigned to it.

### Substitute Must Be Adequate

When a new material is to be substituted in a part of an old design where the dimensions cannot be changed, as in a repair part, the substitute material must be *adequate*. If it is adequate, for that use material B is an equivalent of material A previously used. All of the properties of A and B need not be identical, for A may have had an unneeded excess in some properties, or A may have had properties not called for. If the mechanical properties of B are adequate, it would make no difference for most uses whether the electrical conductivity of A was high and that of B low. On the other hand, it might happen that a similar coefficient of thermal expansion, for example, would be required.

Adequacy cannot be appraised apart from the conditions of service. Equivalence connotes equal adequacy for service, and likewise cannot be considered apart from conditions of service.

Identity can be appraised apart from service, and by that token, it is not necessarily required for service. When a Supreme Court Justice retires, he does not have to be replaced by his identical twin. Identity is no more required in materials than it is in men.

### Design in Terms of Stress

Appraisal of adequacy in design engineering should be in terms of stress and resistance to stress. When pounds, square inches, and pounds per square inch are the words in which requirements are set up, and in which properties are reported, there is no ambiguity, materials are chosen, specified, tested and accepted on a sound engineering basis.

When other attributes than strength are required, for example, resistance to corrosion, then analogous concepts, intensity of attack, ability to resist, and area available for resistance, are called for.

When these requirements and the ability to meet them are rigidly put in the correct numbers, engineering design can proceed soundly. When either the needs or the properties are put only in vague, qualitative terms, we have to guess at what we want, and at whether a given material will fill the want. Just because a test gives numbers

STEEL